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General Maths Book 3G

Produced by members of the TeeJay Writing Group

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PUPIL BOOK

3G

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S3 General Course Structure

The book is aimed at three main groups, dependent on how it is used.

- Those General pupils who would struggle with the complexities of other General resources on the market at present, who find the sudden change of pace and the level of difficulty too great to cope with - the result is usually for them to turn off and possibly give up trying.

- Top Foundation pupils who couldn't cope with General but find Foundation too easy - this textbook should allow them to tackle enough of the work to possibly gain a Grade 4 in the external exam.

- Middling to top General classes who can use this book also as the back-bone of the General course supplemented by the Extension, Assessment and Homework materials (in photocopiable form).

We took the decision to truncate the work in some chapters in S3 , for example :-

Pythagoras - Hypotenuse only

Circle work - Circumference only

Trigonometry - Tangent only (Tan tables at back of book),

in order to allow pupils to have access to these topics and feel confident with the work without burdening them with all the "tricky bits" !

The missing topics from these chapters will come in Book 4G, but for those teachers who feel the pupils could cope with the more taxing aspects of the work, we have included this in the Extension Materials.

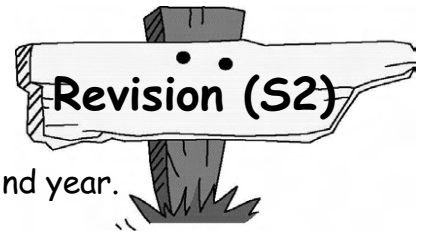
Please let us know what you think of the book - we're big enough to take (*some*) criticism !!!

Tom Strang and Jim Geddes

(*April 11th 2002*)

Contents

Chapter 0



These first 8 pages cover all the work you probably met in 2nd year.

1. Learn your tables NOW - they are a must !!.

2 x 2 = 4	3 x 2 = 6	4 x 2 = 8	5 x 2 = 10
2 x 3 = 6	3 x 3 = 9	4 x 3 = 12	5 x 3 = 15
2 x 4 = 8	3 x 4 = 12	4 x 4 = 16	5 x 4 = 20
2 x 5 = 10	3 x 5 = 15	4 x 5 = 20	5 x 5 = 25
2 x 6 = 12	3 x 6 = 18	4 x 6 = 24	5 x 6 = 30
2 x 7 = 14	3 x 7 = 21	4 x 7 = 28	5 x 7 = 35
2 x 8 = 16	3 x 8 = 24	4 x 8 = 32	5 x 8 = 40
2 x 9 = 18	3 x 9= 27	4 x 9 = 36	5 x 9 = 45

6 x 2 = 12	7 x 2 = 14	8 x 2 = 16	9 x 2 = 18
6 x 3 = 18	7 x 3 = 21	8 x 3 = 24	9 x 3 = 27
6 x 4 = 24	7 x 4 = 28	8 x 4 = 32	9 x 4 = 36
6 x 5 = 30	7 x 5 = 35	8 x 5 = 40	9 x 5 = 45
6 x 6 = 36	7 x 6 = 42	8 x 6 = 48	9 x 6 = 54
6 x 7 = 42	7 x 7 = 49	8 x 7 = 56	9 x 7 = 63
6 x 8 = 48	7 x 8 = 56	8 x 8 = 64	9 x 8 = 72
6 x 9 = 54	7 x 9 = 63	8 x 9 = 72	9 x 9 = 81

2. Copy these and do them (without a calculator) :-

(a) $\begin{array}{r} 219 \\ +782 \\ \hline \end{array}$ (b) $\begin{array}{r} 6145 \\ +4587 \\ \hline \end{array}$ (c) $\begin{array}{r} 8017 \\ -1269 \\ \hline \end{array}$ (d) $\begin{array}{r} 8000 \\ -\ 218 \\ \hline \end{array}$

(e) $\begin{array}{r} 217 \\ \times\ 7 \\ \hline \end{array}$ (f) $\begin{array}{r} 807 \\ \times\ 8 \\ \hline \end{array}$ (g) 5127 x 4 (h) 6 x 2143

(i) $5\overline{)8015}$ (j) $6\overline{)2034}$ (k) $\frac{603}{9}$ (l) 3504 ÷ 8

3. Find (a) 8^2 (b) 10^2 (c) 20^2

4. Write down the answers to :-

(a) 10 x 17 (b) 23 x 10 (c) 116 x 10 (d) 100 x 37

(e) 213 x 100 (f) 1000 x 15 (g) 365 x 1000 (h) 2890 ÷ 10

(i) 5700 ÷ 10 (j) 3800 ÷ 100 (k) 215000 ÷ 100 (l) 265000 ÷ 1000

5. To find 40 x 63, do it in TWO steps as follows :-

step 1 :- find 10 x 63 first (= 630)

step 2 :- then find 4 x 630 (= 2520)

cont'd ...

Find answers to the following using the TWO steps shown on the previous page :-

(a) 20 x 18 (b) 30 x 43 (c) 60 x 24 (d) 115 x 30

(e) 90 x 31 (f) 213 x 50 (g) 90 x 113 (h) 603 x 70

(i) 200 x 81 [First, find 100 x 81 (= 8100), then find 2 x 8100 (= .....)]

(j) 300 x 42 (k) 31 x 400 (l) 123 x 700 (m) 2000 x 38

6. To find 2160 ÷ 40, do it in TWO steps as follows :-

step 1 :- find 2160 ÷ 10 first (= 216)

step 2 :- then find 216 ÷ 4 => $4\overline{)216}$ = 54

Find answers to the following using the TWO steps shown above :-

(a) 320 ÷ 20 (b) 720 ÷ 40 (c) 1320 ÷ 30 (d) 6500 ÷ 50

(e) 2240 ÷ 70 (f) 16800 ÷ 80 (g) 65400 ÷ 60 (h) 1750000 ÷ 50

(i) 2800 ÷ 400 [First, find 2800 ÷ 100 (= 28), then find 28 ÷ 4 (= 7)]

(j) 6400 ÷ 200 (k) 15600 ÷ 300 (l) 27500 ÷ 500 (m) 7920000 ÷ 600

7. Remember **BODMAS**.
This helps you decide which order to carry out calculations.

The answer to :-

2 + 3 x 4 is **NOT** 20

=> 2 + 3 x 4 = 2 + 12 = 14

B brackets - (always do these first)

O of (as in $\frac{1}{2}$ of 18)

D divide } do these before add / subtract

M multiply }

A add } do these last

S subtract }

Do the following (no calculator) :-

(a) What is the answer to 3 + 2 x 4 ? (i) 20 or (ii) 11

(b) What is the answer to 5 + 3 x 3 ? (i) 24 or (ii) 14

(c) What is the answer to 12 – 2 x 4 ? (i) 4 or (ii) 40

(d) What is the answer to 4 x (6 – 2) ? (i) 16 or (ii) 22

(e) 16 + 4 x 3 (f) 5 x 7 – 1 (g) 10 + 4 ÷ 2 (h) 3 + 4 x 2

(i) 3 + (4 x 2) (j) (3 + 4) x 2 (k) $\frac{1}{2}$ of 6 + 4 (l) $\frac{1}{2}$ of (6 + 4)

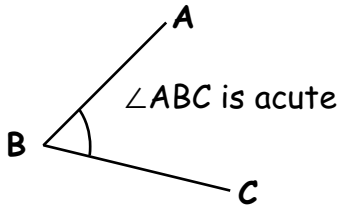
8. (a) A car travels 15 kilometres on 1 litre of fuel. How far will it go on 20 litres ?

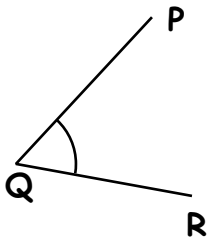
(b) 30 identical sacks of potatoes weigh 480 kilograms. What does 1 sack weigh ?

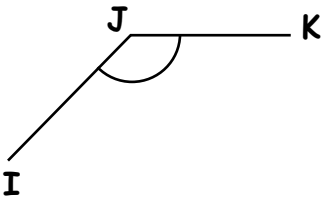
(c) How much smaller is 17 x 20 than 14 x 30 ?

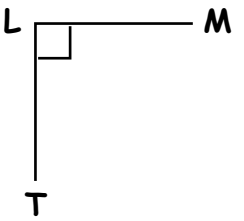
(d) What is the sum of the first 10 (i) "odd" numbers (ii) "even" numbers ?

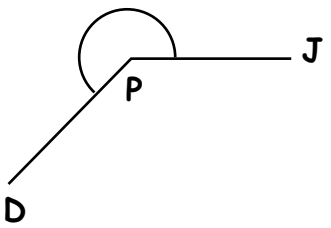
9. Use the words :- **acute**, **right**, **obtuse**, **straight**, **reflex** to describe these angles.

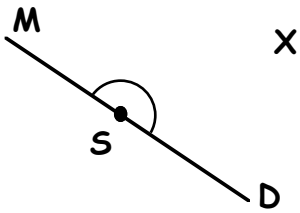


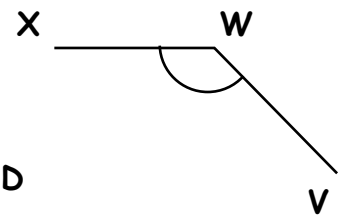


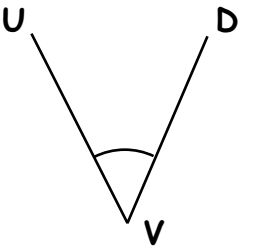




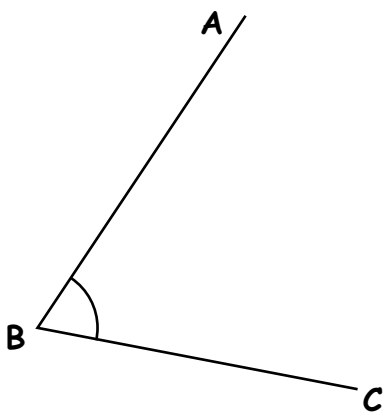


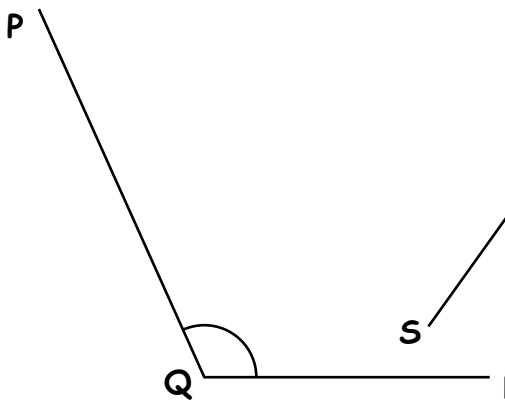


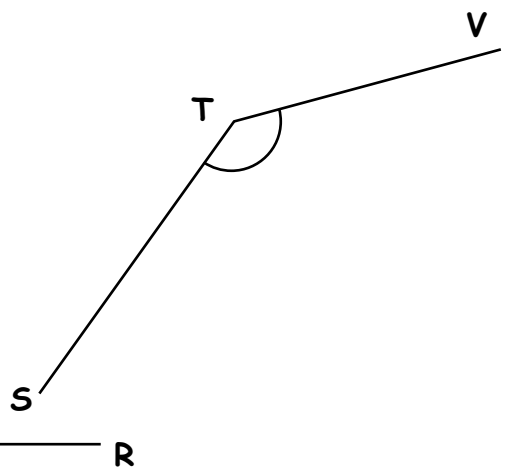




10. Use a protractor to measure these angles :-



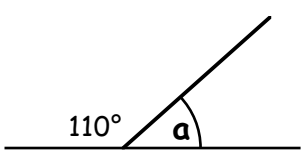


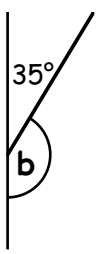


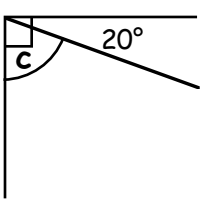
11. Use a protractor to draw these angles (label them) :-

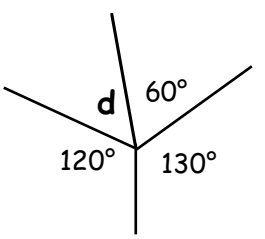
(a) ∠DEF = 23° (b) ∠IJK = 71° (c) ∠SAT = 152°

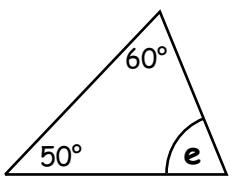
12. Calculate the size of each angle labelled a, b, c, ...

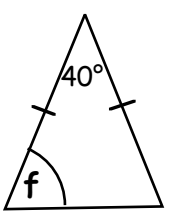


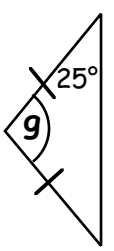


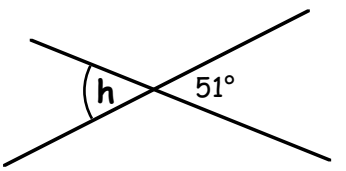




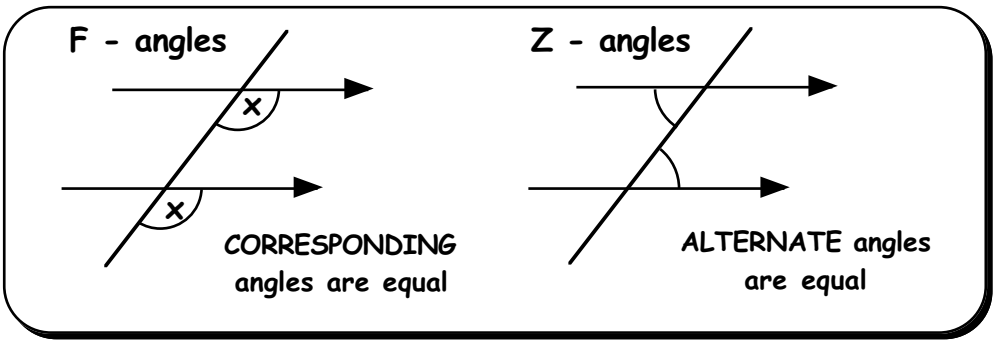






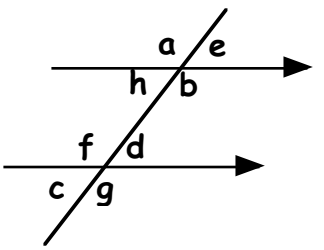


13. **Remember** :-



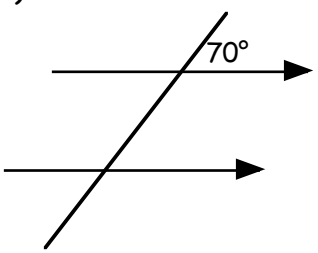
In the figure opposite, which angle is :-

(a) corresponding to a ?
(b) corresponding to b ?
(c) alternate to h ?
(d) alternate to f ?
(e) vertically opposite f ?
(f) corresponding to c ?

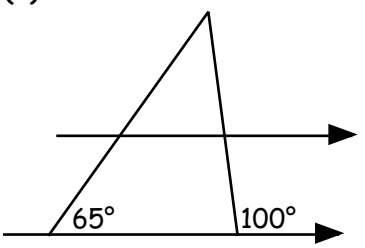


14. Sketch these figures and fill in the sizes of <u>all</u> the missing angles :-

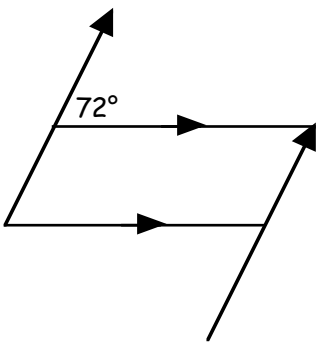
(a)



(b)



(c)



15. Tidy up these expressions :-

(a) $3x + 4x$
(b) $5a - 2a$
(c) $3p + p$
(d) $m + m + m + m$
(e) $8t - t$
(f) $3 \times 2x$
(g) $5 \times 5m$
(h) $10 \times 3g$

16. Tidy these expressions (as far as possible) ;-

(a) $2a + 3b + 5a + 7b$
(b) $6p + 8q - 2p + 5q$
(c) $2m + 7n - m + n$
(d) $8x + 7 - 2x + 5$
(e) $5y - 4 + 3y + 10$
(f) $2t + 3 + 5t$

17. **Remember** :-

$2(x + 3) = 2 \times x + 2 \times 3$
$= 2x + 6$
(not $2x + 3$)

Multiply to remove the brackets :-

(a) $3(x + 4)$ (b) $5(x - 2)$ (c) $4(a + 3)$ (d) $10(p - 2)$

(e) $2(3x + 5)$ (f) $4(5x - 3)$ (g) $6(2 + 3x)$ (h) $8(4 - 3a)$

18. In this question $a = 6$, $b = 5$ and $c = 3$.

Find the value of :-

(a) $a - b$ (b) $a + b - c$ (c) $3a$ (d) $4b$

(e) $2c - a$ (f) ab {means $a \times b$} (g) bc (h) b^2

19. Find the following without a calculator :- (*knowing your tables helps*)

(a) $\frac{1}{2}$ of 18 (b) $\frac{1}{4}$ of 204 (c) $\frac{1}{3}$ of 162 (d) $\frac{1}{8}$ of 2064

(e) $\frac{2}{3}$ of 24 [find $\frac{1}{3}$ (by dividing by 3) then x 2]

(f) $\frac{3}{4}$ of 40 (g) $\frac{2}{5}$ of 165 (h) $\frac{9}{10}$ of 400 (i) $\frac{7}{8}$ of 160

20. <u>These are some simple percentages you should know as fractions.</u> **Learn them !!**

50% = $\frac{1}{2}$ (divide by 2)	25% = $\frac{1}{4}$ (divide by 4)
20% = $\frac{1}{5}$ (divide by 5)	10% = $\frac{1}{10}$ (divide by 10)
$33\frac{1}{3}$% = $\frac{1}{3}$ (divide by 3)	1% = $\frac{1}{100}$ (divide by 100)
75% = $\frac{3}{4}$ (divide by 4 then x 3)	$66\frac{2}{3}$% = $\frac{2}{3}$ (divide by 3 then x 2)
5% = $\frac{1}{20}$ (find 10% and divide by 2)	40% = $\frac{2}{5}$ (divide by 5 then x 2)

Do these **mentally** and write down the answers to :-

(a) 50% of 18 (b) 25% of 36 (c) 10% of 230 (d) $33\frac{1}{3}$% of 120

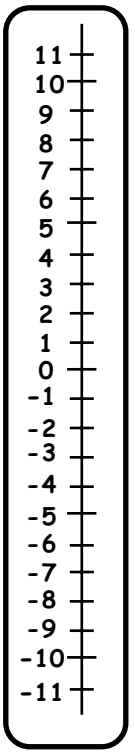
(e) 20% of 45 (f) 5% of 80 (g) 75% of 60 (h) $66\frac{2}{3}$% of 24

(i) 2% of 350 (j) 40% of 50 (k) 1% of 2600 (l) 100% of 18

21. Use the thermometer scale shown opposite to help with these.

Remember – if you add a (+) number —> move up
– if you add a (–) number —> move down
– if you subtract a number —> move down

DO NOT mark this scale



(a) 12 – 2 (b) 2 – 12 (c) (-1) + 5

(d) 6 + (–4) (e) 3 + (–5) (f) –2 – 6

(g) (–4) + (–6) (h) (–11) + 15 (i) 10 – 15

(j) 0 – 3 (k) (–8) + 8 (l) (–11) + 6

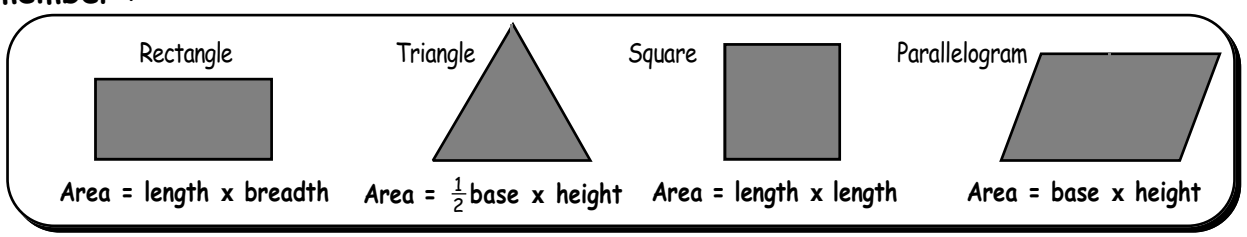
(m) 2 x (–3) (n) 5 x (–9) (o) (–8) x 4

22. What is the number that is :–

(a) 6 bigger than –2 ? (b) 8 smaller than 1 ?

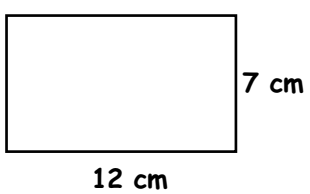
(c) 5 bigger than –8 ? (d) 4 smaller than –3 ?

23. **Remember** :–



Calculate the areas of the following using the formulae above :–

(a)



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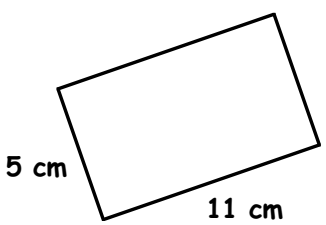

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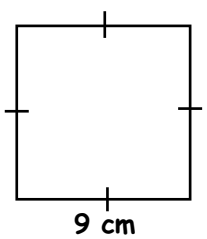

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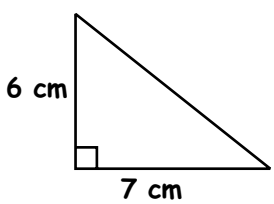
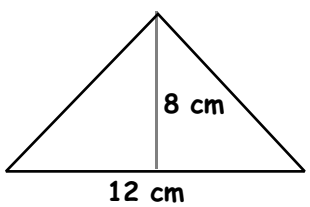
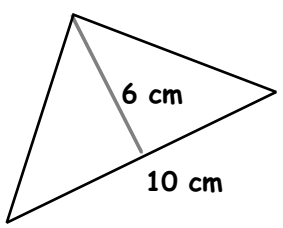


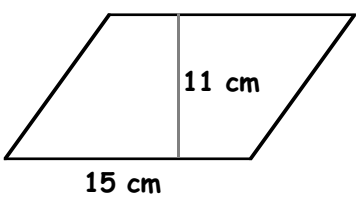
(e)



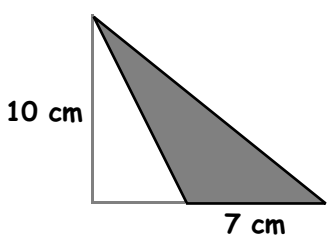
(f)



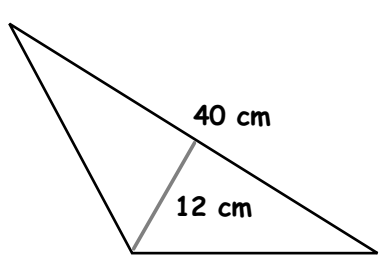
(g)



(h)



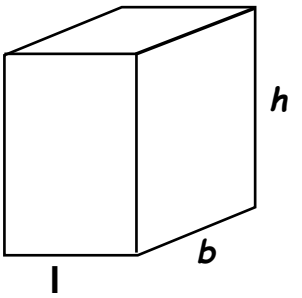
(i)



24. **Remember** :-

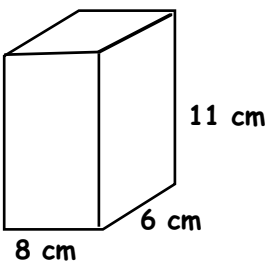
Volume	=	length x breadth x height
1 cm^3	=	1 ml
1000 cm^3	=	1000 ml = 1 litre

$V = l \times b \times h$

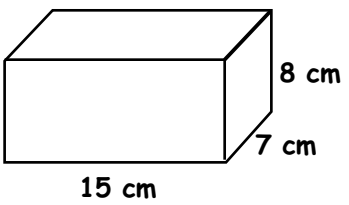


Calculate the volumes (in cm^3) of the following cuboids :-

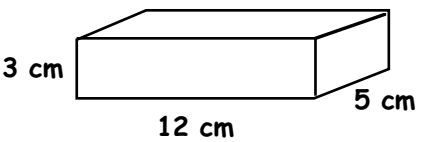
(a)



(b)

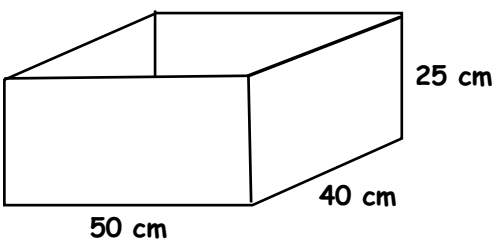


(c)



(d) (i) Calculate the volume of this container (in cm^3).

(ii) How many litres does it hold when full ?



25. Solve for x :- (*see opposite how to possibly set down*)

(a) $x + 2 = 7$ (b) $x - 3 = 5$ (c) $x - 6 = 6$

(d) $x + 10 = 21$ (e) $x - 5 = 0$ (f) $x + 8 = 6$

$x - 6 = 10$
$x = 10 + 6$
$x = 16$

26. Solve for x :- (*see opposite how to possibly set down*)

(a) $3x = 15$ (b) $5x = 50$ (c) $4x = 100$

(d) $7x = 56$ (e) $6x = 360$ (f) $2x = 17$

$2x = 16$
$x = \frac{16}{2}$
$x = 8$

27. Solve for x :- (*see opposite how to possibly set down*)

(a) $2x + 1 = 21$ (b) $2x + 2 = 20$ (c) $5x - 1 = 14$

(d) $7x + 17 = 38$ (e) $8x - 8 = 0$ (f) $4x + 4 = 4$

(g) $6x - 2 = 34$ (h) $10x + 20 = 20$ (i) $9x - 9 = 9$

$2x - 3 = 11$
$2x = 11 + 3$
$2x = 14$
$x = 7$

28. **<u>This is where knowing your tables really helps</u>**.

To simplify the fraction $\frac{14}{21}$ (look for a number that will divide into 14 and 21).
Since 14 and 21 are in the "7 times" table => $\frac{14}{21} \overset{\div 7}{\underset{\div 7}{}} = \frac{2}{3}$

Simplify these fractions :-

(a) $\frac{10}{15}$ (b) $\frac{6}{12}$ (c) $\frac{20}{50}$ (d) $\frac{9}{15}$

(e) $\frac{4}{16}$ (f) $\frac{18}{24}$ (g) $\frac{33}{44}$ (h) $\frac{21}{35}$

29. "**The factors of 6**" are all the (smallish) numbers that divide into 6

=> The factors of 6 are {1, 2, 3, 6}

Find all the factors of :-

(a) 5 (b) 8 (c) 12 (d) 15 (e) 21 (f) 20

(g) 24 (h) 50 (i) 13 (j) 11 (k) 16 (l) 18

30. A **<u>PRIME</u>** number is a special type of number.

A prime number is a number that **CANNOT** be divided by anything else except itself (and 1).

7 can <u>only</u> be divided by 7 (and 1) => 7 **IS** a prime number.

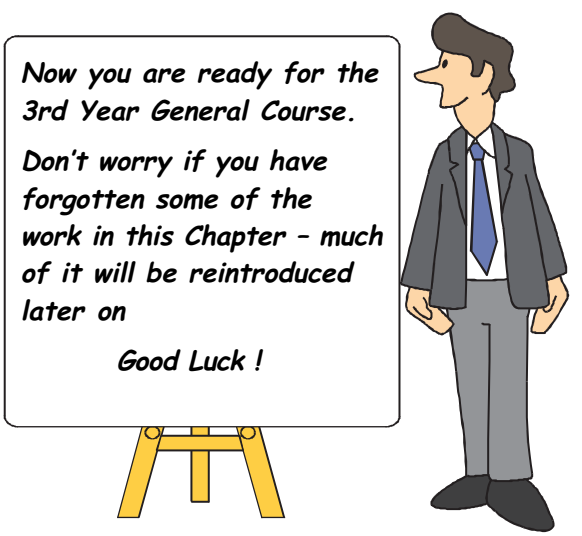
8 can be divided by 2 as well as 8 and 1 => 8 is **NOT** a prime number.

<u>Take your time here</u> !! Decide which of these are prime numbers :-

(a) 2 (b) 5 (c) 6 (d) 9 (e) 11 (f) 13

(g) 15 (h) 21 (i) 10 (j) 19 (k) 24 (l) 25

31. Write down **<u>ALL</u>** the prime numbers under 30.



Chapter 1

Nearest Whole Number

Exercise 1

1. Rounding to the nearest whole number (17·6 → 18)

   Copy these and round to the nearest whole number :-

   (a) 2·8 (b) 7·7 (c) 4·9 (d) 16·3 (e) 29·7

   (f) 62·1 (g) 14·5 (h) 3·17 (i) 23·41 (j) 72·81

   (k) 63·99 (l) 27·09 (m) 8·125 (n) 42·495 (o) 86·500

2. Round to the nearest second :-

   (a) 16·3 sec (b) 22·8 sec (c) 14·4 sec (d) 96·1 sec

   (e) 77·8 sec (f) 39·6 sec (g) 3·45 sec (h) 61·72 sec

   (i) 29·97 sec (j) 63·5 sec (k) 0·71 sec (l) 40·04 sec

3. Using a calculator ⟶ (63 ÷ 8 = 7·875 (check) = 8 to the nearest whole number)

   Do these on a calculator, **THEN** round your answer to the nearest whole number :-

   (a) 93 ÷ 7 (b) 50 ÷ 11 (c) 139 ÷ 4 (d) 653 ÷ 8

   (e) 1023 ÷ 52 (f) 4165 ÷ 51 (g) 989 ÷ 54 (h) 3456 ÷ 89

Nearest 10, 100 or 1000

Exercise 2

1. Round to the nearest 10 :-

   (a) 78 (b) 62 (c) 18 (d) 45 (e) 59

   (f) 82 (g) 64 (h) 83 (i) 7 (j) 15

   (k) 264 (l) 249 (m) 736 (n) 902 (o) 2008

2. Round to the nearest 10 cm :-

   (a) 38 cm (b) 61 cm (c) 75 cm (d) 82 cm (e) 89 cm

   (f) 152 cm (g) 347 cm (h) 608 cm (i) 725 cm (j) 501 cm

3. Round to the nearest 100 :-

   (a) 131 (b) 541 (c) 817 (d) 194 (e) 550

   (f) 777 (g) 364 (h) 83 (i) 5490 (j) 3623

   (k) 6581 (l) 4250 (m) 7070 (n) 3382 (o) 5445

4. Round to the nearest 1000 :-

(a) 8700	(b) 14200	(c) 23830	(d) 19940	(e) 63497
(f) 63503	(g) 1871	(h) 44486	(i) 65720	(j) 83481
(k) 69675	(l) 123800	(m) 215395	(n) 146609	(o) 299763

Using rounding to find estimates

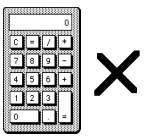
39 x 213
is approximately
40 x 200
≈ 8000

Knowing your tables will help here !

It is possible to estimate "**MENTALLY**" the answer to a question by rounding the numbers to "1 **figure**" accuracy.

for example 786 ÷ 19
is approximately 800 ÷ 20
≈ 80 ÷ 2 ≈ 40

Exercise 3



No calculator.

1. Find approximate answers to these by first rounding each number to 1 figure accuracy ;-

(a) 48 x 48	(b) 37 x 62	(c) 57 x 98	(d) 197 x 42
(e) 307 x 48	(f) 284 x 187	(g) 598 ÷ 29	(h) 788 ÷ 37
(i) 1987 ÷ 206	(j) 2865 ÷ 12	(k) 7965 ÷ 42	(l) 5826 ÷ 28

note !

2. The answer to 98 x 21 is either {208, 2058 or 25058}. (no calculator !)

   By rounding 98 x 21 = 100 x ..... = ... , decide which of the 3 answers is likely to be the correct one.

3. By rounding your numbers before multiplying, decide which of the 3 given answers is most likely to be the correct one :-

(a)	39 x 31	Choice of {12·9, 129 or 1209}
(b)	71 x 18	Choice of {128, 1278 or 12778}
(c)	197 x 61	Choice of {1207, 12017 or 120117}
(d)	398 x 19	Choice of {72, 752 or 7562}

Multiplication by 10, 100, 1000

Learn these rules

Simple rule for whole numbers :-

If you multiply by 10, simply add a 0 at the end
If you multiply by 100, simply add two 0's at the end
If you multiply by 1000, simply add three 0's at the end

Example 117 x 10 = 1170

Exercise 4

1. Write down the answers to these :-

(a) 17 x 10	(b) 8 x 10	(c) 29 x 10	(d) 10 x 64
(e) 10 x 81	(f) 115 x 10	(g) 10 x 233	(h) 10 x 120
(i) 960 x 10	(j) 908 x 10	(k) 10 x 1234	(l) 7608 x 10

2. Write down the answers to these :-

(a) 16 x 100	(b) 37 x 100	(c) 100 x 81	(d) 100 x 60
(e) 123 x 100	(f) 100 x 237	(g) 100 x 450	(h) 206 x 100

3. Write down the answers to these :-

(a) 8 x 1000	(b) 23 x 1000	(c) 56 x 1000	(d) 1000 x 84
(e) 1000 x 70	(f) 125 x 1000	(g) 1000 x 260	(h) 1000 x 300

Division by 10, 100, 1000

Learn these rules

Simple rule for whole numbers :-

If you divide by 10, simply remove last 0
If you divide by 100, simply remove last <u>two</u> 0's
If you divide by 1000, simply remove last <u>three</u> 0's

Example 8200 ÷ 10 = 820

Exercise 5

1. Write down the answers to these :-

(a) 90 ÷ 10	(b) 60 ÷ 10	(c) 120 ÷ 10	(d) 470 ÷ 10
(e) 990 ÷ 10	(f) 1200 ÷ 10	(g) 6300 ÷ 10	(h) 4820 ÷ 10
(i) 1000 ÷ 10	(j) 23000 ÷ 10	(k) 46300 ÷ 10	(l) 12870 ÷ 10

2. Write down the answers to these :-

(a) 400 ÷ 100 = ...	(b) 800 ÷ 100	(c) 1600 ÷ 100	(d) 4700 ÷ 100
(e) 9000 ÷ 100	(f) 14000 ÷ 100	(g) 23000 ÷ 100	(h) 65400 ÷ 100

3. Write down the answers to these :-

(a) 8000 ÷ 1000	(b) 14000 ÷ 1000	(c) 29000 ÷ 1000	(d) 40000 ÷ 1000
(e) 135000 ÷ 1000	(f) 180000 ÷ 1000	(g) 270000 ÷ 1000	(h) 300000 ÷ 1000

Multiplication by multiples of 10, 100, 1000

To multiply 84 x 20

Step 1 Find 84 x 10 = 840 (easy)

Step 2 Now find

$$\begin{array}{r} 840 \\ \times\ 2 \\ \hline 1680 \end{array}$$

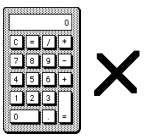
To multiply 124 x 300

Step 1 Find 124 x 100 = 12400 (easy)

Step 2 Now find

$$\begin{array}{r} 12400 \\ \times\ 3 \\ \hline 37200 \end{array}$$

Exercise 6



1. Calculate each of these using the same method shown above :-

   (a) 32 x 30 [Find 10 x 32 first = 320 and then find 320 x 3]

   (b) 17 x 40 (c) 21 x 60 (d) 31 x 70

   (e) 42 x 80 (f) 113 x 50 (g) 214 x 20

2. Work out each of these using the 2 steps shown :-

   (a) 24 x 200 [Find 24 x 100 first = 24<u>00</u> and then find 2400 x 2]

   (b) 31 x 300 (c) 13 x 500 (d) 18 x 700

   (e) 42 x 300 (f) 23 x 300 (g) 34 x 200

   (h) 400 x 13 (i) 800 x 211 (j) 2000 x 31

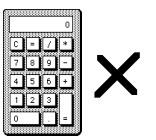
Division by 30,20,500, etc.,

13500 ÷ 30

Step 1 Divide by 10 first $\frac{13500}{10} = 1350$

Step 2 Now divide by 3 = $3\overline{)1350}$ = 450

Exercise 7



1. Divide the following using the same method shown above :-

   (a) 560 ÷ 20 [Find 560 ÷ 10 = 56 and then find $2\overline{)56}$]

   (b) 240 ÷ 30 (c) 1250 ÷ 50 (d) 2400 ÷ 80

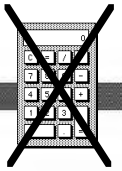
   (e) 11200 ÷ 40 (f) 3660 ÷ 60 (g) 12000 ÷ 50

2. Divide the following :-

   (a) 12300 ÷ 300 [Find 12300 ÷ 100 = 123 and then find $3\overline{)123}$]

   (b) 24600 ÷ 200 (c) 12800 ÷ 400 (d) 22500 ÷ 500

   (e) 14000 ÷ 200 (f) 16000 ÷ 800 (g) 427000 ÷ 700



What have I learned ?

1. Round to the nearest whole number :-

   (a) 71·8 (b) 19·54 (c) 102·4976

2. Round to the nearest 10 :-

   (a) 178 (b) 1324

3. Round to the nearest 100 :-

   (a) 1247 (b) 2360

4. Round to the nearest 1000 :-

   (a) 13501 (b) 29863

5. By rounding each number first, find an <u>ESTIMATE</u> to :-

   (a) 197×12 (b) $7865 \div 39$ (c) $(19)^2$

6. Write down the answer to :-

   (a) 63×10 (b) 10×2060 (c) 13×100

   (d) 100×307 (e) 1000×8 (f) 24×1000

7. Use the "two-step" method to find :-

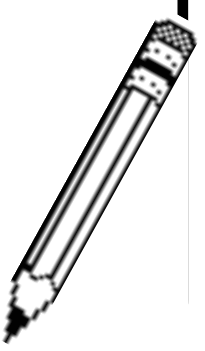
   (a) 41×30 (b) 121×40 (c) 53×20

   (d) 200×31 (e) 500×13 (f) 103×600

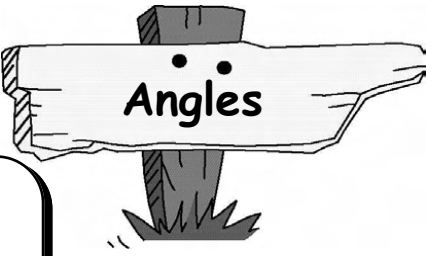
8. Use the "two-step" method to find :-

   (a) $1680 \div 40$ (b) $4320 \div 20$ (c) $13500 \div 50$

   (d) $2400 \div 300$ (e) $13800 \div 200$ (f) $126000 \div 600$

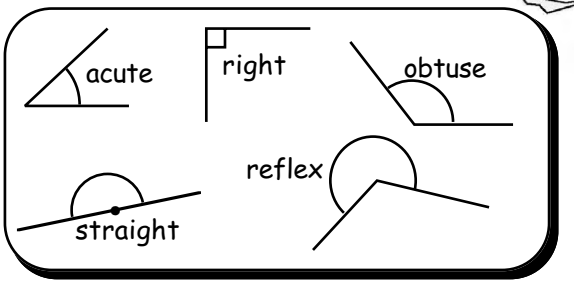


Chapter 2



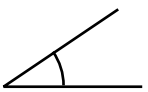
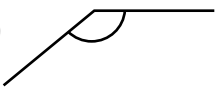
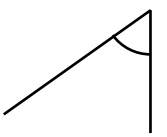
Types of Angles

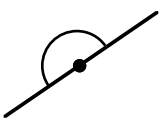
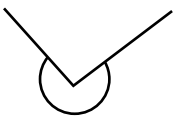
You should be able to say what "kind" of angle is shown.



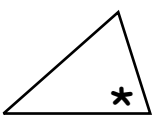
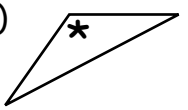
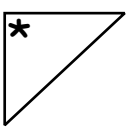
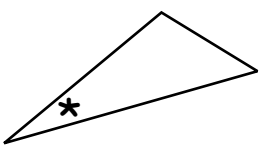
Exercise 1

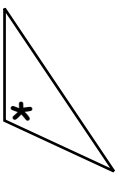
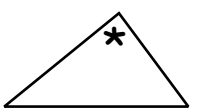
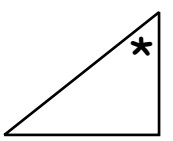
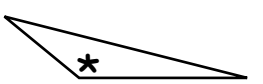
1. Use a word from {acute, right, obtuse, straight, reflex} to describe each of the angles shown below :-

(a)  (b)  (c)  (d) 

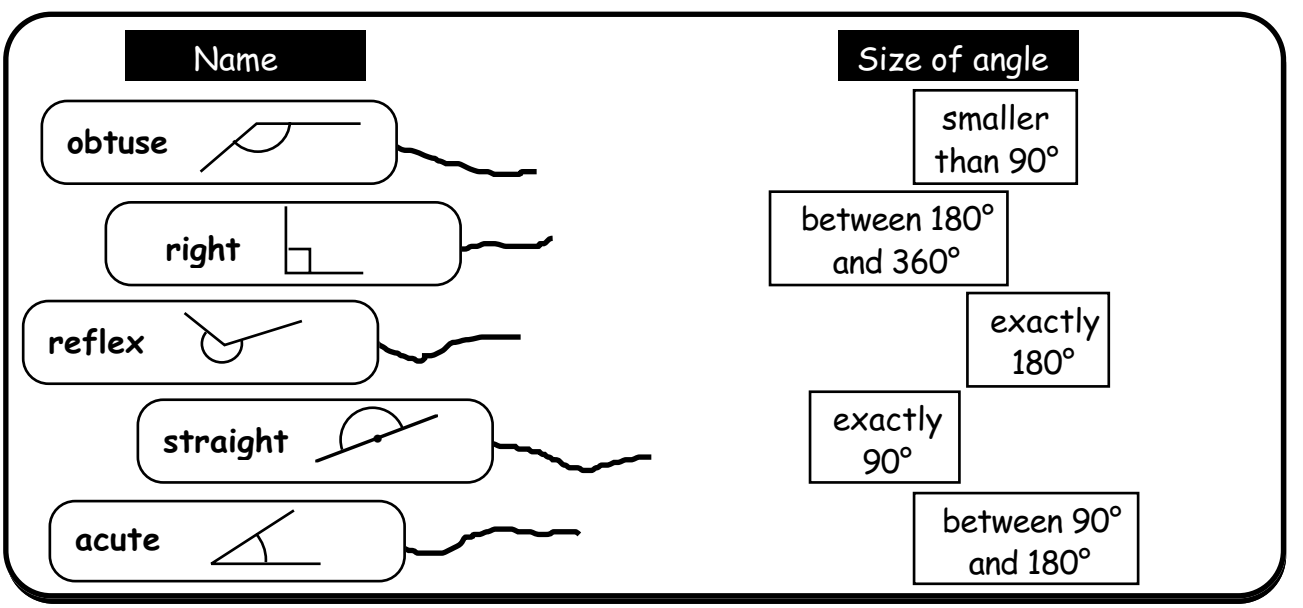
(e)  (f)  (g)  (h) 

2. In each of the following triangles, state what kind of angle the one marked * is :-

(a)  (b)  (c)  (d) 

(e)  (f)  (g)  (h) 

3. Copy this diagram and match the type of angle with the correct size :-



4. Look at the angle sizes listed below :-

   70°, 89°, 105°, 14°, 200°, 90°, 137°, 91°, 180°, 310°, 71°, 179°

   (a) Which of the angles are acute ?

   (b) Which of the angles are obtuse ?

   (c) Which of the angles are right ?

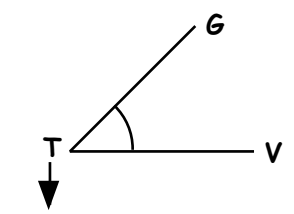
   (d) Which of the angles are reflex ?

   (e) Which of the angles are straight ?

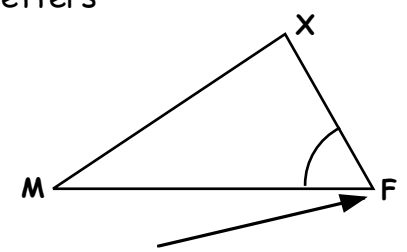
Naming Angles

You **MUST** use 3 letters every time to name an angle.

Always use capital letters



∠GTV (T is the middle letter)

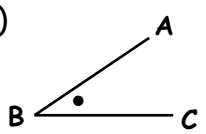


∠MFX (F is the middle letter)

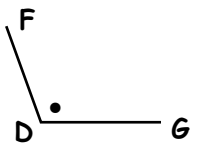
Exercise 2

1. Use 3 LETTERS to name each of the following angles :-
   (remember the "∠ " sign)

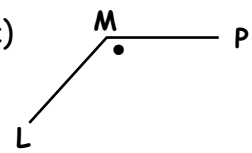
(a)



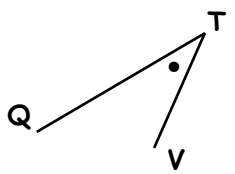
(b)



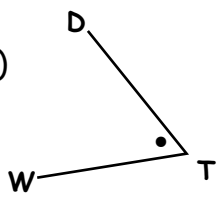
(c)



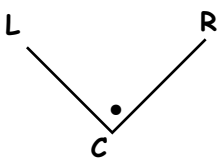
(d)



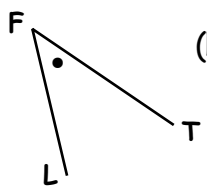
(e)



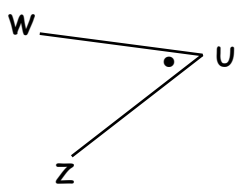
(f)



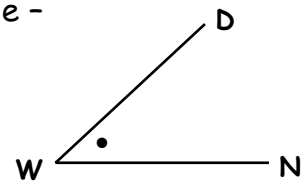
(g)



(h)

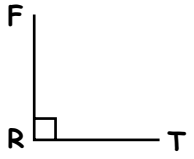


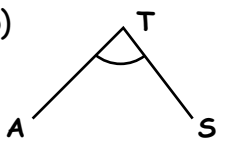
2. Name (using 3 letters) each angle and say what <u>TYPE</u> of angle it is :-
   Example –

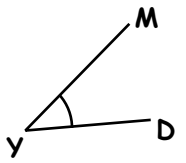


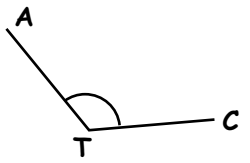
∠ <u>DWN</u> is an **acute** angle.

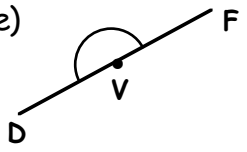
cont'd ...

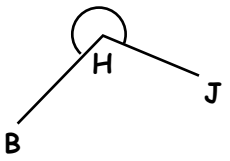
(a) 

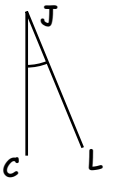
(b) 

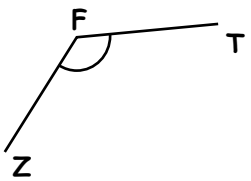
(c) 

(d) 

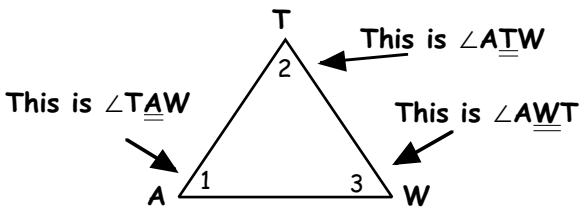
(e) 

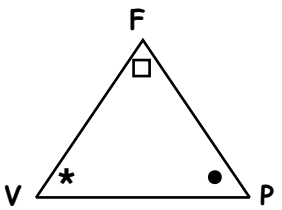
(f) 

(g) 

(h) 

3. In each triangle, there are 3 angles.
You need to be careful how you name them.



(a) 

(i) name the angle marked *.

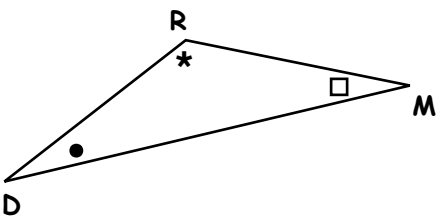
(ii) name the angle marked ●.

(iii) name the angle marked □.

(b) (i) name the angle marked □.

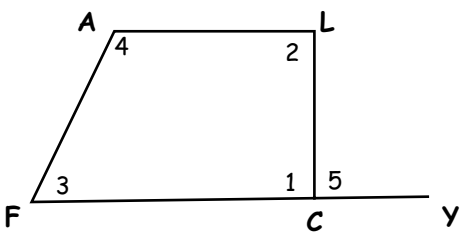
(ii) name the angle marked ●.

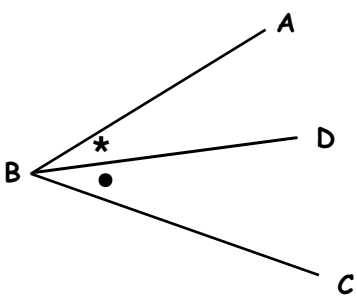
(iii) name the angle marked *.



4. Angle (1) is called ∠LCF.

Name the other 4 angles.
(3 letters each time)



5. 

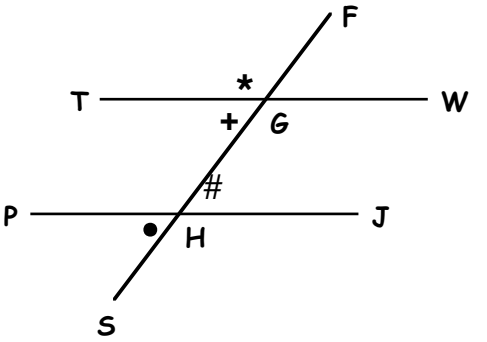
There are 3 angles in this figure.
The big one is ∠ABC.

Name the angles marked :-

(a) ● (b) *

6. There are 8 angles in this figure.
Name the angle marked :-

(a) • (b) * (c) + (d) #



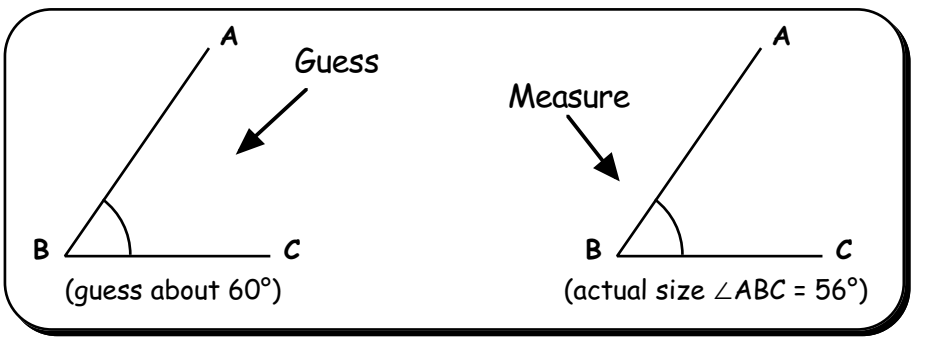
7. Neatly draw and label any **ACUTE** angle, ∠FMV.

8. Neatly draw and label any **RIGHT** angle, ∠TPH.

9. Neatly draw and label any **OBTUSE** angle, ∠DJW.

Measuring Angles

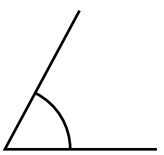
It helps to **estimate** roughly the size of the angle first.



Exercise 3

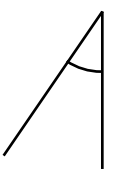
1. Do **not** use a protractor in this question.
Choose the estimate closest to what you think the angle is :-

(a)



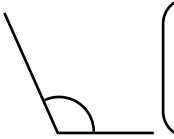
(i) 40°
(ii) 60°
(iii) 88°

(b)



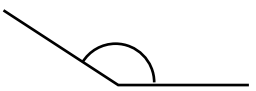
(i) 10°
(ii) 30°
(iii) 70°

(c)



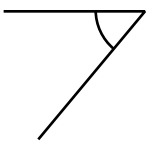
(i) 60°
(ii) 85°
(iii) 110°

(d)



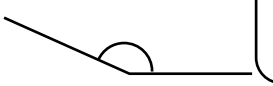
(i) 100°
(ii) 140°
(iii) 170°

(e)



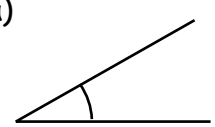
(i) 15°
(ii) 50°
(iii) 75°

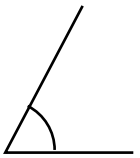
(f)



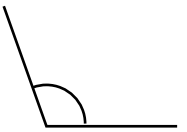
(i) 100°
(ii) 120°
(iii) 160°

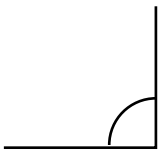
2. Estimate the size of each angle here.
(try to get within 5 – 10° of the correct answer) — **No Protractor !!!**

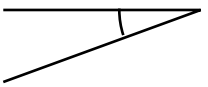
(a) 

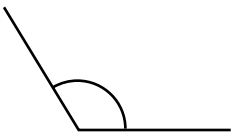
(b) 

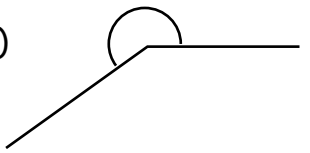
(c) 

(d) 

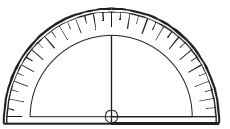
(e) 

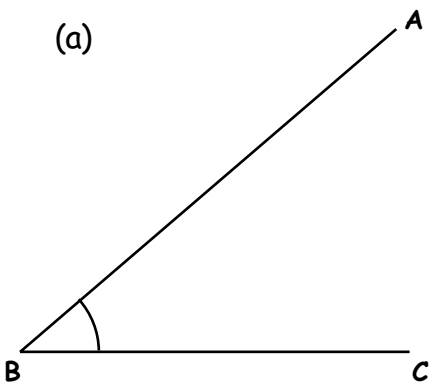
(f) 

(g) 

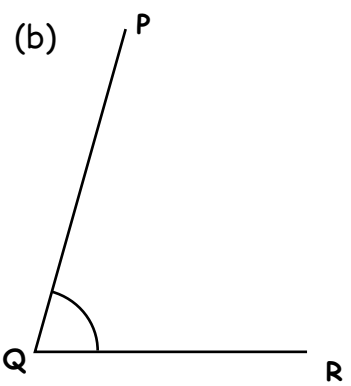
(h) 

3. Use a protractor to measure the angles below :-
(estimate their sizes first in your head)

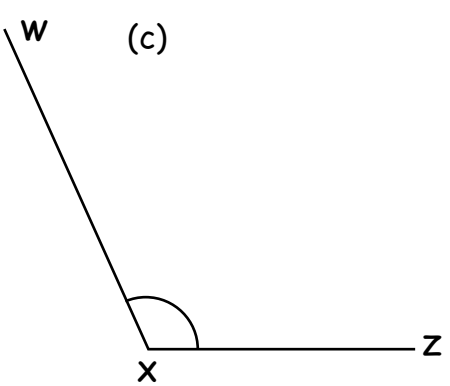


(a) 

∠ABC = ...°

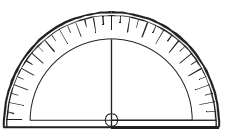
(b) 

∠PQR = ...°

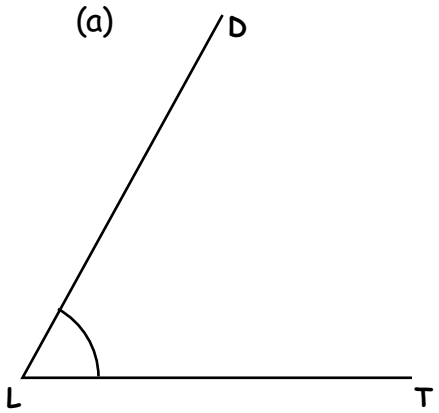
(c) 

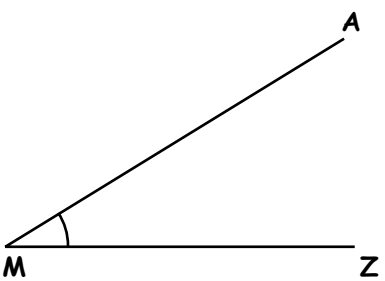
∠WXZ = ...°

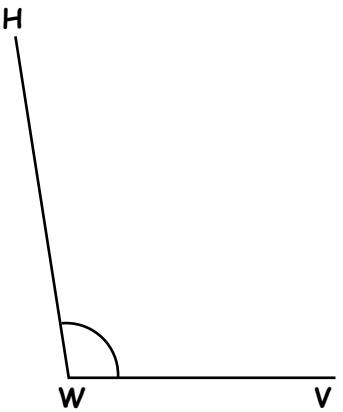
[Show these to your teacher NOW for checking]



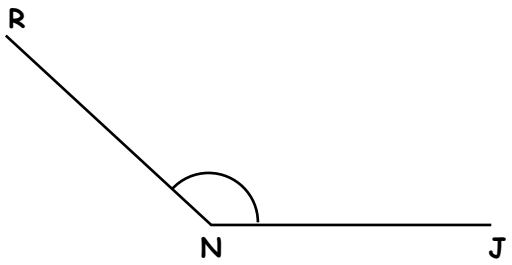
4. Now :- (i) name each angle here (3 letters).
(ii) estimate its size (in your head).
(iii) measure the angle to the nearest degree using your protractor.

(a) 

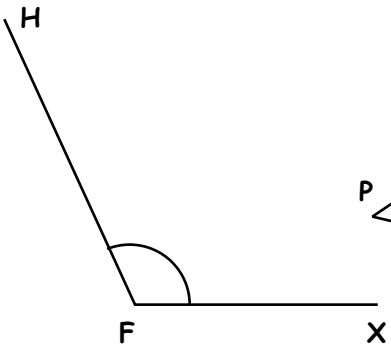
(b) 

(c) 

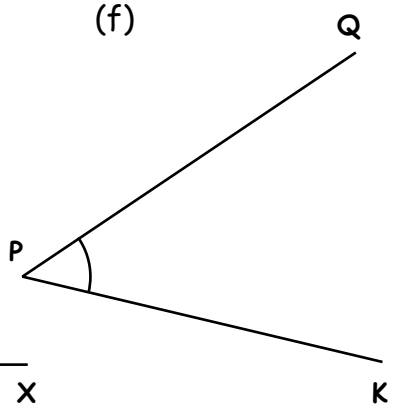
(d)



(e)



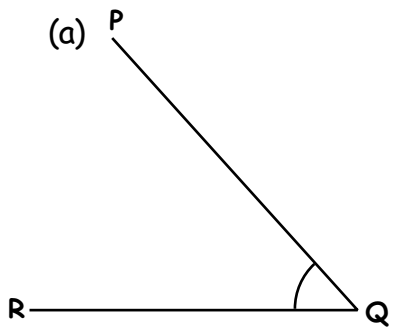
(f)



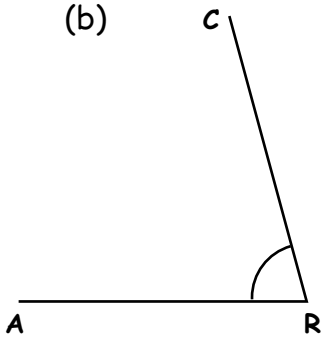
5. These are harder. (you need to be careful which scale you use).

Name each angle, measure its size and write it down.

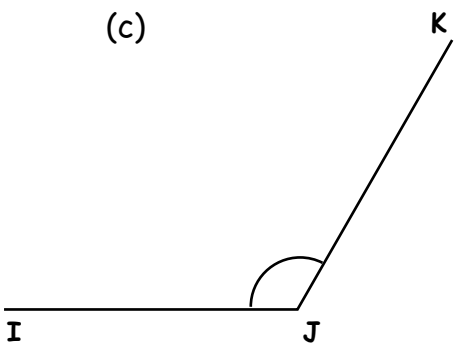
(a)



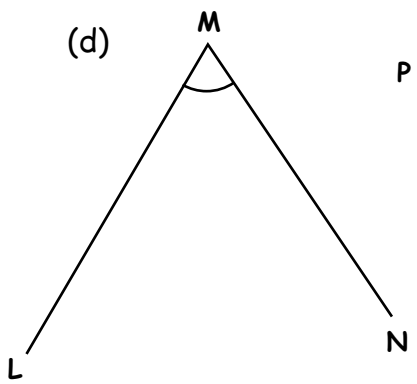
(b)



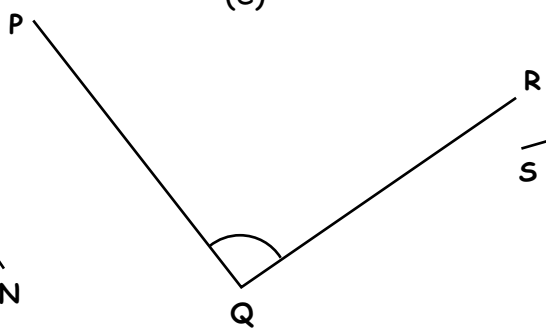
(c)



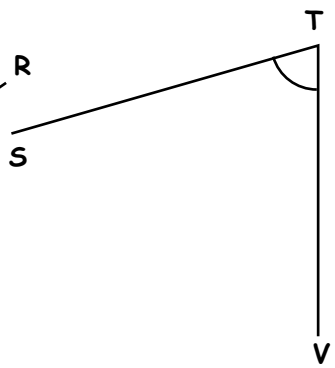
(d)



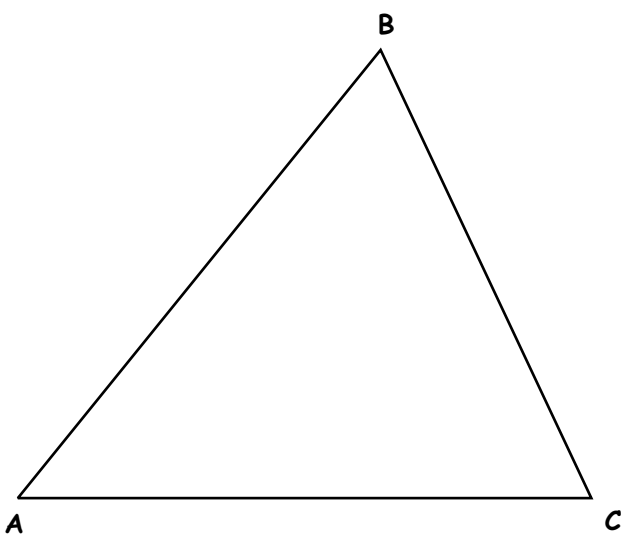
(e)



(f)



6.

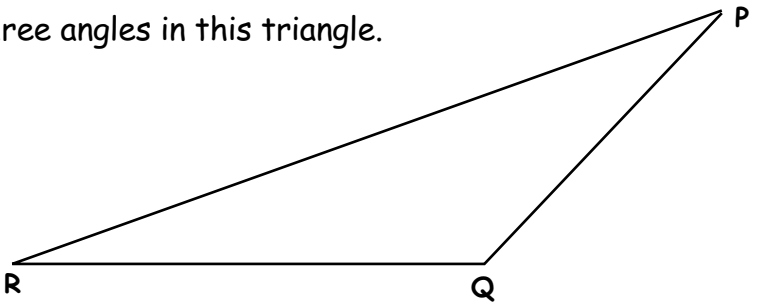


Look at ΔABC.

(a) Measure $\angle BAC$. Write it down.
(b) Measure $\angle BCA$. Write it down.
(c) Measure $\angle ABC$. Write it down.

7. Name and then measure the three angles in this triangle.

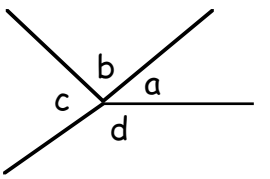
(a) ∠PQR = ? °
(b) ∠..... = ? °
(c) ∠..... = ? °



Calculating Missing Angles

Exercise 4

1. Shown are 4 angles which fit around a point.

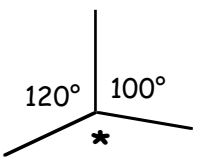


(a) What answer will you get if you add all 4 angles ? (i.e. a + b + c + d = ?)

(b) In general, what answer will you ALWAYS get when you add together all the angles round a point ?

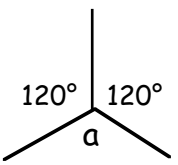
2. (a) What do you get when you add 120° + 100° ?

(b) Calculate the size of the 3rd angle (*).

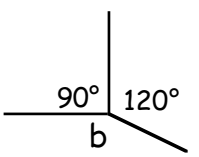


3. Calculate the value of the angles marked a, b, c, ...

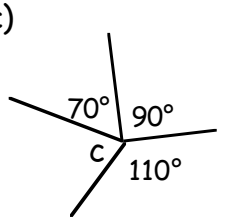
(a)



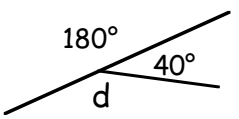
(b)



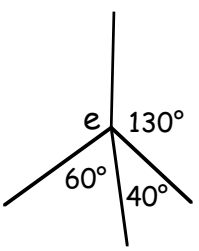
(c)



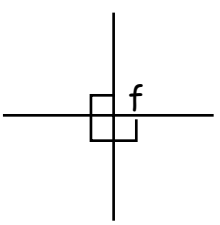
(d)



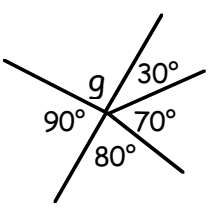
(e)



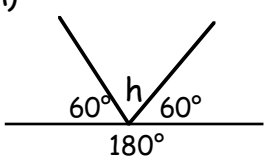
(f)



(g)



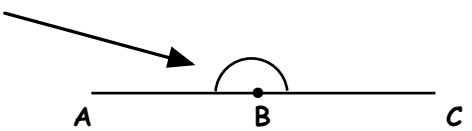
(h)



4. A **full** revolution is 360°.

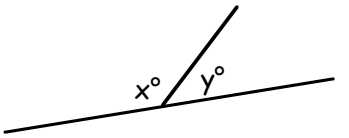
(a) What is $\frac{1}{2}$ a revolution ?

(b) What is the size of this angle in degrees ?



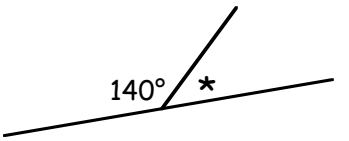
5. 2 angles make up a straight line.

What must the value of (x + y) be ?



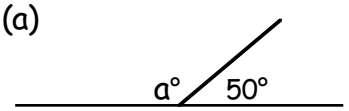
6. In this question, one of the angles is 140°.

<u>Calculate</u> the size of the other angle (*).

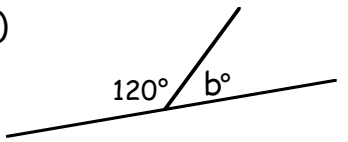


7. Calculate the size of the angles marked a, b, c, ...

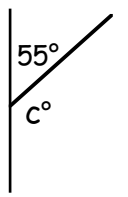
(a)



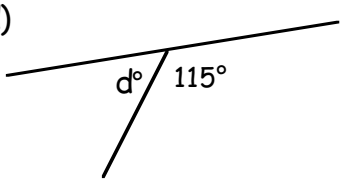
(b)



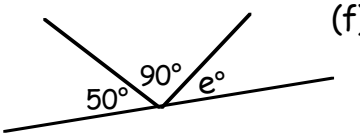
(c)



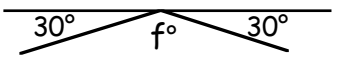
(d)



(e)

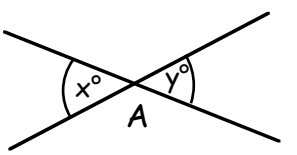


(f)



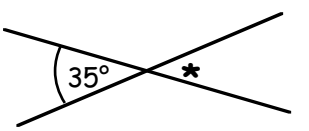
8. Look at the 2 lines crossing over at point A.

What do you think is <u>always</u> true about the angles marked x and y ?



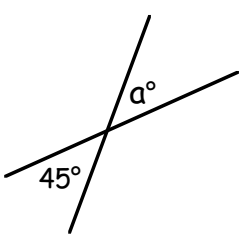
9. In this figure, one angle is 35°.

What is the value of the angle marked (*) ?

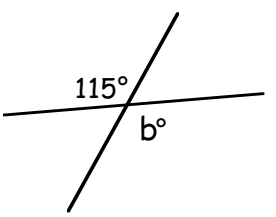


10. Calculate and write down the sizes of the angles marked a, b, c, ...

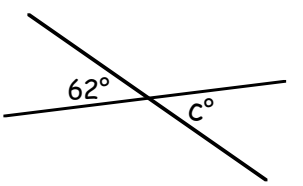
(a)



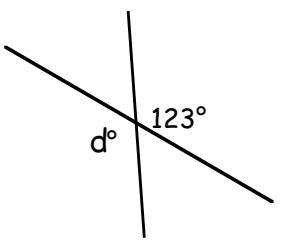
(b)



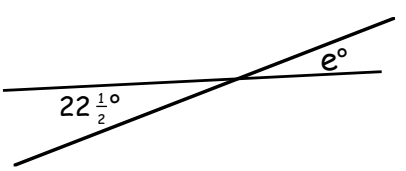
(c)



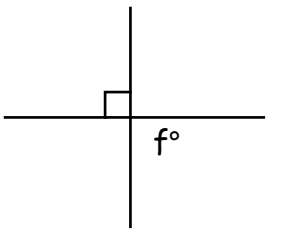
(d)



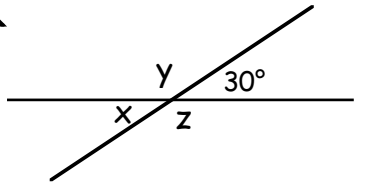
(e)



(f)

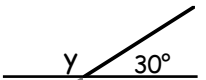


11. In this figure, one angle is 30°.



(a) Write down the value of x.

(b) Calculate the value of y.

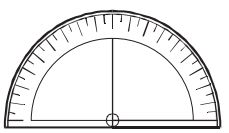
(remember 

)

(c) Now write down the value of z.

Drawing Angles

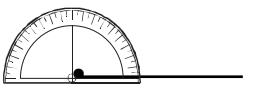
Take your time.
Draw the angle neatly.
Put the letters in at the correct points.



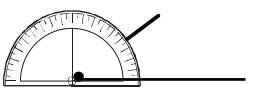
To draw ∠ABC = 37°

Step 1 —> Start with a line with a dot at the end

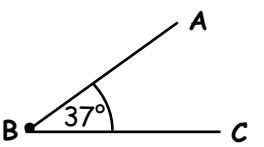
Step 2 —> Put the crossbar of the protractor on the dot and line up with line



Step 3 —> Count round from the zero line to the 37° mark and put in a dot



Step 4 —> Join the dots and put in the letters (middle letter B) —>

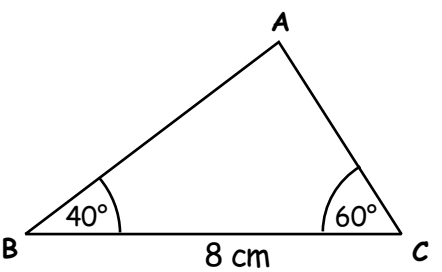


Exercise 5

1. Draw a 6 centimetre line and put a dot on the end (left side).
   Use your protractor to show ∠AFG = 20°.

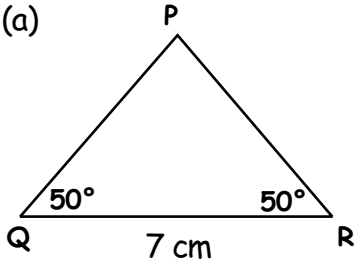
2. Use the same method to draw and name these angles :-
   (a) ∠PQR = 30° (b) ∠MTZ = 70° (c) ∠IJK = 45° (d) ∠ETC = 15°
   (e) ∠ART = 95° (f) ∠ZWV = 110° (g) ∠DVT = 170° (h) ∠HYQ = 132°

3. Shown is a small sketch of ΔABC.
   To draw it accurately :-
   (a) Draw the line BC = 8 cm.
   (Put B and C on your diagram).
   (b) Put your protractor at B and draw an angle of 40°.
   (c) Put your protractor at C and draw an angle of 60°.
   (d) Where the lines cross, call this point A.

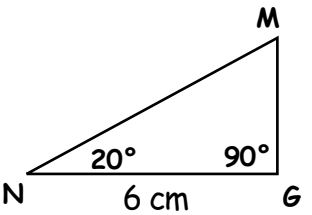


4. Try making full size accurate drawings of these triangles :-

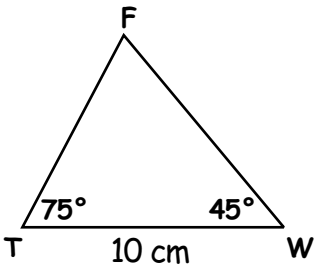
(a)



(b)



(c)



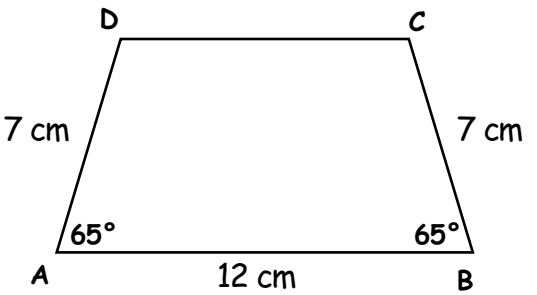
5. To draw this shape :-

(a) Draw the line AB = 12 cm.

(b) Put your protractor at A and draw ∠DAB = 65° (Make sure DA = 7 cm).

(c) Put your protractor at B and draw ∠CBA = 65° (Make sure CB = 7 cm).

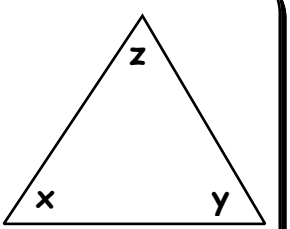
(d) Join D to C.



Angles in a Triangle

It is a well known fact in maths that no matter how big a triangle is, if you add all 3 angles together you always get 180°.

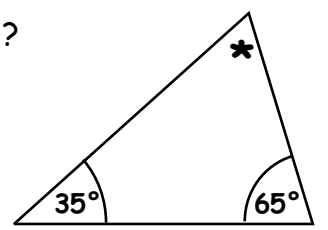
=> **x + y + z = 180°**



Exercise 6

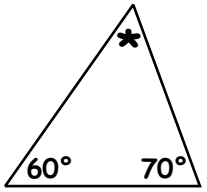
1. (a) In this triangle, what is the value of 35° + 65° ?

(b) If all 3 angles add to 180°, what must the 3rd angle be (marked *) ?

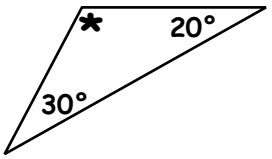


2. In each of these triangles, add the 2 given angles together, then calculate the size of the 3rd angle.

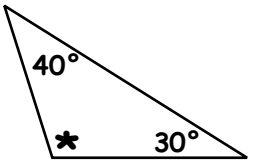
(a)



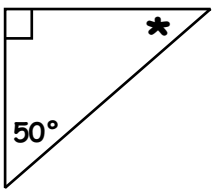
(b)

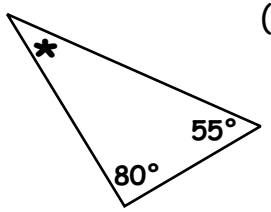


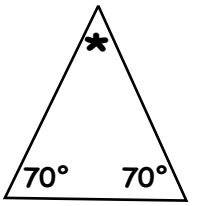
(c)

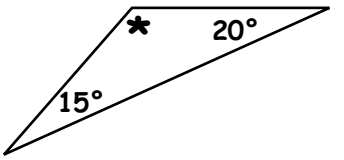


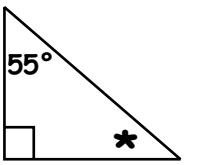
(d)



(e) 

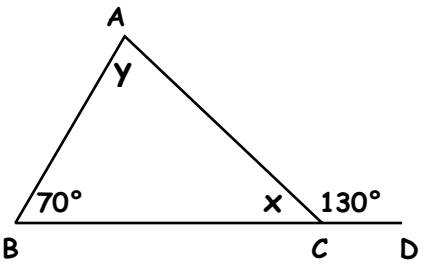
(f) 

(g) 

(h) 

3. (a) Use the 130° to help you calculate the size of the angle marked x.

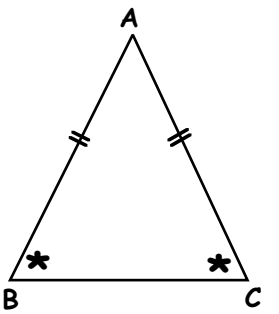
   (b) Now use ΔABC to help you find the value of y.



4. Can you remember the special name for this type of triangle ?

   The 2 sides (AB = AC) are equal.
   The 2 angles (∠ABC = ∠ACB) are equal.

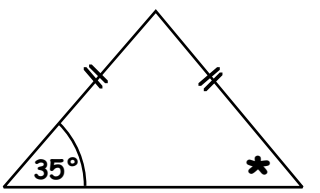
   It is called an **ISOSCELES** triangle.
   Look at the word, cover it up and try to spell it.



5. An isosceles triangle has 2 angles of the same size.

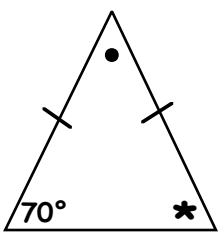
   (a) Write down the value of the angle marked *. (don't measure it)

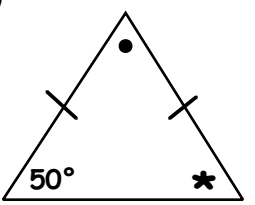
   (b) Now calculate the size of the 3rd angle.

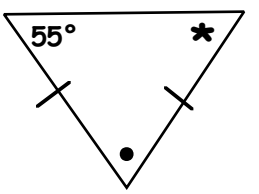


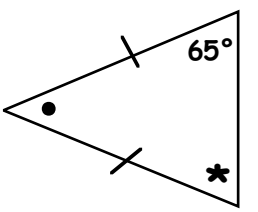
6. Make a small neat sketch of each of these isosceles triangles.

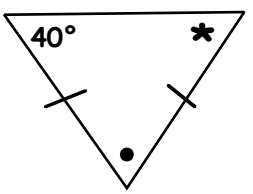
   Calculate the sizes of the two missing angles in each triangle :-

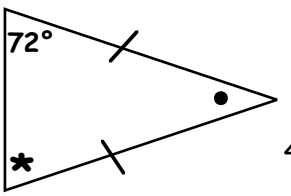
(a) 

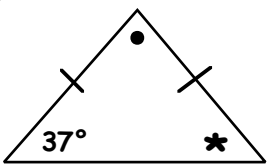
(b) 

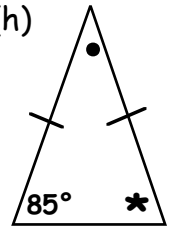
(c) 

(d) 

(e) 

(f) 

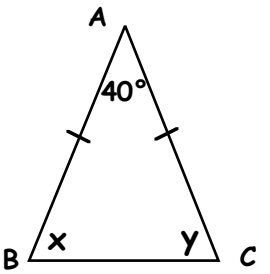
(g) 

(h) 

7. ΔABC is isosceles.

(a) If $\angle BAC = 40°$, what is the value of $(x + y)$?

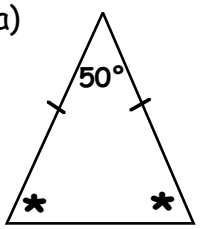
(b) Since x and y are both the same, what must x and y be ?



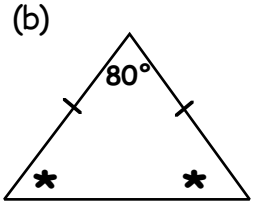
8. Make a small neat rough sketch of each of these isosceles triangles.

Calculate the sizes of the two missing angles in each triangle :-

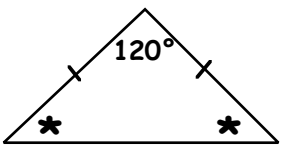
(a)



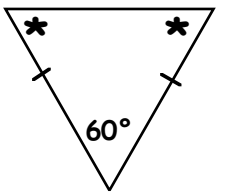
(b)



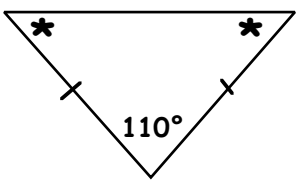
(c)



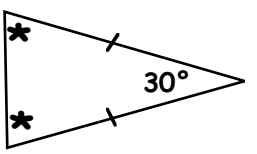
(d)



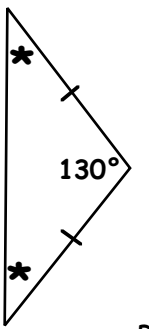
(e)



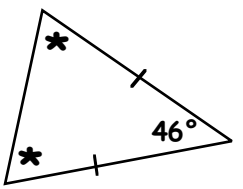
(f)



(g)



(h)

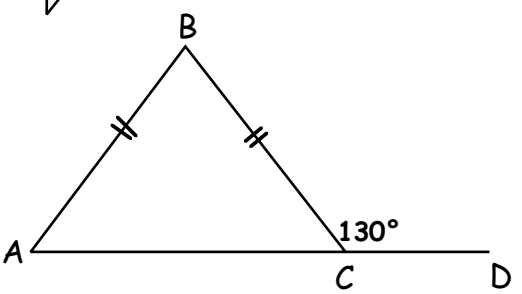


9. ΔABC is isosceles.
$\angle BCD = 130°$

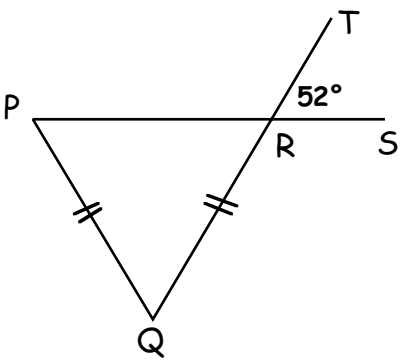
(a) Calculate the size of $\angle BCA$.

(b) Calculate the size of $\angle BAC$.

(c) Now calculate the size of $\angle ABC$.



10.



ΔPQR is isosceles. PQ = RQ
$\angle TRS = 52°$

(a) Calculate the size of $\angle PRQ$.

(b) Now calculate the size of $\angle RPQ$.

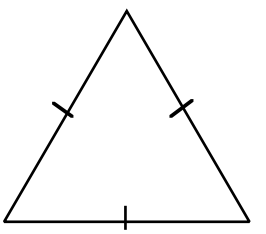
(c) Finally, what is the size of $\angle PQR$?

11. This is a very special triangle.
All 3 of its sides are the same length.

(a) What do we call this type of triangle ?

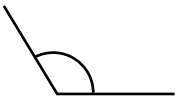
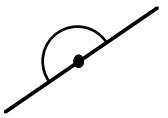
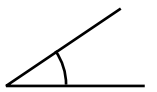
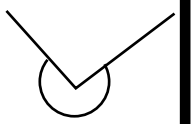
All 3 angles are the same size.

(b) Use your common sense to calculate the size of each of the 3 angles in this triangle.

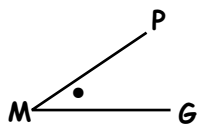


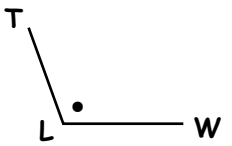
What have I learned ?

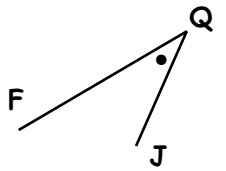
1. What kind of angle is each of these (acute, etc, ...) ?

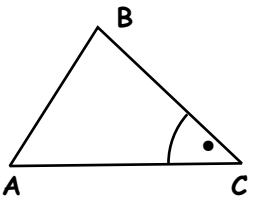
(a)  (b)  (c)  (d)  (e) 

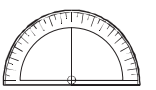
2. Use 3 letters to name each of the angles marked •.

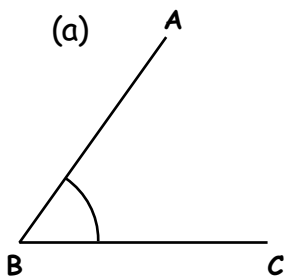
(a) 

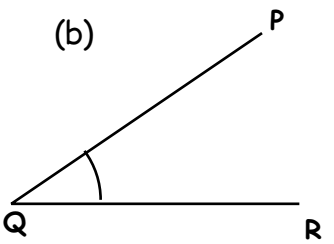
(b) 

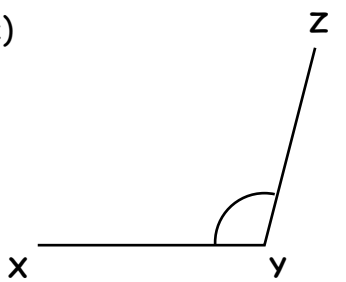
(c) 

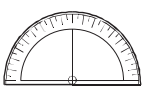
(d) 

3. Measure these 3 angles [Guess their sizes (roughly) first]. 

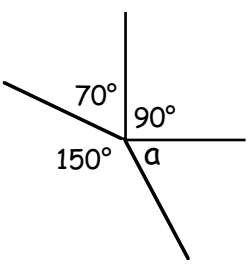
(a) 

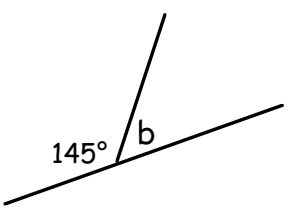
(b) 

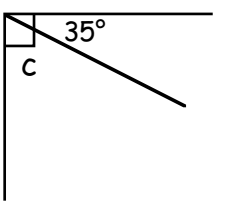
(c) 

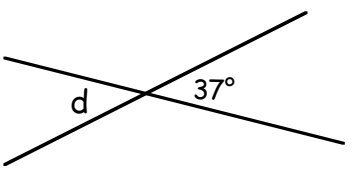
4. (a) Draw a line DE = 6 cm. Use your protractor to show ∠CDE = 65°.
(b) Draw a line ST = 8 cm. Use your protractor to show ∠RST = 110°. 

5. Calculate the sizes of the angles marked a, b, c, ... (don't use a protractor) .

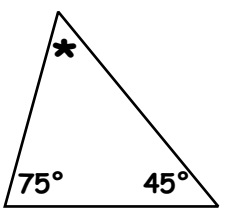


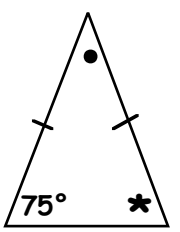


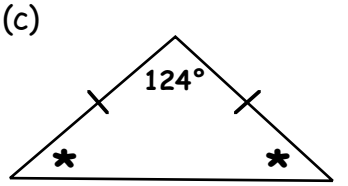




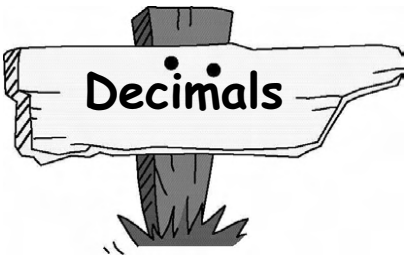
6. Sketch each triangle (neatly). Calculate the sizes of the missing angles and write them in your sketch.

(a) 

(b) 

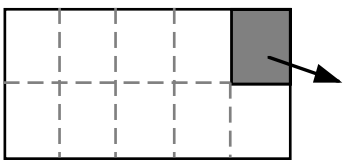
(c) 

Chapter 3

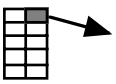


What are decimals ?

1 (large) bar of chocolate

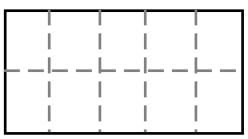


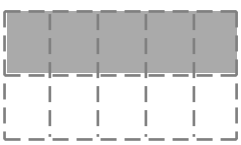
= $\frac{1}{10}$ (of 1 bar) or 0·1

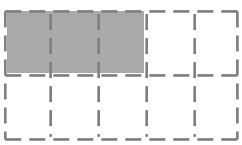


= $\frac{1}{10}$ of $\frac{1}{10}$ of 1 bar = $\frac{1}{100}$ of 1 bar = 0·01

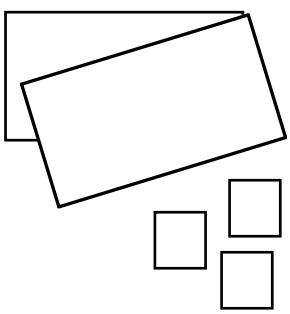
Exercise 1

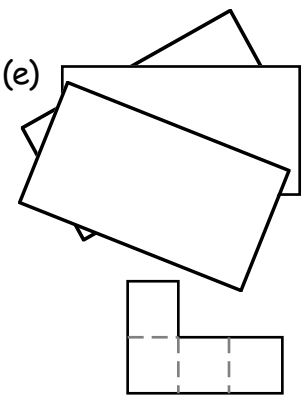
1. If  stands for 1, what numbers are represented here :-

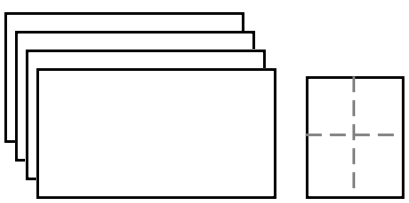
(a) 

(b) 

(c) 

(d) 

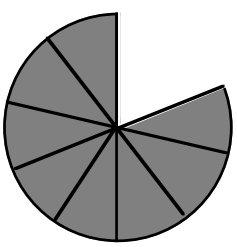
(e) 

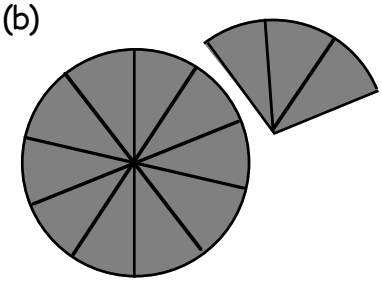
(f) 

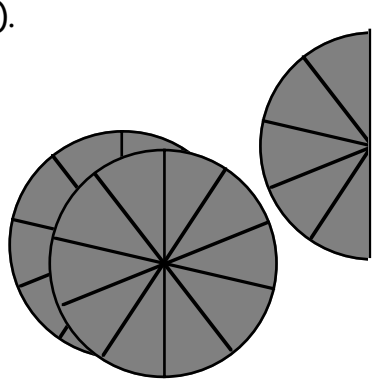
2. Draw neat pictures, similar to those above, to show the numbers :-

(a) 0·7 (b) 1·1 (c) 1·5 (d) 2·9

3. These diagrams show pizza pies (divided into 10 sections).
What decimal number does each picture show :-

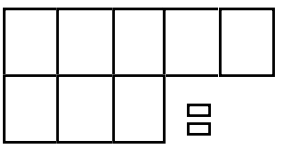
(a) 

(b) 

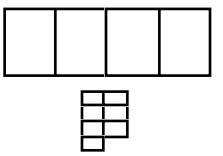
(c) 

4. Given  = 1 bar  = 0·1 bar and = 0·01 bar,

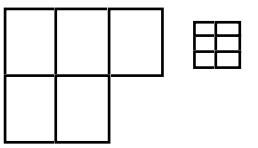
what numbers are represented by these pictures ?

(a) 

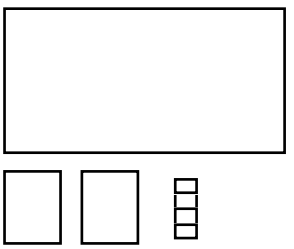
0· 8....

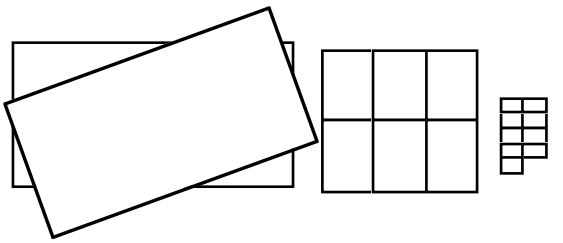
(b) 

0· .....

(c) 

0· .....

(d) 

(e) 

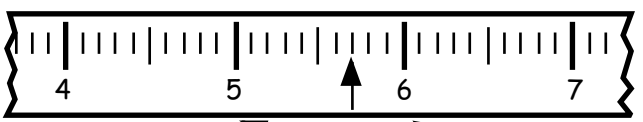
(f) 

5. Use a ruler to draw neat pictures, similar to those above, to show the numbers :-

(a) 0·24 (b) 1·35 (c) 2·81 (d) 1·04

Reading Decimal Scales
1 decimal place

To say which division an arrow points to, decide first of all which 2 whole numbers it lies between.



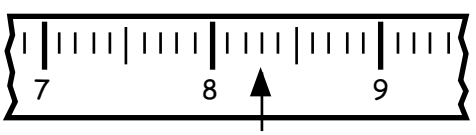
This arrow lies between 5 and 6.

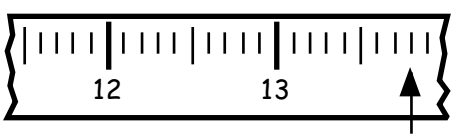
It must be 5· (something).

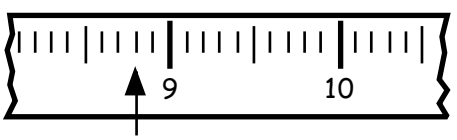
It is in fact 5·7 (can you see this ?)

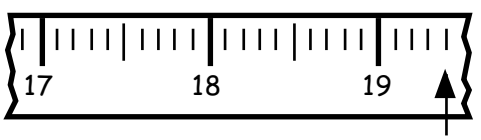
Exercise 2

1. Say what number each of these arrows is pointing to :-

(a) 

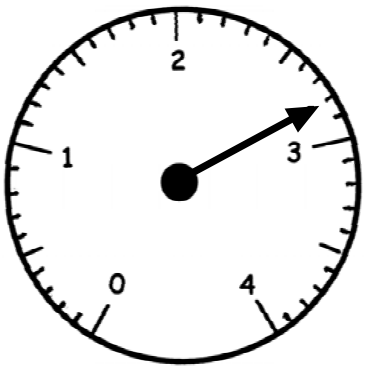
(b) 

(c) 

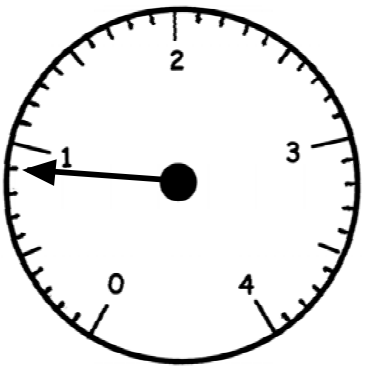
(d) 

cont'd...

(e)

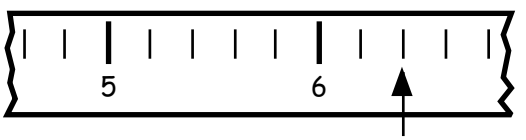


(f)

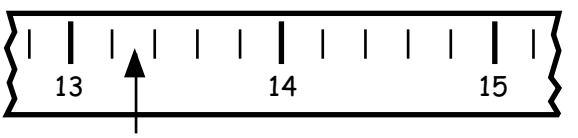


2. **Be careful here.** Say what number each of these arrows is pointing to :-

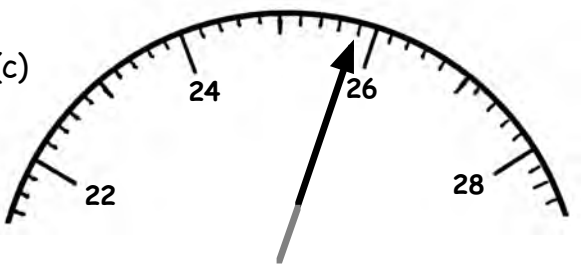
(a)



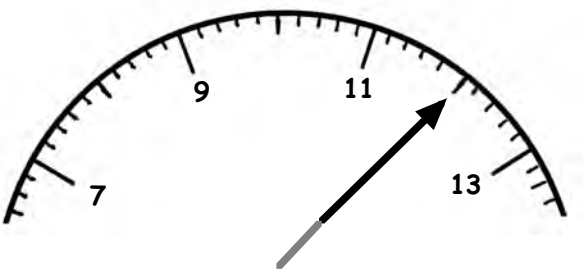
(b)



(c)

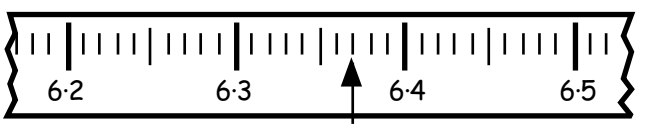


(d)



2 Decimal Places (Harder)

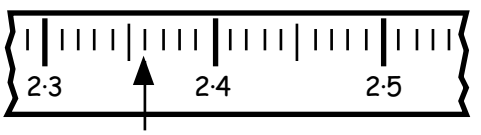
Always look at the 2 readings either side of the arrow.
(the 6·3 and 6·4)



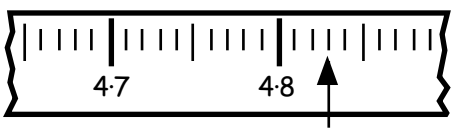
This arrow points to between 6·3 and 6·4
It must be 6·3.... (6·3 something)
It points to <u>6·37</u> (*can you see this ?*)

3. Say what number each of these arrows is pointing to :-

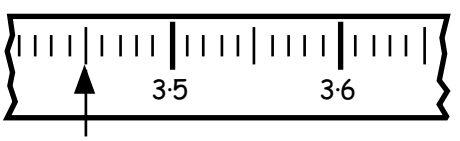
(a)



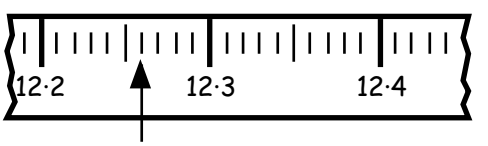
(b)



(c)

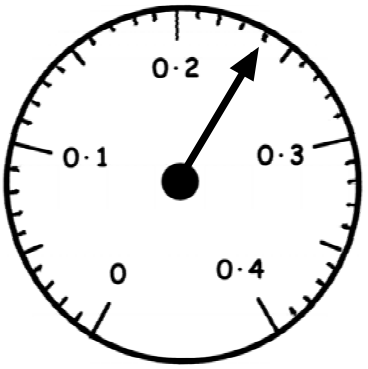


(d)

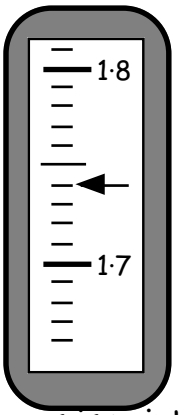


cont'd...

(e)

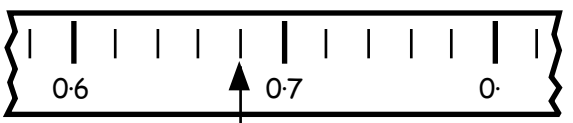


(f)



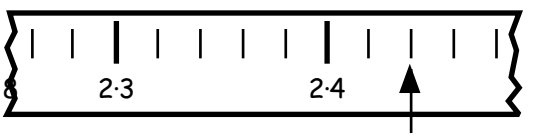
4. **Be careful here.** Say what number each of these arrows is pointing to :-

(a)

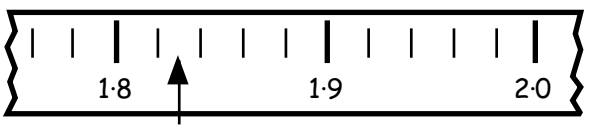


NOT (0·64 or 0·69)

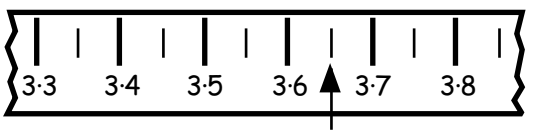
(b)



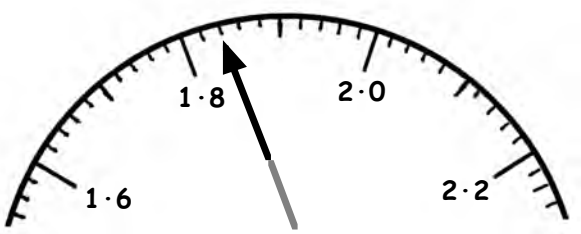
(c)



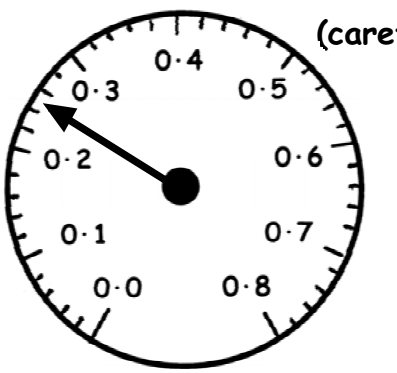
(d)



(e)



(f) **(careful)**



Rounding to 1 or 2 Decimal Places

3·174
lies between 3·17 and 3·18
It is closer to 3·17,
(to 2 decimal places)

11·647
lies between 11·64 and 11·65
It is closer to 11·65,
(to 2 decimal places)

Exercise 3

1. Copy and complete these statements :-

(a)	6·247 lies between 6·24 and 6·2... .	It is closer to ?.
(b)	4·832 lies between 4·83 and ?.	It is closer to ?.
(c)	2·719 lies between ? and ?.	It is closer to ?.
(d)	1·653 lies between ? and ?.	It is closer to ?.
(e)	10·208 lies between ? and ?.	It is closer to ?.
(f)	0·582 lies between ? and ?.	It is closer to ?.
(g)	6·897 lies between ? and ?.	It is closer to ?.
(h)	0·028 lies between ? and ?.	It is closer to ?.

2. Which of the two numbers in the brackets is the correct answer when the number is rounded to 2 decimal places :-

(a) 5·326 (5·32 or 5·33) ? (b) 8·261 (8·26 or 8·27) ?

(c) 1·939 (1·93 or 1·94) ? (d) 0·682 (0·68 or 0·69) ?

(e) 12·277 (12·27 or 12·28) ? (f) 3·006 (3·00 or 3·01) ?

(g) 1·696 (1·69 or 1·70) ? (h) 0·043 (0·04 or 0·05) ?

3. To round "**longer**" numbers like 3·74812 to 2 decimal places :-

—> Step 1 - note that it lies between 3·74 and 3·75
—> Step 2 - say which number it is closer to —> 3·75

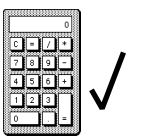
Round these numbers to 2 decimal places, using this method :-

(a) 2·35417 —> 2·35 (b) 1·86773 —> (c) 8·21683 —>

(d) 7·28499 —> (e) 9·32581 —> (f) 4·03707 —>

(g) 5·86333 —> (h) 6·05137 —> (i) 3·89681 —>

(j) 0·24567 —> (k) 10·1037 —> (l) 0·06989 —>



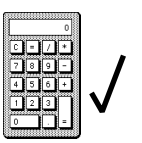
4. Use your calculator to do these divisions and write down the answers. Now round your answer to 2 decimal places :-

(a) 70 ÷ 13 (b) 200 ÷ 27 (c) 63·8 ÷ 23·7

(d) 9·3 ÷ 0·78 (e) 123 ÷ 47·9 (f) 29·7 ÷ 35

(g) 0·98 ÷ 0·47 (h) 385 ÷ 129 (i) 1000 ÷ 345·6

5. To change a fraction to a decimal :-



$\frac{7}{19}$ means 7 ÷ 19 = 0·368421..... = 0·37 (to 2 decimal places)

Change these fractions to decimals and round the answers to 2 decimal places :-

(a) $\frac{5}{13}$ = (5 ÷ 13) = 0·384615.... = 0·..... (to 2 decimal places)

(b) $\frac{7}{11}$ = (7 ÷ 11) = 0·

(c) $\frac{6}{23}$ = (6 ÷ ...) =

(d) $\frac{5}{7}$ =

(e) $\frac{7}{16}$ =

(f) $\frac{2}{3}$ =

(g) $\frac{13}{17}$ =

6. (a) 3 men have a meal. The total bill is £19·67.
They share the bill equally. (£19·67 ÷ 3).

How much should each man pay ?
(*to the nearest 1 pence*)

(b) 6 sacks of potatoes weigh a total of 125 kilograms.

If each weighs the same, what is the weight of 1 sack ?
(to 2 decimal places)

(c) 

A gardener was paid £32 for planting some shrubs.
It took him 7 hours.

How much was he paid each hour ?

(d) Which of these fractions is the biggest and which is the smallest :-

$\{\frac{9}{13}, \frac{7}{9}, \frac{12}{17}\}$

hint : find $\frac{9}{13}$ = 9 ÷ 13 = ...

find $\frac{7}{9}$ = 7 ÷ 9 .....

find $\frac{12}{17}$ = ... (now compare your answers)

Add and Subtract Decimal Numbers

Make sure the decimal points are beneath each other

19·33 + 8·89

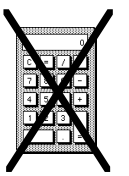
=> 19·33
+ 8·89
= 28·22

match up

35·37 - 19·45

=> 35·37
- 19·45
= 15·92

match up



Exercise 4

1. Set these down and find the answers :-

(a) 17·61 + 8·93

(b) 35·77 + 19·26

(c) 45·69 + 9·88

(d) 23·45 + 9·78

(e) 47·68 + 29·79

(f) 37·64 + 8·27

cont'd...

(g) $\begin{array}{r} 18{\cdot}73 \\ -\ 6{\cdot}58 \\ \hline \end{array}$ (h) $\begin{array}{r} 32{\cdot}49 \\ -\ 15{\cdot}73 \\ \hline \end{array}$ (i) $\begin{array}{r} 64{\cdot}81 \\ -\ 27{\cdot}22 \\ \hline \end{array}$

(j) 14·26 – 8·71 (k) 65·04 – 28·61 (l) 49·52 – 12·3

2. To find $\begin{array}{r} 36{\cdot}8 \\ -\ 14{\cdot}62 \\ \hline \end{array}$ rewrite it as (adding 0's often helps) $\begin{array}{r} {}^{7}\cancel{3}{}^{1}6{\cdot}80 \\ -\ 14{\cdot}62 \\ \hline \end{array}$ ← note

Find the following :-

(a) $\begin{array}{r} 27{\cdot}5 \\ -\ 8{\cdot}36 \\ \hline \end{array}$ (b) $\begin{array}{r} 42{\cdot}9 \\ -\ 13{\cdot}65 \\ \hline \end{array}$ (c) $\begin{array}{r} 21{\cdot}6 \\ -\ 8{\cdot}39 \\ \hline \end{array}$

(d) 24·7 – 6·38 (e) 46·4 – 13·73 (f) 9·4 – 7·88

3. To find $\begin{array}{r} 38 \\ -\ 17{\cdot}36 \\ \hline \end{array}$ rewrite it as $\begin{array}{r} 38{\cdot}00 \\ -\ 17{\cdot}36 \\ \hline 20{\cdot}64 \end{array}$ ← note

Find the following :-

(a) 19 – 7·23 (b) 8 – 6·92 (c) 13 – 2·08

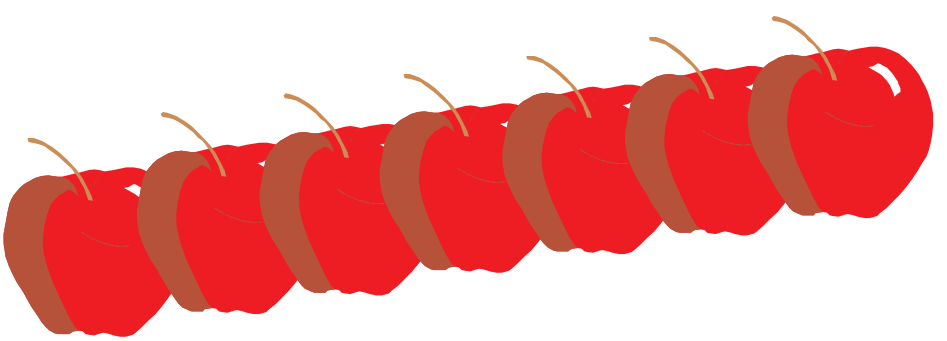
(d) 23 – 13·15 (e) 53 – 29·48 (f) 20 – 0·72

4. (a) From a piece of rope 8·73 metres long, a piece 2·49 metres is cut off. What is the length of the remaining piece ?

(b) 2 bags contain apples. One weighs 5·86 kg and the other weighs 4·95 kg.

(i) What is the <u>TOTAL</u> weight of the 2 bags ?

(ii) By how much is the bigger bag heavier than the smaller one ?



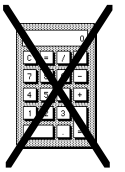
Multiplying Decimals

It helps to copy the decimal point straight down from where it is.

6·47 x 8

$$\begin{array}{r} 6{\cdot}47 \\ \times\ 8 \\ \hline 51{\cdot}76 \end{array}$$

remember the point



Exercise 5 (no calculator)

1. Copy these and find the answers :-

(a) $\begin{array}{r} 4{\cdot}23 \\ \times\ 6 \\ \hline \\ \hline \end{array}$

(b) $\begin{array}{r} 2{\cdot}94 \\ \times\ 5 \\ \hline \\ \hline \end{array}$

(c) $\begin{array}{r} 5{\cdot}06 \\ \times\ 8 \\ \hline \\ \hline \end{array}$

(d) $\begin{array}{r} 8{\cdot}17 \\ \times\ 7 \\ \hline \\ \hline \end{array}$

(e) $\begin{array}{r} 12{\cdot}24 \\ \times\ 3 \\ \hline \\ \hline \end{array}$

(f) $\begin{array}{r} 0{\cdot}81 \\ \times\ 9 \\ \hline \\ \hline \end{array}$

(g) $\begin{array}{r} 16{\cdot}73 \\ \times\ 4 \\ \hline \\ \hline \end{array}$

(h) $\begin{array}{r} 37{\cdot}86 \\ \times\ 2 \\ \hline \\ \hline \end{array}$

(i) $\begin{array}{r} 5{\cdot}27 \\ \times\ 9 \\ \hline \\ \hline \end{array}$

(j) 16·83 x 5

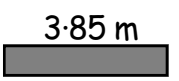
(k) 9·27 x 6

(l) 8 x 1·35

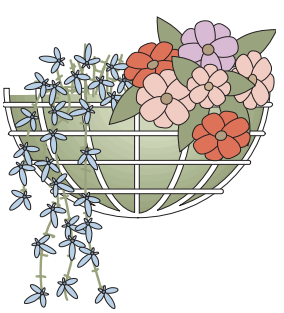
2. (a) A tyre weighs 5·73 kilograms.

What will 4 tyres weigh ?

(b) A plank is 3·85 metres long.



If 6 planks are joined end to end, what will the total length be ?

(c) 

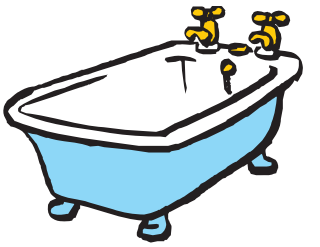
A Garden Centre sells hanging baskets for £8·97.

If I bought 9 baskets, how much would this cost ?

cont'd...

(d) A jug holds 3·67 litres of water when full.
8 full jugs of hot water are poured into an empty bath.

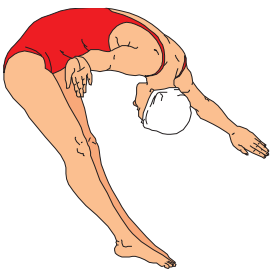
How much water is in the bath ?



(e) Twin boys, Ian and Greg, each weigh 47·63 kg.

What is the combined weight of the 2 boys ?

(f)

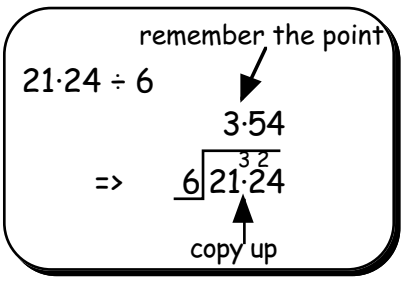


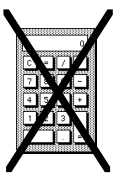
The distance between the banks of a river is 32·65 metres.

How far will Lucy have travelled if she swam from bank to bank 6 times ?

Division by Decimals

Remember to copy the decimal point up to the line above.





Exercise 6 (no calculator)

Again – Knowing your tables REALLY helps here.

1. Copy and do the following :-

(a) $2\overline{)16{\cdot}48}$ (b) $3\overline{)16{\cdot}65}$ (c) $4\overline{)23{\cdot}56}$

(d) $5\overline{)23{\cdot}85}$ (e) $6\overline{)49{\cdot}50}$ (f) $7\overline{)38{\cdot}01}$

(g) $8\overline{)50{\cdot}56}$ (h) $9\overline{)30{\cdot}78}$ (i) $6\overline{)4{\cdot}32}$

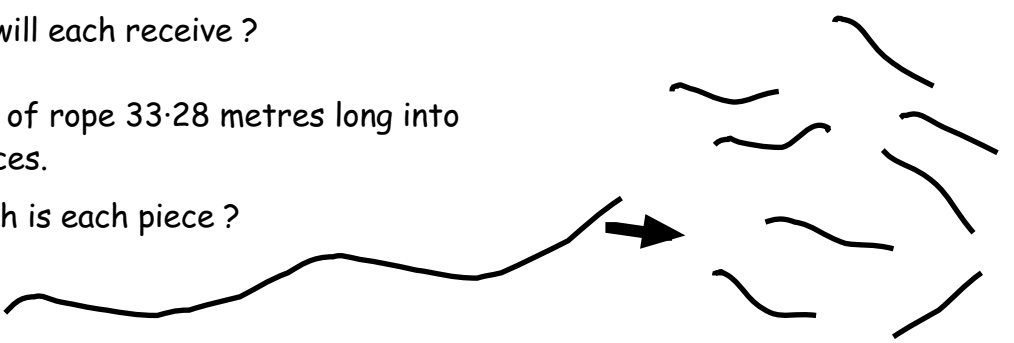
(j) 43·25 ÷ 5 (k) 21·84 ÷ 8 (l) 13·37 ÷ 7

2. (a) Share £58·16 equally amongst 4 women.

How much will each receive ?

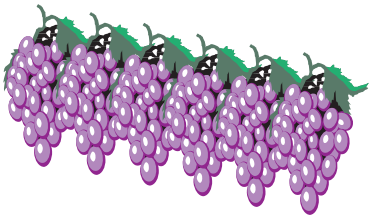
(b) Cut a piece of rope 33·28 metres long into 8 equal pieces.

What length is each piece ?

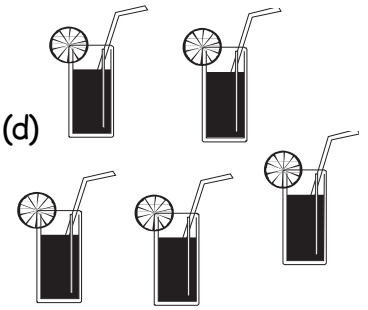


(c) 6 identical bunches of grapes weigh 14·04 kg in total.

What is the weight of 1 bunch ?



(d)



3·45 litres of juice is poured equally into 5 glasses.

How much juice will there be in each glass ?

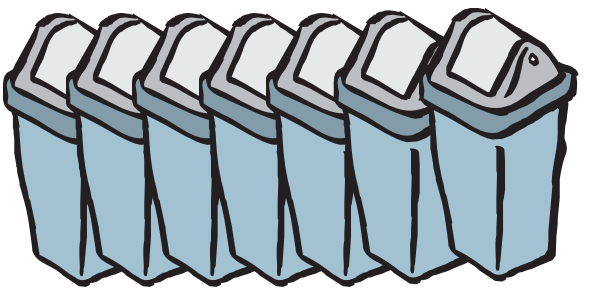
(e) A runner completes 4 circuits of a race in a total of 172·48 seconds.

What was his average time for each circuit ?

(f) 7 new bins are delivered to the Waldorf Hotel.
The total weight of the bins is 26·18 kilograms.

(i) What is the weight of 1 bin ?

(ii) Now calculate the weight of 3 bins.



Multiplication by 10, 100, 1000 – (Rules, Rules, Rules !!)

Can you remember when you multiplied a whole number by 10 you simply added a "0" on to the end ?

$36 \times 10 = 360$

This rule does **NOT** work for decimals.

To find 3·81 x 10

=> 3 · 8 1 × 10 = 3 8 · 1

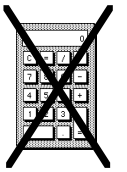
move all the figures 1 place left

To find 1·372 x 100

=> 1 · 3 7 2 × 100 = 1 3 7 · 2 = 137·2

move all the figures 2 places left

Exercise 7 (no calculator)



1. Copy these down and find the following :-

(a)	6·34 × 10	(b)	4·17 × 10	(c)	0·78 × 10
(d)	12·34 × 10	(e)	5·9 × 10	(f)	0·6 × 10
(g)	1·234 × 100	(h)	0·878 × 100	(i)	6·39 × 100
(j)	11·487 × 100	(k)	0·021 × 100	(l)	4·5 × 100

Simple Rules :-

To multiply by 10 => move the **figures** 1 place to the left.
=> (or move the **point** 1 place to the right.)

2. Write down the answers to the following by using the rule above :-

(a) 10 x 8·21 (b) 10 x 1·37 (c) 10 x 0·93 (d) 10 x 6·2

(e) 14·15 x 10 (f) 28·7 x 10 (g) 0·04 x 10 (h) 10 x 1·05

3. Write down the answers to the following by using the rule above :-

(a) 6·31 x 100 (b) 100 x 2·47 (c) 1·358 x 100 (d) 0·927 x 100

(e) 100 x 14·16 (f) 1·037 x 100 (g) 0·002 x 100 (h) 100 x 2·5

4. A drawing pin weighs 0·27 grams.
Calculate the weight of :- (a) 10 pins ? (b) 100 pins ?

5. A bottle holds 1·75 litres of water.
How many litres are there in :- (a) 10 bottles ? (b) 100 bottles ?

6. Extend the above rules to help find the answers to the following :-

(a) 2·134 x 1000 (b) 0·376 x 1000 (c) 15·18 x 1000

(d) 0·00361 x 1000 (e) 1000 x 0·001 (f) 0·0303 x 1000

Division by 10, 100, 1000 – (Yet More Rules !!)

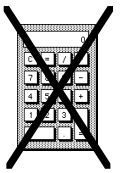
We have just given a rule that said :-

To Multiply by 10
you move all the figures
1 place to the left

=> Now =>

To Divide by 10
you move all the figures
1 place to the right

$16{\cdot}3 \div 10 \Rightarrow$ $10\overline{)16{\cdot}3}$ $1{\cdot}63$



Exercise 8 (no calculator)

1. Copy and find the following :-

(a) $10\overline{)6{\cdot}4}$ (b) $10\overline{)19{\cdot}4}$ (c) $10\overline{)3{\cdot}21}$

(d) $10\overline{)0{\cdot}65}$ (e) $10\overline{)68}$ (f) $10\overline{)0{\cdot}03}$

(g) $14{\cdot}7 \div 10$ (h) $22{\cdot}63 \div 10$ (i) $9 \div 10$

(j) $100\overline{)23{\cdot}1}$ (k) $100\overline{)289}$ (l) $100\overline{)1231}$

(m) $48{\cdot}3 \div 100$ (n) $29{\cdot}81 \div 100$ (o) $6{\cdot}7 \div 100$

(p) $\frac{9{\cdot}8}{10}$ (q) $\frac{27}{10}$ (r) $\frac{0{\cdot}65}{10}$

(s) $\frac{53{\cdot}1}{100}$ (t) $\frac{165}{100}$ (u) $\frac{3{\cdot}7}{100}$

2. The rule for dividing by 10 is simple.

"To divide a number by 10, simply move all the figures 1 place to the right".

(a) Write down a similar rule for dividing by 100.

(b) Now write down the rule for dividing by 1000.

3. Find the following :-

(a) $1000\overline{)265{\cdot}3}$ (b) $1000\overline{)3625}$ (c) $1000\overline{)58{\cdot}1}$

(d) $293{\cdot}1 \div 1000$ (e) $62 \div 1000$ (f) $5870 \div 1000$

(g) $\frac{480}{1000}$ (h) $\frac{18625}{1000}$ (i) $\frac{69{\cdot}3}{1000}$

4. (a) If 10 packets of crisps cost £2·30, what will one packet cost ?

(b) If a box of 100 chocolate biscuits costs £15, what will one biscuit cost ?

(c) 1000 bolts weigh 5·85 kg. What will one bolt weigh ?

(d) 10 planks of wood together measure 95 cm. What is the width of one plank ?

(e) 100 dice weigh 875 grams. What will one dice weigh ?

5. To change from millimetres to centimetres, you "**DIVIDE by 10**".

Change each of the following to centimetres :-

(a) 18 mm (b) 37 mm (c) 8·9 mm (d) 6·0 mm (e) 0·4 mm

6. To change from centimetres to metres, you "**DIVIDE by 100**".

Change each of the following to metres :-

(a) 355 cm (b) 602 cm (c) 88 cm (d) 25·3 cm (e) 6·4 cm

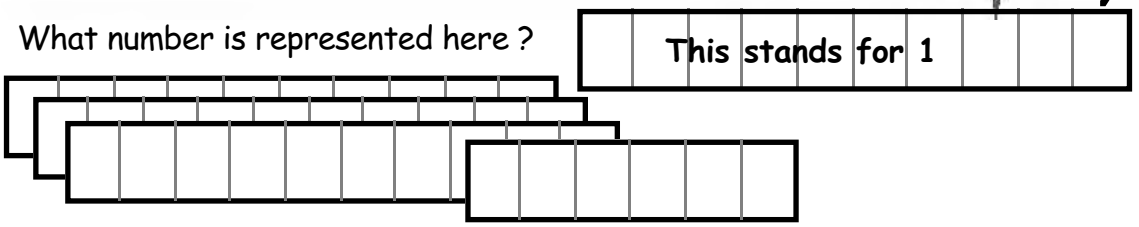
7. To change from metres to kilometres, you "**DIVIDE by 1000**".

Change each of the following to kilometres :-

(a) 32370 m (b) 965 m (c) 472 m (d) 85·9 m (e) 9·7 m

What have I learned ?

1. What number is represented here ?



2. Use a ruler to **neatly** represent the number 2·8 in the same way as shown above.

3. Round these numbers to 1 decimal place :-

   (a) 3·16 (b) 15·82 (c) 4·35 (d) 0·92 (e) 6·98

4. Round these numbers to 2 decimal places :-

   (a) 6·374 (b) 10·187 (c) 0·966 (d) 3·125 (e) 0·0298

5. Copy and do the following :-

   (a) $6{\cdot}82 + 1{\cdot}39$ (b) $17{\cdot}81 - 8{\cdot}45$ (c) $23{\cdot}5 + 6{\cdot}28$ (d) $19 - 8{\cdot}51$

   (e) $11{\cdot}4 - 2{\cdot}73$ (f) $0{\cdot}99 + 9{\cdot}9$ (g) $15 - 4{\cdot}2$ (h) $2 - 1{\cdot}01$

6. Copy and do the following :-

   (a) $6{\cdot}3 \times 4$ (b) $8{\cdot}2 \times 9$ (c) $14{\cdot}5 \times 6$ (d) $0{\cdot}87 \times 8$

   (e) $4\overline{)17{\cdot}2}$ (f) $6\overline{)58{\cdot}2}$ (g) $5\overline{)13{\cdot}75}$ (h) $7\overline{)9{\cdot}38}$

7. Write down the answers to the following :-

   (a) $3{\cdot}12 \times 10$ (b) $10 \times 0{\cdot}816$ (c) $4{\cdot}27 \times 100$

   (d) $0{\cdot}961 \times 100$ (e) $1000 \times 1{\cdot}713$ (f) $0{\cdot}0641 \times 1000$

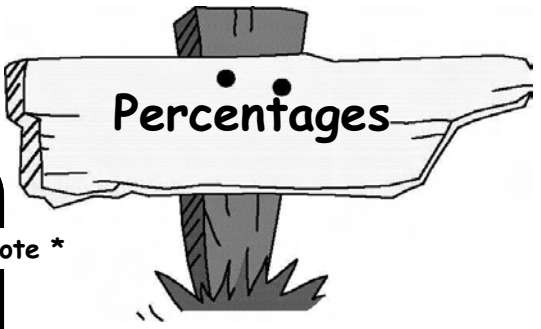
8. Write down the answers to the following :-

   (a) $10\overline{)16{\cdot}2}$ (b) $10\overline{)8{\cdot}5}$ (c) $100\overline{)93{\cdot}2}$

   (d) $100\overline{)93{\cdot}2}$ (e) $100\overline{)35}$ (f) $26{\cdot}8 \div 10$

   (g) $2647 \div 1000$ (h) $\frac{378}{1000}$ (i) $1000\overline{)16{\cdot}4}$

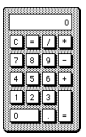
Chapter 4



Remember :-

17% means $\frac{17}{100}$ = 0·17 **note ***

3% means $\frac{3}{100}$ = 0·03



Exercise 1 ✓

1. Write each of the following as a fraction **AND** as a decimal :-

(a) 23% (b) 45% (c) 51% (d) 19% (e) 72%

(f) 8% (g) 2% (h) 9% (i) 17·5% (j) 6·5%

2. (**Your multiplication tables will help here**).

Write these percentages as fractions and simplify where possible :-

(a) 35% = $\frac{35 \div 5}{100 \div 5}$ = $\boxed{\frac{7}{20}}$ (b) 70% = $\frac{70 \div 10}{100 \div 10}$ = $\boxed{\quad}$

(c) 85% (d) 90% (e) 50% (f) 25% (g) 75%

(h) 10% (i) 5% (j) 16% (k) 48% (l) 96%

(m) 2% (n) 60% (o) 15% (p) 26% (q) 80%

3. To change a fraction (like $\frac{2}{5}$) to a percentage :-

$\frac{2}{5}$ means 2 ÷ 5 = 0·4 **(calculator)** = (0·4 x 100) = 40%

$\frac{3}{4}$ means 3 ÷ 4 = 0·75 **(calculator)** = (0·75 x 100) = 75%

Copy the following and use your calculator to change each fraction to a percentage :-

(a) $\frac{7}{50}$ = 7 ÷ 50 = 0·..... = (0·..... x 100) = $\boxed{\quad\quad\%}$

(b) $\frac{1}{4}$ = 1 ÷ 4 = 0·..... = (0·..... x 100) = $\boxed{\quad\quad\%}$

(c) $\frac{4}{25}$ (d) $\frac{4}{5}$ (e) $\frac{7}{10}$ (f) $\frac{13}{20}$ (g) $\frac{1}{2}$ (h) $\frac{1}{10}$

(i) $\frac{19}{20}$ (j) $\frac{17}{25}$ (k) $\frac{1}{8}$ (l) $\frac{3}{8}$ (m) $\frac{9}{10}$ (n) $\frac{1}{100}$

4. David scored $\frac{21}{25}$ in a maths test. To write this as a percentage :-

Score = $\frac{21}{25}$ = 21 ÷ 25 = 0·84 = (0·84 x 100) = 84%

Change each of these test scores to percentages in the same way :-

(a) Suzie scored 27 out of 30 (= $\frac{27}{30}$ = 27 ÷ 30 = 0· ..... = ... %)

(b) Billy scored 45 out of 50

(c) Helen scored 24 out of 40

(d) Ian scored 7 out of 10

(e) Megan scored 19 out of 25

(f) Kayleigh scored 42 out of 60

(g) Lynsey scored 60 out of 80

(h) Jason scored 27 out of 54

Ian

5. Ryan sat 4 separate tests. Listed below are his marks.

English –	45 out of 60	Science –	16 out of 20
Maths –	21 out of 30	History –	18 out of 25

By changing each score to a percentage, write his subjects in order, starting with his best subject.

Percentages using a Calculator

To find 17% of £300 =>

17% of £300 = $\frac{17}{100}$ x 300
= (17 ÷ 100) x 300 = £51

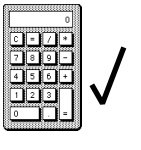
To find 6% of £90 =>

6% of £90 = $\frac{6}{100}$ x 90
= (6 ÷ 100) x 90 = £5·40

note*

Exercise 2a

1. Use your calculator to find the following :-



(a) 16% of £40 = (16 ÷ 100) x 40 = £.....

(b) 14% of £70 (c) 23% of £11 (d) 32% of £750

cont'd ...

(e) 53% of £900 (f) 12% of £80 (g) 62% of £4600

(h) 95% of £8·40 (i) 3% of £9 (j) 1% of £650

(k) 36% of £7·50 (l) 75% of 60p (m) 44% of £2·50

(n) 7% of £14 (o) $17\frac{1}{2}$% of £80 (p) $5\frac{1}{2}$% of £50

(17·5)% (5·5)%

2. (a) Of the 220 pupils in First Year, 45% are boys.

(i) How many boys are there ? (ii) How many girls are there ?

(b) A driver uses 70% of his full tank of petrol driving to Birmingham.

If his car holds 60 litres, how many litres has he used ?

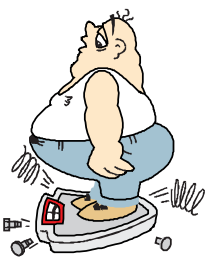
(c) A packet of cereal weighs 750 grams.

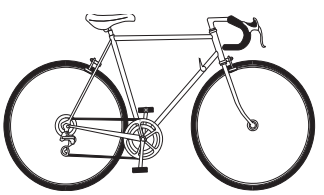
22% of it is sugar
46% of it is starch
8% of it is protein
9% of it is fibre
5% of it is fat

Calculate how many grams of sugar, starch, protein, fibre and fat are in the packet.

(d) 90% of the human body is made up of water.

If Tim weighs 65 kilograms, how much of him is water ?



(e) 

I sold my bicycle for 60% of what I paid for it.
I paid £350 for it a year ago.

How much did I receive when I sold my bicycle ?

(f) I am at school for 25% of the day. Of the 24 hours in a day, how much of the time do I actually spend at school ?

Percentage Rise

My holiday should have cost me £900 but the price rose by 7% =>

Old Price	£900
Rise (7% of 900) =	£ 63 <- (7 ÷ 100) x 900
New Price =	£963

Exercise 2b

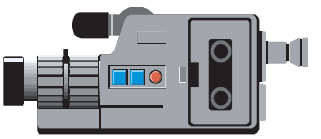
For each Question in this exercise, show the 3 lines of working neatly.

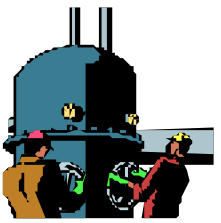
1. A holiday was priced at £800. It rose by 10%.

   What is the new cost of the holiday ?

2. Last year a camcorder cost £280.
   This year it rose by 25%.

   What is the new cost ?



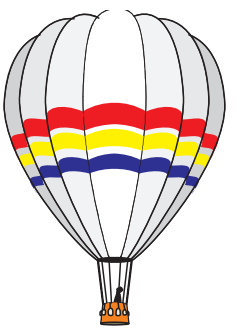
3. 

   The pressure in a boiler was 80 poundals.
   The pressure rose by 15%.

   What is the new pressure ?

4. A hot air balloon rose from a height of 1200 feet by 30%.

   What was its new height ?



5. 

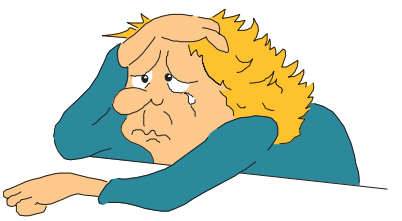
   When David started Secondary School, his height was 1·40 metres.

   By the end of Secondary 4, his height had risen by 20%.

   What was David's new height ?

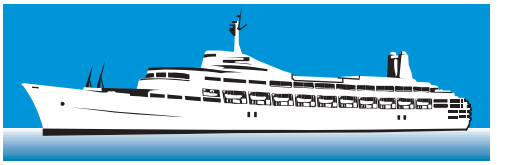
6. Gabby weighed 50 kg, but because of overeating at Christmas and New Year, her weight rose by 8%.

   Calculate Gabby's new weight.



7. A ship was sailing at 25 km/hour.
It increased its speed by 40%.

What was its new speed ?



8. 

The temperature in a furnace was 600°C.
The temperature rose by 13°C.

What was the new temperature ?

9. A boy received £12 pocket money each week.
His dad gave him a rise of 15%.

What was his new pocket money ?

10. 

A sums teacher walked a total distance of 30 kilometres one Saturday.
The next day, he calculated he had only walked 24% of Saturday's journey.

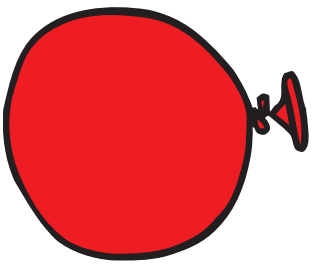
How far had he walked on Sunday ?

11. Nick earned £18000 last year.
He received a 4% pay rise.

How much did Nick earn this year ?

12. This top-of-range Rover 214i cost £10500 two years ago.
This year, the price rose by 8%.

How much does it cost this year ?

13. 

A balloon held 2400 cubic centimetres of air.
It was inflated by a further 60% before it burst.

What was its volume just as it burst ?

14. A **SURCHARGE** is simply an <u>increase</u> in the amount you pay for your holiday. Thornton's had to "levy" a surcharge of **5%** on all their holidays.

	THORNTON'S HOLIDAYS			
Majorca	8th July	7 days	*h/b*	**£360**
Ibiza	15th July	14 days	*h/b*	**£420**
Lanzarote	22nd July	10 days	*room*	**£480**
Minorca	1st July	14 days	*h/b*	**£520**
Tenerife	3rd July	7 days	*s/c*	**£380**

(a) What will it **now** cost to go to Majorca for 7 days ?

(b) How much will it **now** cost to fly to Lanzarote for 10 days ?

(c) Mr McIntosh and his wife booked for 2 weeks in Minorca.

(i) What **should** their bill have come to ? [for the two of them]

(ii) How much "surcharge" did they have to pay ?

(iii) What did their **final** bill come to ?

Percentage Fall

Sometimes prices fall, for example, in a **SALE**

This C.D. should cost £14 but it is REDUCED by 20% in the January Sales

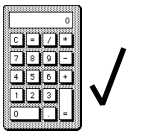
3 lines =>

Old Price = £14

=> Fall = $\frac{20}{100}$ x 14 = £ 2·80 **(calculator)**

=> New Price = (£14 – £2·80) = £11·20

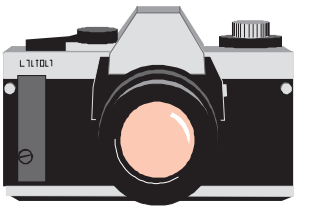
Exercise 2c



For each Question in this exercise, neatly show the 3 lines of working.

1. This camera cost £30·00 last month.
This month it was reduced by 40% in the sale.

   What was its new price ?



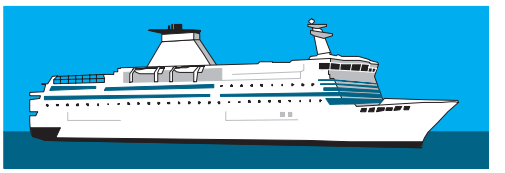
2. 

   "Two-to-Two" mobile phones cost £80.
   The price dropped by 15% in a sale.

   What was the new price of a phone ?

3. A Caribbean cruise cost £660 last summer.
This year, the price had dropped by 8%.

   What is the new price of the cruise ?



4. 

   A plane was flying at 20000 feet.
   Due to a storm, the plane's height dropped by 35%.

   What was the new height of the plane ?

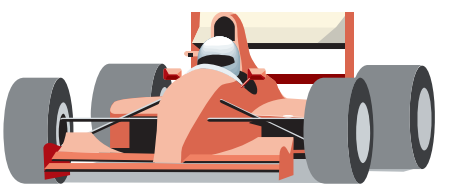
5. The temperature during a warm summer's day was 24°C at noon.
By 8 pm, it had dropped by 25% of this temperature.

   What was the new temperature ?

6. A racing car was doing 140 mph along the straight during a practice lap.

   The driver slowed by 40% at a tight bend.

   What was the car's speed around the bend ?



7. 

Mrs Higgins weighed in at 70 kilograms.
After dieting and exercising for 3 months, she found she had lost 15% of her original weight.

What was her new weight ?

8. A jug left on the windowsill held 4 litres of water.
Whilst sitting in the sunshine, 15% of the water evaporated.

How much water was left in the jug ?

9. 8·2 centimetres of snow fell one night.
By noon the following day, 30% had melted.

What was the depth of the remaining snow ?

10. 

A lady's coat cost £200 when new.

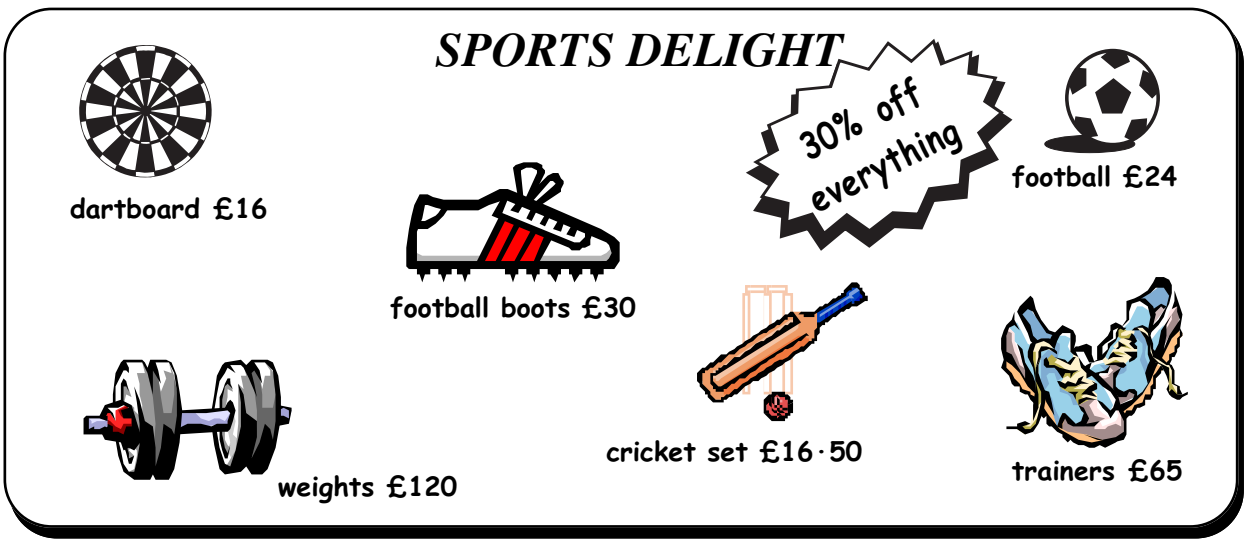
When sold in a charity shop, the price dropped by 95%.

What was the price of the coat in the charity shop ?

11. "SPORTS DELIGHT" had a winter sale. They offered "30% off all goods".

What would the sale price be for :-

(a) the football ?
(b) the pair of trainers ?
(c) the dartboard ?
(d) the cricket set ?
(e) the pair of football boots ?
(f) the weights ?



What have I learned ?

1. Write 23% as (i) a fraction (ii) a percentage.

2. Write each of the following as a fraction and simplify as much as possible.

   (a) 30% (b) 45% (c) 16%

3. Use your calculator to change each of the following fractions to a (i) decimal then (ii) percentage :-

   (a) $\frac{13}{20}$ (b) $\frac{11}{25}$ (c) $\frac{27}{40}$

4. David scored 54 out of 60 in a Maths Test. Write his score as a percentage.

5. Use your calculator to find the following :-

   (a) 37% of £240 (b) 19% of £650
   (c) 8% of £22 (d) $17\frac{1}{2}$% of £840

6. Lucy saw a trouser suit in Murphys priced at £85.

   (a) How much would she have saved in the Summer Sale ?

   (b) How much would the suit cost her in the sale ?

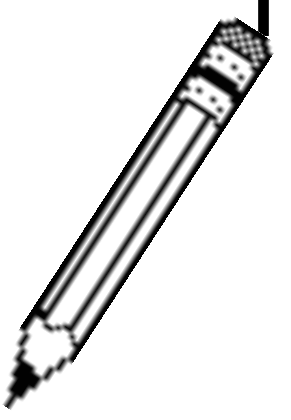
7. A basin held 6·4 litres of water.
   When a tap was opened, the volume of water in the basin increased by 30%.

   How much water was now in the basin ?

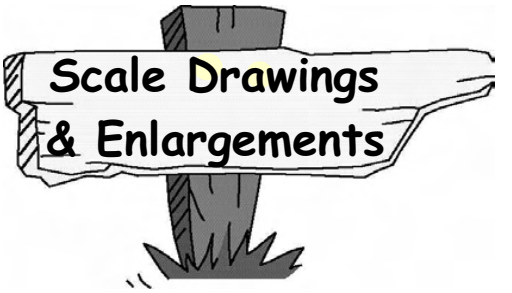
8. **Hard !** Tim's 3 test marks in Science were :-

   Test 1 - $\frac{15}{20}$ Test 2 - $\frac{35}{50}$ Test 3 - $\frac{8}{10}$

   Which was his best mark and which was his worst mark ?
   (Show your working and explain)



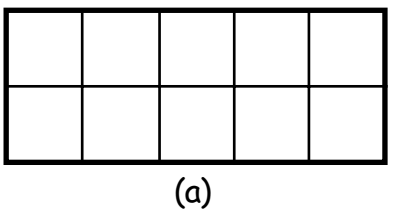
Chapter 5

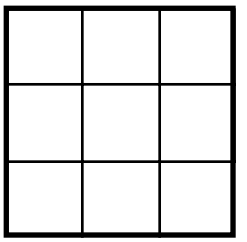


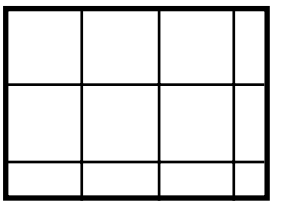
Enlargements

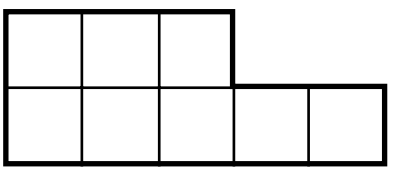
Exercise 1

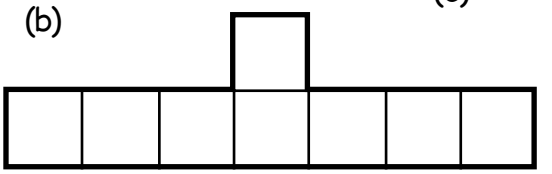
1. Make a neat "two-times" enlargement of each of these shapes :- (each box = 1 cm)

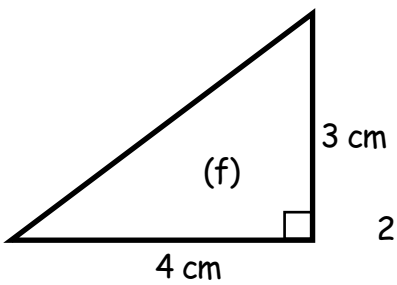

(a)

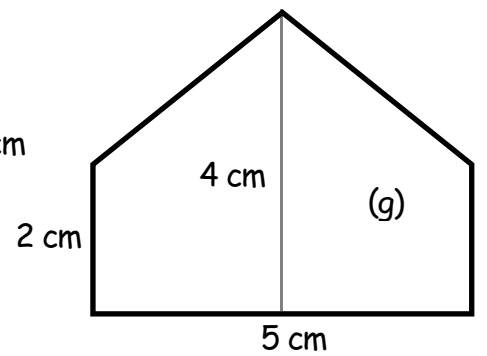

(b)

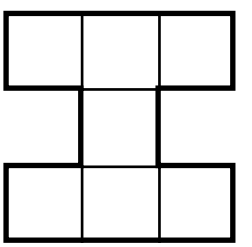

(c)

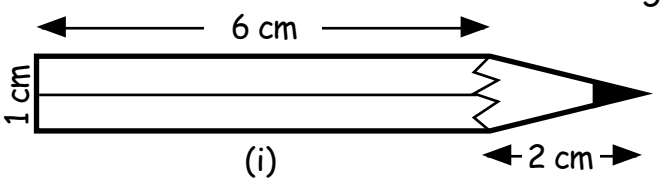

(d)

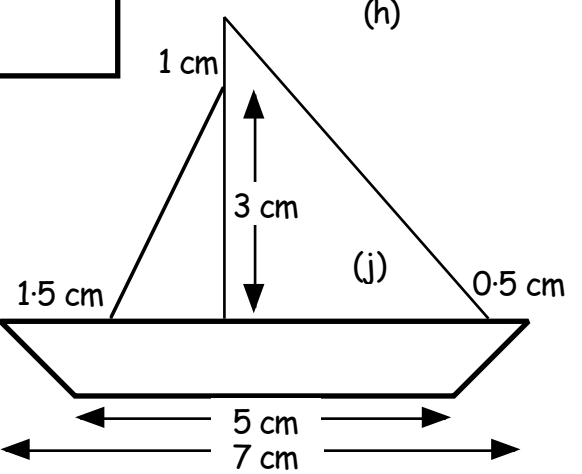

(e)

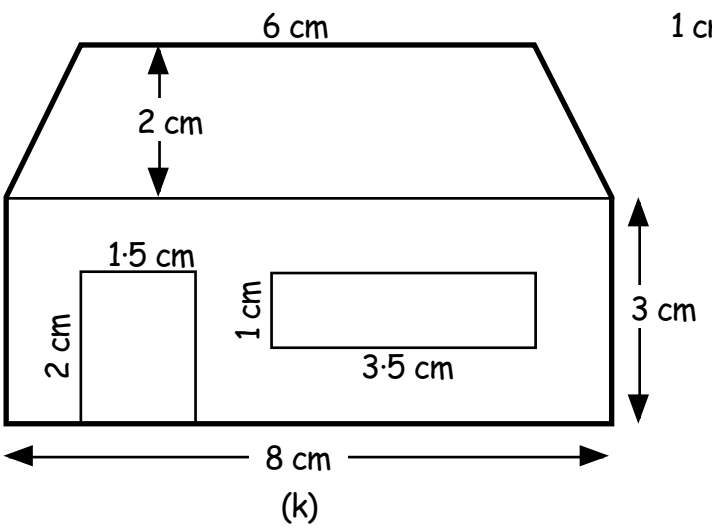


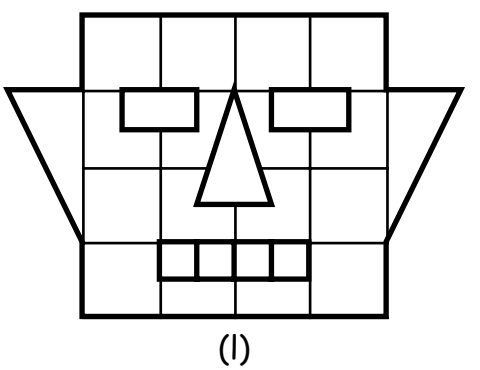



(h)







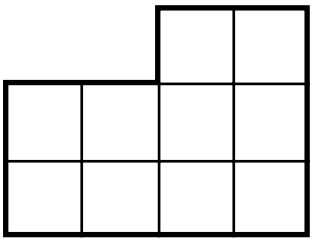

(l)

2. Make enlargements of the following using the given scale :-

(a)

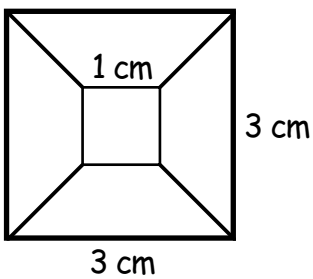
make a **three times** enlargement.

(b)



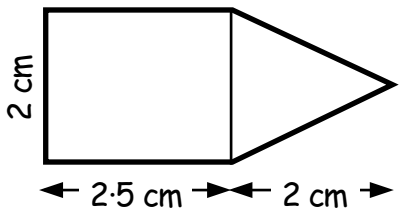
make a **four times** enlargement.

(c)



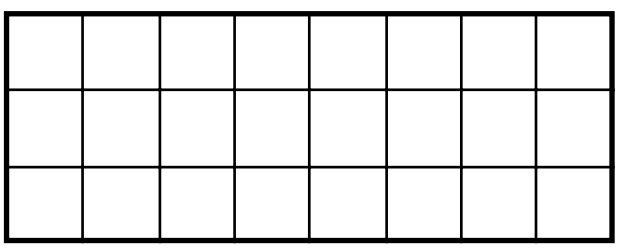
make a **three times** enlargement.

(d)



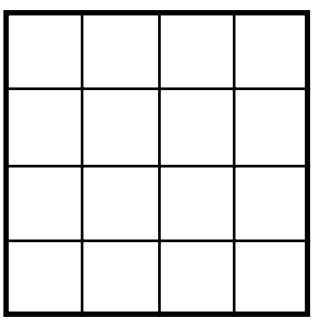
make a **four times** enlargement.

(e)



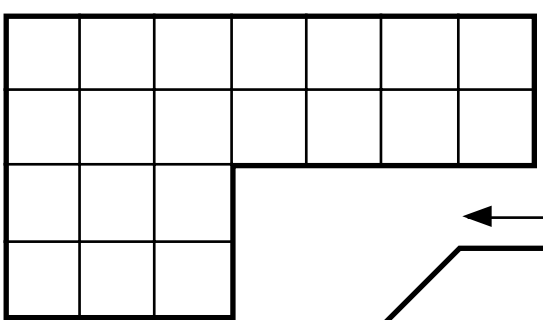
reduce this shape to **half** its size.

(f)



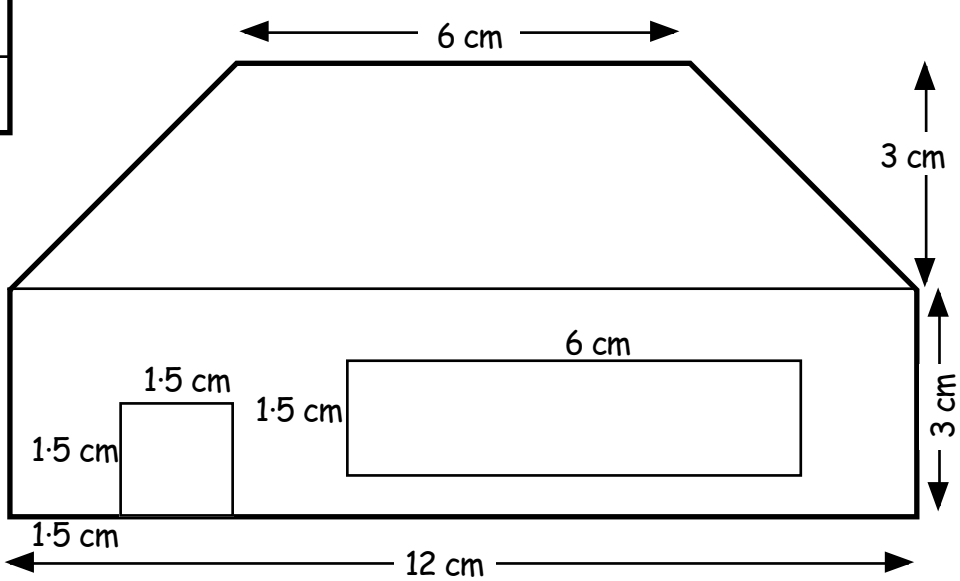
half size

(g)



make this **half** size.

(h) make this a **third** of the size shown



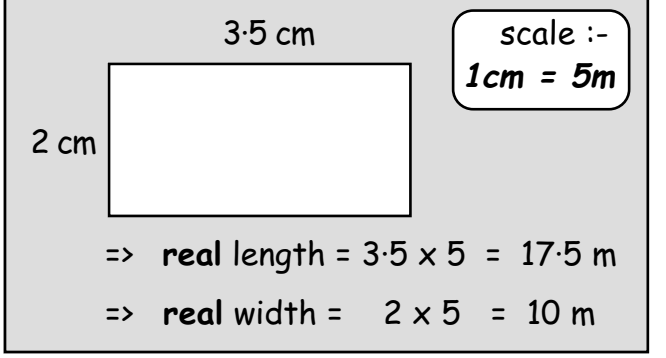
Scale Drawings (basic)

If you know the **scale** used in a drawing,

1cm = 5m

then you simply **multiply** any length (in centimetres) by 5 to determine the **REAL** length of the object (in metres)

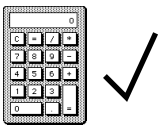
Example:-



=> **real** length = 3·5 x 5 = 17·5 m

=> **real** width = 2 x 5 = 10 m

Exercise 2

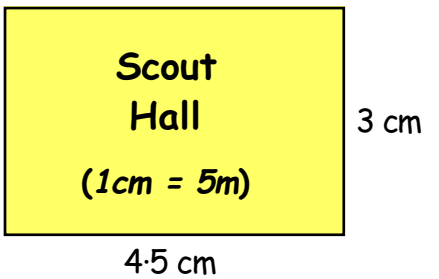


1. This scale drawing of a scout hall is drawn to a scale of :-

1cm = 5m

(a) Calculate the **REAL** width of the hall.

(b) Now calculate the **REAL** length of the hall.



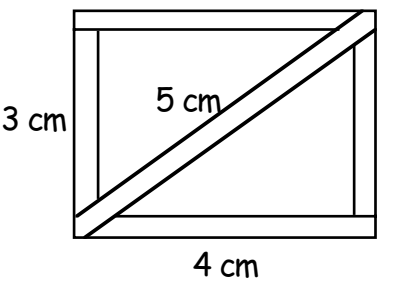
2. This drawing of a garden gate is done using a scale :-

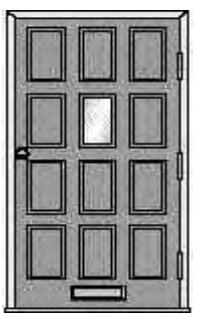
1cm = 20cm

(a) Calculate the **REAL** width of the gate (... x 20)

(b) Calculate the **REAL** height of the gate.

(c) Calculate the real length of the diagonal support bar.



3. 

This door has been drawn to a scale of :-

1cm = 50cm

(a) Calculate the real height of the door.

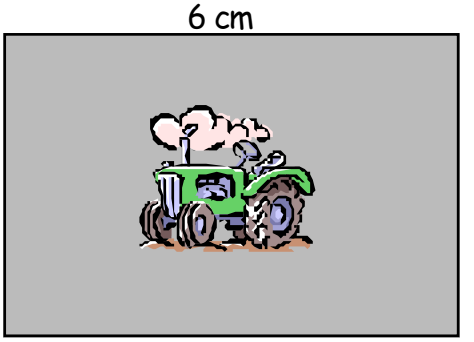
(b) Calculate the real width of the door.

4. Farmer Giles' field is in the shape of a rectangle.

The scale is :- ***1cm = 15 metres***.

(a) Calculate the real length and the real breadth of the field.

(b) Calculate the **perimeter** of the field.

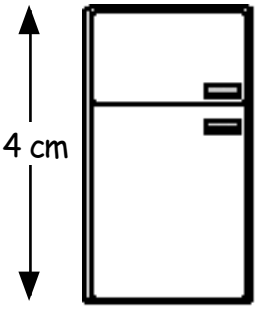


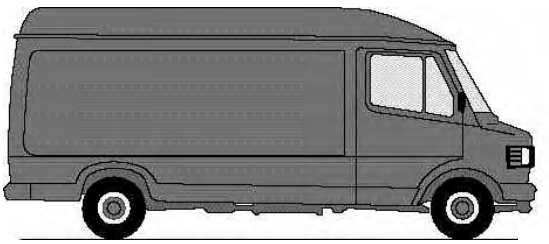
5. This drawing of a fridge-freezer is shown to a scale :-

1cm = 40cm

Calculate the real height of the freezer.

Give your answer in metres (as a decimal).



6. 

This van has been drawn to a scale of :-

1cm = 0·5 metres

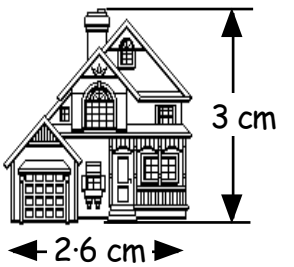
Calculate the length of the real van.

7. This house has been drawn to a scale of :-

1cm = 2·5 metres

(a) Calculate the real height of the house.

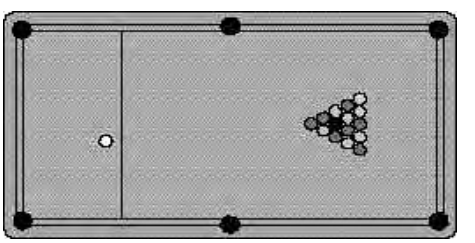
(b) Calculate the real width of the house.



You will need a ruler for the remainder of this exercise.

8. This snooker table has been drawn to a scale of :-

1cm = 12 inches



(a) Measure the length and measure the breadth of the snooker table in centimetres.

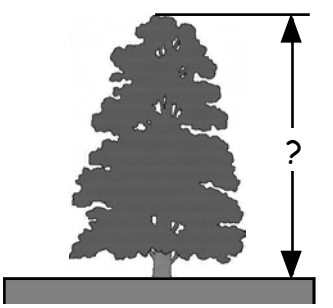
(b) Calculate the real length and breadth of the snooker table.

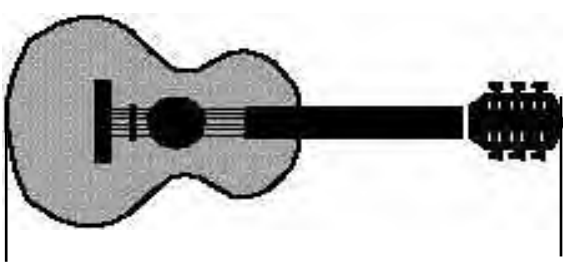
9. (a) Measure the height of this tree in centimetres.

(b) If the scale of the drawing is :-

1cm = 8 metres,

calculate the real height of the tree.



10. 

This guitar has been drawn to a scale :-

1cm = 15cm

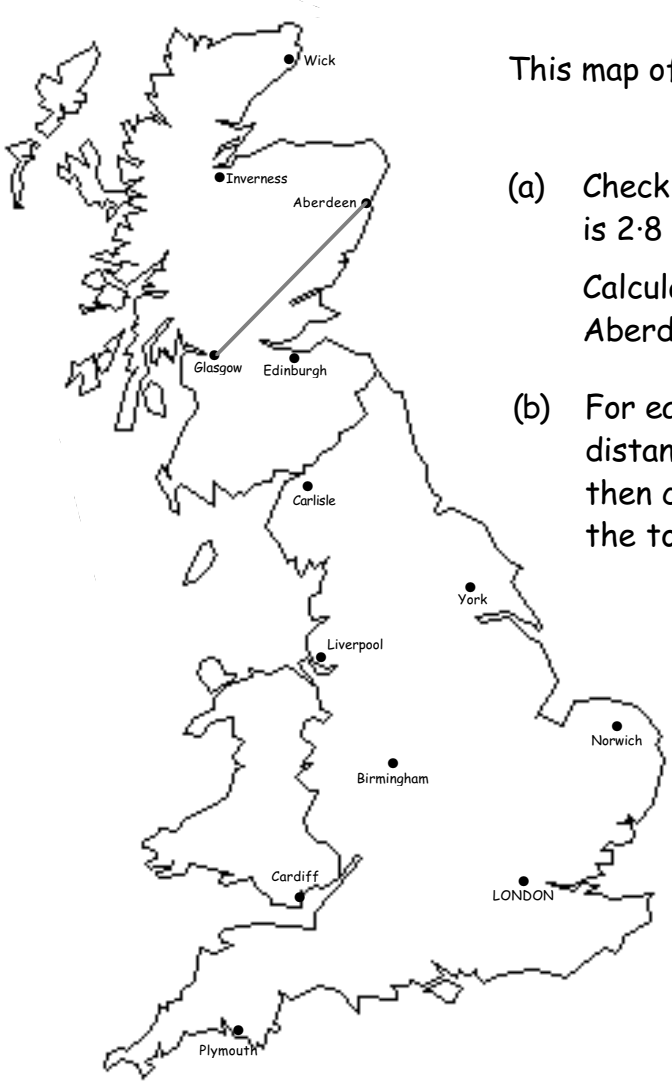
Measure the length of the guitar in the figure and calculate its real length.

11. (a) Use your ruler to measure the height of this balloon in centimetres.

The scale is :- ***1cm = 3·5m***

(b) Calculate the real height of the balloon.

12.



This map of Britain has been drawn to a scale of

1cm = 50 miles

(a) Check that the line from Glasgow to Aberdeen is 2·8 centimetres long.

Calculate the **REAL** distance from Glasgow to Aberdeen, in miles. (2·8 x 50)

(b) For each of the following, measure the distances between the towns in centimetres, then calculate the **real** distances between the towns in miles :-

(i) Glasgow to Wick

(ii) Glasgow to Liverpool

(iii) Edinburgh to London

(iv) Wick to Birmingham

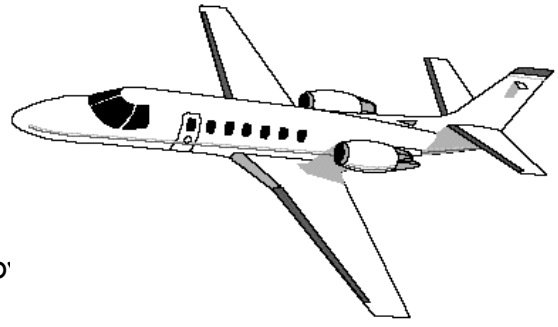
(v) London to Plymouth

(c) A jet, on an exercise, flies from Wick to London, then London to Carlisle and back again from Carlisle to Wick.

(i) Measure each of the three parts of the flight in centimetres.

(ii) Calculate each of the three flights in miles.

(iii) Calculate the total distance flown b the pilot.



Making simple Scale Drawings

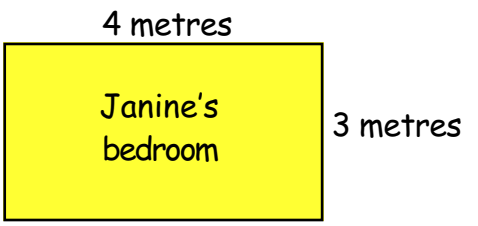
You will need a ruler to draw the figures accurately in this exercise.

Exercise 3

1. This is just a "rough" sketch of Janine's bedroom.

   Make an accurate scale drawing of her room using a simple scale of :-

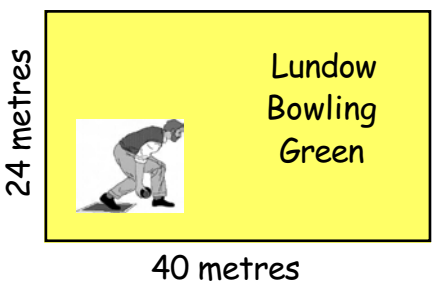
   1cm = 1 metre



2. This is a sketch of Lundow Bowling Green.

   You are going to make an accurate scale drawing of the bowling green using a scale of

   1cm = 4 metres



   (a) If 4 metres is represented by 1 centimetre in the scale drawing

   => 40 metres (length) will be represented by (40 ÷ ***4***) = ? centimetres

   Start your scale drawing by drawing a line ? centimetres long.

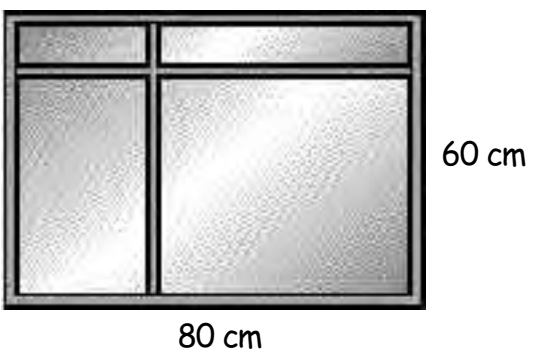
   (b) Also => 24 metres (breadth) will be represented by (24 ÷ ***4***) = ? cm.

   Now finish your scale drawing by drawing the width ? centimetres long and completing the rectangle.

3. This window frame measures 80 centimetres by 60 centimetres.

   Make a scale drawing of the window frame using a scale :-

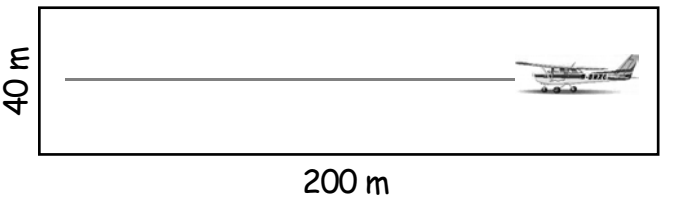
   1cm represents 10cm



4. This light aircraft runway at Aberdeen measures 200 metres by 40 metres.

   Make a scale drawing of the runway.

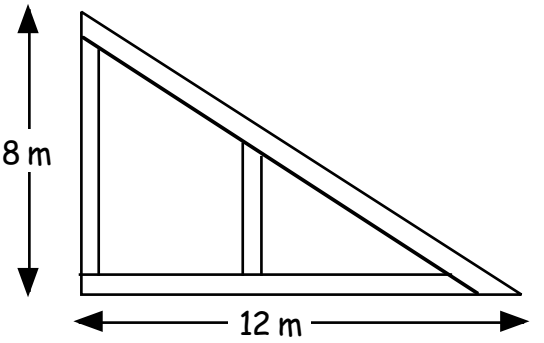
   scale :- ***1cm = 20m***



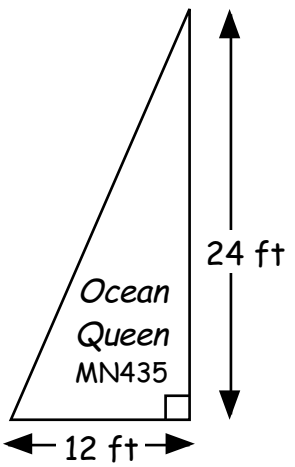
5. Shown is a wooden roof support. It is in the shape of a right angled triangle.

Make a neat scale drawing of the support using a scale of :-

1cm = 2 metres



6.



This triangular sail measures 12 feet by 24 feet.

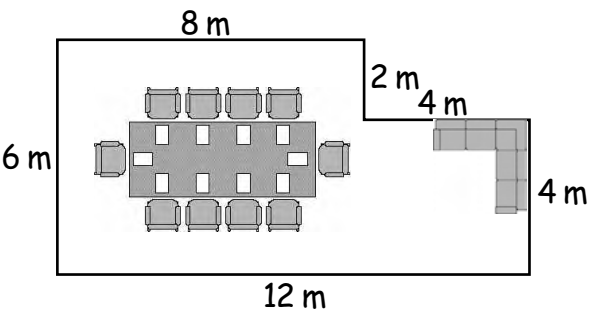
Make a scale drawing of the sail.

Scale :- ***1cm = 3 feet***

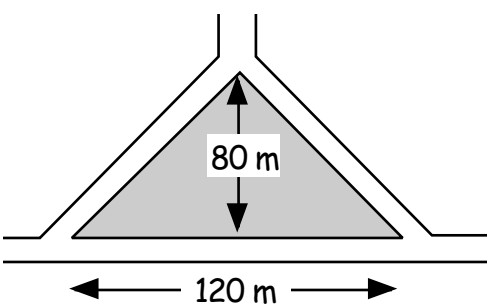
7. This "L-Shaped" board-room is 12 metres long and 6 metres wide.

Make a neat scale drawing of the room using a scale of :-

1cm = 2 metres



8.



This field, formed between three roads, is in the shape of an **isosceles triangle**.

The base of the field is 120 metres long and the "height" of the triangle is 80 metres.

Make a scale drawing of the field.

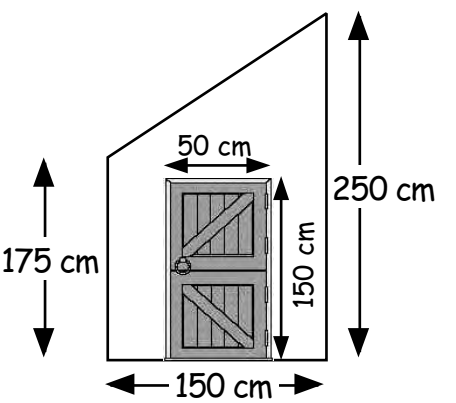
Scale :- ***1cm = 20 metres***

9. This sketch shows the side of a "lean-to" shed.

Make a scale drawing of it using a scale of :-

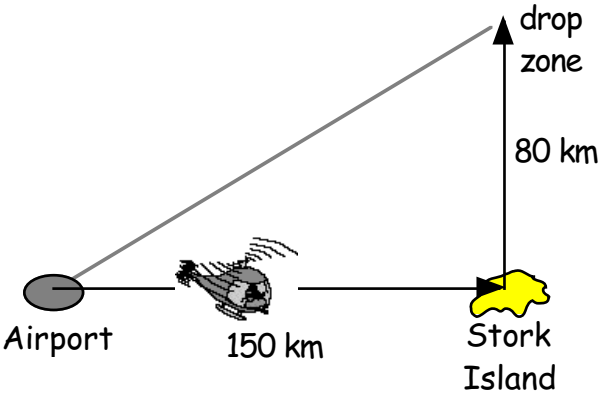
1cm represents 25cm

(Show the door in your drawing)



10. A pilot sets off from the airport in his helicopter and flies 150 kilometres East towards Stork Island.

From Stork Island, he then flies North for 80 kilometres to his drop-zone.



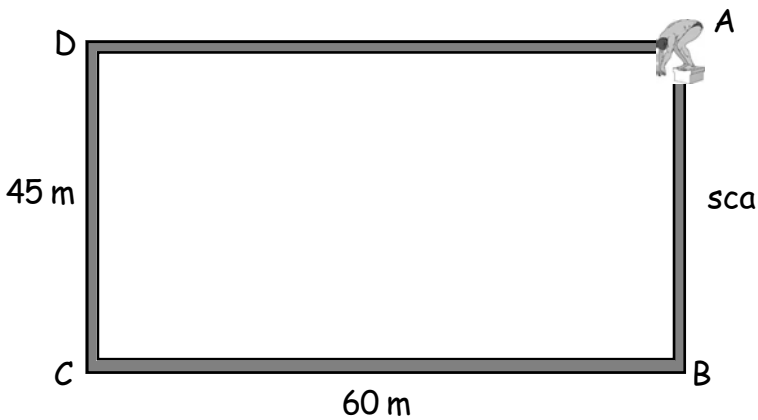
(a) Make a scale drawing of his trip.

scale :- ***1cm = 20 km***

(b) Measure the length of the line joining the Airport to the drop zone on your drawing.

(c) Calculate the **real** distance from the Airport to the drop zone in kilometres.

11. (a) Make a scale drawing of this swimming pool.



scale :- ***1cm = 5 metres***

(b) David swims from corner A to corner C.
Show this as a dotted line <u>on your drawing</u>.

(c) Measure the length of the dotted line on your drawing in centimetres.

(d) Calculate the **real** distance swam by David in metres.

12. This flagpole is 24 metres tall.

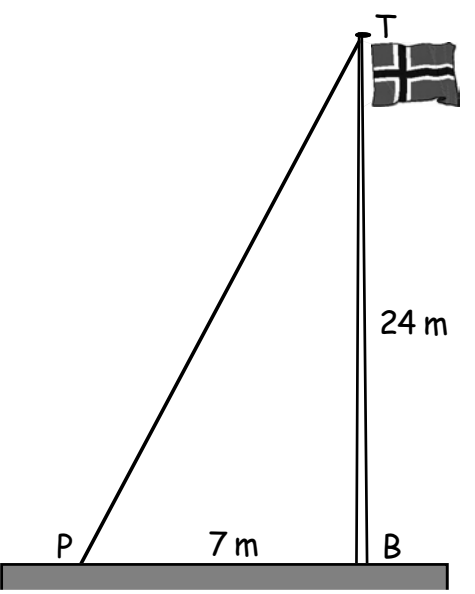
A support wire is attached from the top (T) of the pole to a point (P) on the ground, 7 metres from the base (B) of the pole.

(a) Make a scale drawing showing the pole, the ground and the wire.

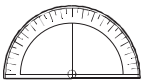
scale ***1cm = 2 metres***

(b) Measure the length of the wire in your drawing (in cm).

(c) Now calculate the **real** length of the support wire.



Scale Drawings (using a protractor)



You will need a <u>ruler</u> and <u>protractor</u> to draw the figures in this exercise.

Exercise 4

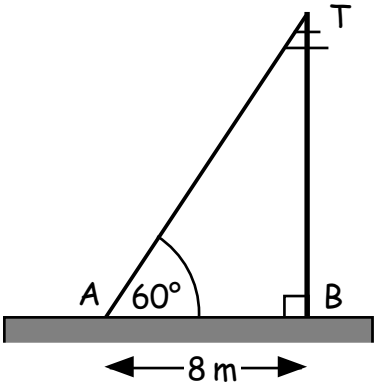
1. The sketch shows a telephone pole supported by a wire (AT).

   The distance from A to B is 8 metres.
   $\angle TAB = 60°$.

   (a) Make a scale drawing using a scale :-

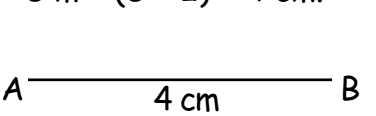
   1cm = 2 metres

   (b) Use your drawing to calculate the real height of the pole.

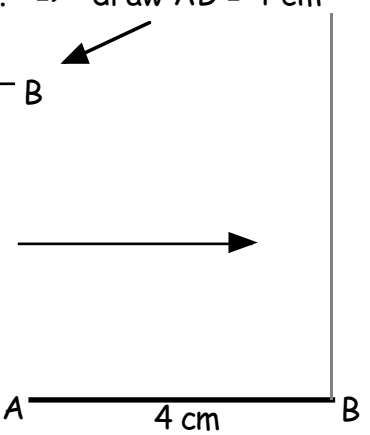


Here's how to do it :-

(a) Step 1 :- Scale 2 m = 1 cm
=> 8 m = (8 ÷ 2) = 4 cm. => draw AB = 4 cm



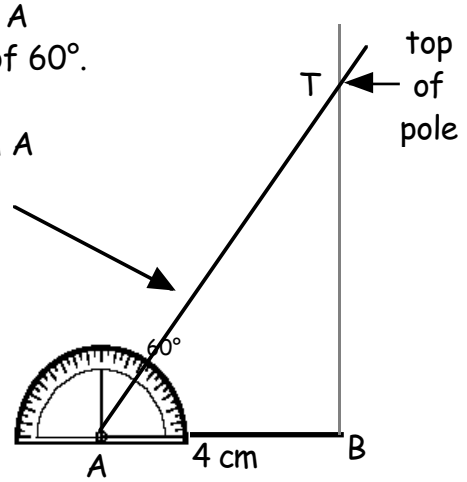
Step 2 :- Draw a (feint) line straight up from B to show the pole



Step 3 :- Put your protractor on A and mark out an angle of 60°.

Step 4 :- Draw the 60° line from A till it crosses the line drawn up from B.

(b) Step 5 :- Measure the length from B to T, where the 2 lines cross (in cm)

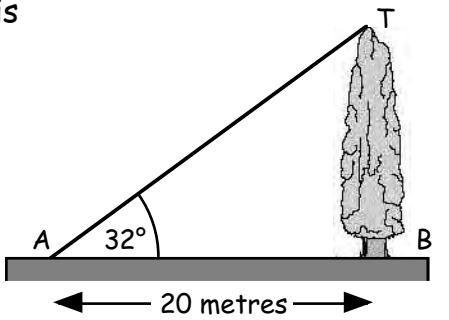


Step 6 :- Multiply this length by the scale (x 2) to obtain the **real** height in metres

2. (a) Make a scale drawing to show this tree as it is viewed from point A.

scale :- ***1cm = 2 metres***

- start by drawing the line representing AB
- draw a feint line straight up from B
- use your protractor to measure out –A = 32°
- complete the drawing



(b) Measure, in centimetres, the height of the tree in your drawing.

(c) Calculate the height of the **real** tree.

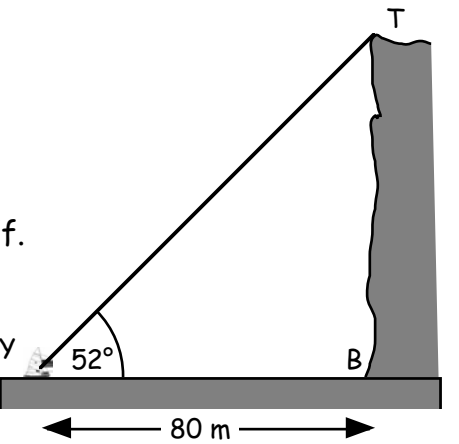
3. A yacht is 80 metres from the foot of a cliff.

The angle of elevation of the top of the cliff from the yacht is 52° (see sketch).

(a) Make a scale drawing of the yacht and the cliff.

scale :- ***1cm = 10 metres***

(b) Calculate the **real** height of the cliff.

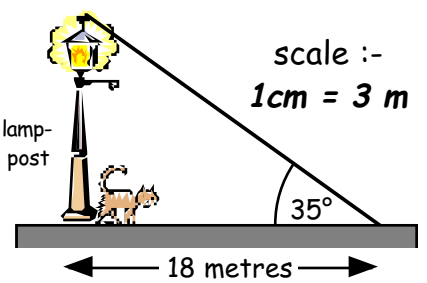


4. For each of the following six sketches :-

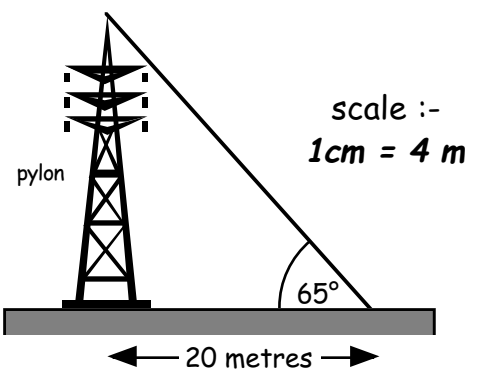
(i) Make a scale drawing using the given scale.

(ii) Calculate the **real** height of the given object.

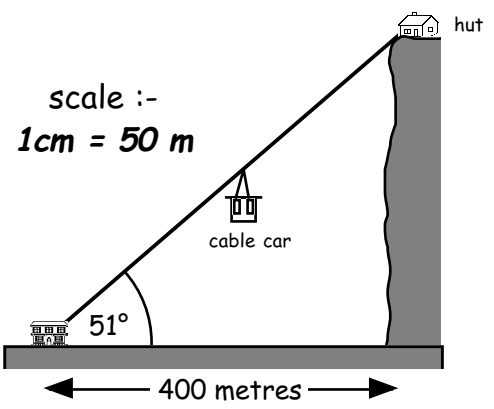
(a)



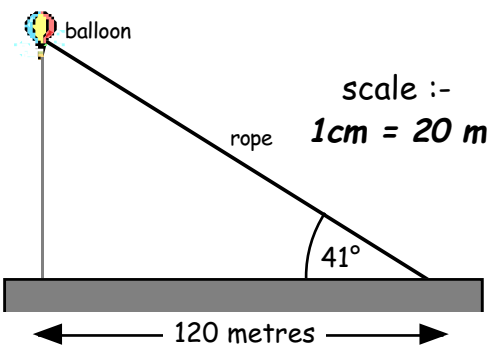
(b)



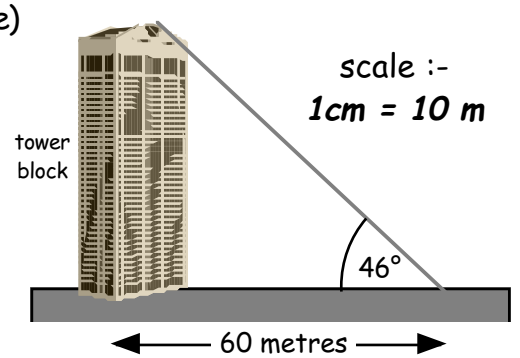
(c)



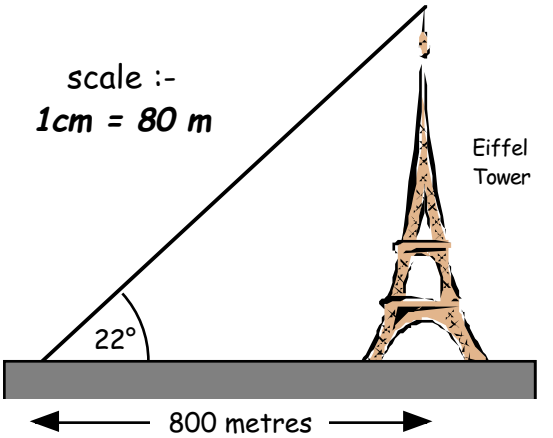
(d)



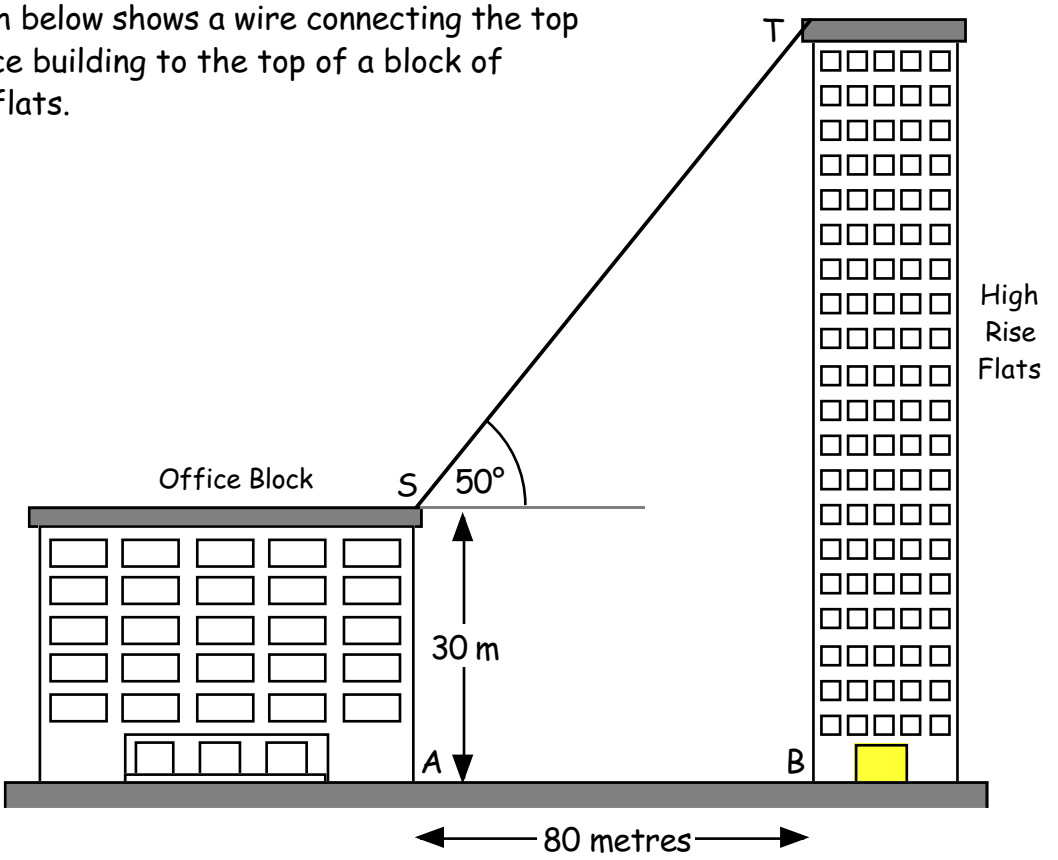
(e)



(f)



5. The sketch below shows a wire connecting the top of an office building to the top of a block of high-rise flats.



(a) Make a scale drawing using the scale ***1cm = 10 metres***

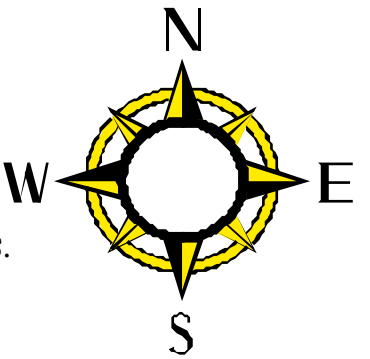
- start with the line showing AB = ... cm
- add on the line showing AS = ... cm
- draw a feint line straight up from B
- put your protractor on top of S
- mark an angle of 50° at S
- complete the scale drawing.

(b) Measure the length of the line BT in centimetres on your drawing.

(c) Calculate the **real** height of the block of high-rise flats in metres.

Compass Points and Scale Drawings

Exercise 5



Remember

1 full turn = 360°

$\frac{1}{2}$ turn = 180°

$\frac{1}{4}$ turn = 90°

1. Make a copy of this compass rose and fill in the 4 missing "in-between" directions.

2. How many degrees are there from :-

   (a) North to South (clockwise)

   (b) North to East (clockwise)

   (c) North to North-East (clockwise)

   (d) North East to South (clockwise)

   (e) North to West (clockwise)

   (f) North to West (anti-clockwise)

   (g) South-East to South-West (clockwise)

   (h) S.W. to N.W. (anti-clockwise)

   (i) N.W. to South (anti-clockwise)

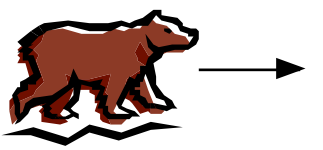
   (j) N.E. to S.W. (anti-clockwise)

3. (a) Iain was facing North. He then made a $\frac{1}{4}$ turn clockwise.
   In which direction is Iain now facing ?

   (b) Suzie was looking South but made a $\frac{1}{2}$ turn clockwise.
   In which direction was Suzie then facing ?

   (c) Brian and Lucy were facing North East. They then turned through 90° clockwise.
   In which direction did they end up facing ?

   (d) A bear was travelling due East. It made a 45° turn anti-clockwise. In which direction was it then facing ?



4. The map shows Craggy Island.

   Middleton is the main town and lies in the centre of the island.

   (a) From Middleton, what would I see if I faced :-

   (i) North ? (ii) West ?

   (iii) S East ? (iv) N West ?

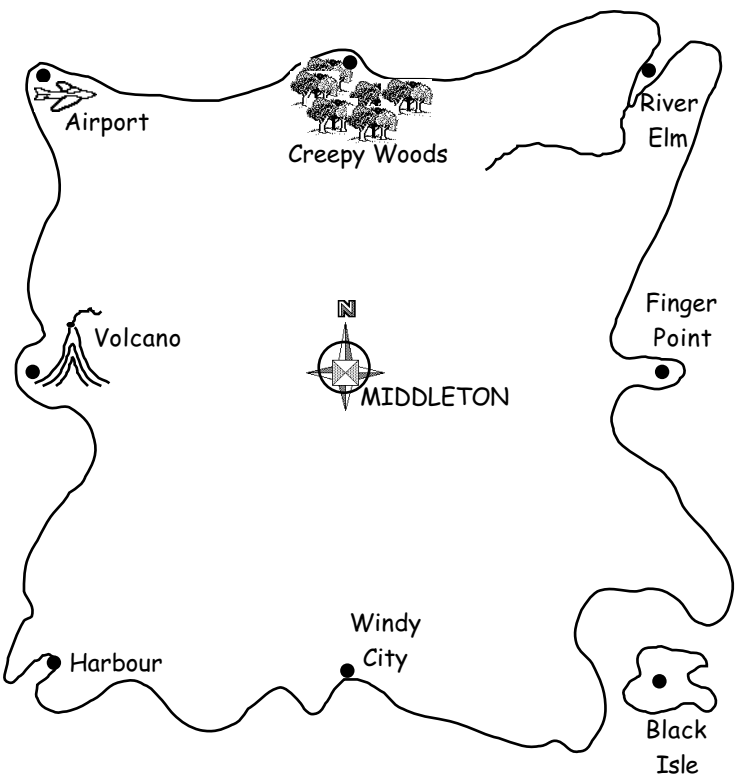
   (b) In which direction, from Middleton, is :-

   (i) Windy City ?

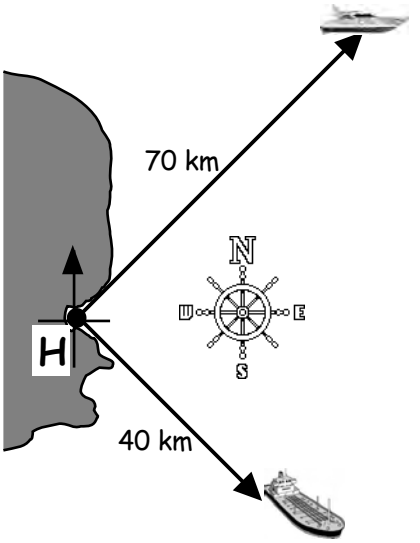
   (ii) the River Elm ?

   (iii) Finger Point ?

   (iv) the Harbour ?



5. A speedboat and an oil-tanker leave harbour (H) at the same time.



The speedboat travels 70 kilometres north east.

The tanker sails 40 kilometres south east.

(a) Make a scale drawing of the two journeys.

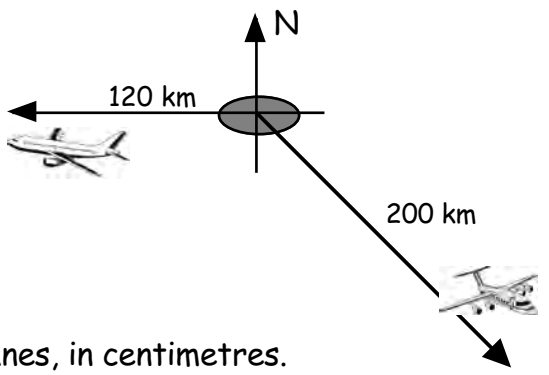
scale ***1cm = 10 km***

- start by marking a point on your page to show H
- draw in the north-south and east-west lines thru' H
- use your protractor to show the 45° from north
- use your ruler to show the speedboat's journey
- repeat for the tanker's trip

(b) Measure the distance between the two boats in centimetres.

(c) Now calculate the **real** distance between them in kilometres.

6. Two jet planes leave Charles de Gaulle Airport in Paris.



One flies West for 120 kilometres.

The other flies South East for 200 kilometres.

(a) Make a scale drawing of the two flights.

scale ***1cm = 20 km***

(b) Measure the distance between the two planes, in centimetres.

(c) Now calculate the real distance between the two planes, in kilometres.

7. The sketch below shows the journey made by a pilot in a light aircraft.

He flew North East from Dulwich Airport for 60 kilometres to Pearl Island.

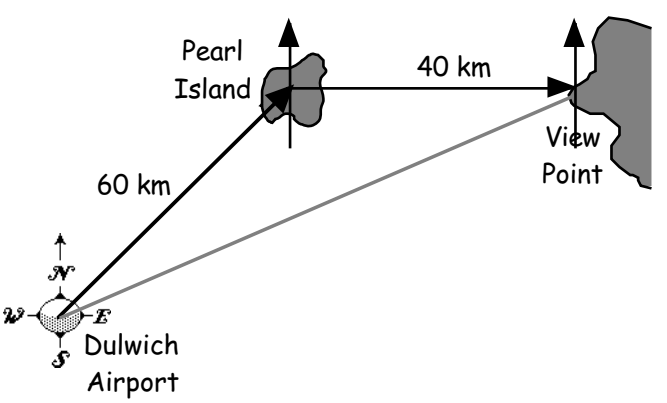
From Pearl Island, he then flew East for 40 kilometres to View Point.

(a) Make a scale drawing showing the two legs of the flight.

scale ***1cm = 5 km***

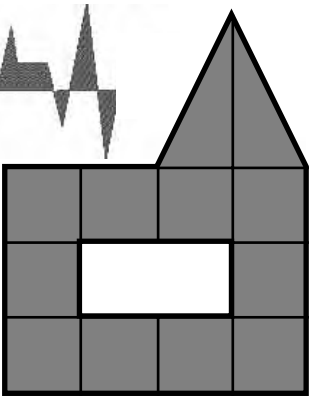
(b) Measure the distance from View Point to the airport, in centimetres.

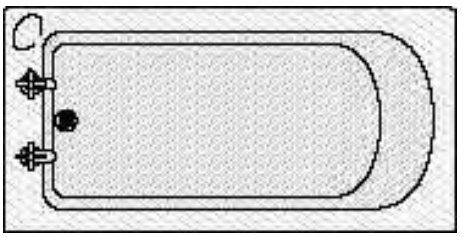
(c) Calculate the **real** distance from View Point to the airport, in kilometres.



What have I learned ?

1. Make a two times enlargement of this figure.



2. 

This bath has been drawn using a scale :-

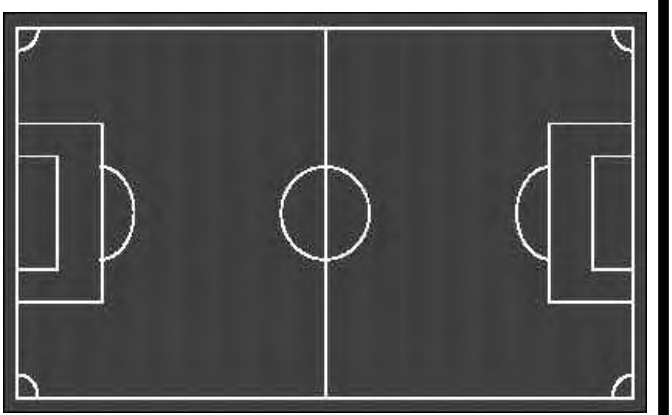
1cm represents 30cm

Calculate the **real** length of the bath.

3. (a) Measure the length and breadth of this scale drawing of a football pitch.

The scale is ***1cm = 12 metres***

(b) Calculate the **real** length and breadth of the football pitch.



4. 

Make a scale drawing of this door using a scale :-

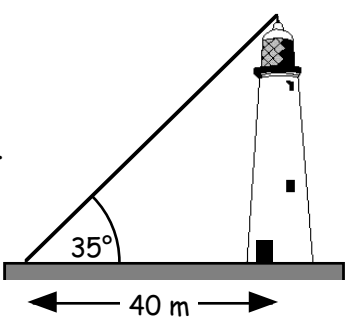
1cm represents 20cm.

5. A wire is attached from the top of a lighthouse to a point 40 metres from its base.

(a) Make a scale drawing of the lighthouse and wire.

scale :- ***1cm = 4 metres***

(b) Measure the height of the lighthouse on your scale drawing, in centimetres.



(c) Now calculate the **real** height of the lighthouse in metres.

6. (a) I am facing South. In which direction will I be facing if I turn through an angle of 45° clockwise ?

(b) A pilot changes from flying North West to a new direction of South West. Through how many degrees must he have turned ?
(*clockwise or anti-clockwise*)

(c) A ship sails North East from Port Stanley to Elephant Island. In what direction must he sail to return to Port Stanley from Elephant Island ?

Chapter 6

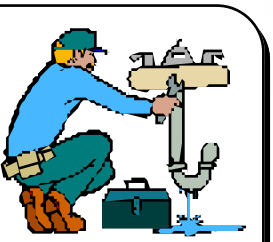
Hourly Rate

David is a plumber.
His hourly rate of pay is £6·50.
Last week he worked 38 hours.

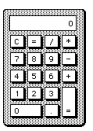
What was his basic pay ?

Answer :-

Pay = 38 × £6·50 = £247·00



Lots of workers receive an "hourly rate" of pay.



Exercise 1a

1. Jim is a shoe salesman with a basic rate of pay of £5·75 per hour.

   If he worked 40 hours last week, how much was he paid ?

2. 

   (a) Brian started a new job as a secretary.
   In his first week, he worked 35 hours.

   Calculate his basic pay for this week's work.

   (b) In his 2nd week, he worked 42 hours.

   (i) Calculate his pay for this week's work.

   (c) How much **more** did he earn in the 2nd week ?

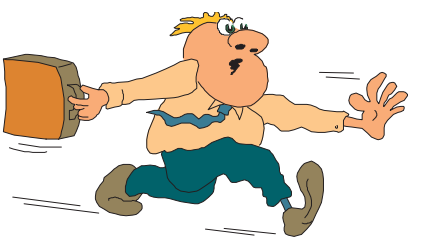
3. Davina works as a computer programmer.
   Her hourly rate of pay is £8·20.

   She worked for 60 hours last week.
   How much did she earn ?

4. David works as a T.V. repair man for "T.V. RENTALS".
   He was very busy last week and worked for 52 hours.

   What was his basic pay for the week ?

T.V. RENTALS
"We keep you in the picture"
£6·80 per hour

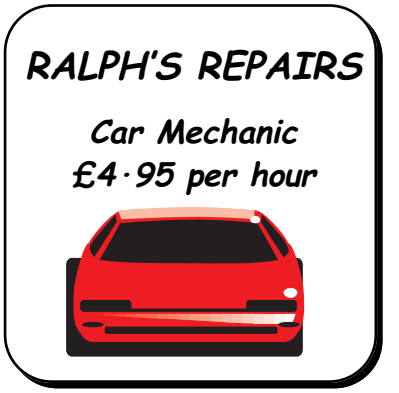


5. Ralph was calculating the pay for each of his 5 mechanics.

Name	*Ted*	*Bill*	*Nick*	*Tam*	*Dave*
Hours	36	42	51	34	40

(a) Calculate the pay due to each of the 5 mechanics.

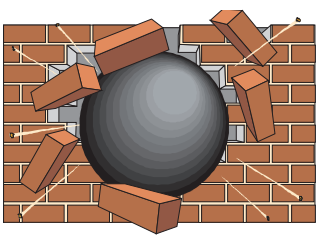
(b) Calculate Ralph's **total** wage bill for the week for his 5 employees.



6. A secretary was typing up a report for a Member of Parliament.
She was paid an hourly rate of £4·40.

It took her 15 hours to finish the report.

How much had she earned ?

7. 

"Brickies" are paid £5·15 an hour by Bob The Builder.

(a) How much would Terry earn if he worked 48 hours ?

(b) Steve only worked 41 hours. How much did he earn ?

(c) How much **MORE** did Terry earn than Steve ?

8. Susie works for a Nursing Agency and her friend Sandra is a typist.
Susie earns £6·75 per hour whereas Sandra is paid £5·20 per hour.
Last week, Susie worked 22 hours and Sandra 30 hours.

(a) Calculate Susie's pay and Sandra's pay for the week.

(b) How much **MORE** did Sandra earn than Susie ?

9. Gary is a long distance lorry driver for "National Express".
His rate of pay is £7·10 per hour.
During an overseas delivery to Italy, he drove for a total of 56 hours.

How much did Gary earn for this trip ?

10. 

Sally works in an office. She earns £4·55 per hour.

How much did she earn in February if she worked :-

week 1	(1st – 5th February)	– 36 hours
week 2	(8th – 12th February)	– 39 hours
week 3	(15th – 19th February)	– 43 hours
week 4	(22nd – 26th February)	– 32 hours

Calculating the Hourly Rate

If you know the total weekly wage for someone and you know the number of hours worked, you can calculate their hourly rate of pay by **DIVIDING**.

Example :-

Ted is a plumber and worked 42 hours last week.
His total basic pay for the week was £243·60.

What was his hourly rate of pay ?

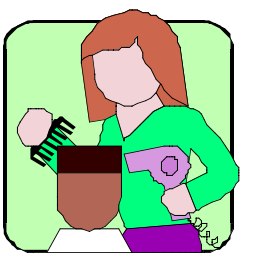
Answer :-

Hourly Rate = £243·60 ÷ 42 = 5·8 = £5·80.

Exercise 1b

1. Arthur's payslip last week showed he earned £225.
   He knew he had worked for 36 hours.

   Calculate Arthur's hourly rate.



2. Jenny is a hairdresser and earned £164 last week.
   She worked for 40 hours.

   What is Jenny's hourly rate of pay ?

3. 

   Simon is a chef. His wage last week was £147·90.
   He had worked for 34 hours.

   (a) Calculate his hourly rate of pay.

   (b) This week he worked for 40 hours.
   How much did he earn this week ? (**multiply** !!)

4. Nicola works as a draftswoman for HOUSEHOLD DESIGNS.
   She earned £354·90 last week for her 42 hours.

   (a) Calculate her hourly rate of pay.

   (b) This week she only worked for 25 hours.
   How much pay is she due this week ?

5. During the month of February, Andy worked 36 hours the 1st week, 42 hours the 2nd week, 40 hours the 3rd week and 44 hours the 4th week.

   (a) How many hours did Andy work altogether in February ?

   (b) If his total wage for the month was £891·00, calculate Andy's hourly rate of pay.

6. Shown below, in a table, are the weekly wages and hours worked by 4 different workers in Meadow's Engineering.

Andy Designer	**Valerie** Secretary	**Thomas** Engineer	**Jenny** Tea-Lady
£492·00 *40 hours*	*£159·60* *28 hours*	*£413·60* *44 hours*	*£48·60* *12 hours*

Calculate the hourly rate for each of the 4 workers.

7. Tim is a carpet fitter for Marywell Carpets. He worked for 54 hours last week fitting carpets in a new company's office.

(a) Calculate Tim's hourly rate.

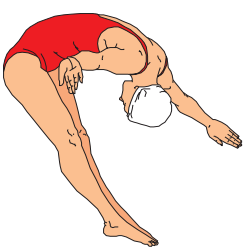
(b) This week he only worked his standard 37 hour week.

How much did he earn this week ?

Marywell Carpets
Payslip for Tim West
54 hours worked
Total Pay £364·50

8. Brian is paid £4·50 per hour.

If he earned £162·00 last week, calculate the number of hours he must have worked. (**divide !!**)

9. 

Lisa is a lifeguard at Matlock Swimming Centre.
Her hourly rate is £5·20.
She earns £208·00 every week.

How many hours does she work in a week ?

10. Ian is an electrician and earned £243·20 last week by working for 38 hours.
Simon is a plumber and earned £275·00 for working 44 hours last week.

Calculate the hourly rate of both and say who has the better rate of pay.

11. Sue started a job as a dental assistant.
She was promised an hourly rate of £4·90.
Her payslip showed £153·60 for her 32 hours worked.

Had her employer kept his promise about her rate ?

Weekly & Monthly Pay

If you know a person's :-

(a) monthly pay —> (x 12) to calculate the annual pay.

(b) weekly pay —> (x 52) to calculate the annual pay.

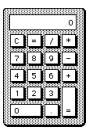
Remember

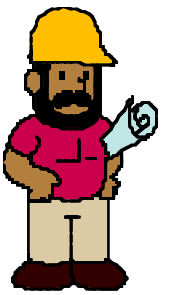
52 weeks = 1 year

12 months = 1 year

"annual" means yearly

Exercise 2a





1. Dick's monthly pay at Dodds Engineering is £1120.
   Calculate his annual pay (yearly). – (**multiply by 12**).

2. Emma's payslip shows she earns £850·25 every month.
   Calculate her annual pay.

3. Karen is a sales assistant for COMET.
   She is paid £912·75 per month.
   Calculate Karen's annual pay.

4. Eddie earns £1095·50 per month and his wife Sally earns £1110·25 per month.
   By how much is Sally's **ANNUAL** pay **greater** than Eddie's ?

5. David does a part-time paper round each morning.
   He is paid £42·50 per week.
   Calculate David's annual pay.

6. 

   Darlinda works in a bakery.
   She earns £148·50 per week.
   Calculate Darlinda's annual pay.

7. Johnny works for a cement firm.
   He is paid a weekly wage of £210·40.
   Calculate Johnny's annual pay.

8. Dan works for EASYTURF LANDSCAPE GARDENERS.
He has a weekly wage of £193·75.

Calculate Dan's annual pay.

9. 

Catrina works 35 hours per week as a filing clerkess..
Her rate of pay is £4·30 per hour.

(a) Calculate Catrina's weekly pay.

(b) Now calculate her annual pay.

10. Gregor works as a gardener for the Parks Department.
He is paid £5·45 per hour and works a standard
40 hours per week.

(a) How much does Gregor earn in a week ?

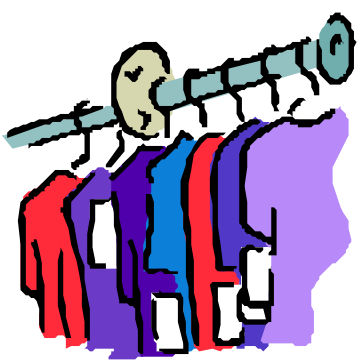
(b) Calculate his annual pay.

11. Dave and his brother Gary are both car mechanics.
Dave is paid monthly and earns £1260·50 per month.
Gary is paid weekly and gets £285·25 per week.

(a) Calculate Dave's annual pay.

(b) Calculate Gary's annual pay.

(c) Who earns more and by how much ?

12. 

Jenny is a manageress for SPARKS & MENCER and
receives an annual salary of £12 145.
Sally is a sales assistant and is paid £986·25 monthly.
Arthur is a van driver for the company and he is paid a
weekly wage of £224·50.

(a) Calculate Arthur and Sally's annual pay.

(b) Of the three, who earns :-
(i) most ? (ii) least ?

13. Del and Trev, both painters for the same company, decide
to check if both receive the same wage.

Del is paid monthly and receives £1050·40 per month.
Trev is paid weekly and earns £242·40 per week.

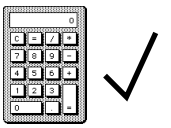
Is one of them paid more than the other ? Explain !!

If you know your **ANNUAL** pay you can easily calculate :-

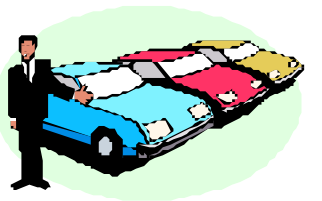
(a) your weekly pay by **DIVIDING** by **52**.

(b) your monthly pay by **DIVIDING** by **12**.

52 weeks = 1 year
12 months = 1 year



Exercise 2b

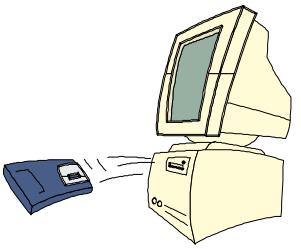


1. Brian earns £19 860 per year as a car salesman.

   Calculate his monthly salary. (÷ **12**).

2. Cheryl has an annual (yearly) salary of £23 580 as a manageress with Q & B.

   Calculate her monthly pay.

3. 

   Brian works for an Internet Company and earns £18 294 annually.

   Calculate his monthly pay.

4. Ryan is a managing director for an electrical company.
   His salary is £42K per year (£42 000).

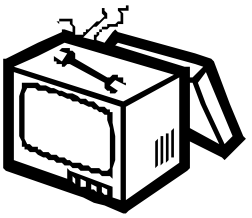
   Calculate his monthly salary.

5. Jilly works as a Primary Teacher.
   Her starting salary is £16 386 per year.

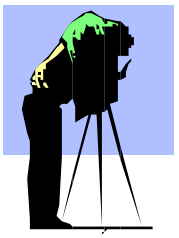
   Calculate her monthly pay.

6. Cathy works as a shop assistant for HOOTS THE CHEMIST.
   She is paid £8 489 per year.

   Calculate Cathy's **<u>weekly</u>** wage.

7. 

   Grant is a T.V. repairman and earns a fixed salary of £14 495 per year.
   Calculate Grant's weekly wage.

8. 

Julie is a photographer's assistant and is paid an annual salary of £11 622.

Calculate how much Julie is paid each week.

9. Nadine works as a manicurist for "Hands On" beauty salon.
She is paid an annual salary of £9 633.

Calculate Nadine's weekly wage.

10. 

Marian starts work in a florists and earns an annual salary of £13 234.

How much does this work out at per week ?

11. Marty works for Micron Computers and earns £18 226·00 per year.

(a) Calculate what he should be paid every week.

(b) Micron is an American Company. They pay their employees every TWO weeks.

How much is Marty paid every 2 weeks ?

12. Ai Yi is offered a job as a laboratory technician. Her salary is £11 856 per year.
She can choose to be paid weekly or monthly.

(a) How much would her monthly salary be ?

(b) Now calculate how much she would earn weekly if this was chosen method of payment.

REQUIRED
Lab Technician
£11 856 p.a.

13. 

Darren works a 40 hour week as a cattle auctioneer.
His annual salary is £13 520.

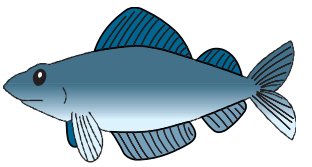
(a) Calculate his weekly pay.

(b) Now calculate Darren's **hourly** rate of pay.

14. Danielle works part-time in a fishmonger's shop for 25 hours every week.
Her annual pay is £5720·00.

(a) How much does Danielle earn each week ?

(b) Calculate her hourly rate.



Wage Rise (Percentage Work)

Remember how to find 5% of £800 using a calculator.

5% of £800 = $(\frac{5}{100} \times 800)$ = $(5 \div 100) \times 800$ = £40.

Example :-

David earned £12 500 last year.
This year he got a 4% pay rise.
Calculate his new annual salary.

Answer :-

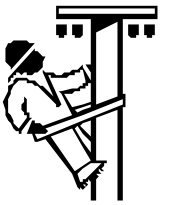
Last year's salary =	£12 500
Rise = $(\frac{4}{100} \times 12500)$ =	+ £500
This year's salary =	£13 000

Exercise 3

In each of the following, set down the 3 lines of working as shown above.

1. Billy earned £12 400 last year as a telephone engineer.
This year he was given a 6% pay rise.

Calculate his new annual salary.



2. 

Theresa is a bank clerk and earns £10 800 per year.
The bank awarded her a pay increase of 3%.

Calculate her new annual salary.

3. Sally has a weekend job at the Vets and earns £40 per week.
She asks for and gets a 15% pay rise.

What is her new weekly pay ?

4. "Rollands The Bakers" offers all its workers a 5% pay rise.

Calculate the new pay due to each of the following workers at Rollands :-

(a) Tim is a baker and earns £16 400 per year.

(b) Marcia is a van driver and earns £9 500 per year.

(c) Natasha works in the baker's shop and earns £7 200 per year.

5. George is a manager in Reeds Furniture showroom and earns £18 500 per year.
George asked his boss for a 6% pay rise.

His boss offered him a rise of £1200 per year.

(a) Calculate what George's new wage would be with a 6% rise.

(b) Should he accept his boss's offer ?

6. Teddy earns £22 000 per year and Norrie earns £20 000 per year.
Teddy gets a 6% pay rise and Norrie a 7% rise.

Who got the bigger rise in money terms ?

7. 

Melissa is a telephonist and her hourly rate of pay is £5·40. She normally works 30 hours per week.

(a) Calculate Melissa's weekly wage.

(b) If she gets a 5% pay rise, what will her new weekly pay be ?

8. Nigel's hourly rate of pay is £7·80. He receives a 5% pay rise.

(a) Calculate Nigel's new hourly rate of pay.

(b) If Nigel works 40 hours per week, calculate :-

(i) what his **OLD** weekly pay would have been.

(ii) what his **NEW** weekly pay is.

(iii) how much of a rise this is in his weekly pay.

9. Willie is a joiner with "McTaggart The Builder".
His hourly rate of pay is £7·35.
He normally works a 40 hour week.

(a) Calculate Willie's basic pay last week for his 40 hours.

Willie also receives an extra £22·50 per week for every house in the new estate for which he hangs all the doors.

(b) Last week, Willie fitted out all the doors in 8 new houses.
How much "extra" was he paid ?

(c) What should Willie's **total** pay be for the week ?

(d) Because the company was doing well, his boss gave Willie an extra 15% of his total wages as a bonus last week.
Calculate Willie's overall total pay last week.

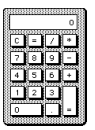
Commission

Some people, particularly sales-persons, do not get paid a weekly or monthly fixed wage. They get a percentage of the value of whatever they make by selling cars, carpets, etc. This is called **COMMISSION**.

Example :-

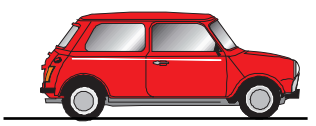
Ted sells cars. He is paid a commission of 5% on any car he sells.
Last week, Ted sold £24 000 worth of cars.

Commission = 5% of £24 000 = $\frac{5}{100}$ x 24000 = £1200

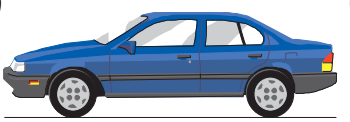


Exercise 4

1. In "Arnold Vardy's Motors", commission is paid at 3% of sales.
Calculate the commission due by selling the following cars.

(a) 

£6 500
(i.e. $\frac{3}{100}$ x £6500)

(b) 

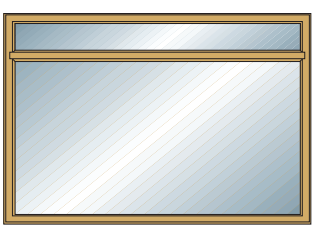
£10 800

(c) 

£18 600

2. Rebecca sells double glazing. She gets 7% commission on any windows she sells.
Last month, she sold £23 500 worth of double glazing.

Calculate Rebecca's commission.



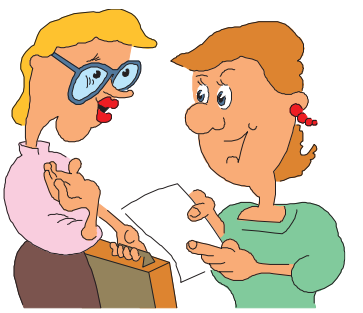
3. 

Andrew works as a door-to-door salesman for "Bettaware", selling household goods. Bettaware pays 15% commission.

How much commission is Andrew due this week if he sells £1600 worth of goods ?

4. Betty is an agent for "Littlehouse Clothing Store".
She sells clothes from a catalogue to her friends.
She receives 12% commission on her sales.
Last week she sold £850 worth of goods.

Calculate her commission.



5. Brian is an agent for "Tipperware". He has a monthly pay of £650.
Besides this, he also gets 10% commission on all sales he makes.
In January, he sold £5 320 worth of goods.

(a) Calculate his commission for January.

(b) Calculate his total pay for January.

6. 

Lucy works for "Macron Computers" and has a monthly salary of £1075.
Last month she received a **BONUS** of £280.

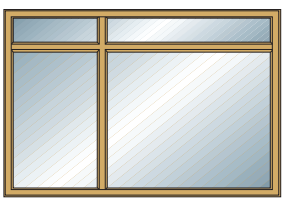
What was her total salary for the month ?

7. Diane works for a boat building company. She earns £18 500 per year.
This year, the company is doing well and Diane receives bonuses of :-

£550 in January, £280 in April, £870 in July and £435 in October

(a) Calculate Diane's total bonus for the whole year.

(b) Now write down Diane's total salary for the year.

8. 

Mike is a joiner and works on a building site.
He gets a bonus of £3·50 for every window frame he builds.
This week he built 32 frames.

Calculate Mike's total bonus for the week.

9. Claire is a hand painter for a mug manufacturer.
She is paid £125·50 per week and gets a bonus of 22p for every mug she paints.
In a normal week she paints 500 mugs.

(a) Calculate Claire's bonus for painting 500 mugs one week.

(b) Calculate Claire's total pay for that week.

10. 

Ally plays for a junior football team.
He is paid £55 a week for playing.

In a big cup game last week he received a £25 bonus for every goal the team scored.

His team won the match 3–0.

How much did Ally get paid altogether last week ?

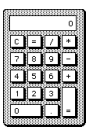
Overtime Pay

Overtime is when you work extra hours above your basic number of hours.

You get paid a **HIGHER RATE** of pay for overtime.

Double Time :- If your basic rate of pay is £6·00 per hour, you will get paid £12·00 per hour for every overtime hour you work (at double time).

Exercise 5



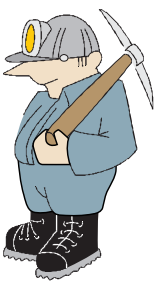
1. Richard works for the Roads Department and his basic rate is £5·00 per hour.

   Last Sunday, he worked 6 hours overtime at **double time**.

   (a) Calculate Richard's **OVERTIME** hourly rate (£5 doubled).

   (b) Calculate Richard's total overtime pay.

2. Steve is a miner who is paid a basic rate of £6·40 per hour.



   On Tuesday night, he worked 4 hours overtime for which he was paid double time.

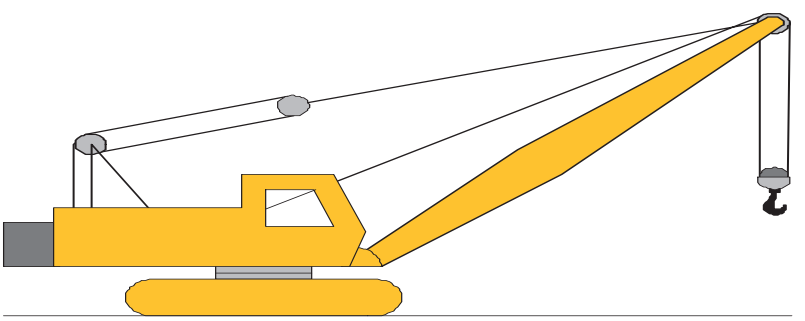
   (a) Calculate Steve's overtime hourly rate.

   (b) How much did Steve earn in total for his 4 overtime hours ?

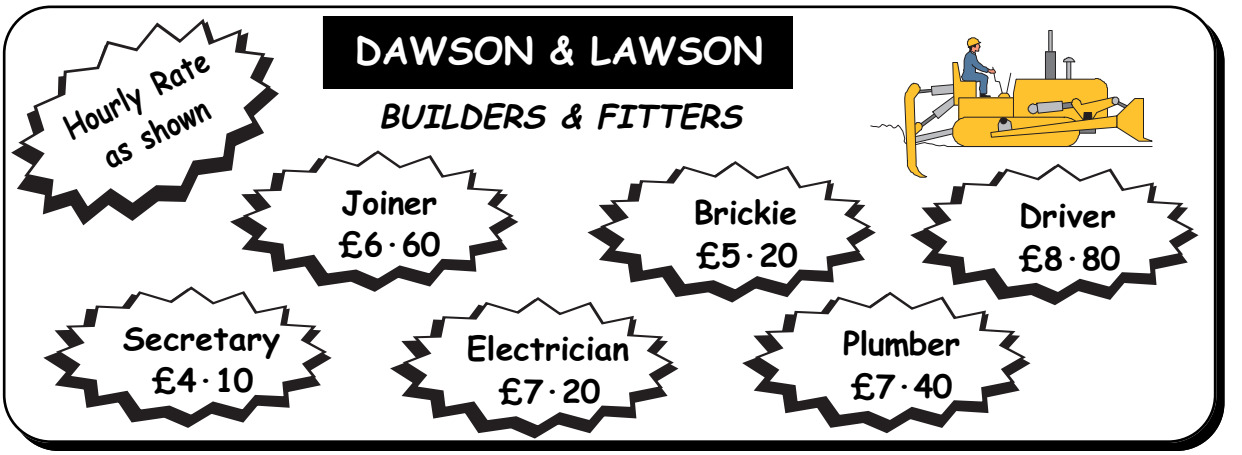
3. Lucy is a crane operator and her normal basic hourly rate is £5·60. She worked a Bank Holiday Monday as overtime at double time.

   (a) Calculate Lucy's overtime hourly rate of pay.

   (b) If she worked 8 hours overtime on the Monday, how much was she paid for this overtime altogether ?



4.



The following people work for "Dawson & Lawson".

(a) Joe is an electrician who works 5 hours overtime (double time).

(i) Calculate Joe's overtime hourly rate of pay.

(ii) Calculate how much his overtime works out at.

(b) Billy is a secretary and last week he worked 6 hours overtime (double time).

(i) Calculate Billy's overtime hourly rate of pay.

(ii) Calculate how much Billy earned for his overtime work.

(c) Lindsay is a driver for "Dawson & Lawson". Last week she worked 10 hours overtime at double time.

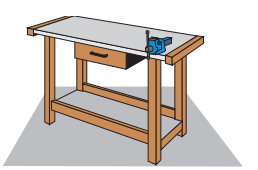
Calculate how much she was paid for her 10 hours overtime.
(*you need to work out her rate of pay for overtime first*)

(d) Pat the plumber did 12 hours overtime at double time last month.

Calculate Pat's total overtime pay.

(e) Nicky works as a joiner for the company. He worked 7 hours overtime one weekend at double time.

How much would he expect to be paid for his 7 hours ?



For questions 5–8 of this exercise, overtime is paid at "time and a half".

Example :-

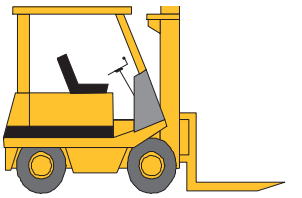
*** note "time and a half" means $1\frac{1}{2}$ or 1·5 times your basic rate**

Tim's pay rate is £6·20 per hour
He works 5 hours overtime at "time and a half".
How much does he earn ?

Answer

Basic rate per hour (note)	=	£6·20
Overtime rate = (1·5 x £6·20)	=	£9·30
=> Overtime pay = (5 x £9·30)	=	£46·50

5. Jimmy works as a fork lift operator for Glasgow Council.
His basic hourly rate of pay is £5·00.



(a) Calculate his overtime rate of pay (at time and a half).

(b) How much does he get paid if he works 4 hours overtime ?

6. 

Martin is a greenkeeper at Pillok Golf Club.
His basic hourly rate of pay is £5·30.

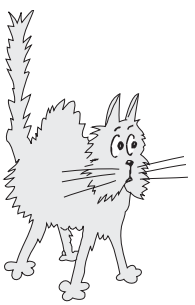
(a) Calculate his overtime rate (at time and a half).

(b) During a golf tournament, Martin had to work 12 hours overtime, how much was he paid for this ?

7. Lisa is an office junior and is paid £4·40 per hour.
Last month she worked a total of 12 hours overtime at time and a half.

(a) Calculate Lisa's overtime rate of pay.

(b) Calculate how much she earned altogether for her 12 overtime hours.

8. 

Kerry works in a Cattery looking after cats.
She is paid a rate of £4·36 per hour.
On Sunday, she worked 6 hours overtime at time and a half.

(a) Calculate Kerry's overtime rate of pay.

(b) Calculate how much she earned altogether for her 6 hours overtime.

9. Nick's basic hourly pay rate is £6·10. He works 5 hours overtime on Saturday.

(a) Nick thought he was getting paid **DOUBLE TIME** for this overtime.

(i) What would his hourly rate be for overtime at double time ?

(ii) What was he hoping to earn for his Saturday work ?

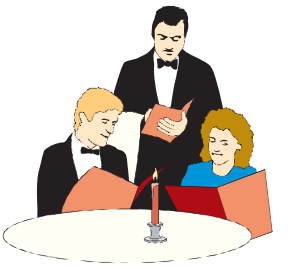
(b) The company only paid him an overtime rate of **TIME AND A HALF**.

(i) What was his actual overtime rate (at time and a half) ?

(ii) How much did Nick actually earn for his Saturday work ?

(c) How much LESS did he earn than he originally thought ?

The following questions require you to calculate the basic pay, the overtime pay and the total pay. They are **HARDER !!**



10. Ken, who is a waiter, has a basic rate of pay of £6·20 per hour.
Last week, he worked his "normal" basic 40 hours.
He also worked 6 hours overtime at time and a half.

COPY this payslip for Ken and complete it.

Ken Stewart	*Payroll Number 0136*	*Date w/e 02/02/02*
Basic Rate = £6·20	***Overtime Rate = (1·5 x £6·20)***	= £ ?
Basic Pay	= 40 x £6·20 =	£ ?
Overtime Pay	= 6 x £..... =	+ £ ?
	Total Pay =	£ ?

11. Lyn works as a dishwasher in the same restaurant as Ken.
Her basic hourly rate is £5·60.
Last week, she worked her "normal" basic 36 hours.
She also worked 10 hours overtime at time and a half.

COPY this payslip for Lyn and complete it.

Lyn Smith	*Payroll Number 0153*	*Date w/e 02/02/02*
Basic Rate = £5·60	***Overtime Rate = (1·5 x .....)***	= £ ?
Basic Pay	= 36 x £..... =	£ ?
Overtime Pay	= 10 x £..... =	+ £ ?
	Total Pay =	£ ?

12. Make up a similar payslip for George Young, the head chef.
George's basic hourly rate of pay is £10·40.
This week, he worked his "normal" basic 38 hours.
He also worked 7 hours overtime at time and a half.
His payroll number is 0183. It is week ending 9th February, 2002.

Calculate his basic pay, overtime pay and total pay for the week.

13. Calculate Sean's total pay for the week. (Do **NOT** write on the book)

MCTAGGART'S				
Name : Sean O'Toole	Works Number – 0333			Week No. 17
Pay Rate	Basic Rate per hour		=	£4·00
	O'time Rate (double time) = (2 x £4·00)		=	£ ?
	O'time Rate (time and a half) = (1·5 x £.....)		=	£ ?
Wage	Basic Pay	= 40 x £4·00	=	£ ?
	Sunday Pay (double time)	= (4 x £ ?)	=	£ ?
	Tuesday Pay (time and a half)	= (3 x £ ?)	=	£ ?
	Total Pay for week		=	£ ?

Deductions on Payslips

GROSS PAY :- This is what you are paid by your employer.

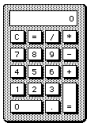
DEDUCTIONS :- These are taken from your pay for various reasons. [find out about Income Tax, National Insurance, Superannuation, etc.]

NET PAY :- This is your take home pay after DEDUCTIONS.

NET PAY = GROSS PAY - DEDUCTIONS

Exercise 6

1. Calculate the Net (take home pay) for each of the following :-

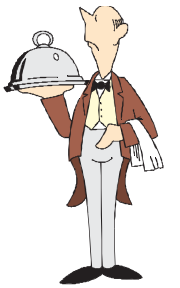


	Gross Pay	Deduction
(a) ***Tom***	£1560/month	£425
(b) ***Lyn***	£1806/month	£695
(c) ***Gary***	£13 945/year	£3 840
(d) ***Dan***	£1085·75/month	£288·65
(e) ***Sal***	£32 680/year	£9 654

	Gross Pay	Deduction
(f) ***Jim***	£375/week	£86
(g) ***Len***	£25 600/year	£6 580
(h) ***Ray***	£493·50/week	£88·25
(i) ***Bob***	£562·80/week	£193·75
(j) ***Malik***	£799·60/f'night	£208·75

2. Henry works as a waiter and earns £850·75 per month.
His deductions usually come to £163·40 per month.

Calculate Henry's net (take home) pay.



3. 

Emma starts work as a computer programmer
at a salary of £22 500 per year.
She calculated that her total deductions come to £4956.

(a) Calculate Emma's NET pay for the year.

(b) Calculate her net MONTHLY pay.
(*do you divide or multiply by 12 ?*)

4. Jimmy's boss, on the building site, promised him a wage of £430·50 last week.
Jimmy found that his total deductions came to £83·75.

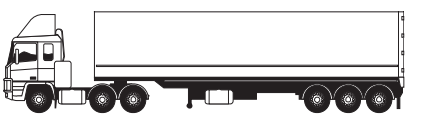
Calculate Jimmy's net pay last week.

5. 

Geoff is a teacher and earns £2125·60 per month.
His total deductions come to £638·85.

Calculate Geoff's net pay for the month.

6. Davy earns £6·80 per hour as a long distance driver.
Last week, he worked his normal 40 hour week.



(a) Calculate Davy's gross pay for the week.

(b) His deductions last week came to £47·50.
Calculate Davy's net pay.

7. 

Nicole earns £8·75 per hour as a nurse.
This week, she worked a total of 44 hours.

(a) Calculate Nicole's gross pay for the week.

(b) If her deductions came to £76·48, calculate
Nicole's net pay for the week.

8. Ken works for "McNicol's The Builders". His basic rate of pay is £4·60 per hour.
One week, Ken worked his basic 40 hour week. He also worked 5 hours overtime
at **time and a half**.

(a) Calculate Ken's total gross pay for the week.

(b) If his deductions came to £48·45, calculate Ken's NET pay for the week.

9. Shown is Norman's payslip for last week.

BLOGGS ENGINEERING

Name :- Norman Bates	Works No. :- 31720	Week No :- 16

Income	Basic –	£675·60	O/time –	£43·20	Bonus –	—	Total –	£ ?
Deducts	I.T. –	£108·76	Superan –	£22·50	Nat Ins –	£32·70	Total –	£ ?
					Net Pay			£ ?

(a) Calculate Norman's total gross pay.

(b) Calculate his total deductions.

(c) What is Norman's net (take home) pay for the week ?

10. For each of the following payslips, calculate :-

(i) Gross Pay (ii) Total Deductions (iii) Net Pay

(a)

BLOGGS ENGINEERING

Name :- Woody Pecker	Works No. :- 21056	Week No :- 16

Income	Basic –	£623·60	O/time –	£39·45	Bonus –	£50·00	Total –	£ ?
Deducts	I.T. –	£143·15	Superan –	£30·75	Nat Ins –	£36·80	Total –	£ ?
					Net Pay			£ ?

(b)

BLOGGS ENGINEERING

Name :- Lois Lane	Works No. :- 18036	Week No :- 16

Income	Basic –	£503·75	O/time –	—	Bonus –	£25·00	Total –	£ ?
Deducts	I.T. –	£75·63	Superan –	£19·75	Nat Ins –	£22·80	Total –	£ ?
					Net Pay			£ ?

(c)

BLOGGS ENGINEERING

Name :- James Riddle		Works No. :- 17402		Week No :- 16		
Income	Basic - £685·75	O/time - £109·72	Bonus - —	Total -	£ ?	
Deducts	I.T. - £152·70	Superan - £32·75	Nat Ins - £41·37	Total -	£ ?	
			Net Pay		£ ?	

(d)

BLOGGS ENGINEERING

Name :- Ally McStay		Works No. :- 36234		Week No :- 16		
Income	Basic - £799·70	O/time - —	Bonus - £75·00	Total -	£ ?	
Deducts	I.T. - £163·64	Superan - £37·93	Nat Ins - £41·85	Total -	£ ?	
			Net Pay		£ ?	

(e)

BLOGGS ENGINEERING

Name :- Ann Robinson		Works No. :- 31307		Week No :- 16		
Income	Basic - £603·65	O/time - £85·50	Bonus - £50·00	Total -	£ ?	
Deducts	I.T. - £142·75	Superan - £30·72	Nat Ins - £34·29	Total -	£ ?	
			Net Pay		£ ?	

11. Gazza works as a sales assistant for "LOWRIES MOTORS".
He receives a basic monthly salary of £875·50.
He also gets 3% commission on any cars he sells.
This month, he sold £42 000 worth of 2nd hand cars.

(a) Calculate how much commission he is due. (3% of £42 000).

(b) Calculate his total gross pay. (£875·50 + £ ?)

(c) If Gazza's deductions this month total £623·60, what is his net pay ?

What have I learned ?

1. George is paid £1550·50 per month. Calculate his **annual** pay.

2. Emile is paid £4·80 per hour as a library assistant.
   How much did he earn last week in which he worked for 38 hours ?

3. Dobbs, the Landscape Gardeners, pays its workers a basic rate of £4·80 per hour.
   (a) What would the OVERTIME hourly rate be at "**double time**" ?
   (b) What would the OVERTIME hourly rate be at "**time and a half**" ?

4. Natalie works for Dobbs. On Sunday she worked 4 hours overtime at "double time". How much overtime pay did Natalie receive ?

5. Billy works in a florist shop. The owner pays him a basic rate of £5·20 per hour.
   Last week Billy worked his normal basic 40 hours.
   He also did 5 hours overtime at "time and a half".
   (a) Calculate Billy's Basic pay. (b) Calculate his overtime pay.
   (c) Calculate the total amount Billy was paid last week.

6. Last year Nadia's pay was £12 400. This year she received a 4% pay rise.
   (a) Calculate the actual pay rise due to Nadia.
   (b) Now calculate Nadia's new annual pay.

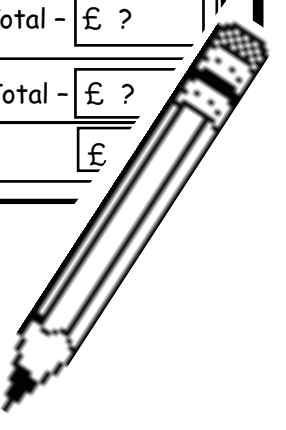
7. Davie sells cars for Hamilton's Motors. He receives 3% **commission** on any car he sells. He sold a new Renault car for £13 500. How much commission is he due ?

8. Shown is Johnny Rotten's pay slip. Calculate his **NET** pay for the week.

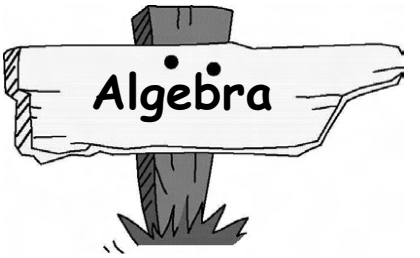
BLOGGS ENGINEERING

Name :- Johnny Rotten Works No. :- 17402 Week No :- 16

Income	Basic -	£685·75	O/time -	£109·72	Bonus -	—	Total - £ ?
Deducts	I.T. -	£152·70	Superan -	£32·75	Nat Ins -	£41·37	Total - £ ?
				Net Pay			£



Chapter 7



Tidying up terms

It is possible to "tidy up" expressions by :-

adding all <u>like</u> terms

See the 3 examples shown opposite.

$8x + 3x - 5x$
$= 6x$

$4p + 7 + 3p - 2$
$= 7p + 5$

$3a + b + a$
$= 4a + b$

Exercise 1

1. Copy each of the following and then give a simplified answer below each one :-

(a)	$3x + 5x$	(b)	$7x - 2x$	(c)	$9x + x$
(d)	$3x - x$	(e)	$6x + 3x + 2x$	(f)	$9x + 2x + x$
(g)	$x + x + x$	(h)	$2x + 5x - 4x$	(i)	$10p + 7p - 12p$
(j)	$7a + 2a - a$	(k)	$20t - 10t + 2t$	(l)	$30g - 20g - g$
(m)	$d + d - d$	(n)	$2y + 4y - 5y$	(o)	$8m - 3m - 2m$
(p)	$17x - x - 10x$	(q)	$8w - w - 7w$	(r)	$2a - a + 5a$
(s)	$f + f + f + f$	(t)	$f + f + f - f$	(u)	$3f + 2f + 5f + 4f$

2. Copy each of the following and then give a simplified answer below each one :-

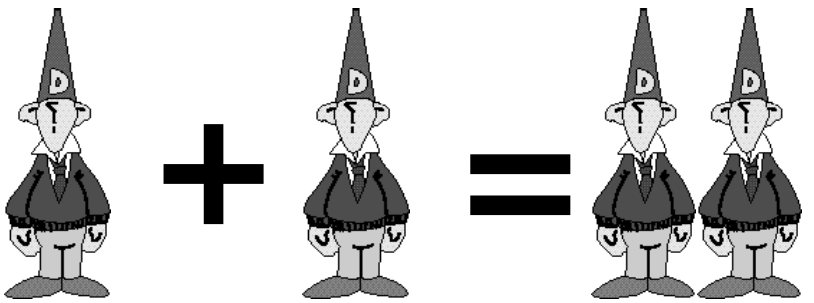
(a)	$3x + 5x + 2x - 9x$	(b)	$5y - y + 2y - 3y$	(c)	$3x + 2 + 8x$
(d)	$5x + 4x + 1$	(e)	$3a - 1 + 5a$	(f)	$3w + 4 + w + 4$
(g)	$2a + 4 - a + 4$	(h)	$3y + 1 - 2y - 1$	(i)	$2x + 3y + 4x + 5y$
(j)	$3a + 2b + 4a + 8b$	(k)	$5p + 3q - 2p - q$	(l)	$7g + h - g + 4h$
(m)	$x + x + x + 2y$	(n)	$3a + 2a + 1 + 8a$	(o)	$4x + 4y + 4x$

(p) $3p + q + 2p + q + p + q$

(q) $8g + 2h - 7g - h + 3g + 4h$

(r) $4x + 4y + 4 - 3x - 3y + 3$

(s) $2p^2 + 6p^2 + 2q^2 - 7p^2 - q^2$



See the 3 examples shown opposite.

$4x \times x = 4 \times x \times x = 4x^2$

$3y \times y = 3 \times y \times y = 3y^2$

$6w \times w = 6 \times w \times w = 6w^2$

Exercise 2

1. Simplify :-

(a)	$5 \times a$	(b)	$3 \times p$	(c)	$2 \times t$
(d)	$7 \times y$	(e)	$m \times 8$	(f)	$w \times 2$
(g)	$a \times b$	(h)	$c \times f$	(i)	$d \times y$
(j)	$a \times a$	(k)	$b \times b$	(l)	$m \times m$
(m)	$2d \times e$	(n)	$5p \times q$	(o)	$7m \times n$
(p)	$4a \times a$	(q)	$7b \times b$	(r)	$2r \times 3s$
(s)	$5u \times 3v$	(t)	$7g \times 5h$	(u)	$2a \times 3a$
(v)	$2m \times 7m$	(w)	$f \times 3f$	(x)	$4w \times 8w$

See the 3 examples shown opposite.

$4(x + 3) = 4x + 12$

$3(x - 2) = 3x - 6$

$5(2a + 4) = 10a + 20$

Exercise 3

1. Multiply out the brackets :-

(a)	$2(x + 1)$	(b)	$3(x - 2)$	(c)	$4(x + 7)$
(d)	$5(x - 3)$	(e)	$7(y - 1)$	(f)	$9(t - 2)$
(g)	$10(a + 7)$	(h)	$20(w + 5)$	(i)	$17(y + 1)$
(j)	$3(x - y)$	(k)	$5(a + b)$	(l)	$2(p - q)$
(m)	$8(g + h)$	(n)	$2(x + y + 2)$	(o)	$6(x + y + 1)$
(p)	$5(x - y - 2)$	(q)	$3(2x + 1)$	(r)	$6(3a - 2)$
(s)	$2(6p - 4)$	(t)	$7(2t + 5)$	(u)	$4(5q - 1)$
(v)	$100(5v - 2)$	(w)	$3(2x + 3y + 1)$	(x)	$2(4x - y + 5)$

See the 3 examples shown opposite.

$3(2x + 4) - 1 = 6x + 12 - 1 = 6x + 11$

$4(x + 2) - 3 = 4x + 8 - 3 = 4x + 5$

$2(3x - 4) + 2 = 6x - 8 + 2 = 6x - 6$

2. Multiply out the brackets and then simplify (Show all working) :-

(a) $2(x + 1) + 1$ (b) $3(x + 2) + 4$ (c) $4(w + 3) - 9$

(d) $5(v + 2) - 10$ (e) $2(x + 4) + x$ (f) $8(y + 1) - y$

(g) $7(g + 2) + g$ (h) $2(w - 3) - w$ (i) $3(x - 1) - 2x$

(j) $5(y - 1) + 2y$ (k) $8(x + 3) + 4x$ (l) $3(h - 2) + 10h$

(m) $2 + 3(x + 1)$ (n) $6 + 2(x + 4)$ (o) $6 + 2(x - 1)$

(p) $10 + 4(x - 2)$ (q) $2(x + 1) + 2(x + 2)$ (r) $5(y + 2) + 2(y + 1)$

(s) $8(y + 1) + 3(y - 1)$ (t) $10(w + 2) + 5(w - 1)$ (u) $3(a + 4) + 2(a + 6)$

(v) $6(c + 3) + 2(c - 8)$ (w) $3(x + 1) + 2(x + 3) + 5$

(x) $5(x + 2) + 3(x + 4) - 20$ (y) $2(x + 4) + 6(x - 1) - 2$

(z) $3(x + 1) + 2(x + 2) + 5(x - 1)$

See the 3 examples shown opposite.

$x + 4 = 7$
$x = 3$

$x - 2 = 10$
$x = 12$

$x - 7 = 14$
$x = 21$

Exercise 4

1. Find the value of x by solving these equations :-
(*use the method shown to you by your teacher*)

(a) $x + 1 = 3$ (b) $x + 5 = 9$ (c) $x + 7 = 15$

(d) $x + 8 = 20$ (e) $x - 1 = 3$ (f) $x - 2 = 18$

(g) $x - 10 = 0$ (h) $x - 40 = 50$ (i) $x + 5 = 5$

(j) $x - 4 = 0$ (k) $x + 17 = 18$ (l) $x - 100 = 100$

(m) $4 - x = 1$ (n) $3 + x = 7$ (o) $6 - x = 0$

(p) $37 + x = 100$ (q) $12 - x = 7$ (r) $50 + x = 50$

See the 3 examples shown opposite.

$3x = 30$
$x = 10$

$4x = 12$
$x = 3$

$6x = 24$
$x = 4$

2. Find the value of x, given :-

(a) $2x = 12$ (b) $3m = 24$ (c) $5p = 35$

(d) $8q = 40$ (e) $6t = 18$ (f) $9a = 90$

(g) $4b = 32$ (h) $7d = 21$ (i) $2x = 7$

(j) $2p = 11$ (k) $4p = 14$ (l) $6m = 21$

(m) $10x = 105$ (n) $8t = 20$ (o) $12p = 30$

(p) $10b = 45$ (q) $4c = 15$ (r) $2n = 23$

See the 3 examples shown opposite.

$2x + 1 = 15$
$2x = 14$
$x = 7$

$3a - 2 = 13$
$3a = 15$
$a = 5$

$4a - 3 = 21$
$4a = 24$
$a = 6$

Exercise 5

1. Find the value of x by solving these equations :-
(*use the method shown to you by your teacher*)

<u>Set down your working carefully</u>.

(a) $2x + 1 = 7$ (b) $2x + 4 = 14$ (c) $3x + 5 = 11$

(d) $5x + 1 = 36$ (e) $2x - 1 = 5$ (f) $2x - 3 = 7$

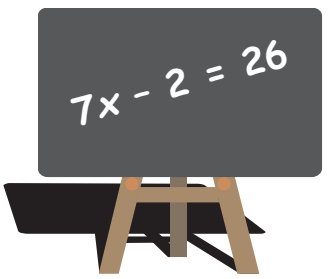
(g) $4x - 4 = 24$ (h) $3x - 5 = 16$ (i) $6x - 1 = 47$

(j) $7x - 3 = 53$ (k) $8x + 5 = 29$ (l) $9x - 4 = 41$

(m) $3x - 8 = 1$ (n) $4x + 10 = 14$ (o) $5x + 10 = 10$

(p) $3x - 3 = 63$ (q) $4x - 4 = 0$ (r) $2x - 1 = 0$

(s) $6x - 3 = 12$ (t) $8x + 5 = 25$ (u) $6x - 11 = 25$



See the 3 examples shown opposite.

$2(x + 3) = 8$
$2x + 6 = 8$
$2x = 2$
$x = 1$

$4(x + 2) = 16$
$4x + 8 = 16$
$4x = 8$
$x = 2$

$3(x - 2) = 9$
$3x - 6 = 9$
$3x = 15$
$x = 5$

Exercise 6

1. Solve these equations by multiplying out the brackets first :-
(*use the method shown to you by your teacher*)

(a) $2(x + 4) = 10$ (b) $3(x + 1) = 9$ (c) $4(y + 2) = 20$

(d) $5(p + 4) = 40$ (e) $8(w + 3) = 40$ (f) $6(m + 2) = 48$

(g) $3(a - 1) = 6$ (h) $2(x - 5) = 4$ (i) $2(p - 2) = 12$

(j) $4(g - 3) = 0$ (k) $7(x - 1) = 7$ (l) $10(x - 10) = 200$

(m) $9(d + 1) = 36$ (n) $8(p - 6) = 0$ (o) $7(r + 2) = 42$

See the 2 examples shown opposite.

$4x + 1 = 2x + 11$
(take "$2x$" from each side)
$2x + 1 = 11$
$2x = 10$
$x = 5$

$7x - 2 = 3x + 18$
(take "$3x$" from each side)
$4x - 2 = 18$
$4x = 20$
$x = 5$

Exercise 7

1. Solve these equations by removing an appropriate number of x's from each side first :-
(*use the method shown to you by your teacher*)

(a) $2x + 1 = x + 3$ (b) $2x + 4 = x + 9$ (c) $5x + 3 = 4x + 9$

(d) $8x + 6 = 7x + 14$ (e) $2x - 1 = x + 5$ (f) $2x - 3 = x + 7$

(g) $4x - 3 = 3x + 7$ (h) $9x - 1 = 8x + 19$ (i) $3x + 4 = x + 6$

(j) $4x + 1 = 2x + 11$ (k) $6x - 1 = 4x + 5$ (l) $3x - 7 = x + 1$

(m) $8x + 1 = 5x + 7$ (n) $5x + 2 = x + 22$ (o) $7x - 3 = 2x + 32$

(p) $10x - 2 = 4x + 40$ (q) $4x - 4 = 2x + 40$ (r) $9x + 1 = x + 41$

What have I learned ?

1. Simplify :-

(a) $4p + 9p$ (b) $8p - 7p$ (c) $5p + 4p - p$

(d) $3m + 4 + 5m$ (e) $8v - 2 - 7v$ (f) $2x + 5 - x + 3$

(g) $4a + 2y + 3a + 4y$ (h) $8x + 5y - 2x - 3y$ (i) $10p + 7q - 3p - 2q$

2. Work out the brackets :-

(a) $5(x + 1)$ (b) $6(x - 4)$ (c) $3(x - 2)$

(d) $7(x + 8)$ (e) $2(a + b)$ (f) $5(p - q)$

(g) $2(3x + 4)$ (h) $4(2w - 1)$ (i) $10(x + y + 2z)$

(j) $3(2a - 3b + c)$ (k) $5(3p - 2q + 4r)$ (l) $\frac{1}{2}(6a + 4b + 2c)$

3. Multiply out the brackets and then simplify :-

(a) $4(x + 1) + 6$ (b) $7(y - 1) + 7$ (c) $3(t + 2) + 5t$

(d) $8 + 2(2x + 3)$ (e) $4 + 3(x - 1)$ (f) $2(x + y) + 3(3x + 2)$

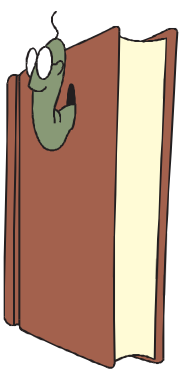
4. Solve :-

(a) $x + 4 = 11$ (b) $y - 2 = 13$ (c) $15 - a = 5$

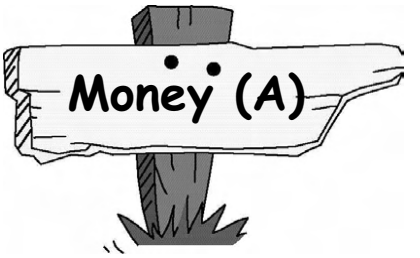
(d) $2m = 18$ (e) $4p = 14$ (f) $2c + 1 = 15$

(g) $3k + 4 = 22$ (h) $7d - 3 = 32$ (i) $2(x + 3) = 16$

(j) $3(y - 2) = 18$ (k) $7x + 2 = 3x + 30$ (l) $5a - 10 = 3a + 10$



Chapter 8



Simple Interest

SCOTIA BANK

Savings Account 6% gross

Special Savings Account 4·1%

High Interest Account 3·7% net

Supersaver Account 7·1%

p.a. means per year

Exercise 1

1. There are two main reasons why, if you should come into a sum of money, you should put it in a bank (or building society).

   Write down the reasons.

2. Dave and Sally put their combined savings of £8 000 into "SCOTIA BANK".

   How much interest would they receive after 1 year ? (*3% of £8 000*)

3. Kenny sells his flat for £35 000 and leaves the money in SCOTIA BANK for 1 year whilst he travels around Australia.

   How much interest is Kenny due at the end of the year ?

4. Some friends compare the interest they are due from various banks and building societies for 1 year.

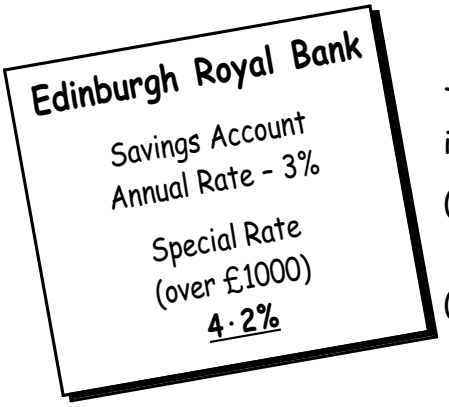
   (a) Tanya left £6 500 for a year. Rate = 4% p.a.

   (b) Alan deposited £9 200 for a year. Rate = 2·5% p.a.

   (c) Alison banked £11 400 for a year. Rate = 3·5% p.a.

   (d) Richard invested £6 850 for a year. Rate = 4·1% p.a.

   Calculate how much interest each person was due.

5. 

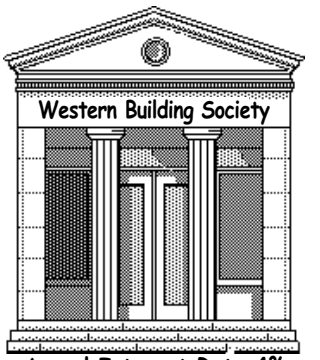
   Tony won £18 000 on the Rangers' Pools. He was about to invest it in his savings account at Edinburgh Royal Bank.

   (a) How much interest would he have received if he had invested the money into his savings account ?

   (b) Instead, he asks for the "special" saver's rate. How much interest did he actually get at the end of the year ?

6. Brian invested £5 200 in a special savings account at his bank for 1 year. The annual interest rate is 3·7%.
His friend Julie saved £4 800 in her building society account for 1 year and received a rate of 4·0% per annum.

Which of the two received more interest in total after 1 year ?
(*you will have to calculate both Brian's and Julie's interest*)



7. I decide to invest £6 000 with the "Western Building Society".

   (a) How much interest would I expect after 1 year ?

   (b) How much would my total savings then be ?
   (£6 000 + £..... =)

8. I deposited £3 400 in my bank account for 1 year where the annual interest rate was 3·5%.

   (a) Calculate my interest after 1 year.

   (b) How much would I then have in my bank account altogether ?

9. For each of the following, calculate how much the savings would be worth <u>in total</u> at the end of 1 year :-

   (a) Sally invested £4 000. Annual Interest Rate = 5% p.a.

   (b) Nadine invested £800. Annual Interest Rate = 3% p.a.

   (c) Stewart invested £2 200. Annual Interest Rate = 2·8% p.a.

   (d) Ralph invested £17 500. Annual Interest Rate = 6·1% p.a.

10. Karen had £7 000 and decided to invest it with "Morden Building Society".

    (a) What RATE of interest would she expect (2·3%, 2·9% or 3·2%) ?

    (b) Calculate how much interest Karen would receive after 1 year.

MORDEN BUILDING SOCIETY

"The more you bank – The higher the rate"

up to £1000	- 2·3%
£1000 - £10000	- 2·9%
over £10000	- 3·2%

11. Decide what "**RATE**" of interest each of the following is due with Morden Building Society and calculate the amount of interest due after 1 year :-

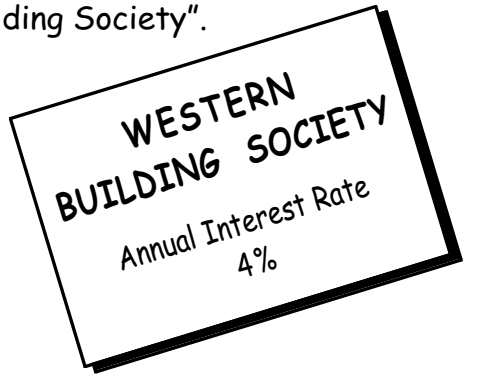
    (a) Nell has £700 to invest for 1 year.

    (b) Naomi has £11 000 to invest for 1 year.

    (c) Jeniffer has £4 500 to invest for 1 year.

    (d) Andrew has £24 000 to invest for 1 year.

12. William decides to invest £3 000 with "Western Building Society".

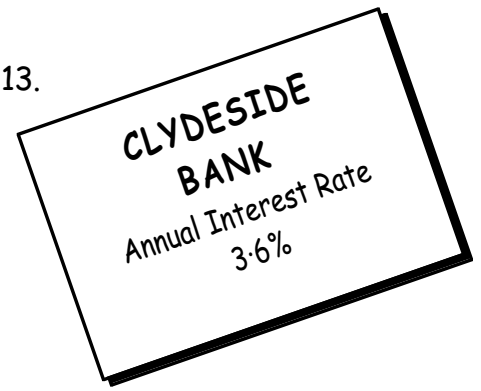


(a) How much interest should he expect if he leaves his money for 1 year ?

(b) How much does this work out at for 1 month ? (*divide by 12*)

(c) How much interest is he due if he withdraws his savings after 8 months ? (*multiply by 8*)

13.



(a) If I left £4 000 with "Clydeside Bank" for 1 year, how much interest would I receive ?

(b) If I withdrew my money after 1 <u>month</u>, how much interest would I receive ?

(c) I decided to leave my money for 5 months. Calculate the amount of interest I should get.

14. For each of the following :-

(i) calculate the interest for 1 year.

(ii) then calculate the interest for 1 month (÷ 12).

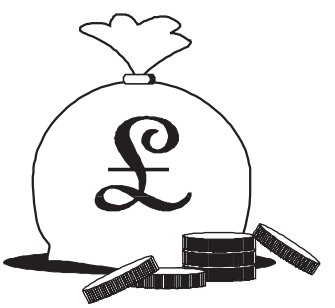
(iii) finally calculate the interest for the length of time the money was actually invested. (*multiply*)

(a) Felicity invested £6 000 at an annual rate of 4%. She withdrew her savings after 3 months.

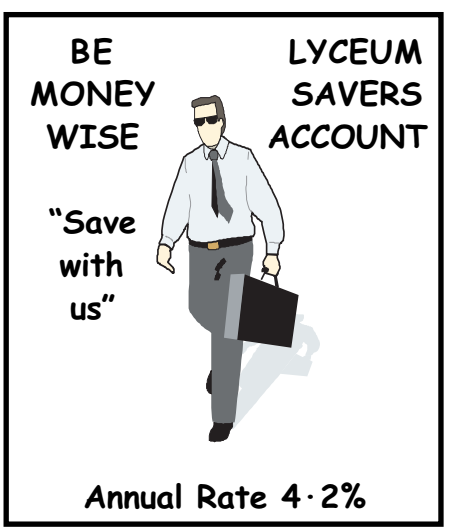
(b) Alison invested £720 at an annual rate of 2·5%. She withdrew her savings after 8 months.

(c) Denise invested £8 400 at an annual rate of 4·3%. She withdrew her savings after 6 months.

(d) Andrea invested £120 000 at an annual rate of 5·5%. She withdrew her savings after 10 months.



15.



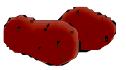
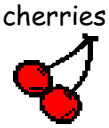
David withdrew £15 000 from his bank and opened up a new account with the "Lyceum".

(a) Calculate how much interest he could expect if he left his money there for 1 year.

(b) David withdrew his money after 8 months. Calculate how much interest he received.

(c) What was the total value of David's savings after withdrawing his money ?

Bob The Grocers

onions	milk	sliced ham	apples	cucumber	bananas
 18p/kg	 38p/pint	 80p/ $\frac{1}{4}$ kg	 34p/kg	 80p each	 48p/kg
eggs	**carrots**	**potatoes**	**parsnip**	**strawberries**	**pumpkin**
 72p for six	 34p/kg	 32p/kg	 40p/kg	 92p/kg	 62p/kg
oranges	**lemons**	**peaches**	**cherries**	**cheese**	**roast chicken**
 50p/kg	 66p/kg	 90p/kg	 £1·20/kg	 £3·20/kg	 80p/kg

Exercise 2 (no calculator needed here) 

1. Neatly copy each of the following bills and calculate the <u>total</u> each time :-

(a)
1 kg potatoes –
1 kg onions –
2 pts of milk -

(b)
$\frac{1}{2}$ cucumber –
2 kg bananas –
3 kg carrots -

(c)
4 kg apples –
12 eggs –
3 kg oranges -

(d)
3 kg carrots –
$\frac{1}{2}$ kg parsnip –
1 kg cheese -

(e)
$\frac{1}{2}$ kg strawberries –
$\frac{1}{2}$ kg cherries –
$\frac{1}{2}$ kg sliced ham -

(f)
2 kg oranges –
$\frac{1}{2}$ pumpkin –
3 pts of milk -

(g)
2 cucumbers –
6 kg onions –
3 kg carrots -
4 kg potatoes -

(h)
2 pts milk –
6 kg bananas –
3 eggs -
$\frac{3}{4}$ kg roast chicken -

(i)
2 kg apples –
$1\frac{1}{2}$ kg oranges –
2 kg bananas
$1\frac{1}{2}$ kg peaches -

(j)
4 kg onions –
$1\frac{1}{2}$ cucumbers –
$\frac{1}{2}$ kg carrots -
3 kg apples -

(k)
1 dozen eggs –
$\frac{3}{4}$ kg sliced ham –
$\frac{1}{2}$ pint of milk -
$1\frac{1}{2}$ kg parsnip -

(l)
$1\frac{1}{2}$ kg cherries –
2 kg peaches –
3 kg oranges
$2\frac{1}{2}$ kg bananas -

2. Copy this garage bill, calculate the VAT, and find the final overall bill.

THOMSON'S GARAGE

Parts	–	£86·70
Labour	–	£43·30
Sub Total		£
+ VAT (17½%)		£ COPY ← (17·5 ÷ 100 x ....)
Final Bill		£

3. For each of the following, copy the bill and calculate the VAT and the overall bill :-

(a)

FURNITURE RENOVATORS

Material	=	£235·70
Labour	=	£320·30
Sub Total	=	
+ VAT (17½%)	=	COPY
Total Bill		

(b)

P.C. REPAIRS

Parts	=	£37·85
Labour (4 hrs at £17·50)	=	£
Sub Total	=	
+ VAT (17½%)	=	COPY
Total Bill		

(c)

PICASSO PAINTERS

Wallpaper	=	£43·50
Paint	=	£18·75
Paste	=	£ 3·60
Labour (8 hrs at £12·50)	=	£
Sub Total	=	
+ VAT (17½%)	=	COPY
Total Bill		

(d)

TERRY'S T.V. REPAIRS

Parts	=	£26·40
Labour	=	£32·60
Sub Total	=	
+ VAT (17½%)	=	COPY
Total Bill		

(e)

THE LANDSCAPE GARDENERS

Plants	=	£34·50
Compost	=	£18·25
Labour (6 hrs at £9·75)	=	£
Sub Total	=	
+ VAT (17½%)	=	COPY
Total Bill		

(f)

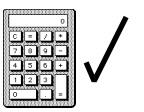
THE CAR BODY SHOP

New Wing	=	£48·60
Panel	=	£17·25
Labour (3 hrs at £11·40)	=	£
Sub Total	=	
+ VAT (17½%)	=	COPY
Total Bill		

4. Calculate the cost of <u>each</u> of the following items :-

(a)	20 metres of heavy duty chain at £3·20/metre.	(+ VAT) at 17½%)
(b)	A computer (£575) plus printer (£185)	(+ VAT) " "
(c)	4 new tyres at £47·85 each.	(+ VAT) " "
(d)	A T.V. Set (£325·50) plus video recorder (£169·50)	(+ VAT) " "
(e)	Hire of a van for 8 hours at £8·75/hour.	(+ VAT) " "
(f)	7 hours of a gardener's time at £7·80/hour.	(+ VAT) " "
(g)	A C.D. Burner (£235) plus £5 delivery charge.	(+ VAT) " "

Electricity Bills



Exercise 3

1. Study this Electricity Bill.

SOUTH WEST SCOTLAND ELECTRICITY BOARD (SWSEB)	
Householder :- Mr J Riddle	**Period :- Jan 15th – Mar 15th (2002)**
Units	Charges
Present Reading :- 02631 Previous Reading :- 02271 Units used :- ?	? units at 13·4p/unit = £ ? + VAT (8%) = £ ? Amount due = £ ?

(a) By subtracting 2271 from 2631, calculate how many units of electricity have been used from January to March.

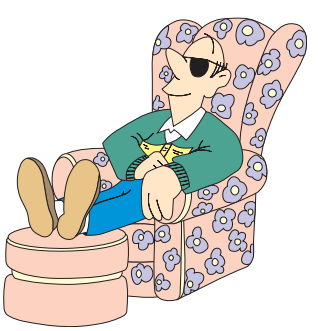
(b) By multiplying this number of units by 13·4p, calculate :-

(i) the cost of the units <u>in pence</u>.

(ii) the cost of the units <u>in £'s</u>. (divide by 100)

(c) Calculate the VAT due (at 8%, **not** 17½%).

(d) Calculate the final bill sent to Mr Riddle.



2. Neatly copy out this bill and calculate the final amount due.

SOUTH WEST SCOTLAND ELECTRICITY BOARD (SWSEB)	
Householder :- Mr B Spice	**Period :- Mar 15th – May 15th (2002)**
Units	Charges
Present Reading :- 07634	? units at 13·4p/unit = £ ?
Previous Reading :- 06914	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £

3. You do NOT have to copy each of the following bills.

In each case, calculate :-

- the number of units used
- the cost of the units (in £'s)
- the VAT (at 8%)
- the final amount due

(a)

BORDERS ELECTRICITY BOARD (BEB)	
Householder :- Mr J Blunt	**Period :- Jun 13th – Aug 13th (2002)**
Units	Charges
Present Reading :- 08021	? units at 14·1p/unit = £ ?
Previous Reading :- 07461	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £ ?

(b)

NORTHERN ELECTRICITY BOARD (NEB)	
Householder :- Mr A Bloggs	**Period :- Sep 15th – Nov 15th (2002)**
Units	Charges
Present Reading :- 05931	? units at 16·2p/unit = £ ?
Previous Reading :- 05376	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £ ?

(c)

CENTRAL POWER ELECTRICITY BOARD (CPEB)	
Householder :- Mr J Doe	**Period :- Mar 30th – May 30th (2002)**
Units	Charges
Present Reading :- 10271	? units at 15·8p/unit = £ ?
Previous Reading :- 09861	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £ ?

(d)

HIGHLAND ELECTRICITY BOARD (HEB)	
Householder :- Mrs M Thatcher	**Period :- May 14th – Jul 14th (2002)**
Units	Charges
Present Reading :- 21345	? units at 17·5p/unit = £ ?
Previous Reading :- 20863	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £ ?

(e)

CENTRAL POWER ELECTRICITY BOARD (CPEB)	
Householder :- Mr T Blair	**Period :- Jan 30th – Mar 30th (2002)**
Units	Charges
Present Reading :- 18437	? units at 15·8p/unit = £ ?
Previous Reading :- 17921	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £ ?

(f)

HIGHLAND ELECTRICITY BOARD (HEB)	
Householder :- Mr D Dan	**Period :- May 14th – Jul 14th (2002)**
Units	Charges
Present Reading :- 09137	? units at 17·5p/unit = £ ?
Previous Reading :- 08667	+ VAT (8%) = £ ?
Units used :- ?	Amount due = £ ?

What have I learned ?

1. Give one reason why you should deposit any large sum of money you have in a bank or building society, rather than put it in a box under your bed.

2. Scotia Bank pays an annual rate of interest of 4%.

   David puts his life savings of £18000 into Scotia and leaves it there for 1 year.

   (a) Calculate how much interest David will receive.

   (b) How much will David's savings then be worth ?

3. Melanie has been left £2400 by her Gran.
   She decides to put it into the Scotia Bank for 1 year.

   (a) How much interest would she expect at the end of the year ?

   (b) If she withdrew her money after 1 month, how much interest should she receive ?

   (c) In fact, Melanie lifted the money from her account after **9 months**. How much interest did the bank have to pay to Melanie ?

4. V.A.T. is charged at $17\frac{1}{2}\%$. How much V.A.T. would you expect to pay when you buy an iMac computer priced £680 ?

5. Mike had a car accident and put his car in for an estimate with the BODY PANEL SHOP.

   Make a copy of the estimate and calculate the final overall estimated bill for repairing Mike's car.

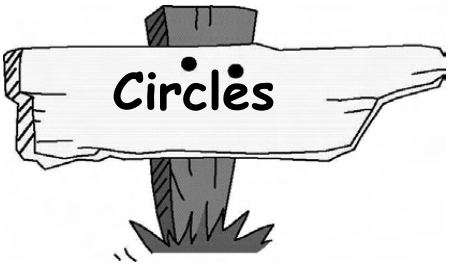
THE BODY PANEL SHOP

New Bonnet	=	£64·50
Front Bumper	=	£47·90
Labour (4 hrs at £10·80)	=	£ ?
Sub Total	=	?
+ VAT ($17\frac{1}{2}\%$)	=	?
Total Bill		?

6. Mr LaRue's electricity bill arrived for the period June to August 2002.
   Copy the bill out neatly and calculate the final amount due.

HIGHLAND POWER ELECTRICITY BOARD (HPEB)	
Householder :- Mr D LaRue	**Period :- Jun 28th – Aug 27th (2002)**
Units	Charges
Present Reading :- 29548	? units at 13·7p/unit = £
Previous Reading :- 29032	+ VAT (8%) = £
Units used :- ?	Amount due =

Chapter 9



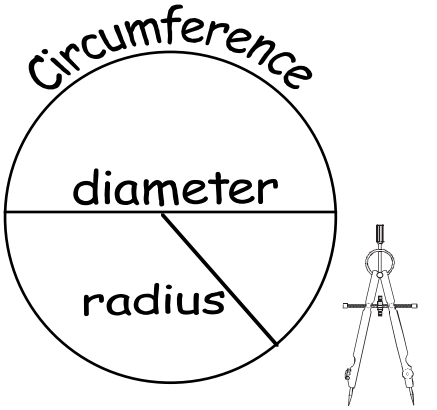
The Parts of a Circle

The curved distance around the edge of a circle is called the **circumference (C) of the circle.**

The line joining two points on the circumference passing through the centre is the **diameter**.

The shorter line joining the centre of the circle to the circumference is the **radius**.

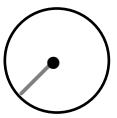
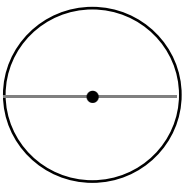
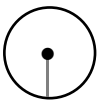
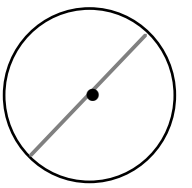
The **diameter** is always twice the **radius**.



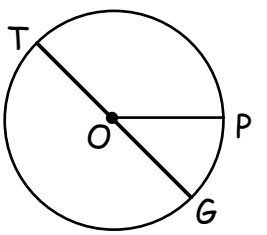
Exercise 1 **(you will need a ruler and a pair of compasses for this exercise)**

1. (a) Use a pair of compasses to draw a circle with a radius of 3 centimetres.
   (b) Draw in a diameter and label it "diameter".
   (c) Draw in any radius and label it "radius".
   (d) Label the circumference of your circle.

2. For each of these circles, say whether the dotted line is a radius or a diameter :-

   (a) 
   (b) 
   (c) 
   (d) 

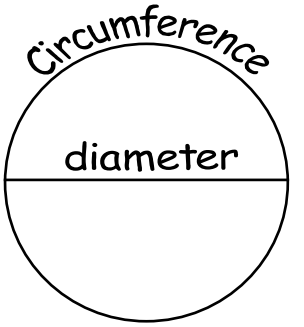
3. (a) Use two letters to name the line which is a diameter in this circle.
   (b) Name the radius in the figure.



4. (a) Draw a circle with a radius of 4 centimetres. Put a point (O) at its centre.
   (b) Draw a radius OA on your circle and label the point A.
   (c) Draw any diameter DE on your circle and label the points D and E.
   (d) Measure the length of DE and show it is twice the length of radius AO.

5. (a) If the radius of a circle is 7 centimetres, what is the length of its diameter ?
   (b) If the diameter of a circle is 20 centimetres, what is the length of its radius ?
   (c) If the diameter of a circle is 31 centimetres, what is its radius ?
   (d) If the radius of a circle is 4·3 centimetres, what length is its diameter ?

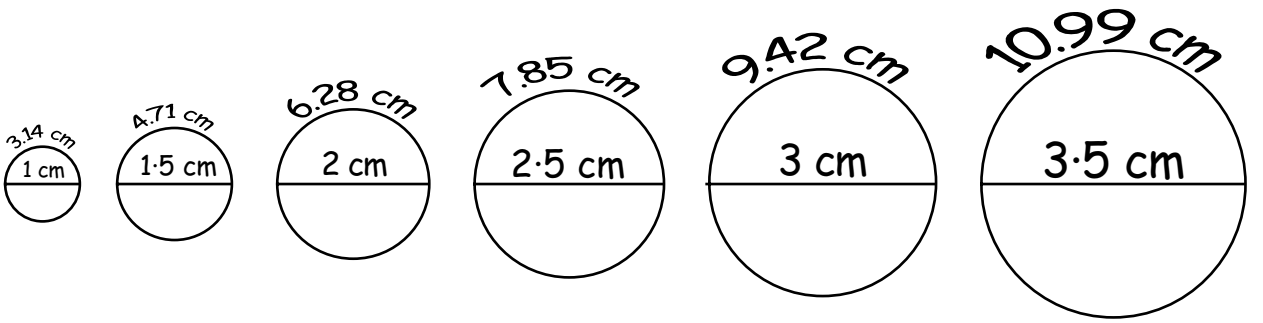
The Circumference (C) of a Circle



A long time ago it was discovered that there was a connection between the length of the **diameter** of a circle and the length of its **circumference**.

Practical Exercise

1. Shown below are drawings of circles with their diameters and circumferences given.



(a) Copy this table and fill in the **first two rows** :-

diameter (D)	1	1·5	2	2·5	3	3·5
circumference (C)	3·14	4·71	6·28	?	?	?
C ÷ D	3·14	?	?	?	?	?

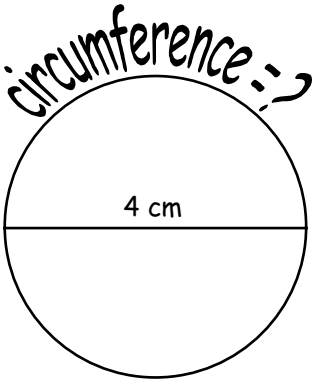
(b) Use your calculator to divide the circumference of each circle by its diameter. Fill in the third row of your table.

(c) What answer did you obtain each time ?

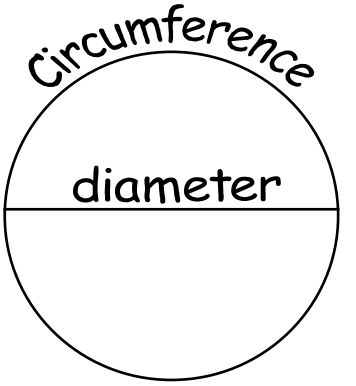
2. You may like to measure the diameters of a half dozen circular objects like tin lids. You could also measure their circumferences using a measuring tape or a piece of string. (***check with your teacher***).

   If you have made your measurements accurately, you should check to see that when you divide the circumference of each circle by its diameter, you obtain the same answer as that discovered in question number 1.

3. (**difficult**) If the pattern in question 1 continues, can you guess what the circumference of this circle with diameter 4 centimetres might be ?



The Circumference (C) of a Circle (continued)



It has been known for a long time that in when you divide the **circumference** of a circle by its **diameter** you always get the answer 3·14...

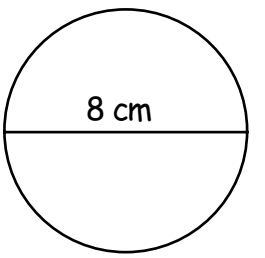
$$\Rightarrow \quad \frac{C}{D} = 3{\cdot}14...$$

This number (3·14...) is so famous in mathematics, it is given a name. It is called **π** (pronounced "pie")

$$\Rightarrow \quad \frac{C}{D} = \pi \qquad \text{(where } \pi = 3{\cdot}14..\text{)}$$

We can use the rearrangement of this to help us calculate the circumference of a circle as long as we know what its diameter is.

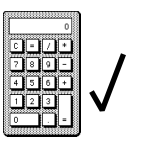
$$\Rightarrow \quad \boldsymbol{C = \pi \times D} \qquad \text{(or } C = \pi D \text{ for short)}$$



Example :- Calculate the circumference of this circle which has a diameter of 8 centimetres :-

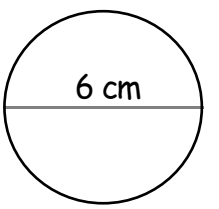
$$\Rightarrow \quad C = \pi D$$
$$\Rightarrow \quad C = 3{\cdot}14 \times 8 \text{ cm}$$
$$\Rightarrow \quad C = 25{\cdot}12 \text{ cm}$$

its as simple as that !



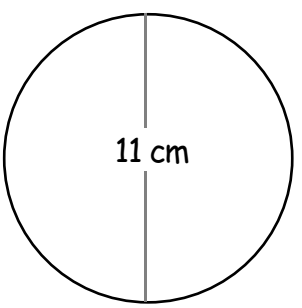
Exercise 2 *(you can use your calculator here)*

1. Calculate the circumference of this circle with a diameter of 6 cm.



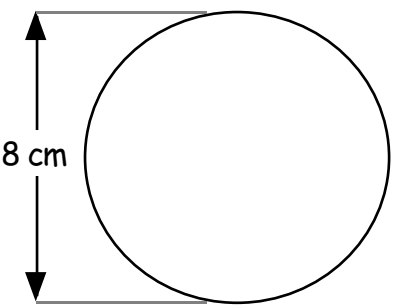
(copy this working)

$$\Rightarrow \quad C = \pi D$$
$$\Rightarrow \quad C = 3{\cdot}14 \times 6 \text{ cm}$$
$$\Rightarrow \quad C = ? \text{ cm}$$

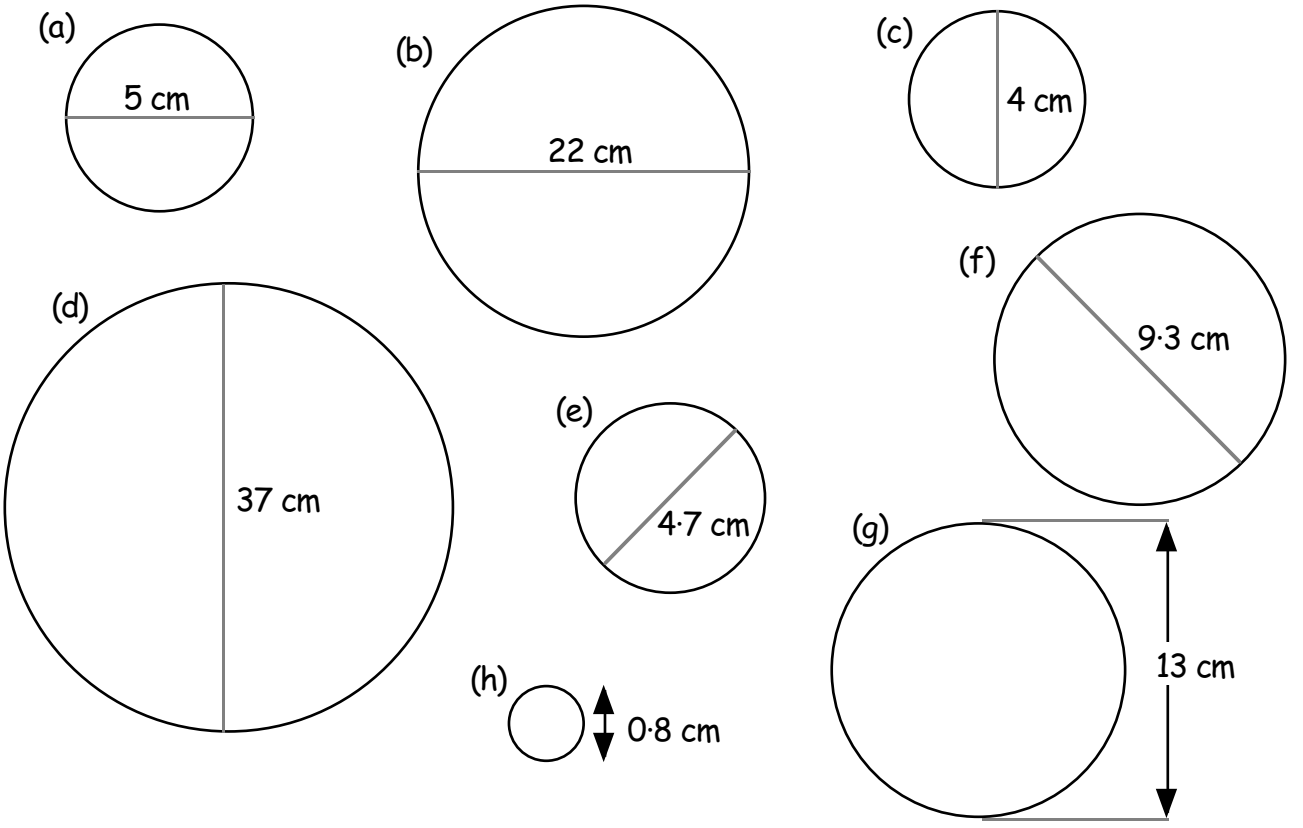
2. 

Calculate the circumference of the circle with diameter 11 centimetres.

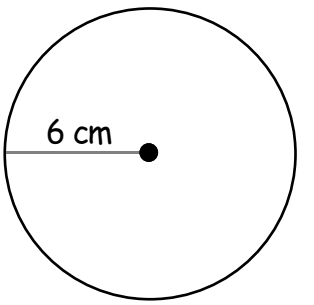
3. Calculate the circumference of this circle :-



4. For each of these circles, set down the three lines of working and calculate the lengths of their circumferences :-



5. Be careful here !!



This time you are told that the **RADIUS** is 6 centimetres.

To calculate the circumference, you have to find the length of the **diameter** first.

radius = 6 cm => **diameter** = 2 x 6 = 12 cm

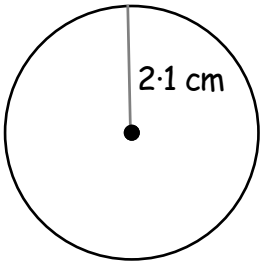
Now we can proceed => $C = \pi D$

note

=> $C = 3{\cdot}14 \times 12$ cm

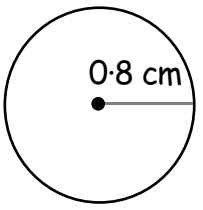
=> $C =$? cm

6. For this circle,



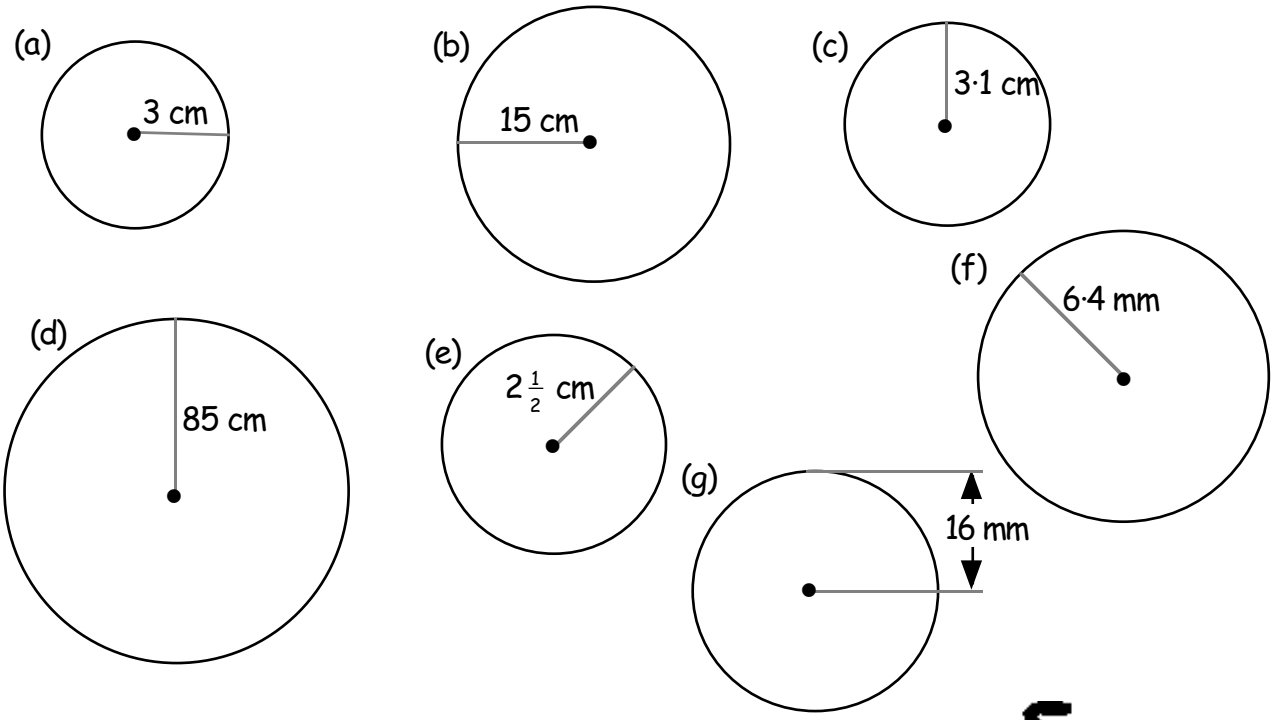
(a) Double the radius to get the diameter.

(b) Use the diameter to calculate the circumference.

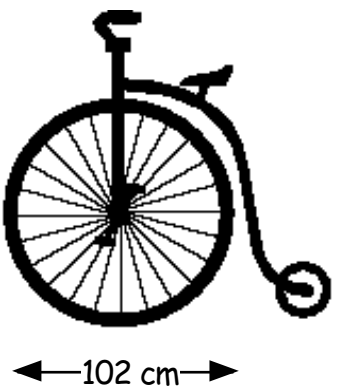
7. 

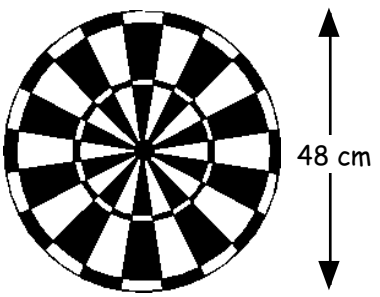
Calculate the circumference of this circle.

8. Calculate the diameter, then the circumference of each of these circles :-



9. Calculate the circumference of the large bicycle wheel

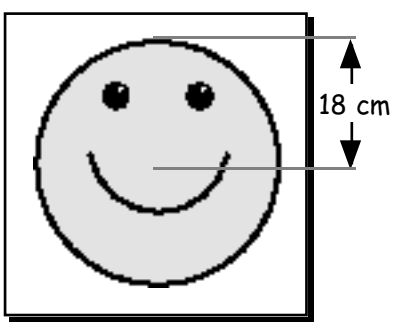


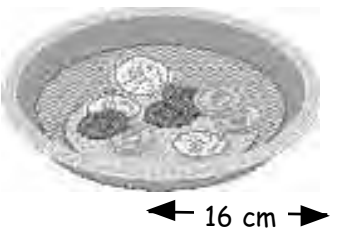
10. 

Calculate the length of the metal strip used to bind the edge of this dart board.

11. The **radius** of this Mr Happy face is 18 centimetres.

Calculate the circumference of the face.

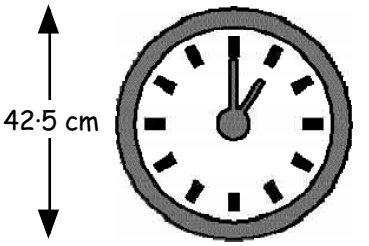


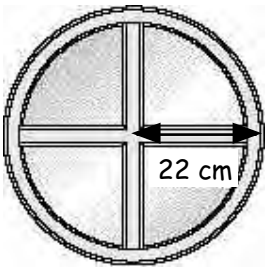
12. 

The radius of the top of this church collection plate is 16 centimetres.

Calculate its circumference.

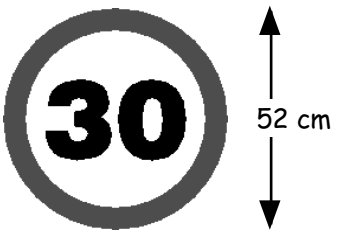
13. This wall clock has a diameter of 42·5 centimetres.
Calculate the circumference of the clock.

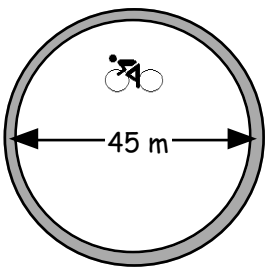


14. 

This circular window has a **radius** of 22 centimetres.
Calculate the circumference of the window.

15. This road sign has a diameter of 52 centimetres.
Calculate the circumference.



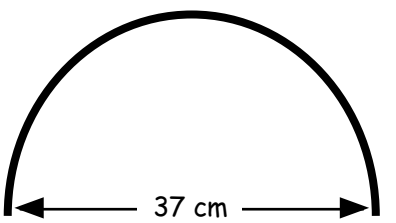
16. 

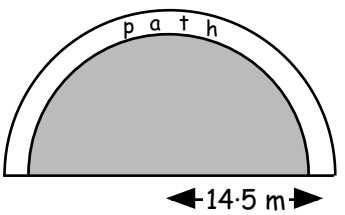
Shown is a circular cycle race track.
The diameter of the track is 45 metres.

(a) Calculate the distance round one lap of the track.

(b) A cyclist goes around the track 25 times during a race. How far has he cycled altogether ?

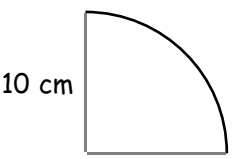
17. A piece of steel bar is bent into the shape of a **semi-circle** (a half circle).
The diameter of the semi-circle is 37 centimetres.
Calculate the length of the metal bar.



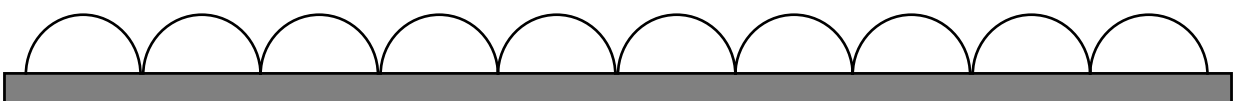
18. 

The path around a garden is in the shape of a semi-circle.
The radius of the semi-circle is 14·5 metres
Calculate the length of the path.

19. The diagram shows a quarter circle with radius 10 centimetres.
Calculate the length of the curved part of the shape.



20. A garden is edged with 10 semi-circular pieces of plastic wire as shown.
The diameter of each semi-circle is 27 centimetres.

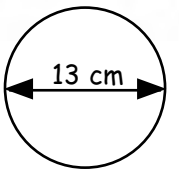


(a) Calculate the length of one of the semi-circular loops.

(b) Calculate the total length of plastic wire required for all the loops.

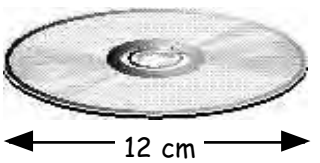
What have I learned ?

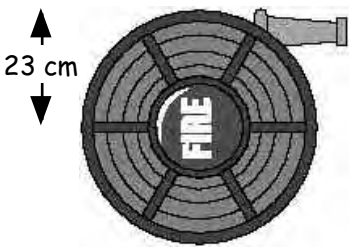
1. The diameter of this circle is 13 centimetres.
   Write down the length of its radius.



2. I can picture a circle in my head. It has a radius of 4·2 centimetres.
   What must its diameter be ?

3. Calculate the <u>circumference</u> of this CD.



4. 

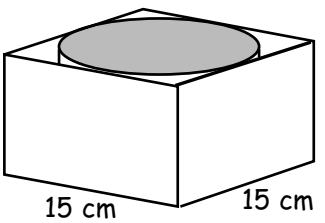
   The **radius** of the fire hose holder is 23 centimetres.

   Calculate the circumference of the hose holder.

5. This circular biscuit tin just fits inside this square box of side 15 centimetres.

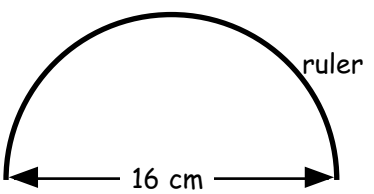
   (a) Write down the diameter of the tin.

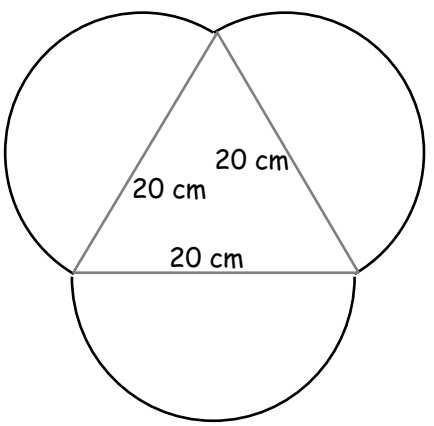
   (b) Calculate the circumference of the tin.



6. A boy bends his plastic ruler into this semi-circular shape.

   Calculate the length of the ruler.



7. 

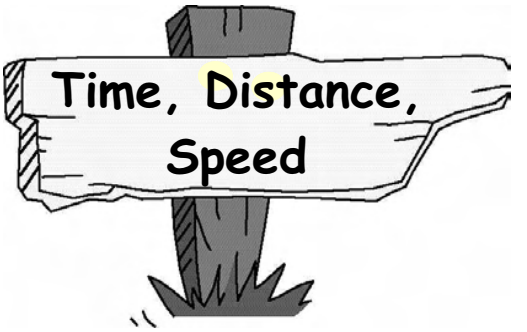
   Shown is an equilateral triangle with three semi-circles, one drawn on each side.

   (a) What is the diameter of each semi-circle ?

   (b) Calculate the length of each semi-circle.

   (c) Calculate the perimeter of the shape.
   (*the distance round the outside*)

Chapter 10



Time

12 hour time —> 24 hour time

24 hour time —> 12 hour time

Exercise 1

1. 6·30 am —> 0630 4·40 pm —> 1640

Change the following 12 hour clock times to <u>24 hour clock times</u> :-

(a)	3·30 am	(b)	1·45 am	(c)	4 am
(d)	1·30 pm	(e)	3·15 pm	(f)	5 pm
(g)	5·15 am	(h)	8·40 pm	(i)	2·45 am
(j)	7·25 am	(k)	midday	(l)	12·50 am
(m)	12·50 pm	(n)	9·30 pm	(o)	3·55 am
(p)	8·10 pm	(q)	10·55 pm	(r)	9·35 am
(s)	11·20 pm	(t)	10·32 am	(u)	9·50 pm

2. 0430 —> 4·30 <u>am</u> 2145 —> 9·45 <u>pm</u>

Change the following 24 hour clock times to <u>12 hour clock times</u> :-

(a)	0130	(b)	1120	(c)	0905
(d)	1330	(e)	1540	(f)	2215
(g)	0250	(h)	1935	(i)	1810
(j)	1601	(k)	1200	(l)	0830
(m)	0550	(n)	1420	(o)	2305
(p)	1955	(q)	0030	(r)	0735
(s)	1135	(t)	2020	(u)	2355

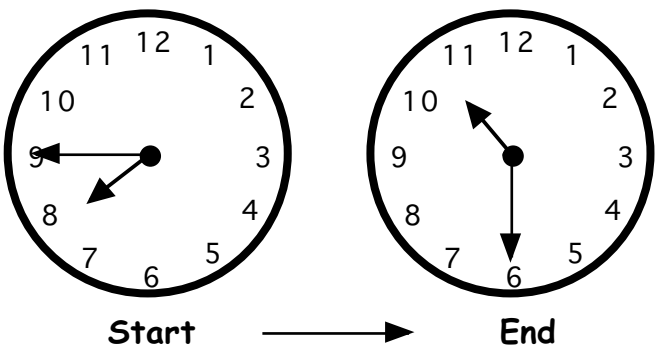
Exercise 2

1. How long is it from :-

   (a) 4·15 pm to 7·15 pm
   (b) 7 am to 10·30 am
   (c) noon to 5·30 pm
   (d) 6·30 pm to 10·15 pm
   (e) 4·45 am to 6·20 am
   (f) 2·20 am to 10·15 am
   (g) 0620 to 0825
   (h) 1945 to 2010
   (i) 1715 to 1905
   (j) 2310 to 0100 (next day ?)

2. The clocks indicate the start and finish of a concert one evening.

   For how long did the concert last ?



3. Shown is part of the train timetable from Kyle to Renton.

	Kyle → *Cairns* → *Colford* → *Duns* → *Renton*				
Early Train	7·15 am	8·20 am	10·30 am	11·15 am	1·50 pm
Late Train	11·30 am	12·35 am			6·05 pm

   (a) How long does the early train take to travel from :-

   (i) Kyle to Cairns ? (ii) Colford to Duns ? (iii) Kyle to Renton ?

   (b) Assuming that the late train travels at the same speed as the early train, when would it be expected to arrive at :-

   (i) Colford ? (Hint ! Notice how long the early train takes from Cairns to Colford)

   (ii) Duns ?

4. Here are the bus timetables for **"Stirling <—> John O'Groats"**.

Stirling <—> John O'Groats			
Stirling	leave	0955	2300
Perth	arrive	1050	2355
	leave	1050	midnight
Dunkeld	arrive	1120	0025
Pitlochry	arrive	noon	0105
	leave	1310	0120
Kingussie		1430	0240
Carrbridge		1508	0310
Inverness	arrive	1558	0405
	leave	1640	0405
John O'Groats	arrive	1800	0530

John O'Groats <—> Stirling			
John O'Groats	leave	1000	2200
Inverness		1140	2340
Carrbridge		1232	0032
Kingussie	arrive	1300	0105
	leave	1345	0110
Pitlochry		1425	0150
Dunkeld	arrive	1455	0220
	leave	1505	0220
Perth	arrive	1532	0251
	leave	1532	0315
Stirling	arrive	1610	0440

(a) How long does it take from Inverness to John O'Groats on each of the 0955 and the 2300 services from Stirling ?

(b) At what times do the buses leave Kingussie for Pitlochry ? (answer using a.m. or p.m.)

(c) Where will you have time for lunch on each of the **day time services** ? How long in each case ?

(d) On the **night time services** – where will you have time for a comfort stop and for how long in each case ?

(e) Which of the two evening service takes longer and by how much ?

(f) If you dislike travelling by bus, but had to undertake a journey from John O'Groats to Stirling, which bus would you choose to take and why ?

5. A plane leaves Edinburgh Airport at 2340 on Wednesday.
It touches down in Teneriffe at 0410 (British time) on Thursday.

How long did the flight take ?

6. British Airways flight BA447 left Gatwick Airport at 10·25 pm on Monday and arrived in New York at 5·10 pm (British time) on Tuesday morning.

(a) How long did the flight take ?

(b) New York is 5 hours **behind** Britain. What time (New York time) was it really when the plane touched down ?

7. Look at the T.V. programme listings and answer the following :-

BBC1

DAWN FRENCH: 9.00pm

6.00 **Breakfast** (T) 776062
9.00 **Kilroy** (T) 8715333
10.15 **City Hospital** (T) 5877791
11.00 **Big Strong Boys** (R) (T) 2284
11.30 **Real Rooms** (T) 3913
12.00 **Call My Bluff** (T) 55888
12.30 **Passport to the Sun** (T) 74401
1.00 **BBC News; Weather** (T) 48159
1.30 **Regional News; Weather** 63631028
1.45 **Neighbours** See 5.35pm for details (T) 51893468
2.10 **Diagnosis Murder** An arson attack ends in death (R) (T) 6923975
2.55 **Dragan Sgeul (Dragon Tales)** Fire-breathing fun for kids 5475371
CHILDREN'S
3.25 **Tweenies Songtime** (T) 3796081 **3.26 Tweenies** (T) 5956197 **3.45 Rugrats** (R) (T) 8610062 **3.55 SMart on the Road** (T) 6812062 **4.10 The Wild Thornberrys** (R) (T) 7803994 **4.35 The Next Big Thing** (T) 2831420 **5.00 Blue Peter** (T) 5099468 **5.20 Newsround Extra** (T) 7729352
5.35 **Neighbours** It's Toadie's last day at Stewart, Whitehead and Moore, and Flick is fed up with Matt's obsession with cars (R) (T) 763081

BBC2

6.00 **OU** 72468
CHILDREN'S
7.00 **Potsworth and Co** (R) (T) 1062994 **7.20 Arthur** (R) (T) 1854710 **7.45 Captain Abercromby** 2543888 **8.00 Pocket Dragon Adventures** (R) (T) 2911081 **8.15 Bill and Ben** (R) (T) 5514975 **8.25 Just So Stories** (R) (T) 5538555 **8.35 Postman Pat** (R) (T) 4000028 **8.50 Pingu** (R) 4867197 **9.00 Teletubbies** (R) (T) 9061994 **9.50 Playdays** (R) (T) 2579371 **10.10 Tweenies** 2787053
CHILDREN'S
10.50 **Hands Up!** (T) 2360555 **11.05 Numbertime** (T) 3019517 **11.20 Words and Pictures** (T) 3023710 **11.35 Watch** (T) 7553913 **11.50 Zig Zag** (T) 7530062 **12.10 Landmarks** (T) 4600791
12.30 **Working Lunch** The latest stories from the business world 76541
CHILDREN'S
1.00 **Bill and Ben** (R) (T) 39229401
1.10 **FILM: MOGAMBO** Lumbering jungle romance with Clark Gable. See Movies (T) 60018623
3.05 **Afoot Again in the Past** Gavin Stamp traces the Great Western Railway and Kirsty Wark examines Paddington Station (T) 5943623
3.20 **BBC News; Regional News; Weather** (T) 3786604
3.30 **Esther** The hostess chairs another round of topical debate (T) 25888
4.30 **Ready Steady Cook** Culinary duel in which two celebrity chefs compete to prepare a meal in only 20 minutes (T) 4473449
5.15 **The Weakest Link** Anne Robinson hosts the general knowledge quiz in which contestants answer

SCOTTISH

6.00 **GMTV** Kate Garraway and Eamonn Holmes present the final part of Child Car Seat Safety Week 2823642
9.25 **Trisha** Guests relate their stories in the studio discussion (T) 8660994
10.30 **This Morning** Popstars contestant Warren Stacey performs live and talks about what he's been up to in the last year. Plus Phil Vickery's cookery ideas for the weekend and the regular phone-in slot (T) 14623
12.00 **Family Fortunes** Two families compete for prizes, the £5000 jackpot and a new car (R) (T) 73284
12.30 **ITV News; Weather** (T) 4463791
1.10 **Scotland Today** (T) 51408178
1.40 **Oliver Twist** Fagin's attempt to set Oliver up as a criminal fails when the victim, Mr Brownlow, becomes the boy's benefactor (R) (T) 5707807
2.40 **Passport Quiz** Bryan Burnett asks the questions as three couples vie for a holiday in the sun (T) 5471555
3.10 **ITV News** (T) 3793994
3.15 **Scotland Today** (T) 9188807
CHILDREN'S
3.25 **Dog and Duck** (T) 3772401 **3.35 Kipper** (R) (T) 6836642 **3.45 Little Ghosts** (T) 8605130 **3.55 Cardcaptors** 2510438 **4.20 How 2** (R) (T) 7213826 **4.40 My Parents Are Aliens** (R) (T) 2823401
5.05 **Airline** Katrina anxiously prepares for her first check-up since the cancer operation, and football fever descends on Luton Airport prior to Manchester United's Champions League final (R) (T) 9039517
5.30 **Catchphrase** Nick Weir offers encouragement as contestants try to deduce everyday phrases and

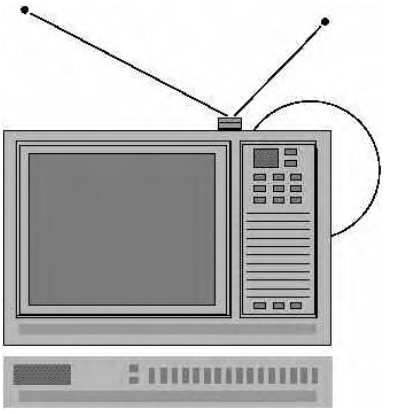
(a) Which channel is showing the film "**Mogambo**" ?

(b) How long is the lunchtime showing of "**Neighbours**" ?

(c) "**GMTV**" lasts for how long ?

(d) I watch "**Passport Quiz**" on Scottish till the end of the programme, then switch to BBC1 for "**Dragan Sgeul**".
How much have I already missed of "**Dragan Sgeul**" ?

(e) I want to record "**Real Rooms**", "**Family Fortunes**", "**Working Lunch**", "**Bill & Ben**" and "**Scotland Today**" on a 2 hour tape.
Is this possible ? Explain !!



Time, Distance, Speed

Calculating Distance

$$\text{Distance} = \text{Speed} \times \text{Time}$$

Exercise 3

1. How far, in kilometres, can you travel :-
   (a) walking at 4 km/hr for 2 hours ?
   (b) jogging at 5 km/hr for 4 hours ?
   (c) cycling at 9 km/hr for 3 hours ?
   (d) driving at 32 km/hr for 5 hours ?

2. Calculate the distance travelled by :-

   (a) a car, travelling at 48 m.p.h. for 2 hours.
   (b) a train, travelling at 80 m.p.h. for 6 hours.
   (c) a plane, flying at 360 m.p.h. for 4 hours.
   (d) a yacht, sailing at 14 m.p.h. for 3 hours.

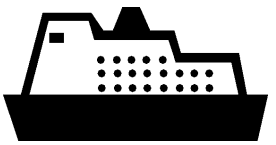
3. What distances are covered by the following :-
   (a) a van, travelling for 30 minutes at an average speed of 50 m.p.h. ?
   (b) a $1\frac{1}{2}$ hour jog, at an average speed of 8 m.p.h. ?
   (c) a car journey lasting $2\frac{1}{2}$ hours at an average speed of 40 m.p.h. ?
   (d) a speed boat ride for 3 hours 30 minutes, at an average speed of 40 km/hr ?
   (e) a plane journey of 5 hours 30 minutes, at an average speed of 300 m.p.h. ?

4. What distances are covered by the following :-
   (a) a canoe, going at an average speed of 8 m.p.h., for $\frac{1}{4}$ of an hour ?
   (b) a lion, going at an average speed of 24 m.p.h., for quarter of an hour ?
   (c) a boat trip, sailing at an average speed of 12 m.p.h. for 1 hour 15 minutes ?
   (d) a lorry, travelling at an average speed of 40 km/hr for 45 minutes ($\frac{3}{4}$ hour) ?
   (e) an athlete, running at an average speed of 12 km/hr for 1 hour 45 minutes ?

5. (a) A plane left Berlin at 8·45 am and arrived at Prestwick at 11·45 am. The plane flew at an average speed of 320 m.p.h.

How long did the flight take and how many miles did it cover ?

(b) A ferry left the pier at 2·50 pm and sailed at a steady speed of 16 m.p.h.



How far is the ferry from the pier at 4·50 pm ?

(c) A jogger leaves Tamley Cross at 0830 and heads for Stratham. She jogs at an average speed of 10 km/hr and arrives at St George's Park in Stratham at 1000.

How far had she travelled ?

Calculating Speed

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Exercise 4

1. Use the formula to find the average speed of these journeys :-

   (a) 15 miles in 3 hours. (b) 28 km in 7 hours.

   (c) 140 miles in 10 hours. (d) 350 km in 2 hours.

2. Calculate the average speed of these journeys (watch the units) :-

   (a) 30 km in 2 hours. (b) 400 miles in 8 hours.

   (c) 200 metres in 10 seconds. (d) 30 km in 4 hours.

   (e) 42 000 miles in 7 hours. (f) 210 000 km in 3 hours.

3. Calculate the average speed of these journeys (in miles per hour) :-

   (a) A ship sails 420 miles in only 7 hours !

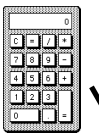
   (b) A plane flies 6000 miles in 8 hours.

   (c) A train travels 273 miles in 3 hours.

   (d) A marathon runner covers 18 miles in 2 hours.

   (e) A bus travels 549 miles in 9 hours.

4. Find these average speeds :-



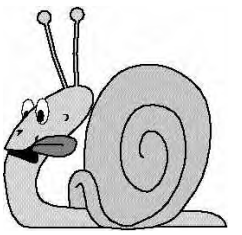
(a) a lorry travelling 78 miles in 2 hours.

(b) a car travelling 15 miles in 30 minutes. (how far does it travel in 1 hour ?)

(c) a boat sailing 9 miles in $\frac{1}{2}$ hour

(d) an athlete running 12 miles in 1 hour 30 minutes. ($1\frac{1}{2}$ hours)

(e) a snail crawling $\frac{1}{2}$ metre in $\frac{1}{2}$ hour !



5. Find the average speed of :-

(a) a runner who averages 2 km in 15 minutes.

(b) a bus which travels 12 miles in $\frac{1}{4}$ hour.

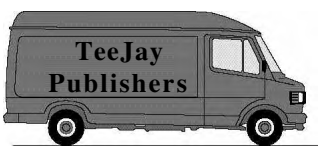
(c) a ferry which sails 18 km in 30 minutes.

(d) a motor cyclist covers 60 km in 1 hour 30 minutes. ($1\frac{1}{2}$ hrs)

(e) a plane flying 1000 miles in 2 hours 30 minutes. ($2\frac{1}{2}$ hrs)

6. A delivery van leaves Brechin at 0845. By 1245 it has covered a distance of 240 kilometres.

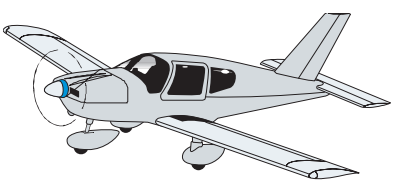
Calculate the average speed of the van.



7. A plane left Birmingham Airport at 3·45 pm and flew 300 miles to Glasgow, arriving at 5·15 pm.

(a) How long did the journey take ?

(b) What was the plane's average speed ?

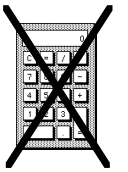


8. Two friends hire a rowing boat and go rowing on the loch. They row to an island, taking two hours to get there, but the return journey takes three hours.

If the island is 6·25 miles from the hiring jetty, calculate the average speed for their round trip.
(hint :- speed = total distance ÷ total time)

Calculating Time

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$



Exercise 5

1. Change these times into hours and minutes :-

   (a) $1\frac{1}{2}$ hours (b) $3\frac{1}{2}$ hours (c) $5\frac{1}{4}$ hours (d) $4\frac{3}{4}$ hours

   (e) $6\frac{1}{2}$ hours (f) $8\frac{1}{4}$ hours (g) 3·5 hours (h) 2·5 hours

   (i) 4·25 hours (j) 1·25 hours (k) 2·75 hours (l) 0·75 hours

2. <u>2 hours 30 minutes is 2·5 hours</u>, <u>1 hour 15 minutes is 1·25 hours</u>

   What are these times in hours :-

   (a) 3 hours 30 minutes ? (b) 2 hours 15 minutes ?

   (c) 5 hours 45 minutes ? (d) 1 hour 15 minutes ?

   (e) 6 hours 30 minutes ? (f) 4 hours 30 minutes ?

   (g) 1 hour 45 minutes ? (h) 7 hours 45 minutes ?

3. Use the formula $T = \frac{D}{S}$ to calculate the time taken for each of these journeys :-

   (a) walking, 3 km at 3 km/hr. (b) flying, 3000 miles at 500 m.p.h.

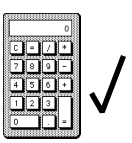
   (c) running, 200 m at 10 m/sec. (d) driving, 240 km at 30 km/hr.

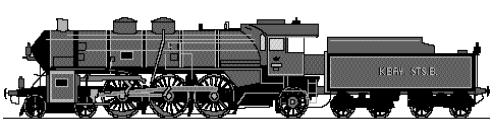
   (e) crawling, 10 cm at 2 cm/hr. (f) jogging, 16 miles at 8 m.p.h.

   (g) running at 9 km/hr for 18 km. (h) driving at 40 m.p.h. for 60 miles.

4. When will these trains arrive at their destinations :-

   (a) ***<u>Steam Engine</u>*** - departs 11 am – travels 180 miles at 90 m.p.h. ?





   (b) ***<u>Electric Train</u>*** - departs 3·30 pm – travels 105 km at 70 km/hr. ?

   (c) ***<u>Diesel Train</u>*** - departs 6·15 am – travels 200 miles at 80 m.p.h. ?

5. How long, **in hours and minutes**, did the following journeys take :-

   (a) a lorry, travelling 45 km at an average speed of 30 km/hr ?

   (b) a coach, travelling 150 miles at an average speed of 60 m.p.h. ?

   (c) a snail, covering 50 centimetres at an average speed of $\frac{1}{2}$ cm/sec ?
   (answers in minutes and seconds)

   (d) a bicycle, travelling 40 km at an average speed of 16 km/hr ?

6. Use this mileage chart to find the distance between the towns and find how long each of the journeys would take :-

   (a) Duns —> Tomley at 40 m.p.h.

   (b) Tomley —> Portown at 50 m.p.h.

   (c) Duns —> Portown at 60 m.p.h.

	Duns	
80		***Tomley***
90	**50**	***Portown***

7. 

   A train leaves Carlisle at 6·45 am. It travels the 105 miles to Glasgow at an average speed of 70 m.p.h.

   (a) How long did the journey take ?

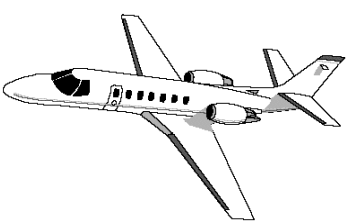
   (b) At what time did the train arrive in Glasgow ?

8. An aeroplane leaves Heathrow Airport at 3·30 pm.
   Its destination is a tropical island 2340 miles away.

   If it travelled at a steady 520 m.p.h. :-

   (a) How long was the journey ?

   (b) At what time did the plane reach its destination ?



9. The speed of sound is about 340 metres per second.
   Sally shouts to Harry who is standing 1700 metres away.

   How many seconds does it take before Harry hears Sally's voice ?

Sally

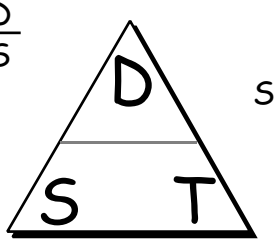
Time ? Distance ? or Speed ?

Use the correct formulae to answer the questions in this exercise.

$T = \frac{D}{S}$

$S = \frac{D}{T}$

$D = S \times T$



Exercise 6

1. (a)

Distance	– 80 miles
Speed	– 20 m.p.h.
Time	?

(b)

Distance	– 200 km
Time	– 8 hours
Speed	?

(c)

Speed	– 40 m.p.h.
Time	– 4 hours
Distance	?

(d)

Distance	– 120 km
Time	– 3 hours
Speed	?

(e)

Distance	– 250 miles
Speed	– 100 m.p.h.
Time	?

(f)

Speed	– 4 m/sec
Time	– $2\frac{1}{2}$ seconds
Distance	?

2. A policeman followed a seventeen year old student who drove 55 km in half an hour.

   What was the student's average speed ?

3. 

   A hot air balloon travelled 75 miles at an average speed of 30 miles per hour.

   How long did it take to complete its journey ?

4. A small boat, sailing at a steady rate of 18 km/hr, takes $3\frac{1}{2}$ hours to travel from Portree to the mainland.

   What is the length of its journey ?

5. A pilot took off from an airfield at 0745 and flew north-east to a meeting point, arriving there at 0945.

   If the aircraft travelled 320 miles, what was its average speed ?

6. 

   A canoeist travels at an average speed of 8 km/hr.

   How long does it take him to canoe a distance of 10 km ?
   (answer in hours and minutes)

7. A communications satellite orbits a planet at an average speed of 15 500 m.p.h.
   It takes $2\frac{1}{2}$ hours to complete its orbit.

   Calculate the length of the orbit.

8. 

   Hazel can walk to school in 30 minutes.
   The distance from her house to the school is 2 miles.

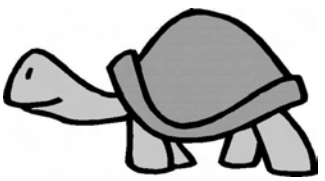
   (a) Calculate Hazel's average speed.

   She can cycle twice as fast as she can walk.

   (b) How long will it take her to cycle to school ?

9. A bird takes $12\frac{1}{2}$ days to migrate from the U.K. to U.S.A.

   If it maintains an average speed of 240 miles per day, what distance did it fly to reach America ?

10. 

    At full speed, a tortoise can travel at 50 centimetres per minute.

    How long does it take the tortoise to cross a garden path measuring 3 metres wide ?

11. The police radar trap is set up in a "**30 miles per hour**" stretch of road.

    Which of the following drivers might be caught for speeding ?

    (a) John, covering 8 miles in 15 minutes .

    (b) Alison, covering 6 miles in 10 minutes .

    (c) Bert, covering 10·5 miles in 20 minutes .

Exercise 7

1. This graph indicates a lorry driver's journey from Ailsa to Barrow, 80 miles away.

   He set off from Ailsa at 1300 along the motorway and stopped for some lunch before completing the rest of his journey along a dual carriageway.

   (a) For how long was he driving on the motorway ?

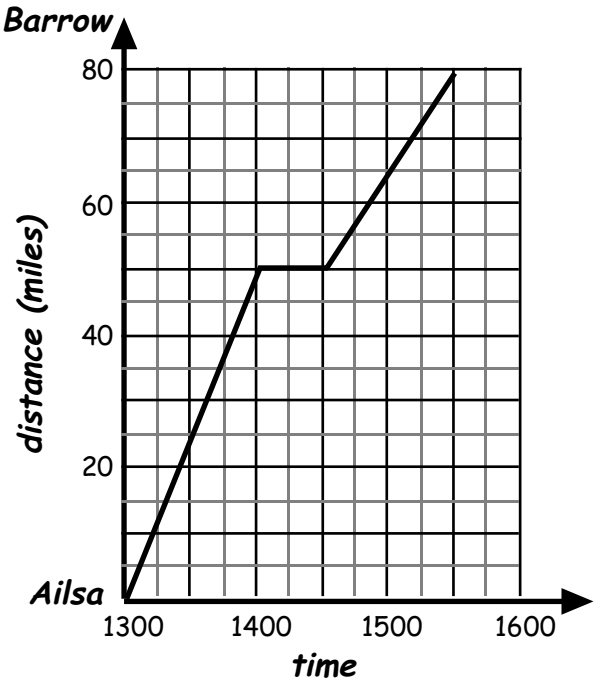
   (b) For how long did he stop for lunch ?

   (c) At what time did he set off after lunch ?

   (d) When did he arrive in Barrow ?

   (e) Calculate the speed of the lorry :-

   (i) on the motorway.
   (ii) between 1400 and 1430.
   (iii) on the dual carriageway.

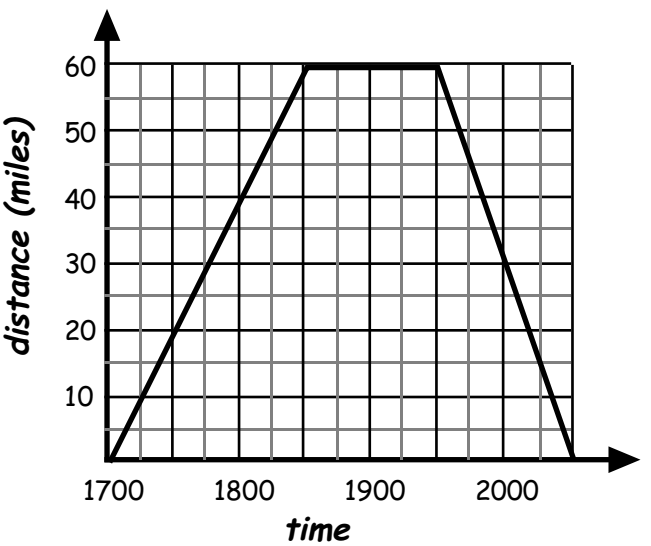


2. Jill drove from her house to her aunt's and stayed there until it began to get dark. She then drove home via a different route.

   (a) For how long did she stay at her aunt's ?

   (b) Calculate her speed for both the outward and the return journey.

   (c) Which of the two trips do you think might have been done on the motorway ?



3. Jan set off on her scooter at 11 am to travel to Hyde, 30 kilometres away.

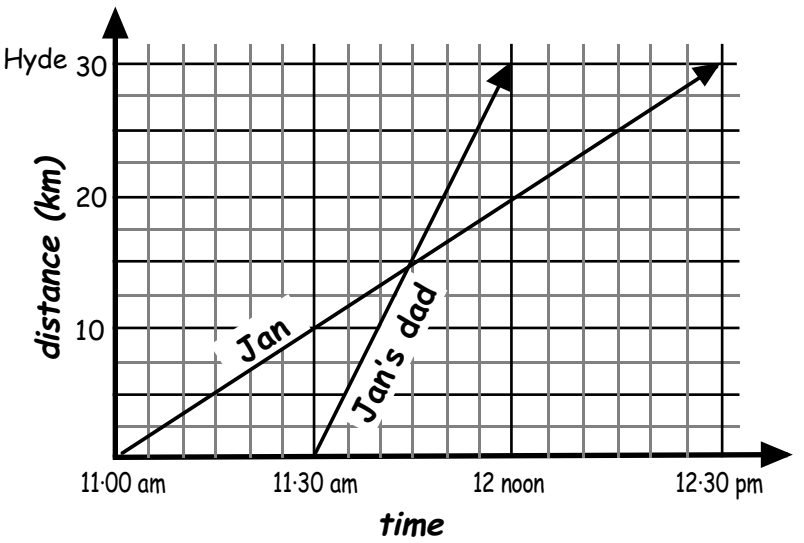
   Her father left their house at 11·30 am and drove to Hyde.

   (a) Calculate Jan's speed.

   (b) Calculate her dad's speed.

   (c) At what time did Jan's dad overtake her ?

   (d) How far away from her home was she when her father passed her ?



4. "Bob's Stores" have two depots, one at Hayle and the other, 160 kilometres away at Dyce.

   Tom sets off from Hayle at 8·00 with a load of timber for Dyce.

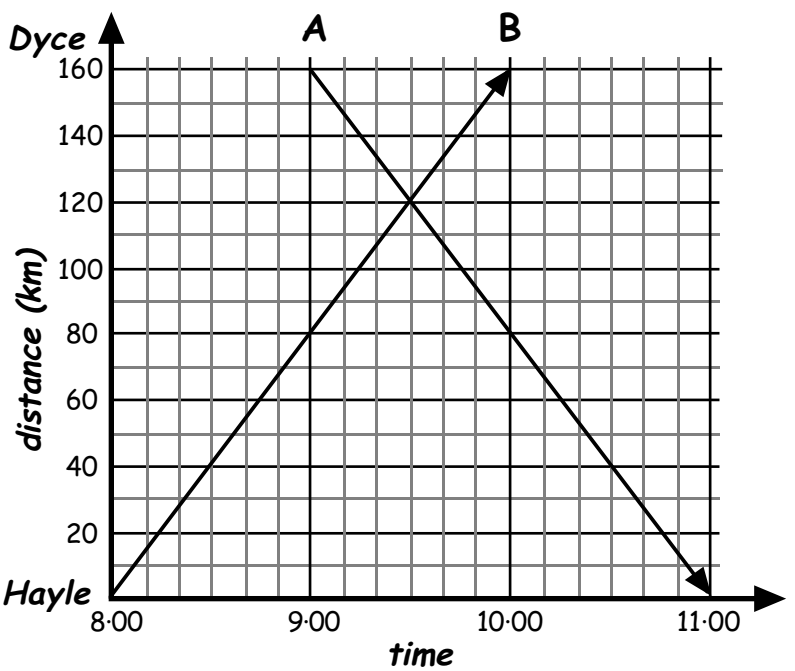
   Dan sets off at 9·00 from Dyce heading for Hayle.

   (a) Which line, A or B, represents Tom's Journey ?

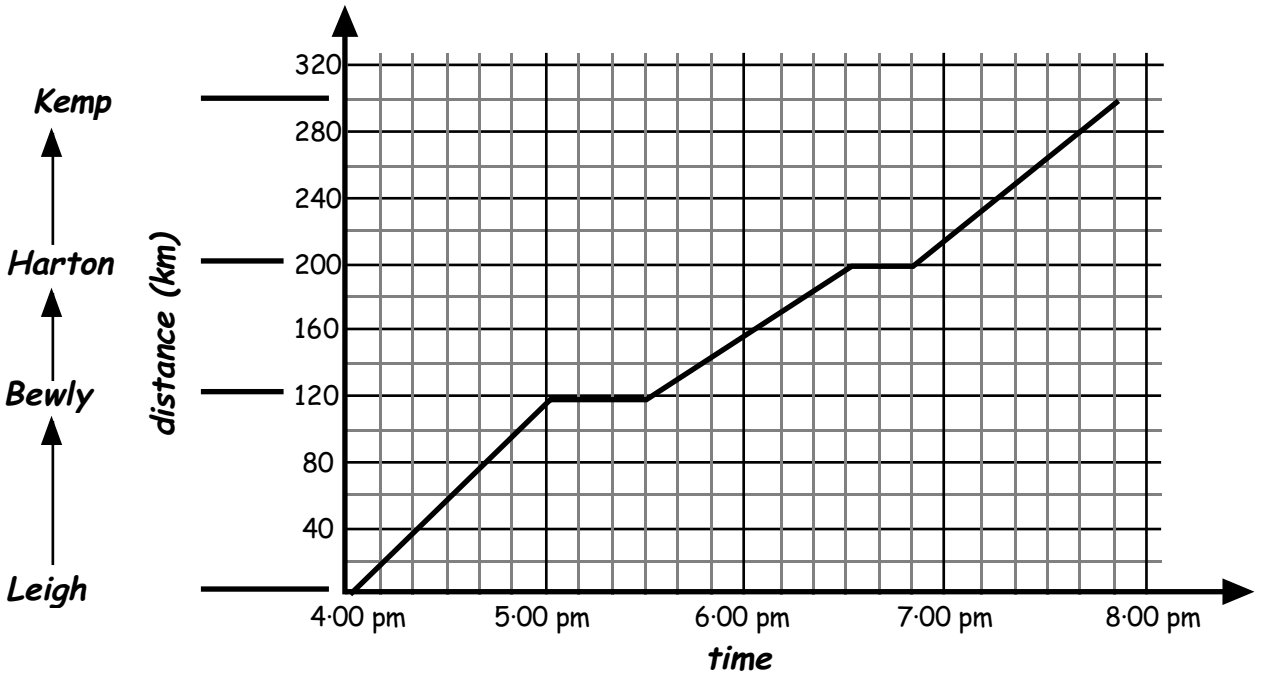
   (b) Calculate :-

      (i) Tom's speed.
      (ii) Dan's speed.

   (c) At what time could the two drivers wave to each other ?



5. The graph shows a train journey from Leigh to Kemp.



(a) Copy and complete this timetable.

Leigh	Bewly		Harton		Kemp
depart	*arrive*	*leave*	*arrive*	*leave*	*arrive*
4·00 pm —>	?	?	?	?	?

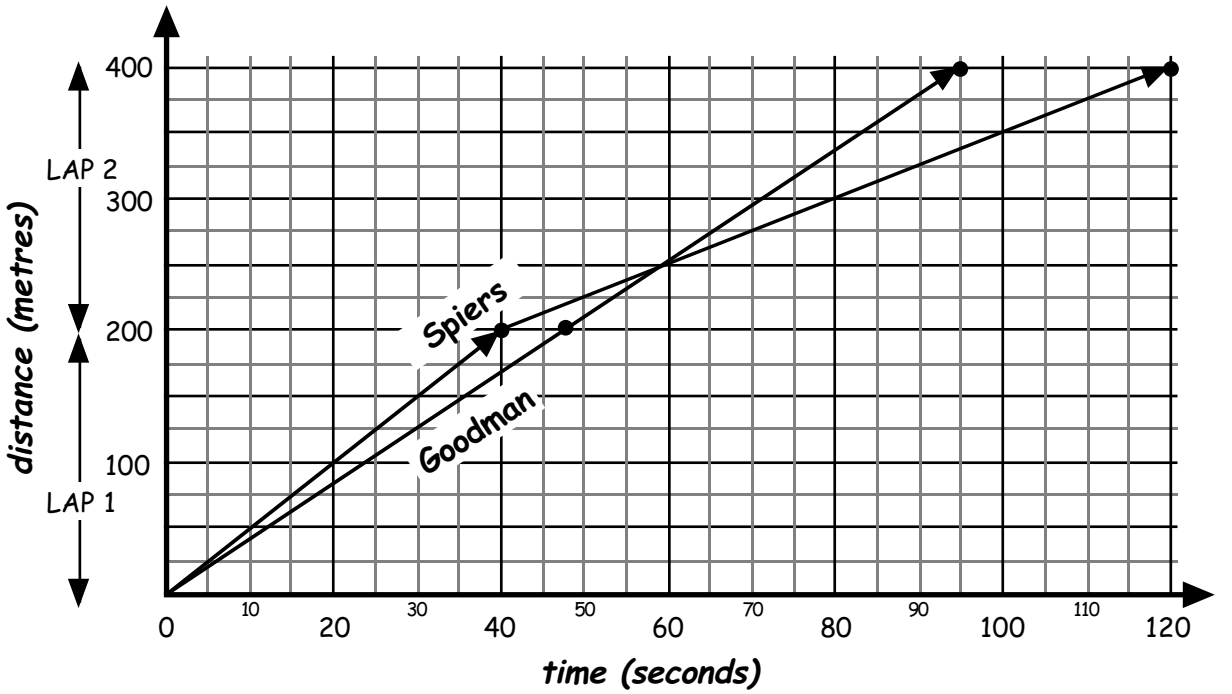
(b) How far is it from :- (i) Leigh to Bewly ? (ii) Harton to Kemp ?

(c) Calculate the average speed of the train :-

(i) from Leigh to Bewly (ii) from Bewly to Harton

(iii) from Harton to Kemp (iv) from Leigh to Harton

6. The graph shows how two amateur 400 metre athletes, Spiers and Goodman, paced themselves over the two 200 metre laps.



(a) Who was the faster athlete over the first 200 metres ?

(b) How long did each runner take to cover the first lap ?

(c) Who won the 400 metre race ?

(d) How long did each runner take to complete the 2nd lap ?

(e) For how many seconds (approximately) was Spiers in the lead ?

(f) By how many seconds did the winner beat the runner up ?

(g) Calculate Spiers' speed for the first lap in metres per second.

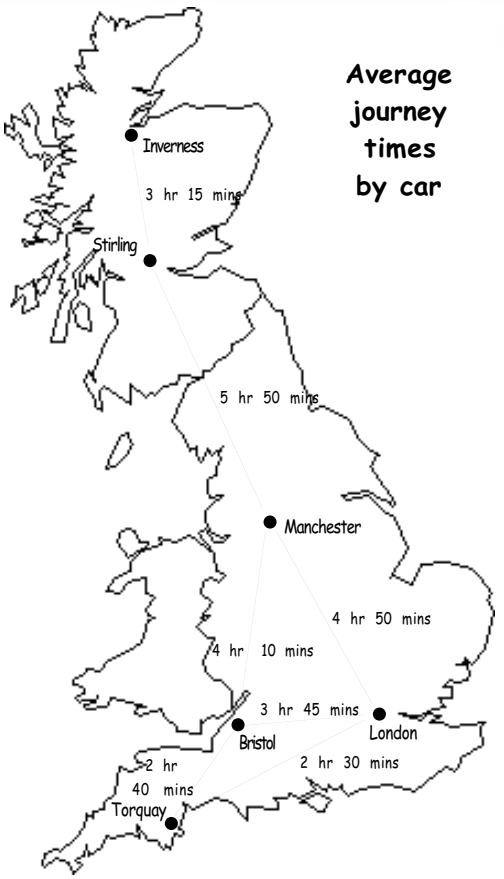
(h) Calculate his speed for the second lap in metres per second.

(i) Calculate Goodman's speed in metres per second, to one decimal place.

(j) Who ran the fastest 200 metre lap ?

What have I learned ?

1.

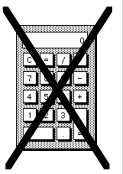


Average journey times by car

(a) How long does it take from :-

(i) Inverness to Manchester ? (via Stirling)

(ii) Stirling to London ? (via Manchester)



(iii) London to Bristol via Torquay ?

(b) Bob leaves Bristol at 9 am. He travels to Stirling, going through Manchester.

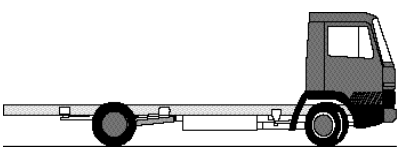
At what time does he arrive in Stirling ?

(c) Ann has a meeting in London at 1630. She leaves her home in Inverness at 0230.

Can she make her meeting in London on time ? Explain !

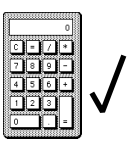
2. A truck leaves Arbroath and travels for 5 hours at an average speed of 46 m.p.h.

How far will the truck have travelled ?



3. Dai travels the 40 miles from Cardiff to Swansea on the M5 motorway. He covers the journey in just $\frac{1}{2}$ an hour.

Did Dai break the 70 m.p.h. speed limit ? Explain.

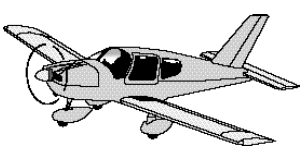


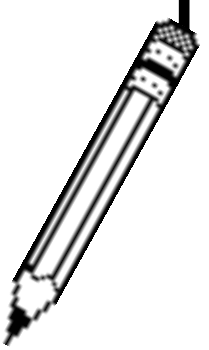
4. A van travelled 210 km in 6 hours.

What was its average speed, in km/hr ?

5. Harold flew for 1120 miles at an average speed of 320 m.p.h.

How long did his flight take ? (in hours and minutes)





cont'd....

What have I learned ?

6. Kim drove for 90 km at an average speed of 60 km/hr.

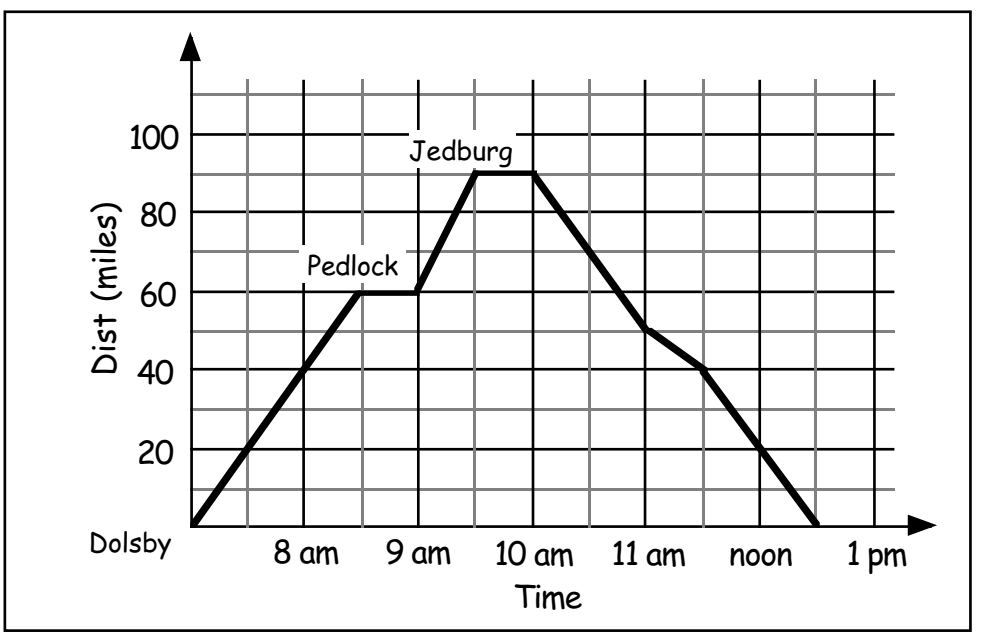
If she left home at 0845, at what time did she reach her destination ?

7. A message in a bottle floats harmlessly on the surface of the ocean at a steady speed of 0·4 kilometres per hour.

It floated for 130 hours before being picked up by a boy on the beach.

How far would it have travelled in that time ?

8. The graph shows a car journey from Dolsby to Jedburg via Pedlock, and back.



(a) At what time did the journey begin ?

(b) How far is it from (i) Dolsby to Pedlock (ii) Pedlock to Jedburg ?

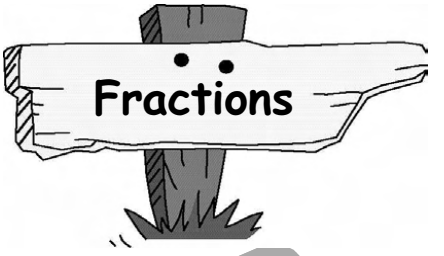
(c) How long did it take from Pedlock to Jedburg ?

(d) How far did the car travel in the last half hour of the trip ?

(e) Calculate the average speed from Dolsby to Pedlock.

(f) Calculate the average speed from Jedburg back to Dolsby.

Chapter 11



What is a Fraction ?

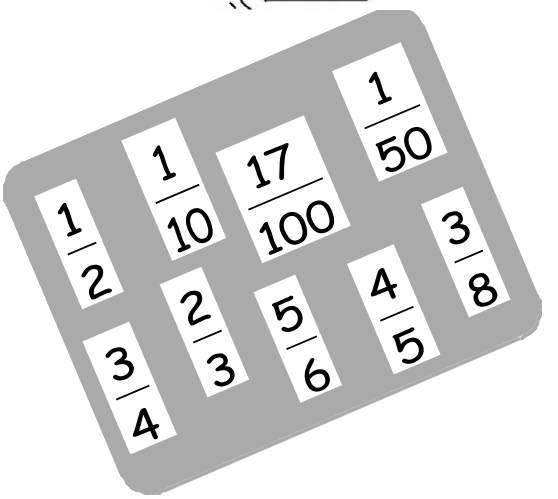
A fraction consists of 2 parts :-

$\frac{3}{4}$ ← this is the **NUMERATOR**

← this is the **DENOMINATOR**

The "**denominator**" is the name (or type) of fraction you are dealing with (quarters here)

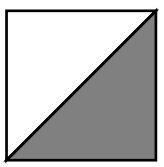
The "**numerator**" tells you the number or "how many" of the quarters (in this case 3)

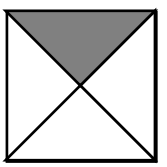


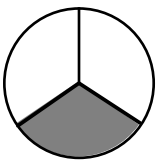
Simplifying Fractions

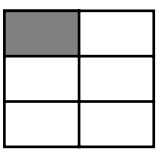
Exercise 1

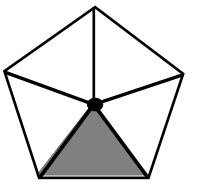
1. For each of the following, say what fraction has been shaded :-

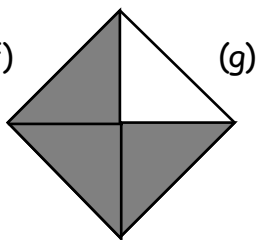
(a) 

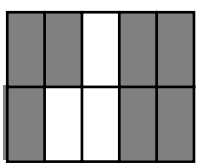
(b) 

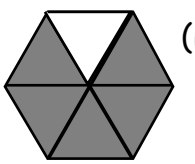
(c) 

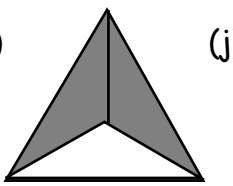
(d) 

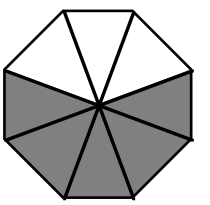
(e) 

(f) 

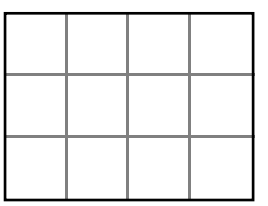
(g) 

(h) 

(i) 

(j) 

2. (a) Use a ruler to draw this rectangle measuring 4 boxes by 3 boxes. Shade in any $\frac{1}{2}$ of it.



(b) Draw the same box again. This time shade or colour in $\frac{1}{4}$ of the shape.

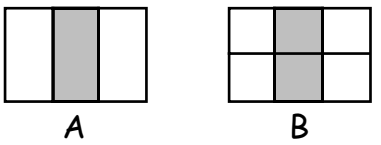
(c) Draw the same box again. This time shade or colour in $\frac{1}{3}$ of the shape.

(d) Draw the same box again. This time shade or colour in $\frac{3}{4}$ of the shape.

(e) Draw the same box again. This time shade or colour in $\frac{5}{6}$ of the shape.

(f) Draw the same box again. This time shade or colour in $\frac{7}{12}$ of the shape.

3. Two fractions might have different **numerators** and **denominators** but they might still represent the same number :-



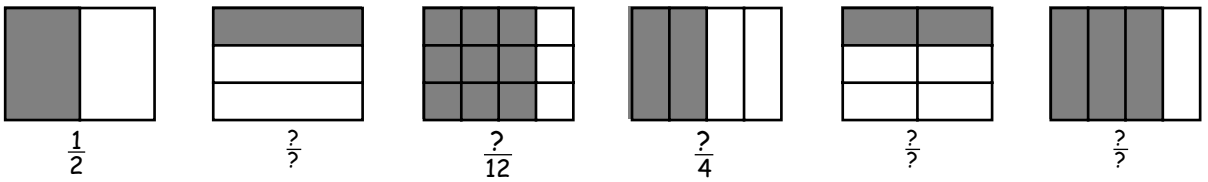
Look at the two diagrams representing fractions.

(a) What fraction is shaded in figure A ?

Can you see that the fraction shaded in B is $\frac{2}{6}$?

(b) What do the two diagrams tell you about the fractions $\frac{2}{6}$ and $\frac{1}{3}$?

4. Make neat sketches of the following and write down underneath each one the fraction represented by the shading :-



(a) From the six pictures you can see another fraction equal to $\frac{1}{2}$. ($\frac{1}{2} = \frac{?}{?}$) ?

(b) The second and fifth diagrams show that $\frac{1}{3}$ is the same as $\frac{?}{?}$?

(c) The third and the last diagram shows that $\frac{?}{12}$ is the same as $\frac{?}{?}$?

5. It is possible to find a fraction **equivalent** to $\frac{2}{3}$ by simply "multiplying the numerator and the denominator by any number" :-

=> $\frac{2}{3}$ becomes $\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$ numerator x 4 / denominator x 4

(a) Multiply the top and the bottom of $\frac{2}{3}$ by 5 to create a new fraction. What is it ?

(b) Multiply the top and the bottom of $\frac{2}{3}$ by 6 to create a new fraction. What is it ?

(c) Find at least 5 more fractions equivalent to $\frac{2}{3}$.

6. By choosing any (simple) number as a multiplier, find another fraction equivalent to :-

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$ (c) $\frac{2}{5}$ (d) $\frac{5}{6}$ (e) $\frac{1}{3}$ (f) $\frac{3}{10}$

7. It is possible to **SIMPLIFY** fractions (like $\frac{6}{8}$) by "dividing" top and bottom by a number.

=> $\frac{6}{8}$ becomes $\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$ (this is the fraction in its simplest form)

(a) By dividing the top line and bottom line of each fraction by 2, simplify each one :-

(i) $\frac{10}{12}$ (ii) $\frac{8}{10}$ (iii) $\frac{20}{22}$ (iv) $\frac{14}{24}$ (v) $\frac{16}{30}$ (vi) $\frac{18}{26}$

7. (b) By dividing the top line and bottom line of each fraction by 3, simplify each one :-

(i) $\frac{9}{12}$ (ii) $\frac{12}{15}$ (iii) $\frac{3}{18}$ (iv) $\frac{21}{24}$ (v) $\frac{30}{33}$ (vi) $\frac{15}{27}$

(c) By dividing the top line and bottom line of each fraction by 5, simplify each one :-

(i) $\frac{5}{10}$ (ii) $\frac{20}{25}$ (iii) $\frac{45}{100}$ (iv) $\frac{15}{50}$ (v) $\frac{25}{55}$ (vi) $\frac{200}{205}$

8. This is where it really pays to know your tables well !!

For each of the following fractions, find a number that will divide into both the numerator and the denominator to simplify the fraction :-

(a) $\frac{8 \div 4}{12 \div 4}$ (b) $\frac{5}{15}$ (c) $\frac{7}{14}$ (d) $\frac{16}{24}$ (e) $\frac{18}{24}$

(f) $\frac{28 \div 7}{35 \div 7}$ (g) $\frac{9}{12}$ (h) $\frac{8}{32}$ (i) $\frac{24}{36}$ (j) $\frac{30}{100}$

(k) $\frac{4}{12}$ (l) $\frac{24}{32}$ (m) $\frac{50}{75}$ (n) $\frac{10}{25}$ (o) $\frac{75}{100}$

(p) $\frac{4}{16}$ (q) $\frac{21}{56}$ (r) $\frac{18}{36}$ (s) $\frac{22}{33}$ (t) $\frac{40}{50}$

Fractions of a quantity

To find $\frac{1}{2}$ of 10, you simply divide 10 by 2 => $\frac{1}{2}$ of 10 = (10 ÷ 2) = 5

To find $\frac{1}{3}$ of 18, you simply divide 18 by 3 => $\frac{1}{3}$ of 18 = (18 ÷ 3) = 6

To find $\frac{1}{10}$ of 70, you simply divide 70 by 10 => $\frac{1}{10}$ of 70 = (70 ÷ 10) = 7

Exercise 2

1. Find the following :- (no calculator)

(a) $\frac{1}{2}$ of 18 (b) $\frac{1}{4}$ of 20 (c) $\frac{1}{3}$ of 21

(d) $\frac{1}{5}$ of 100 (e) $\frac{1}{10}$ of 70 (f) $\frac{1}{6}$ of 12

(g) $\frac{1}{8}$ of 32 (h) $\frac{1}{100}$ of 500 (i) $\frac{1}{20}$ of 40

(j) $\frac{1}{7}$ of 28 (k) $\frac{1}{5}$ of 65 (l) $\frac{1}{50}$ of 200

2. You may use a calculator for this question :-

(a) $\frac{1}{4}$ of 248 (b) $\frac{1}{5}$ of 365 (c) $\frac{1}{3}$ of 315

(d) $\frac{1}{8}$ of 2048 (e) $\frac{1}{7}$ of 2352 (f) $\frac{1}{11}$ of 3003

(g) $\frac{1}{15}$ of 4500 (h) $\frac{1}{12}$ of 1452 (i) $\frac{1}{30}$ of 960

(Harder) To find $\frac{2}{3}$ of a number (like 18), you do it <u>in 2 steps</u>.

Step 1 :- Find $\frac{1}{3}$ of 18 (÷ 3) first => $\frac{1}{3}$ of 18 = 18 ÷ 3 = 6

Step 2 :- Now find $\frac{2}{3}$ of 18 by (x 2) => $\frac{2}{3}$ of 18 = 6 x 2 = 12

Here's how you should set the working down :-

$\frac{2}{3}$ of 18 => (18 ÷ 3) = 6 x 2 = 12

$\frac{3}{4}$ of 20 => (20 ÷ 4) = 5 x 3 = 15

$\frac{5}{6}$ of 12 => (12 ÷ 6) = 2 x 5 = 10

<u>Rule</u> :-

To multiply by a fraction like $\frac{3}{5}$
=> "divide by the denominator" (5)
=> then "multiply by the numerator" (3)

3. Do the following **without a calculator** :-

(a) $\frac{2}{3}$ of 30 = (30 ÷ 3) = 10 x 2 = ?

(b) $\frac{3}{4}$ of 24 = (24 ÷ ?) = ? x 3 = ?

(c) $\frac{2}{5}$ of 15 (d) $\frac{4}{5}$ of 30 (e) $\frac{5}{6}$ of 18

(f) $\frac{3}{8}$ of 32 (g) $\frac{3}{10}$ of 80 (h) $\frac{2}{9}$ of 18

(i) $\frac{3}{7}$ of 28 (j) $\frac{7}{8}$ of 40 (k) $\frac{7}{10}$ of 50

(l) $\frac{3}{100}$ of 200 (m) $\frac{9}{10}$ of 70 (n) $\frac{3}{4}$ of 240

4. Do the following :- **(you may use a calculator)**

(a) $\frac{3}{5}$ of 160 = (160 ÷ 5) = 32 x 3 = ??

(b) $\frac{7}{8}$ of 240 = (240 ÷ ?) = ? x 7 = ??

(c) $\frac{2}{3}$ of 120 (d) $\frac{3}{4}$ of 560 (e) $\frac{7}{10}$ of 1700

(f) $\frac{3}{5}$ of 85 (g) $\frac{5}{9}$ of 270 (h) $\frac{3}{7}$ of 364

(i) $\frac{7}{8}$ of 640 (j) $\frac{5}{6}$ of 192 (k) $\frac{4}{5}$ of 720

5. (a) A school has 850 pupils. $\frac{3}{5}$ of them are girls.
(i) How many girls are there ? (ii) How many boys ?

(b) I earn £256 per week. I spend $\frac{3}{8}$ of it on food.
(i) How much do I spend on food ? (ii) How much am I left with ?

(c) Of the 96 mental questions a girl did in class, she got $\frac{7}{8}$ of them correct.
(i) How many correct answers did she get ? (ii) How many were wrong ?

Back to Percentages

In the chapter on percentages, you discovered how to find 17% of £80 using a calculator.

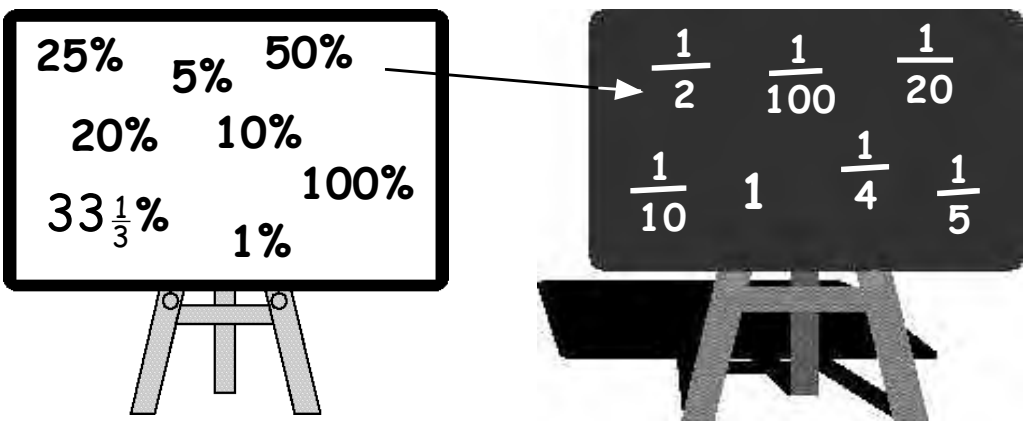
$$17\% \text{ of } £80 = \frac{17}{100} \times £80 = (17 \div 100) \times £80 = 13{\cdot}6 = £13{\cdot}60$$

There are some very basic percentages which can be thought of as simple fractions.

for example, $50\% = \frac{50}{100} \overset{\div 10}{\underset{\div 10}{}} = \frac{5}{10} \overset{\div 5}{\underset{\div 5}{}} = \frac{1}{2}$ => $\boxed{50\% = \frac{1}{2}}$

Exercise 3

1. Discuss with your teacher which of these percentages match up with which fractions.



2. Copy and complete this table using your answers obtained from question 1.

percentage	100%	50%	$33\frac{1}{3}\%$	25%	20%	10%	5%	1%
fraction	?	$\frac{1}{2}$	?	?	?	?	?	?

You **MUST** learn and know how to use these to answer basic percentage questions.

You can now do simple percentage work using the equivalent fraction instead :-

example 50% of £40 means $\frac{1}{2}$ of £40 (= 40 ÷ 2) = £20

3. Do the following **MENTALLY** :-

   (a) 50% of £80 (b) 50% of 24 (c) 50% of 1800

4. (Remember 25% means $\frac{1}{4}$). Find without a calculator :-

   (a) 25% of £20 (= $\frac{1}{4}$ of 20 = 20 ÷ 4 = £?)

   (b) 25% of £400 (c) 25% of £16 (d) 25% of 240

5. Find the following without a calculator :- (remember 20% means $\frac{1}{5}$)

   (a) 20% of £15 (b) 20% of £60 (c) 20% of £2500

6. Find the following without a calculator :- (use fractions instead)

   (a) 50% of £160 (b) 25% of £32 (c) 20% of £55

   (d) 10% of £80 (e) 100% of £37 (f) $33\frac{1}{3}$% of £60

   (g) 25% of £12 (h) 1% of £400 (i) 20% of £450

   (j) 50% of £1200 (k) $33\frac{1}{3}$% of £120 (l) 5% of £40

7. 50% of the pupils in a school of 840 are boys. How many boys are in the school ?

8. I earn £360 per week as a van driver. I spend 25% of it on paying my mortgage.

   (a) How much of the £360 is spent on my mortgage ?

   (b) How much of the £360 does that leave me with ?

9. Maisy saw a pair of curtains priced £45 last week at "Harry's Textiles".

   This week there was $33\frac{1}{3}$% off the price in a sale.

   (a) Calculate how much Maisy saved in the sale.

   (b) How much did she actually pay for the curtains ?

A few more Percentages

By now, you should have **memorised** the percentage <=> fraction equivalences.

Can you also see that :- $75\% = 3 \times 25\% = 3 \times \frac{1}{4} = \frac{3}{4}$

and $40\% = 2 \times 20\% = 2 \times \frac{1}{5} = \frac{2}{5}$

Exercise 4

1. Copy the following and complete :-

   (a) $75\% = 3 \times 25\% = 3 \times \frac{1}{4} = \frac{3}{4}$ (b) $40\% = 2 \times 20\% = 2 \times \frac{1}{5} = \frac{2}{5}$

   (c) $60\% = 3 \times 20\% = 3 \times \frac{1}{5} = ?$ (d) $80\% = 4 \times ?\ \% = 4 \times \frac{1}{5} = ?$

   (e) $66\frac{2}{3}\% = ? \times 33\frac{1}{3}\% = ? \times \frac{1}{3} = ?$ (f) $30\% = 3 \times 10\% = ? \times \frac{1}{10} = ?$

   (g) $70\% = ? \times 10\% = ? \times ? = ?$ (h) $90\% = ? \times ?\ \% = ? \times ? = ?$

2. You now have an **extended** list to learn :-

percentage	50%	25%	75%	$33\frac{1}{3}\%$	$66\frac{2}{3}\%$	20%	40%	60%	80%	10%	30%	70%	90%
fraction	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{1}{10}$	$\frac{3}{10}$	$\frac{7}{10}$	$\frac{9}{10}$

Copy this list into your jotter and **MEMORISE** the above connections.
You will need them to do mental percentage work.

3. Copy and complete the following :- (no calculator)

(a) 40% of £30 = $\frac{2}{5}$ of £30 = (30 ÷ 5) = 6 x 2 = £12

(b) 80% of £40 = $\frac{4}{5}$ of £40 = (? ÷ 5) = ? x 4 = £?

(c) 75% of £16 = $\frac{3}{4}$ of £? = (? ÷ ?) = ? x 3 = £?

(d) $66\frac{2}{3}\%$ of £21 = ? of £21 = (? ÷ ?) = ? x ? = £?

4. Do the following **MENTALLY** by using the fractions instead of the percentages :-

(a) (i) 25% of £80 (ii) 75% of £80

(b) (i) 20% of £15 (ii) 60% of £15

(c) (i) 20% of £40 (ii) 80% of £40

(d) (i) $33\frac{1}{3}\%$ of £18 (ii) $66\frac{2}{3}\%$ of £18

(e) (i) 10% of £90 (ii) 70% of £90

(f) (i) 10% of £120 (ii) 30% of £120

(g) (i) 20% of £150 (ii) 40% of £150

(h) (i) 10% of £300 (ii) 90% of £300

(i) (i) 10% of £140 (ii) 5% of £140 (half of 10%)

(j) (i) 1% of £600 (ii) 7% of £600

5. No calculator here. Use the above "two step" approach to find the following :-

(a) 75% of £12 (think of 25% = $\frac{1}{4}$ of £12 first, then ?.)

(b) 40% of £35 (c) 60% of £15 (d) $66\frac{2}{3}$ of £36

(e) 30% of £70 (f) 70% of £50 (g) 60% of £45

(h) 6% of £200 (i) 75% of £80 (j) 80% of £150

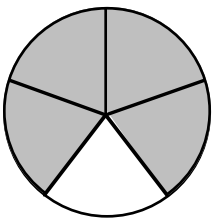
6. Lucy saw a coat priced £120 in a sale. The notice said "75% OFF"

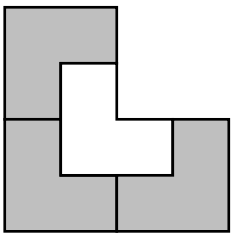
(a) Calculate 75% of £120. (b) How much did Lucy end up paying for the coat ?

What have I learned ?

NO calculator allowed !

1. What fraction of these two shapes is shaded ?

(a) 

(b) 

2. (a) Find one other fraction equivalent to the fraction $\frac{5}{7}$.

   (b) Find any two fractions equivalent to $\frac{4}{11}$.

3. Simplify the following fractions :-

   (a) $\frac{8}{10}$ (b) $\frac{12}{18}$ (c) $\frac{35}{40}$.

4. Find (a) $\frac{1}{2}$ of 22 (b) $\frac{1}{4}$ of 28

5. Find (a) $\frac{3}{5}$ of 30 (b) $\frac{5}{6}$ of 18

6. I collected 80 shells from the beach. $\frac{2}{5}$ of them were "razor shells". How many razor shells had I collected ?

7. What <u>fraction</u> is equivalent to :-

   (a) 25% (b) 20% (c) 70% ?

8. Do the following **mentally** :-

   (a) 50% of 180 (b) 10% of £35

   (c) 25% of 44 (d) $33\frac{1}{3}$% of £120

   (e) 20% of £350 (f) 1% of £80

   (g) 5% of £90 (h) 100% of £3·60

   (i) 75% of 60p (j) $66\frac{2}{3}$% of £1·50

Chapter 12

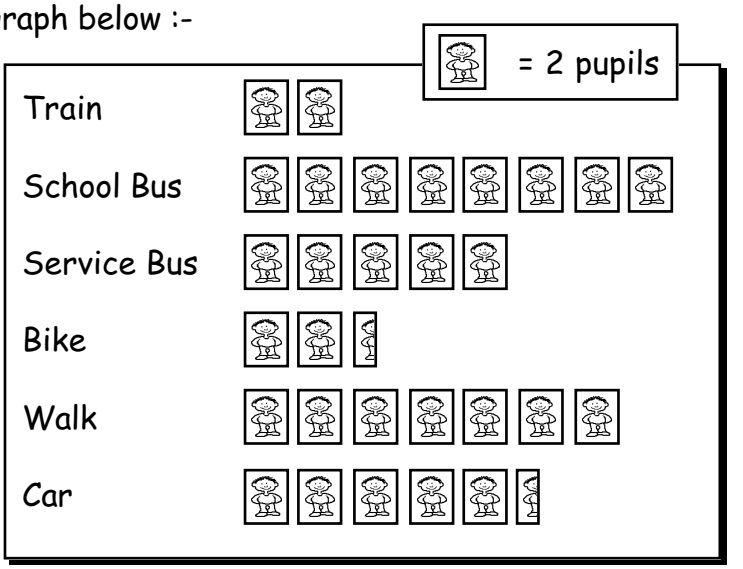
Interpreting Graphs

Pictographs, Bar Graphs and Line Graphs

Exercise 1

1. A survey was taken in classes 1A and 1B on *"how I travel to school"*.

The results are shown in the Pictograph below :-



(a) What is the most popular method of travelling to school ?

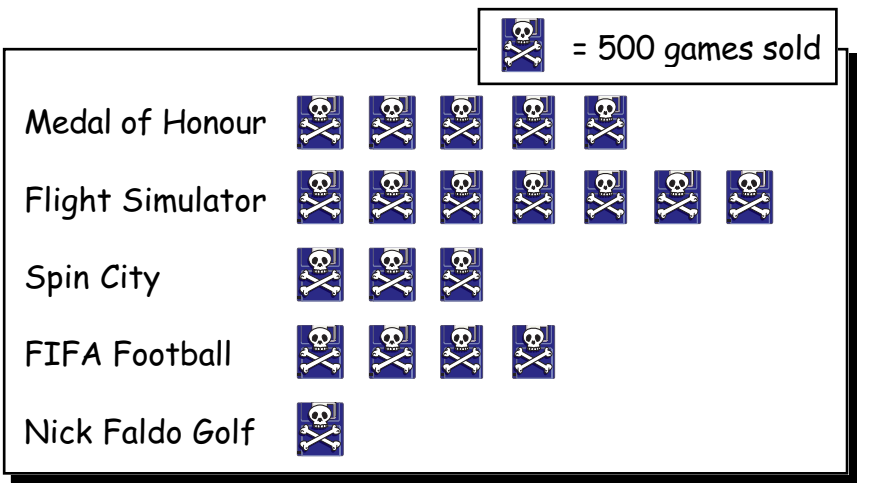
(b) What is the least popular ?

(c) How many were present when the survey took place ?

(d) How many **more** walk to school than go by bike ?

(e) What **fraction** of the class came by either bus or train ?

2.



This pictograph shows the sales of computer games during a sale at "Electronic Palace".

(a) How many "**Medal of Honour**" games were sold ?

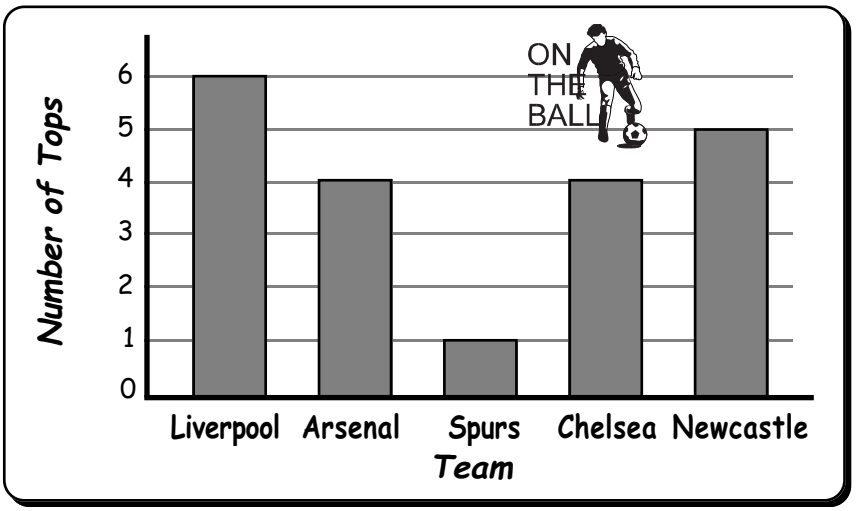
(b) What was the most popular game ?

(c) How many <u>more</u> "**FIFA Football**" games were sold than "**Spin City**" ?

(d) The "**Nick Faldo Golf**" game did not sell very well.
Compare sales of this game with "**Medal of Honour**".

(e) What FRACTION of the total number of games sold was "**FIFA Football**" ?

3. This bar chart shows the sales of football tops in a Glasgow Sports Shop one morning between 9·00 am and 12·00 noon.



(a) How many **Chelsea** tops were sold ?

(b) What was the most popular top sold that morning ?

(c) What was the least popular top sold that morning ?

(d) Which two tops sold in the same quantity ?

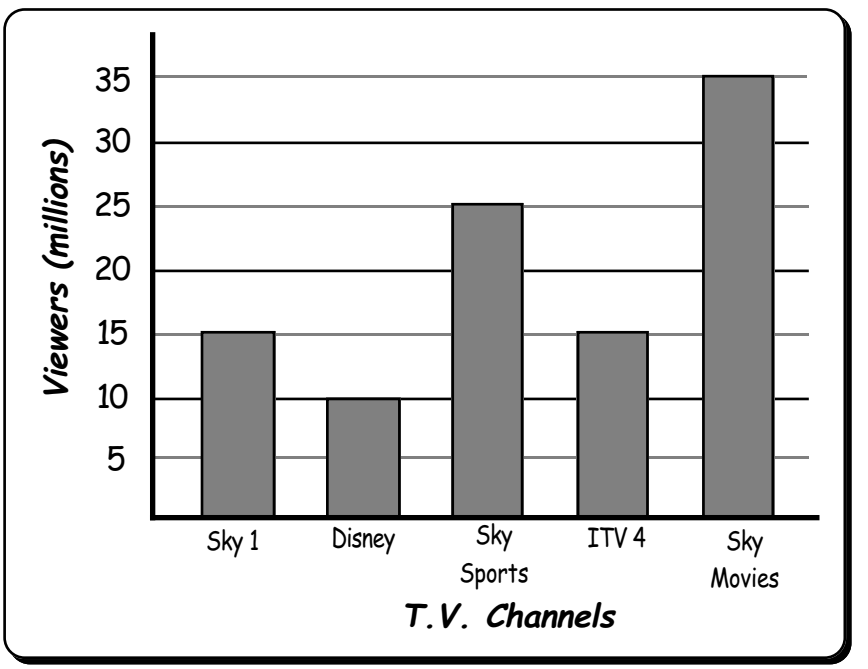
(e) How many more **Liverpool** tops were sold than **Newcastle** ?

(f) How many tops were sold altogether ?

(g) What fraction of the total number of tops sold were Newcastle tops ?

4. This bar chart shows the number of viewers who regularly watch various digital T.V. channels

Disney Channel



(a) Which T.V. channel is most popular ?

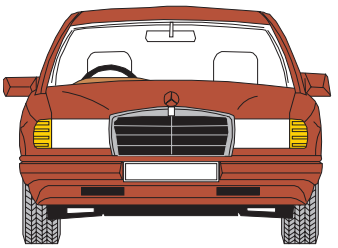
(b) Which channel was watched by the least number of viewers ?

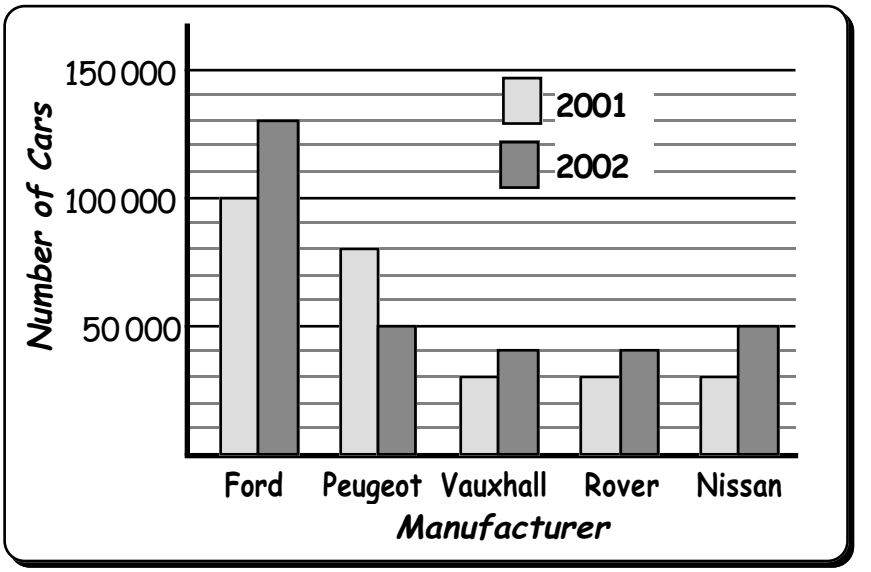
(c) Which two channels have the same number of viewers ?

(d) How many people in total watch the channels ?

(e) Which T.V. channel was watched by $\frac{1}{4}$ of all the viewers ?

5. This bar chart shows the approximate number of cars sold by various manufacturers in the first three months of the years 2001 and 2002.





(a) How many <u>more</u> **Ford** cars were sold in 2002 than in 2001 ?

(b) How many <u>less</u> **Nissan** cars were sold in 2001 than in 2002 ?

(c) Only one company's sales fell from 2001 to 2002. Which one ?

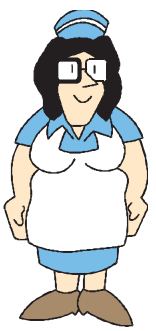
(d) What was the total number of cars sold in <u>2002</u> ?

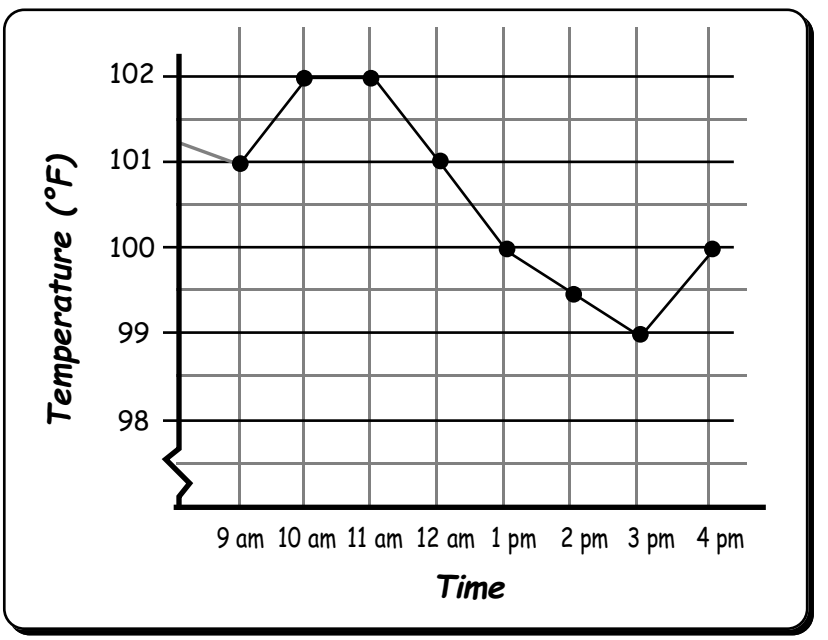
(e) Which two companies had the identical sales records over the 2 years ?

(f) After Ford, which car manufacturer sold most cars altogether over the 2 years ?

6. A nurse took a patient's temperature every hour from 9 am until 4 pm.

The results are shown in this line graph.





(a) When was the patient's temperature at its highest ?

(b) When was it at its lowest ?

(c) By how many degrees did it fall between 11 am and 3 pm ?

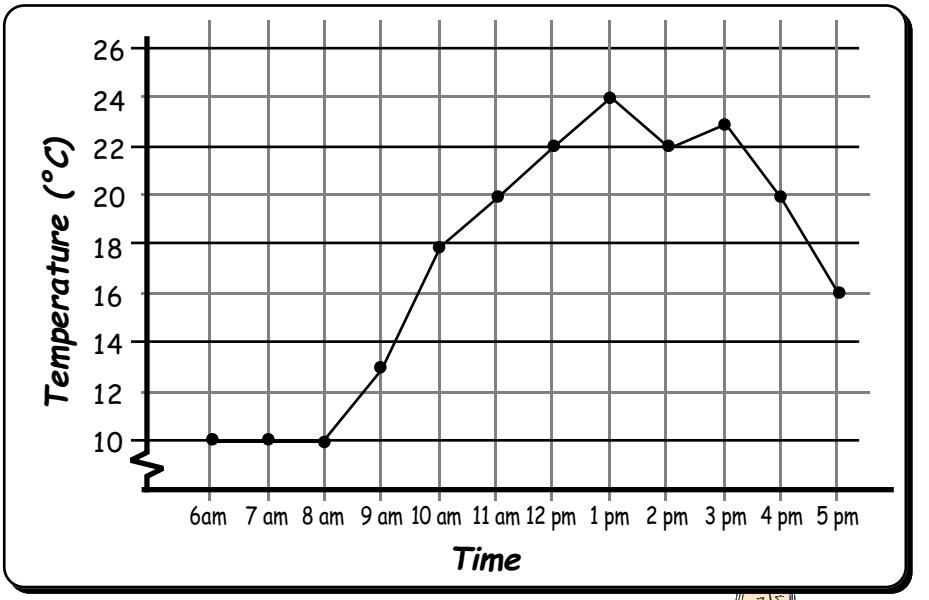
(d) At which two times did the temperature begin to rise ?

(e) Estimate the patient's temperature at 12·30 pm.

7. The janitor recorded the temperature at Ayr High School.

He noted the temperature every hour from 6 am until the school closed at 5 pm.

The results are shown in this line graph.



(a) At what time do you think the school's heating system came on ?

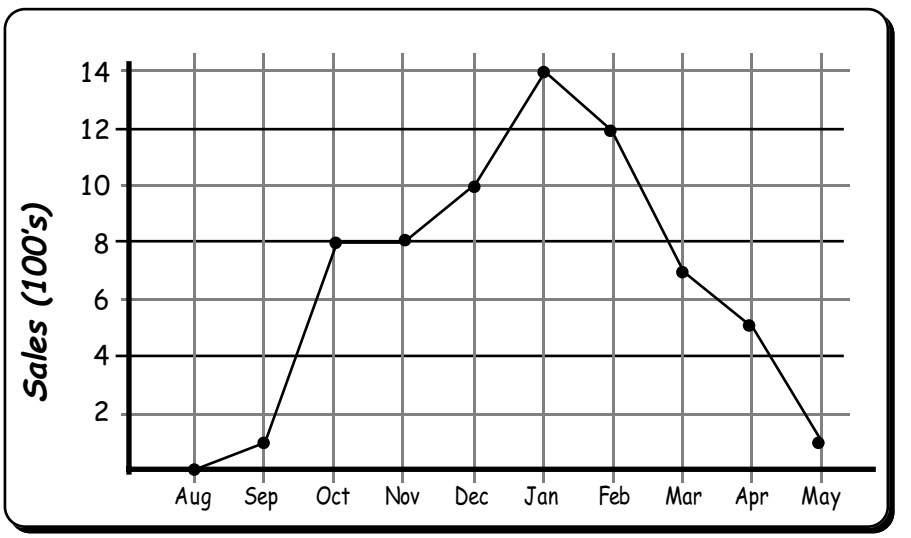
(b) What was the highest temperature ? When did this occur ?

(c) Give a reason for the drop in temperature between 1 pm and 2 pm.

(d) By how many °C did the temperature rise between 8 am and 12 pm ?

(e) When do you think the heating system switched itself off for the day ?

8. This line graph shows the number of umbrellas sold (in 100's) by Grace Bros from August 1998 until May 1999.



(a) Why are sales quite low in August ?

(b) During which two consecutive months do sales remain the same ?

(c) Between which two consecutive months did sales –

(i) rise the most ? (ii) fall by the most ?

(d) When are sales at their maximum ? Why ?

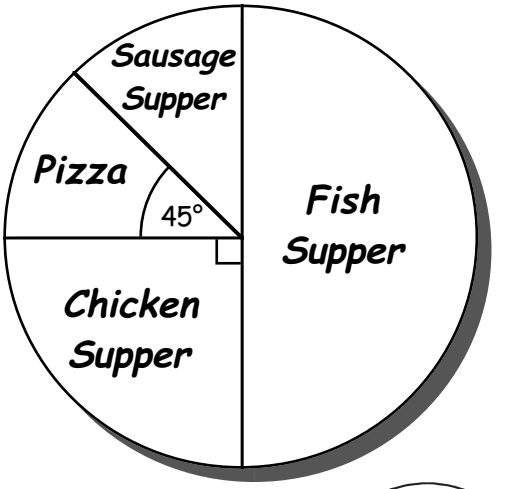
(e) Why do sales appear to fall after January ?

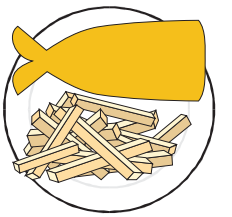
(f) Grace Bros. sell some umbrellas in May – but not a lot ! How many.

(g) What was the general "trend" of the graph after January ?

9. 40 people were asked, whilst queuing in Dave's Fish Bar, – "What is your favourite meal which can be bought here in Dave's".

The result of the survey is shown in this pie chart.





(a) List the meals in order of popularity, starting with the favourite.

(b) What two kinds of meals were equally popular ?

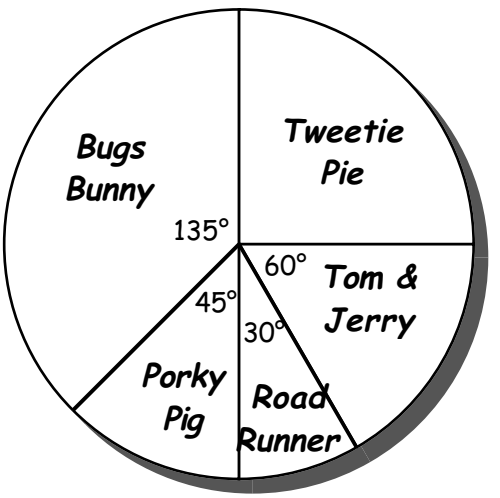
(c) What <u>fraction</u> of the 40 people surveyed preferred :-

(i) a fish supper ?
(ii) a chicken supper ?
(iii) a pizza ?

(d) <u>How many</u> of the 40 people asked preferred :-

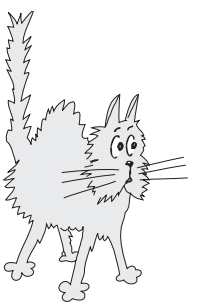
(i) a fish supper ? (ii) a chicken supper ? (iii) a sausage supper ?

10.



Mrs Green asked her 24 Primary 4 pupils who their favourite cartoon characters were.

This pie chart shows the result.



(a) Which cartoon character was the most popular ?

(b) Which, of those mentioned, was the least popular ?

(c) What fraction of the pupils voted for :-

(i) Tweetie Pie ? (ii) Tom & Jerry ? (= $\frac{60}{360}$ simplified)
(iii) Road Runner ? (iv) Porky Pig ?

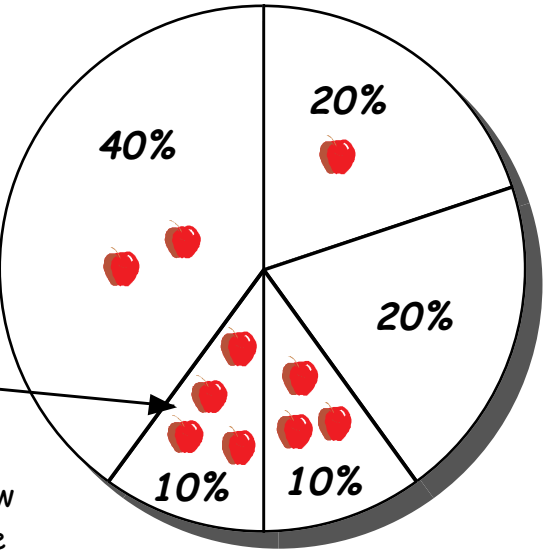
(d) Calculate how many of the 24 pupils liked :-

(i) Tweetie Pie ? ($\frac{1}{4}$ of 24) (ii) Tom & Jerry ?
(iii) Road Runner ? (iv) Porky Pig ?

(e) How many liked Bugs Bunny ?

11. A health club draws up a pie chart showing the number of apples eaten one week by its 200 members.

The result of the survey is shown in this pie chart.



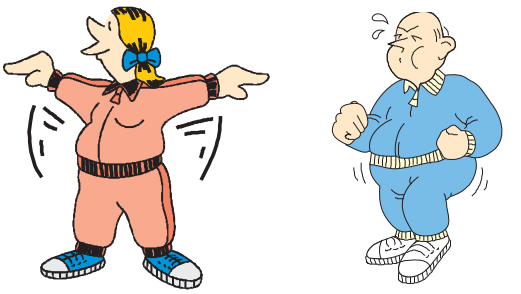
(a) How many of the 200 members eat :-

(i) 4 apples in a week ? ($\frac{10}{100} \times 200$)

(ii) 1 apple in a week ?

(b) Use your answer to (a) part (i) to find how many apples are eaten <u>altogether</u> by those members who eat "**4 apples**" per day.

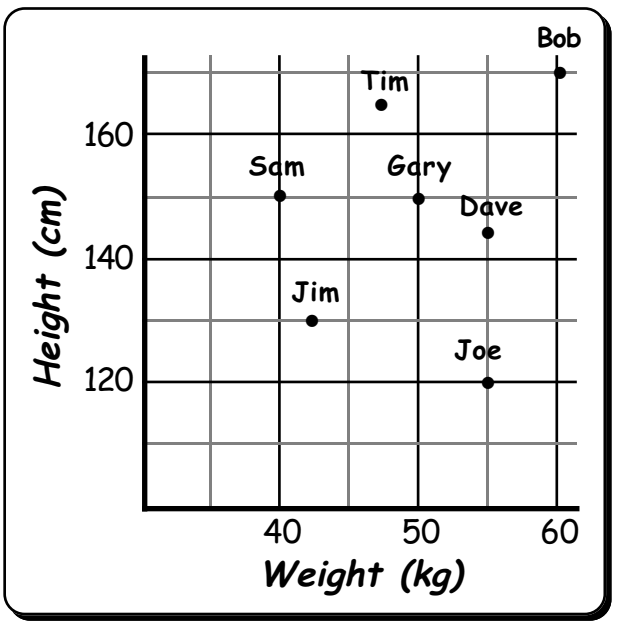
(c) Calculate the total number of apples eaten in one week by all 200 members.



Scattergraph & Codes

Exercise 2

1. This scattergraph shows the height and weight of seven young boys at a rugby match.



(a) What weight is Bob ?

(b) What height is Joe ?

(c) Which two boys are the same height?

(d) Which two boys are the same weight?

(e) Who is the lightest ?

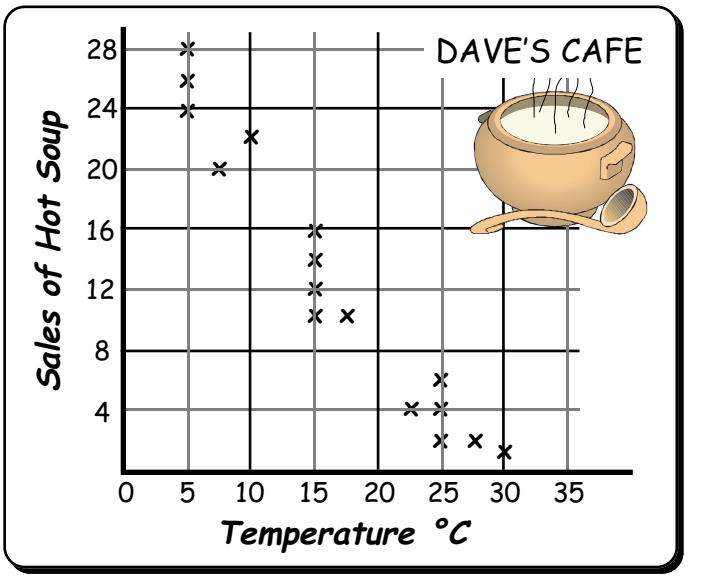
(f) Who is the smallest ?

(g) What weight is Jim ?

(h) How much heavier is Bob than Dave ?

(i) How much taller is Gary than Dave ?

2. This scattergraph shows a connection between the temperature during the day and the sales of cups of hot soup from Dave's Cafe.



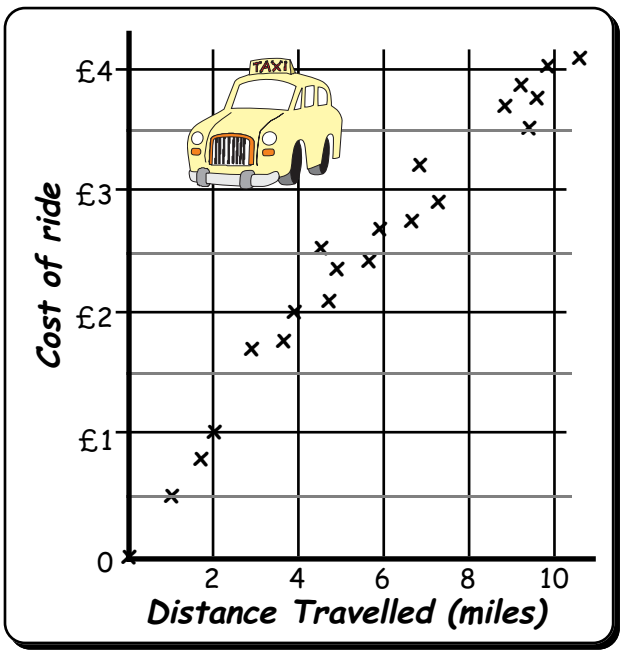
(a) Suggest in words a connection between the temperature and the sales of cups of hot soup.

(b) Use the graph to estimate how many cups of soup will be sold when the temperature is 20°C.

(c) When the temperature was 10°C, how many cups of soup were sold ?

(d) Estimate what the temperature might be when 18 cups of hot soup were sold.

3. This scattergraph shows the fares which taxi drivers charge for short distances around town.



(a) What is the link between the number of miles travelled and the taxi fare ?

(b) Why is there a cross at (0,0) ?

(c) Use the diagram to find how far you could travel for £0·50.

(d) Estimate how much an 8 mile journey would cost ?

4. **CODE BREAKERS**

A	B	C	D	E	F	G	...
1	2	3	4	5	...	...	...

(a) Copy and complete the table above showing all 26 letters of the alphabet.

11 / 25 / 12 / 9 / 5 – is the code for **KYLIE** ? (check it !!)

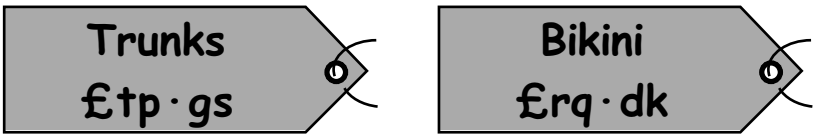
(b) In the same way decode these names :-

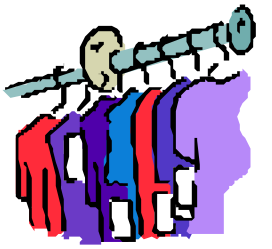
(i) **20 / 15 / 14 / 25** **2 / 12 / 1 / 9 / 18**

(ii) **20 / 9 / 7 / 5 / 18** **23 / 15 / 15 / 4 / 19**

(iii) **13 / 1 / 4 / 15 / 14 / 14 / 1**

5. The KIMBALL tags on goods in a shop are shown below.
(This is a code used by shops to price items)



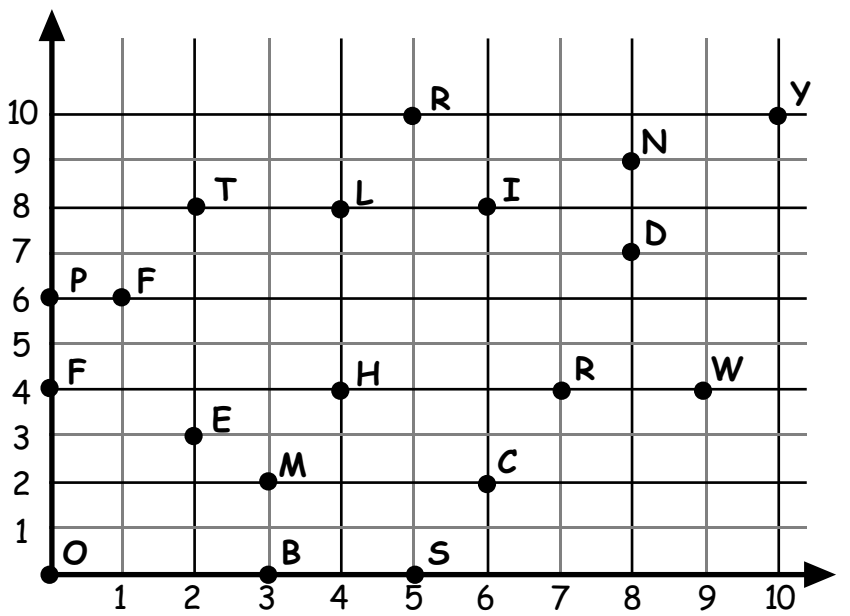


The Trunks are actually **£16·35**.
The Bikini is really **£42·90**.

Use the above two pieces of information to work out and write down the code for a bath robe costing £69·52.

6. June is sending a message to Jenny using a code to stop others from reading her messages.

June uses this coordinate diagram to give Jenny the position of each letter.



The message **(4,4) (6,8) / (2,8) (4,4) (2,3) (7,4) (2,3)**

says **"HI THERE"**

Decode these two messages :-

(a) **(9,4) (4,4) (2,3) (8,9) / (9,4) (6,8) (4,8) (4,8) / (9,4) (2,3) / (3,2) (2,3) (2,3) (2,8).**

(b) **(3,0) (10,10) (2,3) / (0,4) (0,0) (7,4) / (8,9) (0,0) (9,4).**

Exercise 3

1. A group of people were asked their ages before entering a rock concert.
The data is shown in this stem-and-leaf diagram.

Age in years	
1	7 7 8 9
2	4 5 6 6 7 8
3	1 7

1 | 9 = 19 years

(a) The first line should read as 17 years, 17 years, 18 years and 19 years.
Write out the ages in level 2 in the same way.

(b) (i) What age was the youngest person surveyed ?

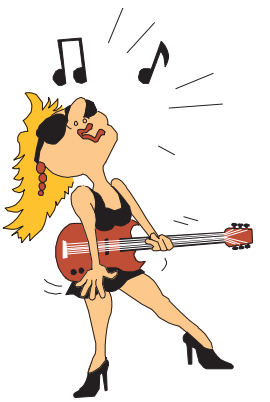
(ii) How many were that age ?

(c) What age was the oldest person ?

(d) How many people were in the survey ?

(e) Copy and complete :-

"Most of the people asked were in their ?'s".
(teens, 20's or 30's)



2.

Money taken in	
1	4 7
2	0 2 2 4 7 8 9
3	1 1 1 4 9
4	3
5	5 6 7 8

3 | 1 = £3·10

Sales in a newspaper shop were recorded over a one hour period.

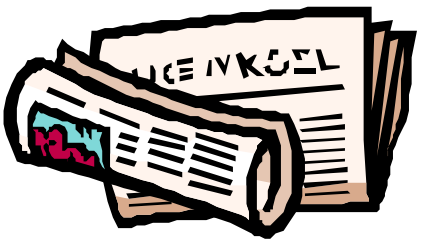
(a) List the amount of money taken in, in order of size, starting with the least amount i.e. £1·40.

(b) Which level has the most data ?

(c) Which amount of money appears most often (the mode) ?

(d) How many takings are there below £2·70 ?

(e) How many customers bought items from the shop in the hour ?



3. The marks for pupils in a Primary 6 spelling test are shown in this stem-and-leaf diagram.

Pupils' Marks

0	9
1	2 5 5 7
2	0 1 3 6 8
3	0 4 4 8
4	7 7 7 8 8 9
5	0

1 | 2 = 12

(a) The test was marked out of 50.
How many pupils scored :-

(i) full marks ?
(ii) half-marks ?
(iii) a mark of 34 ?

(b) How many pupils sat the test ?

(c) Work out the median mark.
(the "middle" mark)

(d) What was the most common mark (the mode) ?

4. The ages of new members joining the Hawkhead Bowling Club are shown below.

New members' Ages

3	0
4	
5	8 9 8
6	4 1 5 2 2 3 7 2
7	6 4 7 1

6 | 3 = 63 years old

(a) The stem-and-leaf diagram has not been set out in order.

Rearrange the ages so that a new stem-and-leaf is constructed with the ages in order.

(b) What age was the :-

(i) youngest ?

(ii) oldest new member ?

(c) Why is there an empty space at " 4 | " ?

5. Ten senior citizens aged in their 60's, and ten senior citizens aged in their 70's, were asked how many times per year they went to the hairdresser's.

Number of Hair-do's

sixties		seventies
3	0	1
3 2 2 1	1	3 5
0	2	2 2 4
7 1	3	0
9 4	4	8
	5	1 2

1 | 3 means 13 times

(a) One person gets her hair done once per year.
In which age group is she (sixties or seventies) ?

(b) For the 10 senior citizens in their 60's, add **all** the visits together.
How many times did they visit the hairdresser altogether ?

(c) Do the same for the 10 senior citizens in their 70's.

(d) Who went more often – the 10 in their sixties or the 10 in their seventies ?

Drawing Graphs and Charts

Exercise 4

1. Using the symbol  to represent a boy and  to represent a girl, illustrate these birth-months in a **pictograph**.

January	8 boys born	4 girls born
February	3 boys born	7 girls born
March	1 boy born	3 girls born
April	5 boys born	5 girls born
May	10 boys born	0 girls born
June	0 boys born	3 girls born

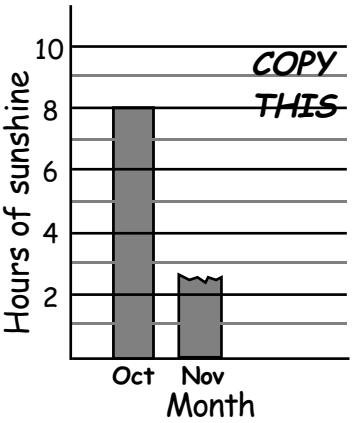
January □□□□□□□□○○○○

February *COPY THIS*

2. This table shows the average daily hours of sunshine in Malaga from October to April.

Draw a **BAR CHART** to show the information.

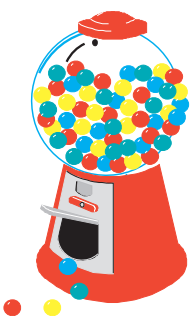
Oct	Nov	Dec	Jan	Feb	Mar	Apr
8	6	5	3	$6\frac{1}{2}$	7	10

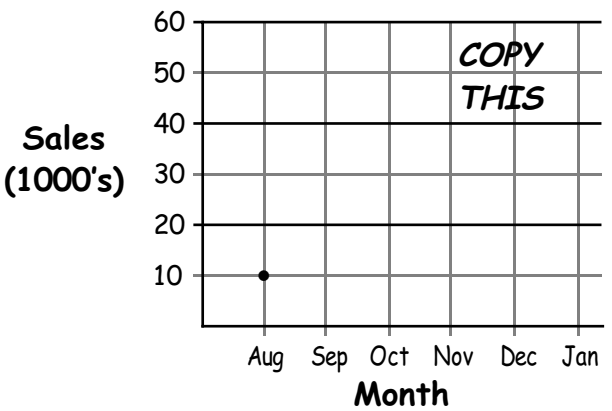


3. The sales figures for a new toy are shown in the table below.

Month	Aug	Sep	Oct	Nov	Dec	Jan
Sales (1000's)	10	25	20	30	55	5

(a) Show the above data in a LINE GRAPH using a scale like the one shown below.

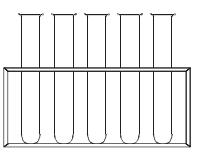




(b) Why were the sales so high in December ?

4. Shown is a table of exam marks (out of 50) from a Science department.

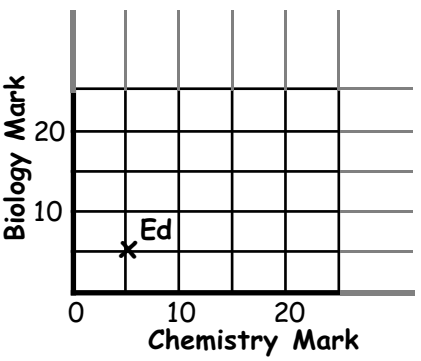
Pupil	Ed	Kim	Joe	Ann	Lyn	Bob	Tom
Chemistry	5	20	40	40	50	40	10
Biology	5	25	10	35	40	50	10



(a) Draw a scatter diagram, similar to the one shown, plotting the information from the table.

(b) One person's marks appear "different" from the pattern of the rest of the class.

Who is the "odd one out" ?



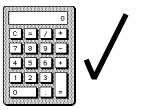
5. The weights of 20 newborn kittens (to the nearest gram) are given below.

52	47	65	41	50	55	73	48	60	57
65	49	54	63	89	50	64	71	59	57

Draw a **STEM-AND-LEAF** diagram to illustrate this data.
(Remember to state a KEY)

Calculation of Averages

Range, Mode, Median, Mean



Exercise 5

1. The **Range** (= HIGHEST – LOWEST).

   For each set of data, find the **RANGE** of numbers :-

   (a) 4, 6, 5, 9, 3, 12, 5, 4, 7, 7, 9, 2, 6, 8.

   (b) 94, 78, 65, 32, 54, 29, 47, 22, 25, 21, 95, 37, 36, 28.

   (c) 3·4, 6·1, 7·2, 1·9, 3·3, 4·7, 5·1, 8·4, 2·1, 6·3.

2. The **Mode** (The number that appears MOST often).

   For each set of data, find the **MODE** :-

   (a) 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 6, 6, 7, 8, 9.

   (b) 8, 2, 5, 2, 1, 8, 6, 3, 2, 9, 3, 5, 2.

   (c) 246, 240, 247, 241, 241, 249, 240, 241, 241, 242, 243,
   243, 240, 244, 244, 240, 245, 246, 241, 246, 248, 249.

3. The **Median** (This is the MIDDLE score)
   (Make sure you put the numbers in order first)

   For each set of data, find the **MEDIAN** :-

   (a) 2, 3, 3, 4, 5, 6, 6, 7, 8.

   (b) 20, 22, 22, 25, 27, 29, 30, 31, 31, 33, 37.

   (c) 8, 9, 9, 10, 12, 13, 14, 16.

   (d) 9, 5, 2, 5, 5, 3, 4, 7, 6, 8, 8, 5, 5, 4, 1, 1, 9, 8, 7, 7, 4.

   (e) £15, £18, £17, £16, £20, £21, £19, £17, £16, £16.

   (f) 35g, 15g, 15g, 27g, 25g, 23g, 19g, 27g, 26g, 15g, 24g, 27g, 28g, 35g.

4. The **Mean** (or average)

$$\text{Mean} = \frac{\text{total of all the scores}}{\text{number of scores}}$$

Show how you added the set of numbers first, then show your division.

example :- Find the mean of 4, 3, 2 and 7 =>

$$\text{Mean} = \frac{4+3+2+7}{4} = \frac{16}{4} = 4$$

Find the **Mean** of :-

(a) 3, 5, 7, 9.

(b) 8, 20, 11, 17, 24.

(c) £6, £9, £12, £30, £24, £3.

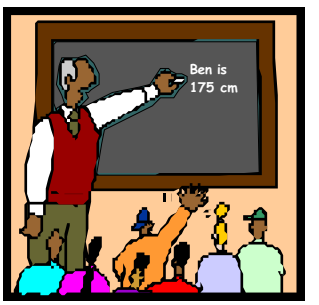
(d) 9 cm, 18 cm, 36 cm, 24 cm, 14 cm, 31 cm.

(e) 6·2, 4·1, 3·7, 5·4, 6·8, 3·9, 7·1, 1·6, 4·4.

(f) 3·85, 2·76, 1·93, 5·86.

5. Given below are the heights, to the nearest centimetre, of seven children.

175 cm, 176 cm, 186 cm, 172 cm, 190 cm, 182 cm, 185 cm.



Calculate :-

(a) the range of heights

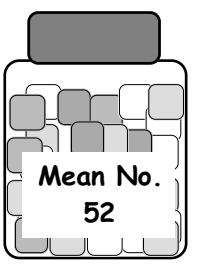
(b) the mean height (to the nearest cm).

(c) the median height (remember to put them in order first).

6. Mr James buys 10 tubs of marshmallows.

He finds that they contain the following number of marshmallows

50, 52, 54, 52, 55, 51, 53, 50, 54, 54.



(a) (i) Calculate the mean number of marshmallows.

(ii) Should he complain ?

(b) Find the median.

(c) What is the mode ?

7. Cricketers use the **MEAN** when calculating their average number of runs.

(a) Trevor scored a **total** of 515 runs in his 5 innings (5 games).
Find his average number of runs per innings.

(b) He scored 109 runs in his next innings.
What was his new average for the 6 innings ?

8. This **stem-and-leaf diagram** shows the number of people buying a lottery ticket from "Maitlands Store" in Kilmarnock over a period of 15 days.

Lottery Ticket Sales

3	1 3 7 8
4	0 2 2 4 8
5	1 7
6	4 6
7	1 1

3 | 7 = 37

(a) What is the **median** of the distribution ?

(b) What is the **range** ?

(c) Calculate the **mean** number of people buying a ticket over the 15 days.

9. The **mean** weight of 2 girls is 40 kilograms.

If Lyn weighs 45 kilograms, what must Sandy weigh ?

10. The **mean** age of 3 boys, Tom, Dick and Angus, is 12.

Tom is age 15.
Dick is aged 9.

How old must Angus be ?
(Think carefully how to do this !!)

Angus ?

Dick 9

Tom 15

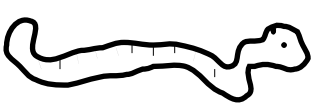
11. Bobby sat 4 maths tests marked out of 20.
His average (**mean**) score was 14.
You can see what he scored in each of his first 3 tests.

Test 1 – 19 | Test 2 – 18 | Test 3 – 10 | Test 4 –

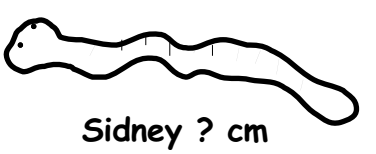
What must he have scored in his 4th test ?

12. The average length of 3 pet worms is 6·5 cm.

Willie 8 cm



Sammy 4·5 cm

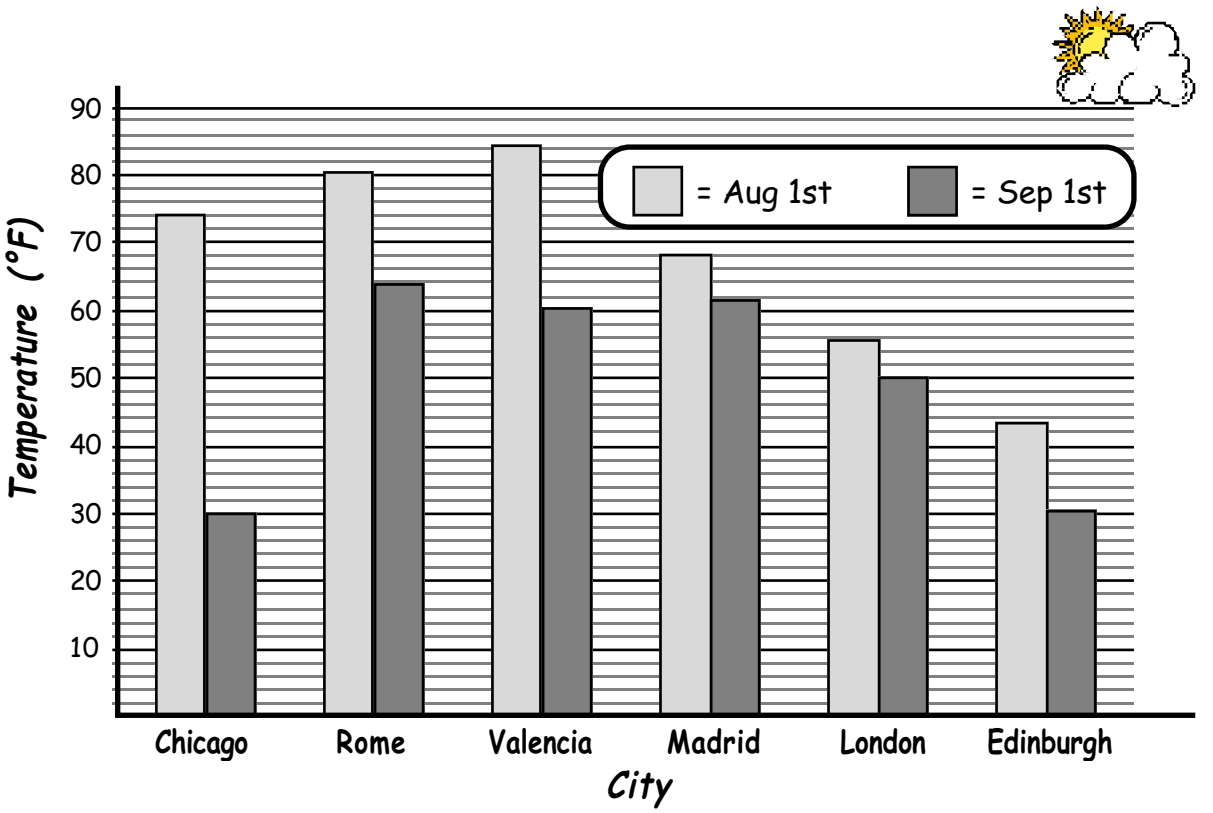


Sidney ? cm

Calculate Sidney's length.

What have I learned ?

1. The bar graph below shows the temperature in six places on 2 different days.



(a) What was the warmest place on August 1st ?

(b) What was the coldest place on August 1st ?

(c) What was the temperature in Rome on August 1st ?

(d) What was the temperature in Chicago on August 1st ?

(e) What was the temperature in Madrid on September 1st ?

(f) In which city did the temperature drop by the greatest amount from August 1st to September 1st ?

(g) Two cities were at the same temperature on September 1st. Which two, and what was the temperature ?

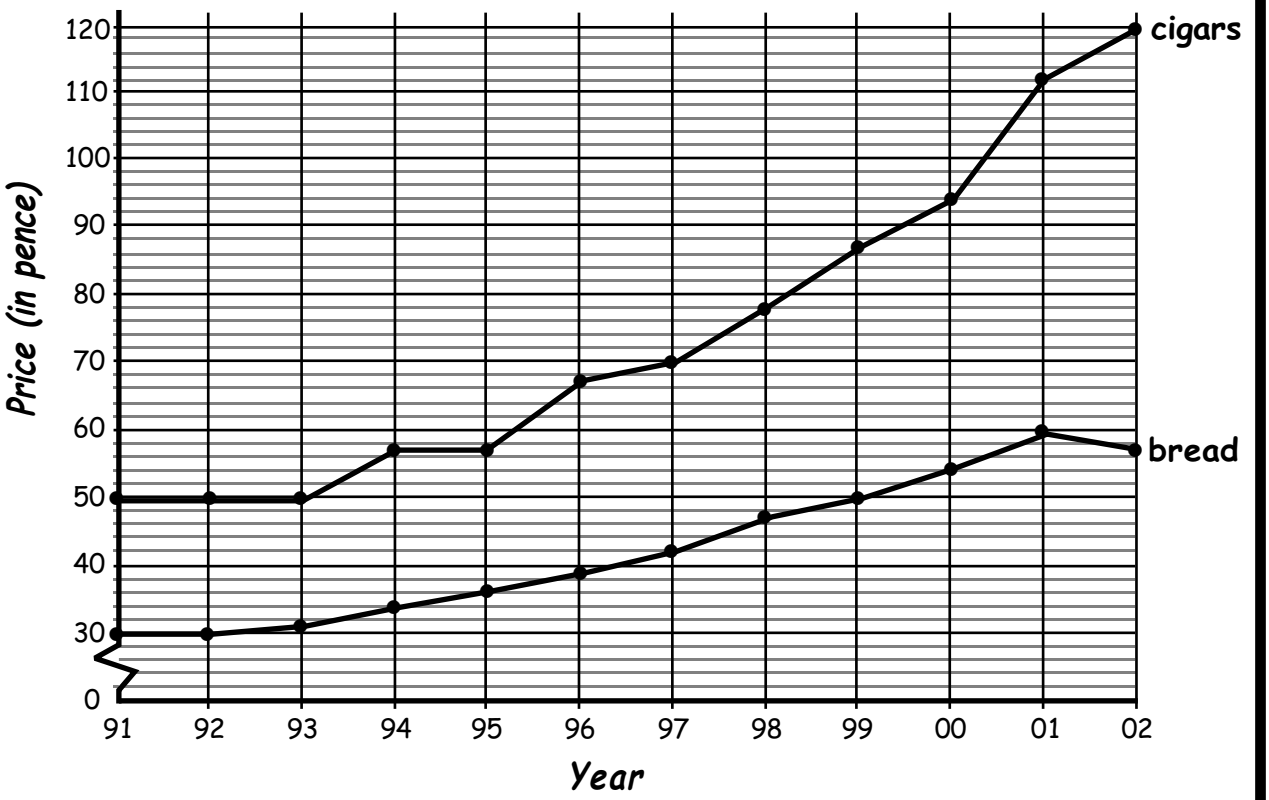
(h) How many places had a temperature greater than 75°F on August 1st ?

(i) Which place had a drop in temperature of 13°F between August and September ?

cont'd...

2. The line graphs below show how the prices of 2 items have changed between 1991 and 2002.

The items are :- a packet of cigars
a loaf of bread



(a) What was the price of cigars in :- (i) 1991 ? (ii) 2002 ?

(b) Between which years did the price of cigars **NOT** increase ?

(c) Describe the trend of cigar prices over the 12 years.

(d) What was the price of a loaf in :- (i) 1991 ? (ii) 2002 ?

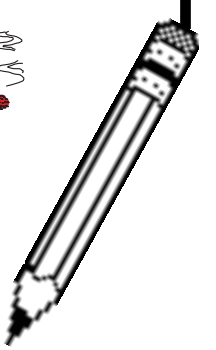
(e) Describe the trend of loaf prices compared to cigar prices.

(f) Which item increased more in price and by how much ? Explain.

(g) One of the items dropped in price at one point. Which one and when ?

(h) How much more expensive was a packet of cigars than a loaf in :-

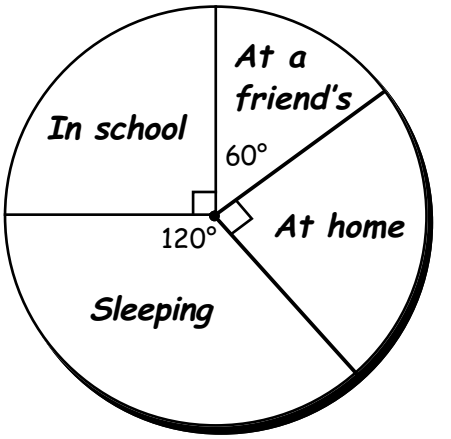
(i) 1994 ? (ii) 2000 ?



cont'd...

What have I learned ?

3. The pie chart shows how Kelly spent her time over a 24 hour period.



(a) (i) For what <u>fraction</u> of the day was Kelly **in school** ?

(ii) For what fraction of the day was Kelly in bed sleeping ?

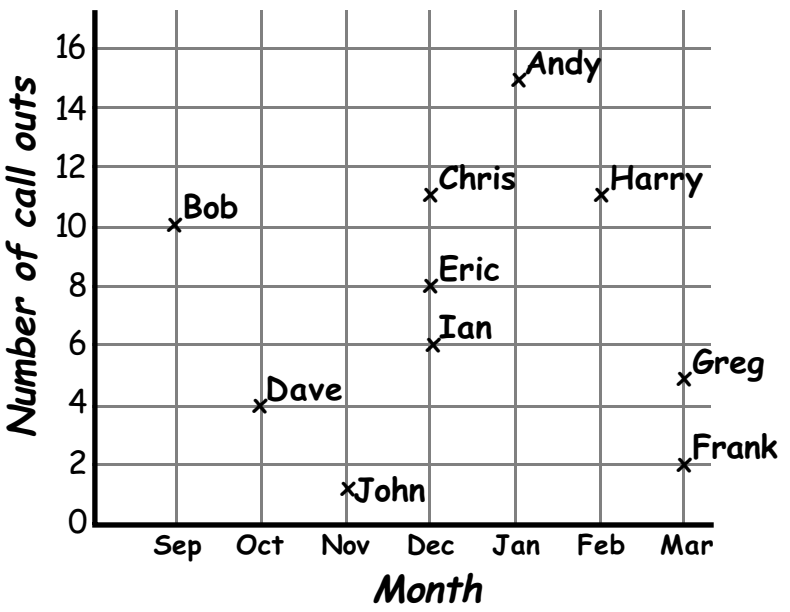
(b) For how many hours was Kelly :-

(i) In school ? (ii) At home ?

(iii) At a friend's house ? ($\frac{60}{360}$ x 24) (iv) Sleeping ?

4. An emergency roofer decided to monitor the number of call-outs his workers had to attend to over a period of time.

The results are shown in the scattergraph.



(a) How many emergency call outs did "Bob" make in September ?

(b) **2** employees made the same number of call outs.
Who were they and in which months ?

(c) Which employee made the most call outs and in which month ?

(d) Was December a very "**wild and windy**" month ? Explain.

(e) John said that November was a great month for weather.
How can you tell that this was the case ?

cont'd...

What have I learned ?

5. The amounts of money (pence) spent by children in a sweet shop are shown below.

41	61	21	52	42	60	53	38	58	45	59
62	84	51	24	72	49	43	72	66	31	71
50	35	80	60	35	59	24	86	30	55	46

(a) Copy the diagram opposite and set up an **ORDERED** stem-and-leaf diagram.
(*you may have to draw the stem-and-leaf diagram unordered then re-draw it as an ordered diagram*)

(b) How many children were in the survey ?

(c) What was the **median** (the middle amount) ?

Pocket Money

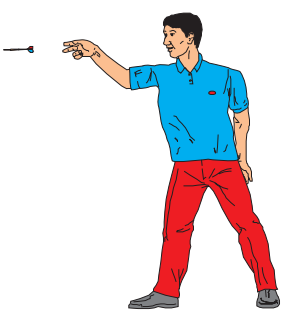
2	.....
3	.....
4	.....
5	.....
6	.....
7	.....
8	.....

COPY

4 | 1 = 41 pence

6. A darts player threw 10 darts at a dartboard.
His scores were :-

20 18 5 18 5 5 12 1 20 5



(a) Write his scores in order, starting with the lowest.

(b) What was his **median** score ?

(c) What was the **mode** ?

7. The table shows some results from the English Premiership.

Premiership

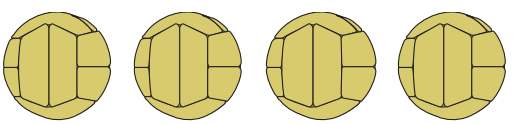
Arsenal	3	Spurs	3
Liverpool	1	Everton	2
Leeds	1	Derby	2
Charlton	3	Ipswich	2
Bolton	2	Chelsea	6

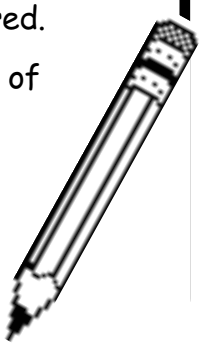
(a) What was the **range** of goals scored ?

(b) What was the **mode** ?

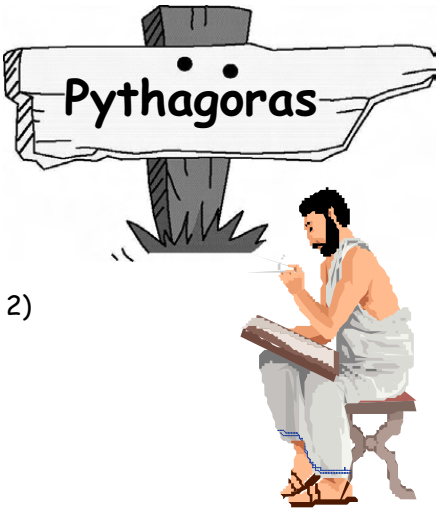
(c) Write the number of goals in order and find the **median** number of goals scored.

(d) Calculate the **mean** (average) number of goals scored.





Chapter 13



Squares

To "**SQUARE**" a number means to <u>multiply it by itself</u>.

For example "the square" of 7 is $7 \times 7 = 49$ (not 7×2)

We shorten this to "7 squared = $7 \times 7 = 49$"

or even shorter $\boxed{7^2 = 7 \times 7 = 49}$

(we read 7^2 as "7 squared")

Exercise 1

1. No calculator in this question. Copy each line and find the value :-

(a) $6^2 = 6 \times 6 = ?$ (b) $4^2 = 4 \times 4 = ?$

(c) $2^2 = 2 \times ? = ?$ (d) $5^2 = 5 \times ? = ?$

(e) 9^2 (f) 10^2

(g) 1^2 (h) 3^2

(i) 0^2 (j) 8^2

2. You **can** use a calculator this time. Find the values of :-

(a) 16^2 (b) 22^2 (c) 19^2 (d) 41^2

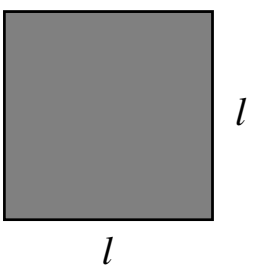
(e) 32^2 (f) 50^2 (g) 17^2 (h) 53^2

(i) 85^2 (j) 93^2 (k) 101^2 (l) 200^2

3. It is possible to calculate the **AREA** of a SQUARE using the formula :-

$$\text{AREA} = (\text{length})^2$$

or simply $\boxed{A = l^2}$



Calculate the areas of the following squares :-

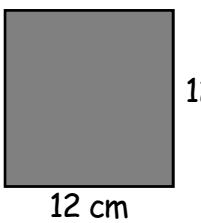
(a)

Area = l^2

=> $A = 8^2$

$A = ?$ cm^2

(b)

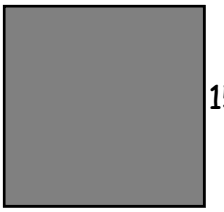


Area = l^2

=> $A = 12^2$

$A = ?$ cm^2

3. (c)

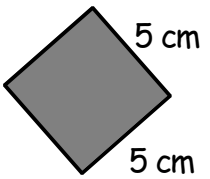


Area = l^2

=> A = ?^{2}

A = ? cm^2

(d)

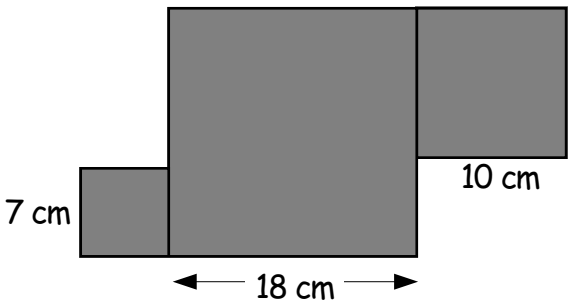


Area = l^2

=> A = ?^{2}

A = ? cm^2

4. Calculate the total area of this shape, which consists of three squares :-
(*Show all your working*)



5. Use your calculator to find :-

(a) $3^2 + 4^2$ (b) $7^2 + 6^2$ (c) $10^2 + 5^2$ (d) $8^2 + 2^2$

(e) $11^2 + 9^2$ (f) $2^2 + 3^2 + 4^2$ (g) $10^2 + 9^2 + 8^2$ (h) $13^2 + 15^2$

6. (a) Use your calculator to find each of the following :-

$1^2 - 0^2$, $2^2 - 1^2$, $3^2 - 2^2$, $4^2 - 3^2$, $5^2 - 4^2$, $6^2 - 5^2$, $7^2 - 6^2$.

(b) Did you notice a pattern ? If so, write down the value of $8^2 - 7^2$ without using your calculator. Now check your guess with a calculator.

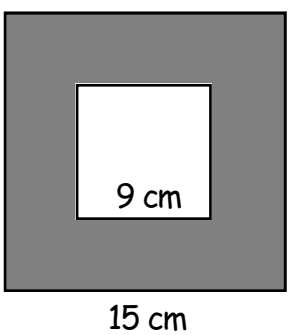
(c) No calculator. Write down the value of :- $9^2 - 8^2$, $10^2 - 9^2$, $11^2 - 10^2$.

7. Shown is a small square hole cut from a large square piece of cardboard.

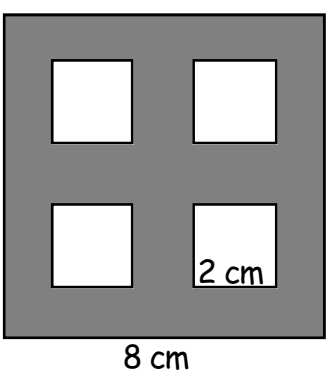
(a) Calculate the area of the large square.

(b) Calculate the area of the small square hole.

(c) Now calculate the shaded area. (add or subtract ?).



8.



By calculating the area of the large square and the area of the 4 small square holes, calculate the area of the shaded part of this figure.

Squares Roots ($\sqrt{\ }$)

You now know how to find $7^2 = 7 \times 7 = 49$

In reverse we sometimes want to know "**which number, times itself, gives 49**" ?

The answer, as can be seen from above, is obviously 7.

We say **"the SQUARE ROOT of 49 is 7 "**

which shortens to $\sqrt{49} = 7$ (this reads as "the square root of 49 is 7")

Exercise 2

1. No calculator in this question. Copy each line and complete :-

   (a) since $5^2 = 25 \Rightarrow \sqrt{25} = 5$ (b) since $4^2 = 16 \Rightarrow \sqrt{16} = ?$

   (c) since $3^2 = 9 \Rightarrow \sqrt{9} = ?$ (d) since $8^2 = 64 \Rightarrow \sqrt{64} = ?$

   (e) since $11^2 = ? \Rightarrow \sqrt{121} = ?$ (f) since $2^2 = ? \Rightarrow \sqrt{4} = ?$

2. Find the following :-

   (a) $\sqrt{36}$ (b) $\sqrt{1}$ (c) $\sqrt{81}$ (d) $\sqrt{100}$

3. In this question, you should use the "$\sqrt{\ }$" button on your calculator to find :-

   (a) $\sqrt{64}$ (b) $\sqrt{81}$ (c) $\sqrt{121}$ (d) $\sqrt{400}$ (e) $\sqrt{625}$

   (f) $\sqrt{900}$ (g) $\sqrt{256}$ (h) $\sqrt{169}$ (i) $\sqrt{1 \cdot 44}$ (j) $\sqrt{3 \cdot 24}$

   Some "square roots" are not exact :-

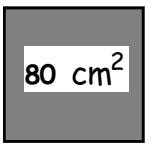
   $\sqrt{54} = 7{\cdot}3484692? = 7{\cdot}35$ (to 2 decimal places) - check this !

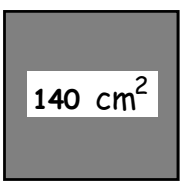
4. Use your calculator to find the following **to two decimal places** :-

   (a) $\sqrt{14}$ (b) $\sqrt{19}$ (c) $\sqrt{37}$ (d) $\sqrt{68}$ (e) $\sqrt{93}$

   (f) $\sqrt{115}$ (g) $\sqrt{207}$ (h) $\sqrt{300}$ (i) $\sqrt{520}$ (j) $\sqrt{735}$

5. This square shown has an **area** of 80 cm^2
   Calculate the length of one of its sides. ($\sqrt{80}$)



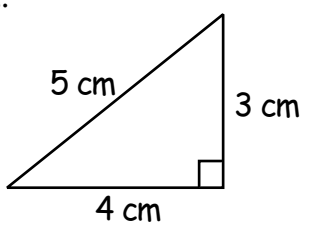
6. 

   This square shown has an **area** of 140 cm^2
   Calculate the length of one of its sides.

Pythagoras Theorem

Pythagoras was a famous Greek Mathematician who discovered an amazing connection between the three sides of a **right angled triangle**. This connection means it is possible to **CALCULATE** the length of one side of a right angle triangle as long as you know the lengths of the other two.

Look at this right angled triangle with sides 3cm, 4cm and 5cm.



If you add the two smaller sides (3cm and 4cm) together do you get the longer side (5cm) ? - NO.

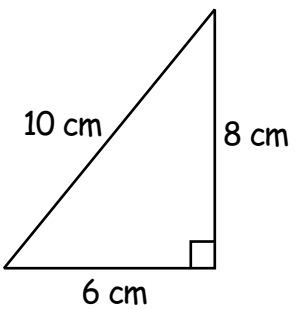
Can you see that $3^2 = 9$, $4^2 = 16$ and $5^2 = 25$?

Can you also see that:- $3^2 + 4^2 = 9 + 16 = 25 = 5^2$?

Pythagoras found that this connection between the three sides of a right angled triangle was true for every right angled triangle.

Exercise 3

1. The three sides of this right angled triangle are 6cm, 8cm and 10cm.

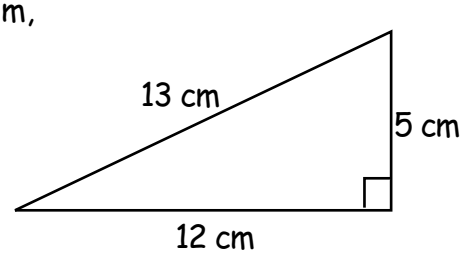


   (a) Write down the values of 6^2, 8^2 and 10^2.

   (b) Find the value of $6^2 + 8^2$.

   (c) Check that $6^2 + 8^2 = 10^2$.

2. The three sides of this right angled triangle are 5cm, 12cm and 13cm.



   (a) Write down the values of 5^2, 12^2 and 13^2.

   (b) Find the value of $5^2 + 12^2$.

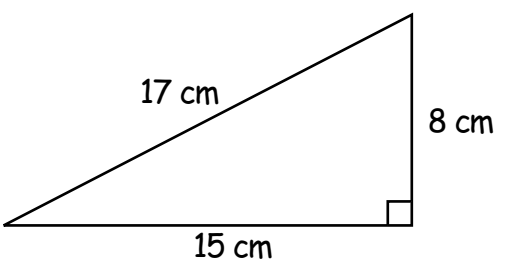
   (c) Check that $5^2 + 12^2 = 13^2$.

3. The three sides of this right angled triangle are 8cm, 15cm and 17cm.

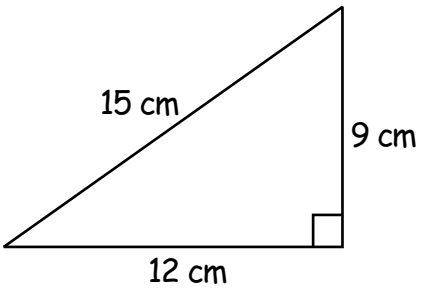
   (a) Write down the values of 8^2, 15^2 and 17^2.

   (b) Find the value of $8^2 + 15^2$.

   (c) Check that $8^2 + 15^2 = 17^2$.



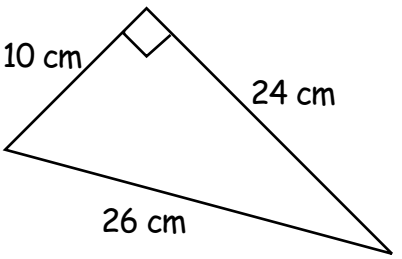
4. The three sides of this right angled triangle are 9cm, 12cm and 15cm.



(a) Write down the values of 9^2, 12^2 and 15^2.

(b) Find the value of $9^2 + 12^2$.

(c) Check that $9^2 + 12^2 = 15^2$.

5. 

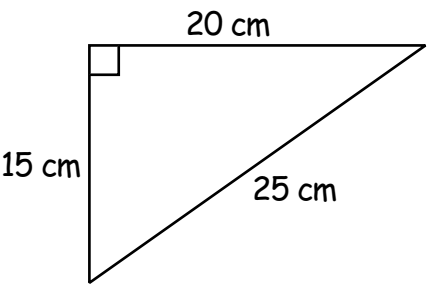
The three sides of this right angled triangle are 10cm, 24cm and 26cm.

(a) Write down the values of 10^2, 24^2 and 26^2.

(b) Find the value of $10^2 + 24^2$.

(c) Check that $10^2 + 24^2 = 26^2$.

6. The three sides of this right angled triangle are 15cm, 20cm and 25cm.



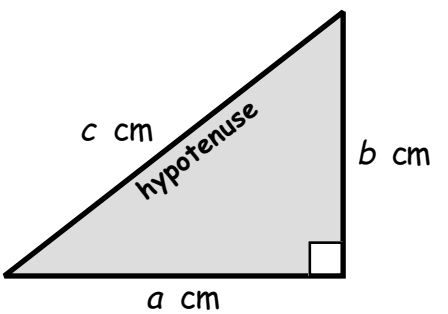
(a) Write down the values of 15^2, 20^2 and 25^2.

(b) Find the value of $15^2 + 20^2$.

(c) Check that $15^2 + 20^2 = 25^2$.

Pythagoras Theorem (proper)

Pythagoras made up a small rule which shows the connection between the three sides of any right angled triangle.



The **longest** side of a right angled triangle is called the **HYPOTENUSE**.

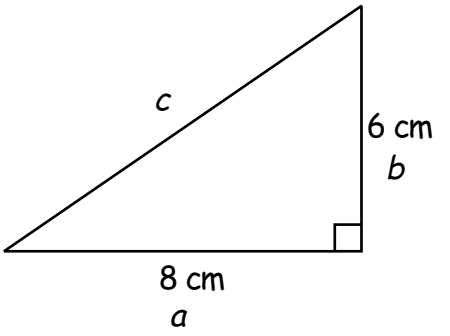
If the three sides are a cm, b cm and c cm (the hypotenuse), then Pythagoras' rule says :-

$$\Rightarrow \quad \boxed{c^2 = a^2 + b^2}$$

We can use this rule to calculate the length of the **hypotenuse** of a right angled triangle if we know the lengths of the two **smaller** sides.

Example 1 :- The two smaller sides of this right angled triangle are 8 centimetres and 6 centimetres.

To calculate the length of the hypotenuse, use **Pythagoras' Rule**.



=> $c^2 = a^2 + b^2$

=> $c^2 = 8^2 + 6^2$

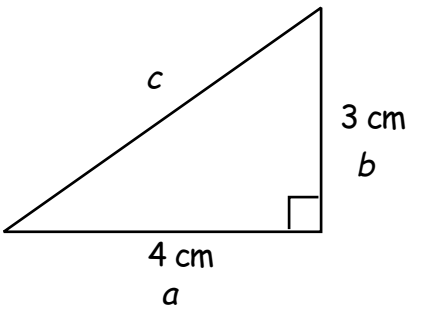
=> $c^2 = 64 + 36 = 100$

=> $c = \sqrt{100} = 10$ cm

This is how you set down the working

Exercise 4

1. In the same way as shown above, use **Pythagoras' Rule** to calculate the length of the hypotenuse in this triangle :-



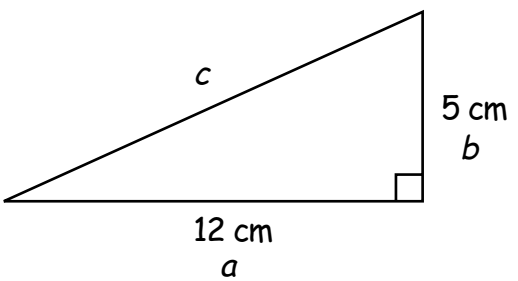
=> $c^2 = a^2 + b^2$

=> $c^2 = 4^2 + ?^2$

=> $c^2 = 16 + ? = ?$

=> $c = \sqrt{?} = ?$ cm

Copy and complete the working

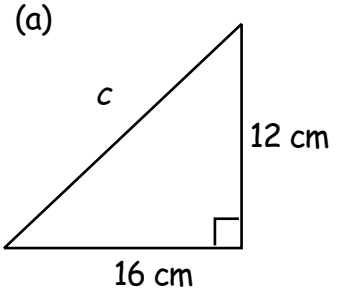
2. 

Use **Pythagoras' Rule** to calculate the length of the hypotenuse in the right angled triangle shown on the left.

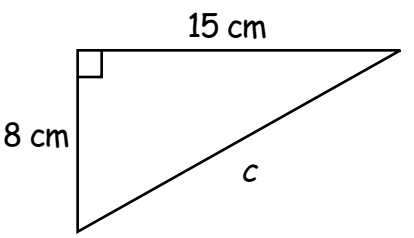
(*set down your 4 lines of working as shown*)

3. Use Pythagoras' Rule to calculate the length of the hypotenuse in each of these triangles :-

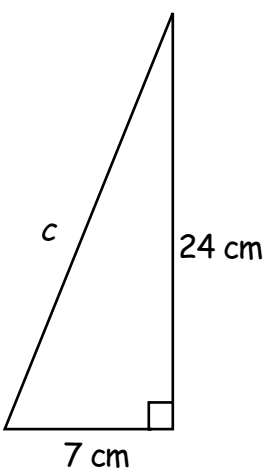
(a)



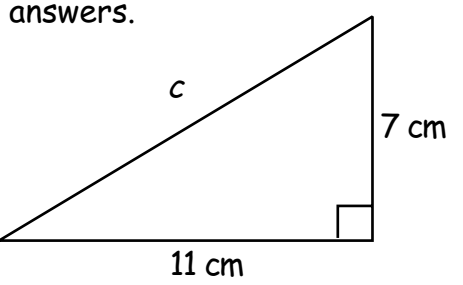
(b)



(c)



Example 2:- You do NOT always get nice whole number answers.



$\Rightarrow \quad c^2 = a^2 + b^2$

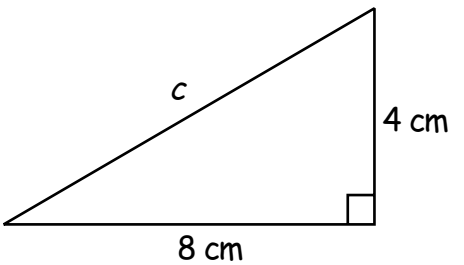
$\Rightarrow \quad c^2 = 7^2 + 11^2$

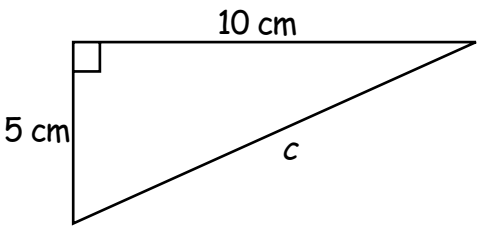
$\Rightarrow \quad c^2 = 49 + 121 = 170$

$\Rightarrow \quad c = \sqrt{170} = 13{\cdot}03840481...$

$= 13{\cdot}04$ cm (to 2 decimal places)

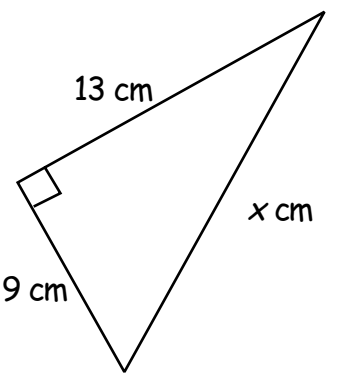
4. In the same way as shown above, use **Pythagoras' Rule** to calculate the length of the hypotenuse in this triangle to 2 decimal places.

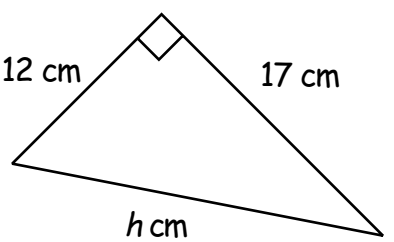


5. 

Use **Pythagoras' Rule** to calculate the length of the hypotenuse in the right angled triangle shown (2 decimal places).

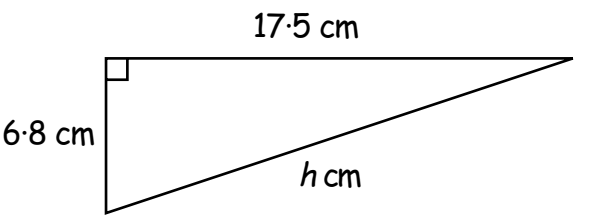
6. Calculate the length of the hypotenuse marked x cm (to 2 decimal places).



7. 

Calculate the length of the line marked h cm, to 2 decimal places.

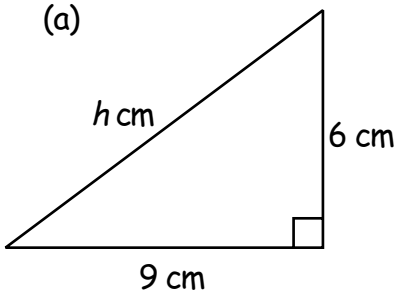
8. Calculate the length of the hypotenuse in this right angled triangle, correct to 2 decimal places.



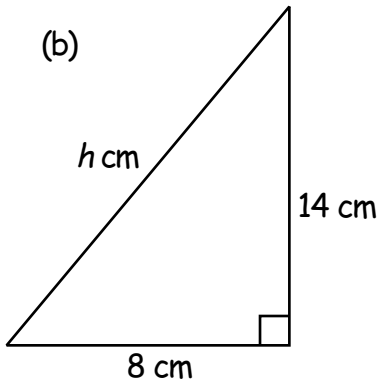
9. Make a neat "sketch" of each of these right angled triangles :-

Use Pythagoras' Rule (called **Pythagoras' Theorem**) to calculate the length of the hypotenuse each time, correct to two decimal places.

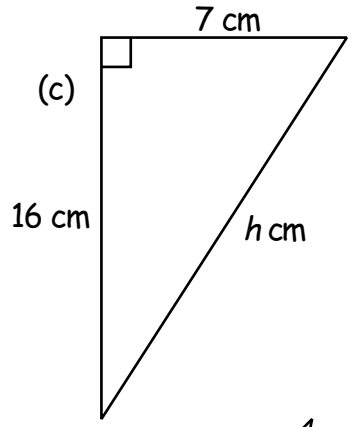
(a)



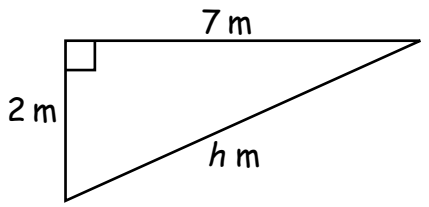
(b)



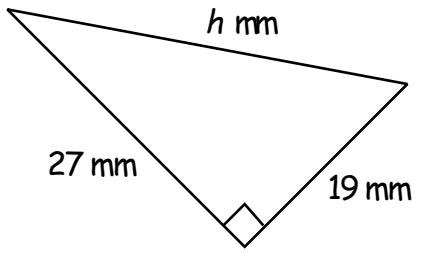
(c)



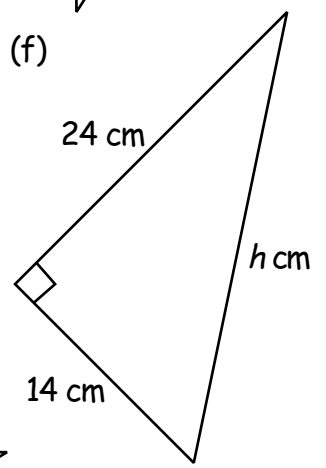
(d)



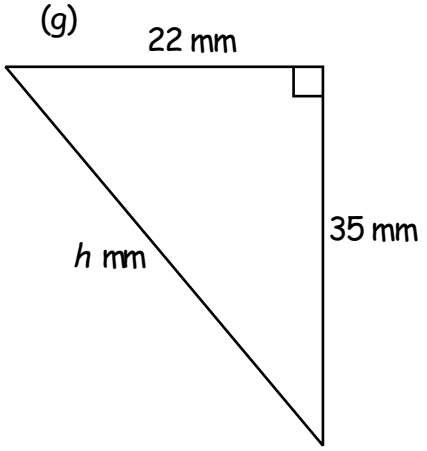
(e)



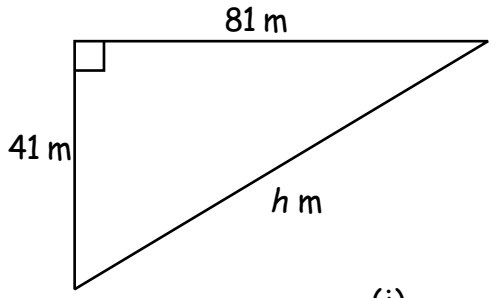
(f)



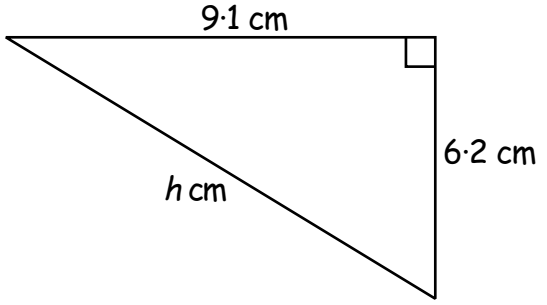
(g)



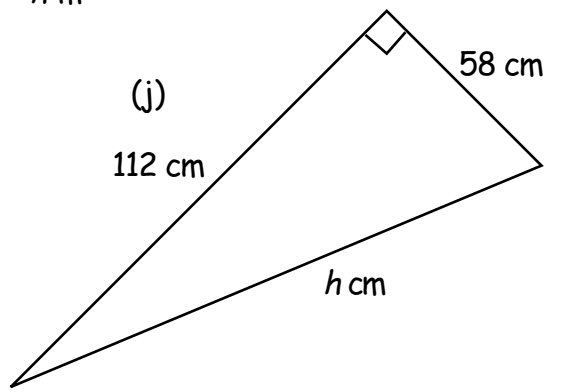
(h)



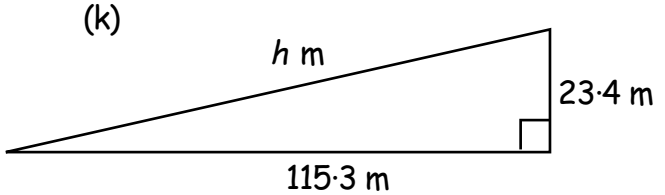
(i)



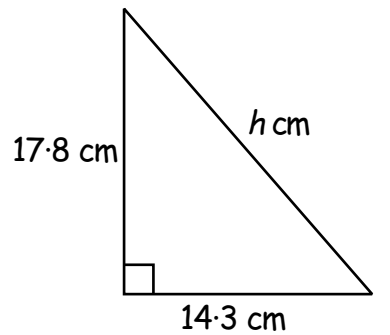
(j)



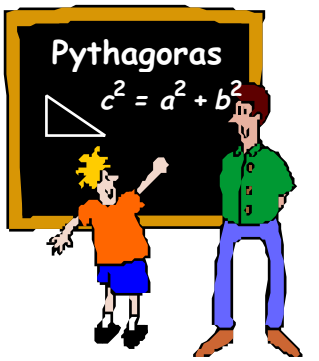
(k)



(l)



Problems involving Pythagoras Theorem

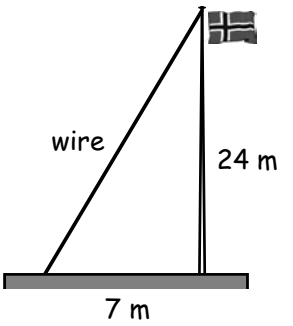


Whenever you come across a problem involving finding a missing side in a right angled triangle you should consider using Pythagoras' Rule to calculate its length

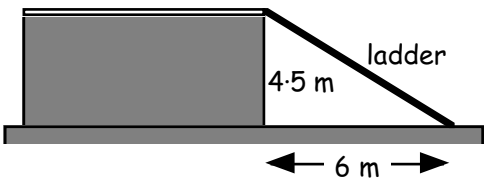
Exercise 5

(The triangles in questions 1 to 7 are right-angled)

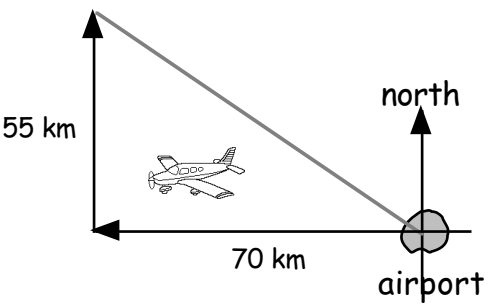
1. A wire is used to support a flagpole.
Calculate the length of the wire.



2. A ladder rests against a wall as shown.
Calculate the length of the ladder.

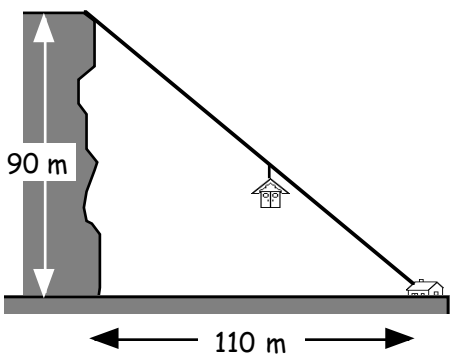


3. A plane left Edinburgh Airport. The pilot flew 70 kilometres West. He then flew 55 kilometres due North. Calculate how far away the plane then was from Edinburgh Airport.

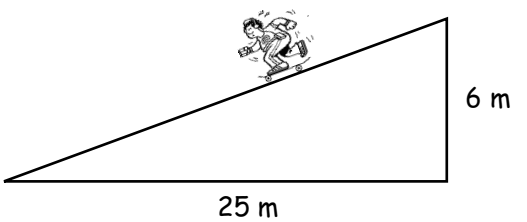


4. A cable-car, attached to a strong wire cable, is hauled up the mountain.

Calculate the length of the cable.

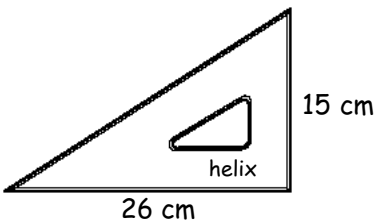


5. Shown is a wooden skate-board ramp.
Calculate the length of the ramp.



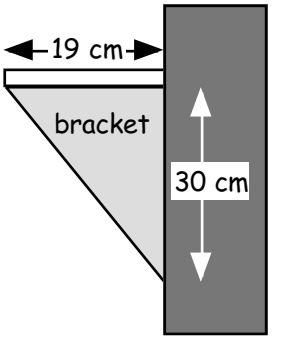
6. This is a "set square" used in mathematics.

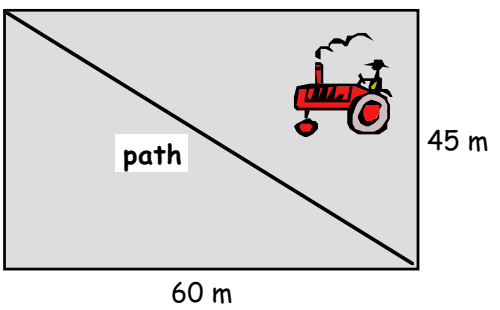
Calculate the length of the longest side.



7. A triangular bracket is fixed to a wall to support a shelf 19 centimetres wide.

Calculate the length of the sloping side of the bracket.



8. 

Farmer Wilkes has a field in the shape of a rectangle 60 metres long by 45 metres wide.

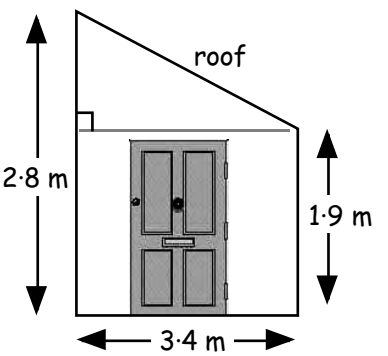
A diagonal path runs across the field.

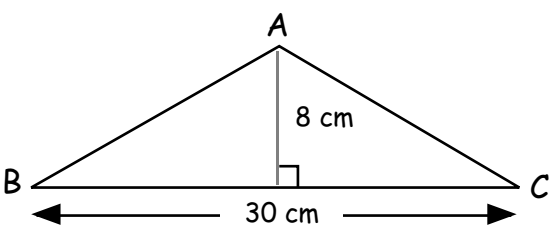
Calculate the length of the path.

9. The picture shows the side view of a "lean-to" hut.

Calculate the length of the sloping roof.

(Hint :- just consider the right angled triangle at the top)



10. 

Be careful this time :-
Triangle ABC is **isosceles**.
Calculate the length of the side AB.

(**not** $c^2 = 8^2 + 30^2$) !!!!!

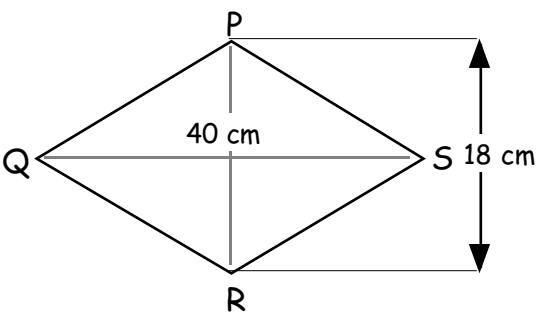
11. PQRS is a rhombus.

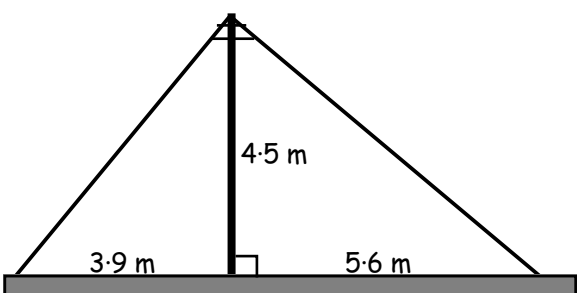
The long diagonal QS is 40 centimetres.

The shorter diagonal PR = 18 centimetres.

Calculate the length of any of its 4 sides.

(*they are all the same length*).



12. 

Two wires are used to support a telephone pole as shown in the diagram.

Calculate the **total** length of wire required.

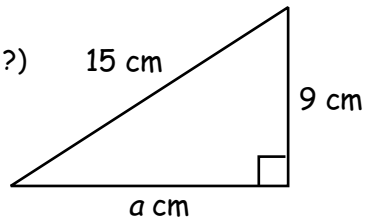
Finding the Length of a Smaller Side (*optional) (this will be covered again in S4)

You can use Pythagoras' Rule to calculate one of the smaller sides as follows :-

Can you see this time that to find a smaller side (a) :-

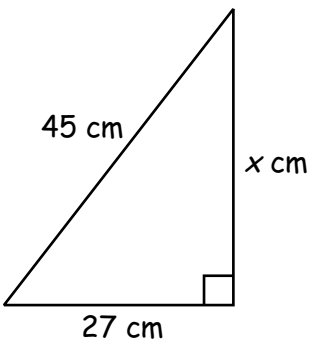
$$\Rightarrow \quad a^2 = c^2 - b^2$$
$$\Rightarrow \quad a^2 = 15^2 - 9^2$$
$$\Rightarrow \quad a^2 = 225 - 81 = 144$$
$$\Rightarrow \quad a = \sqrt{144} = 12 \text{ cm}$$

(can you see why the "–" sign ?)



Exercise 5

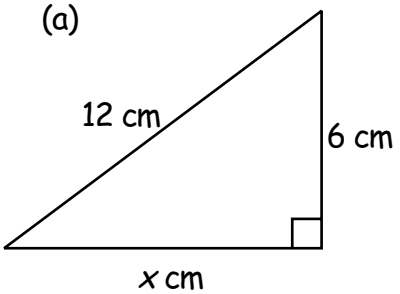
1. Calculate the length of the side of this right angled triangle marked with an x.



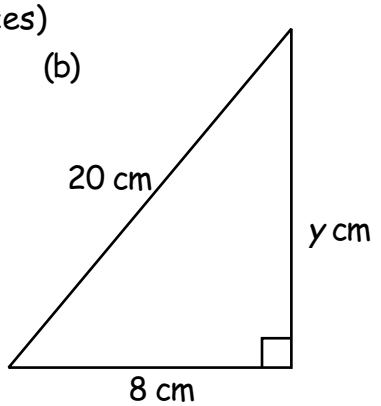
$$a^2 = c^2 - b^2$$
$$\Rightarrow \quad x^2 = 45^2 - 27^2$$
$$\Rightarrow \quad x^2 = 2025 - 729$$
$$\Rightarrow \quad x^2 = 1296$$
$$\Rightarrow \quad x = \,?\text{ cm}$$

2. Calculate the size of each of the smaller sides in the following right angled triangles. (to 2 decimal places)

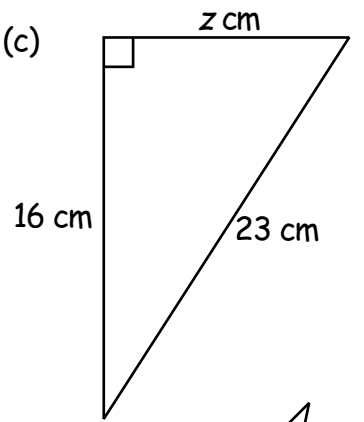
(a)



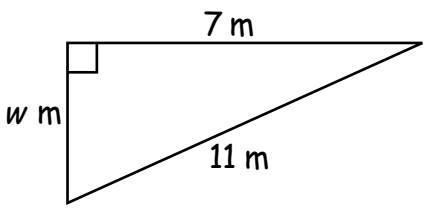
(b)



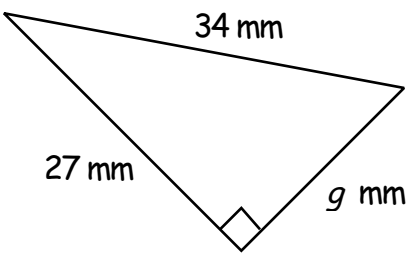
(c)



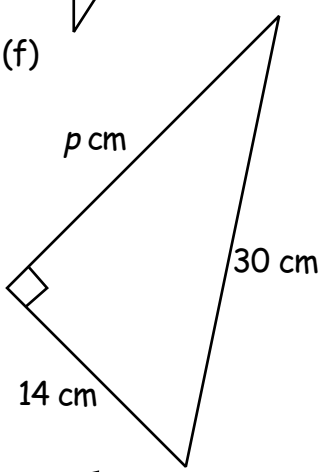
(d)



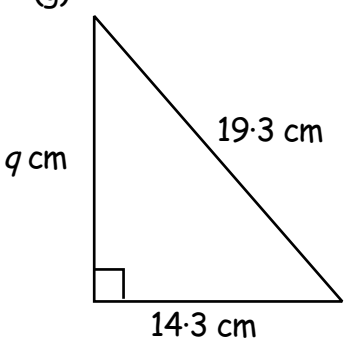
(e)



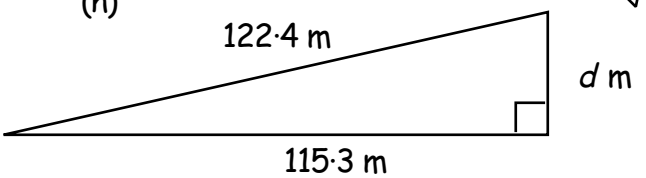
(f)



(g)



(h)

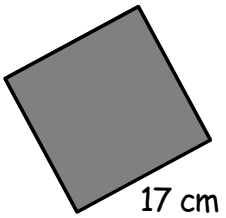


What have I learned ?

1. Use a calculator to find the values of :-

   (a) 13^2 (b) 19^2 (c) 43^2 (d) 101^2

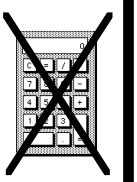
2. Calculate the **area** of this square :-



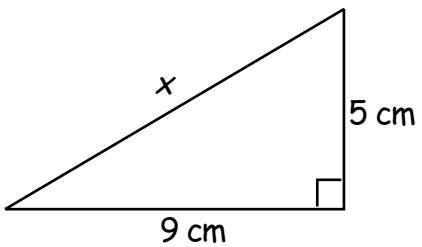
3. Use your calculator to find the following **to two decimal places** :-

   (a) $\sqrt{40}$ (b) $\sqrt{85}$ (c) $\sqrt{170}$ (d) $\sqrt{18 \cdot 9}$

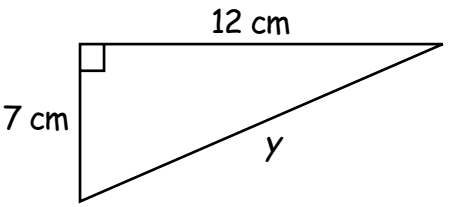
4. Calculate the lengths of the hypotenuses of these right angled triangles :-
   (*give your answers to 1 decimal place*)



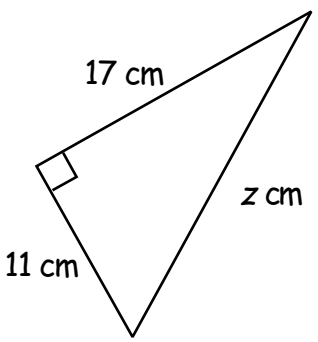
(a)



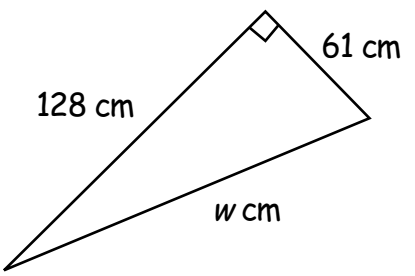
(b)



(c)

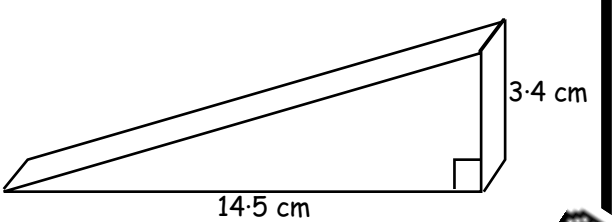


(d)



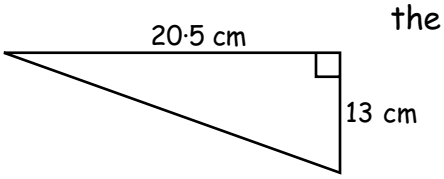
5. The side face of this door wedge is in the shape of a right angled triangle.

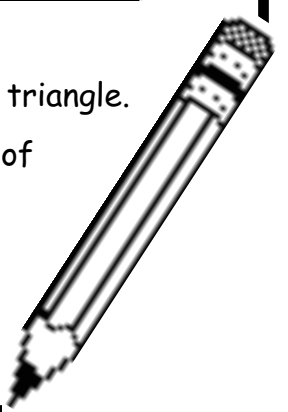
   Calculate the length of the sloping edge.



6. The wing of the paper plane is a right angled triangle.

   Calculate the length of the sloping edge.





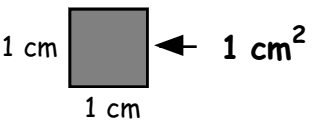
Chapter 14

The **AREA** of a shape is defined as :-

"how much space it takes up"

If you think of a box 1 cm by 1 cm, we say it has an area of :-

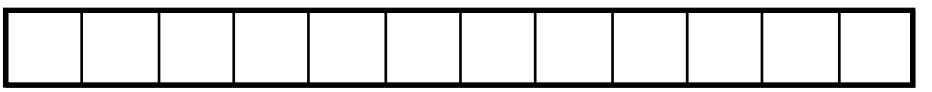
or **1 square centimetre** / **1 cm^2** (for short).



(note 1 cm^2 reads as "1 square centimetre")

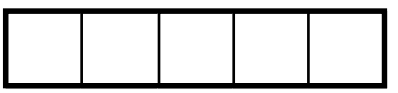
Exercise 1

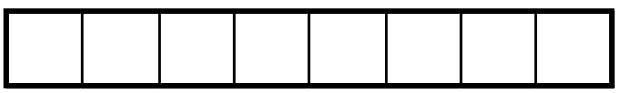
1. (a) How many boxes (1 centimetre by 1 centimetre) are shown here ?

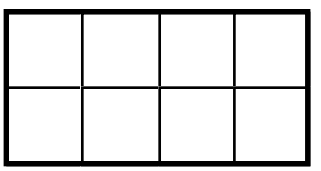


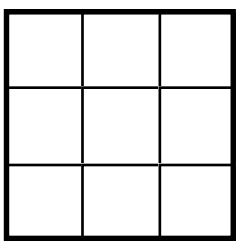
(b) Write down the area as :- Area = ? cm^2.

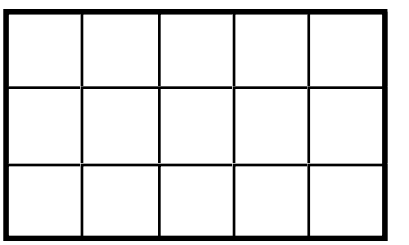
2. Write down the areas (use cm^2) of each of the following shapes :-

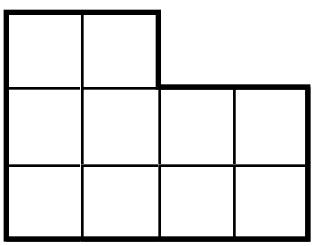
(a) 

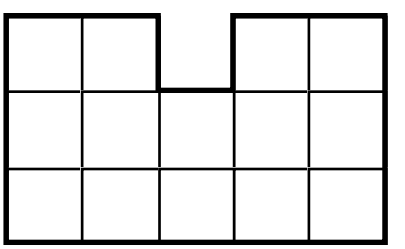
(b) 

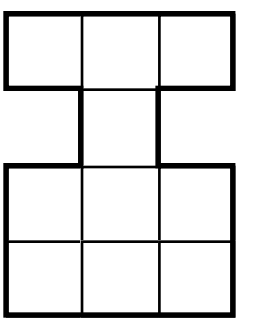
(c) 

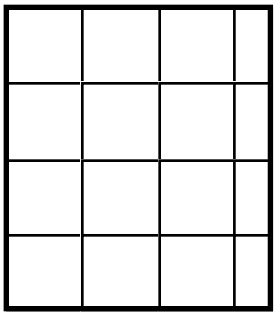
(d) 

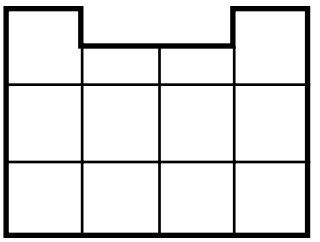
(e) 

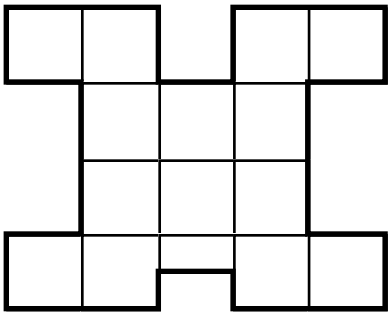
(f) 

(g) 

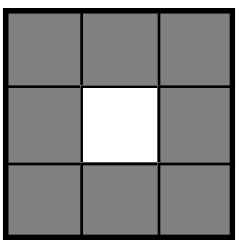
(h) 

(i) 

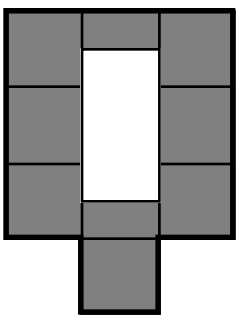
(j) 

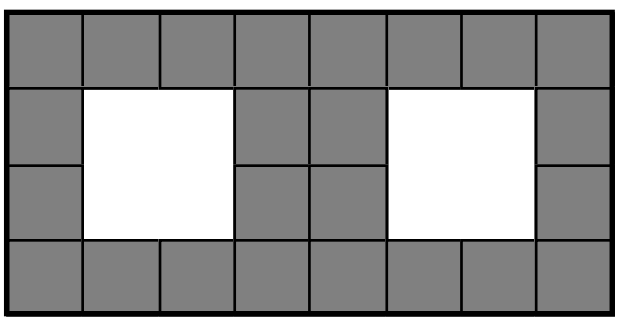
(k) 

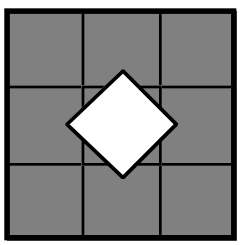
3. Calculate the shaded areas (don't include the holes) :-

(a) 

(b) 

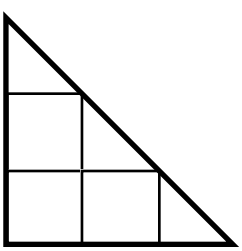
(c) 

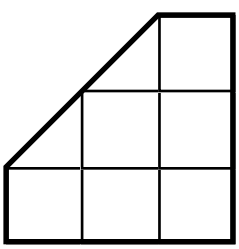
(d) 

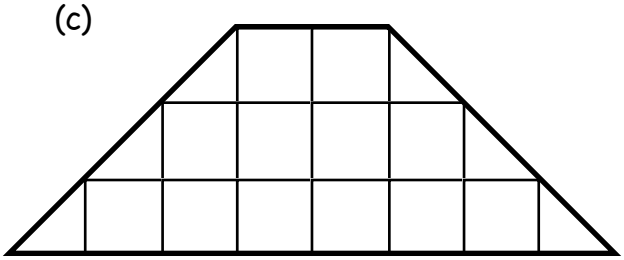
(e) 

4. **Be careful here with $\frac{1}{2}$ squares !!**
Find the areas of :-

 = $\frac{1}{2}$ cm^2

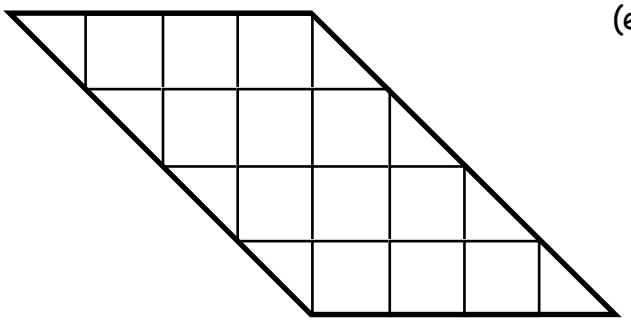
(a) 

(b) 

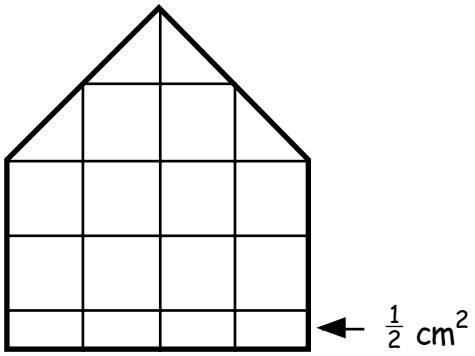
(c) 

cont'd .....

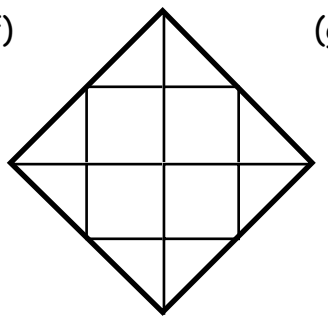
(d)



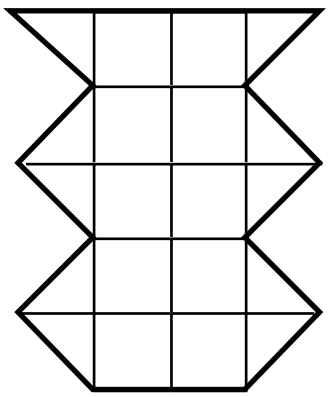
(e)



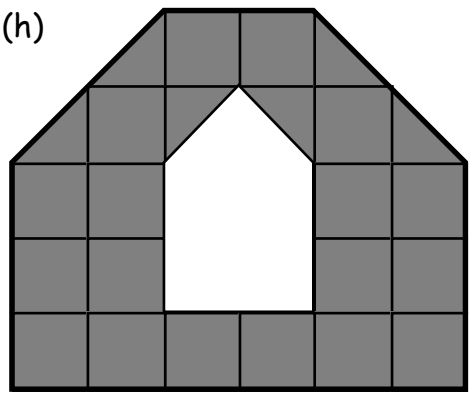
(f)



(g)



(h)



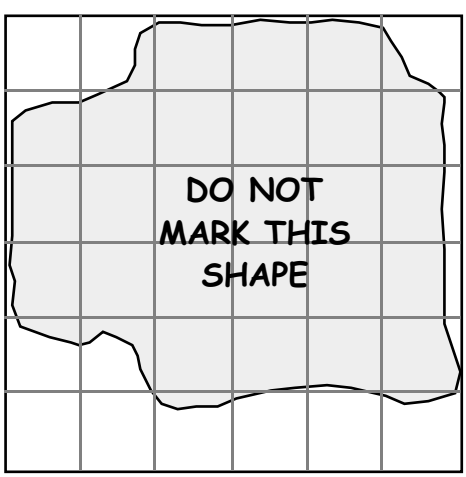
(Shaded area only)

5. Estimate the areas of these shapes as follows :-

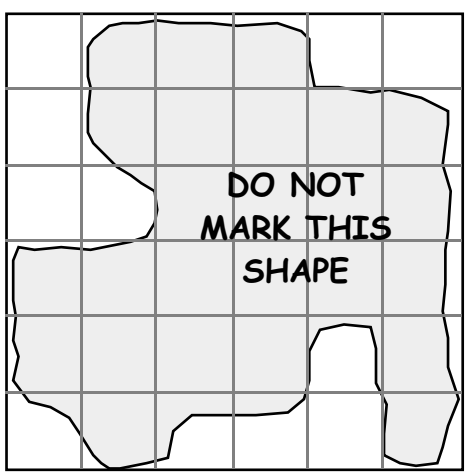
If more than $\frac{1}{2}$ a box is covered —> count it as 1 cm^2

If less than $\frac{1}{2}$ a box is covered —> do not count it at all

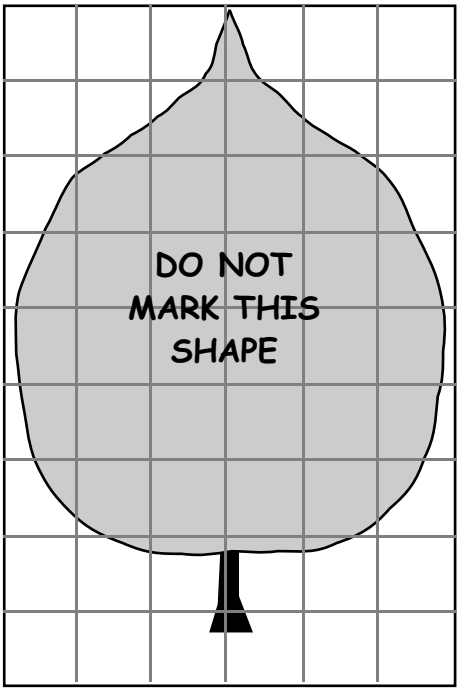
(a)



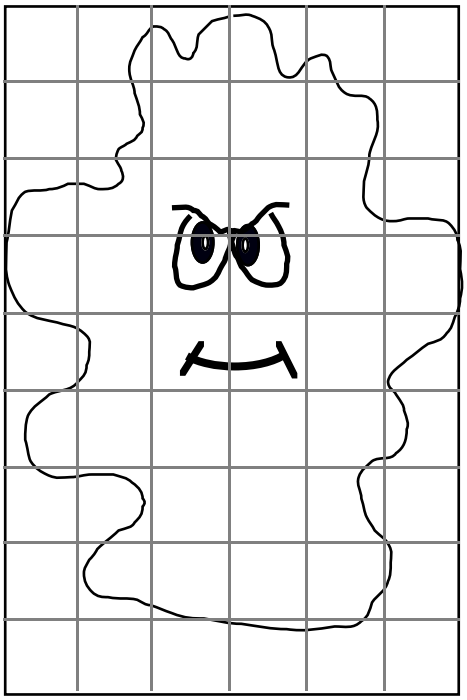
(b)



(c)

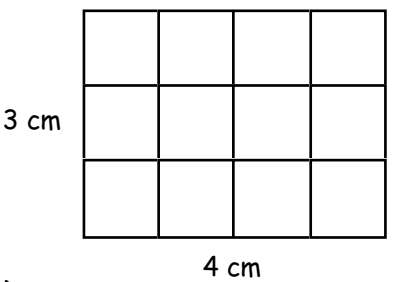


(d)



Area of a Rectangle (a formula)

This rectangle measures 4 centimetres by 3 centimetres.



(a) Calculate its area (in cm^2) by counting all the boxes.

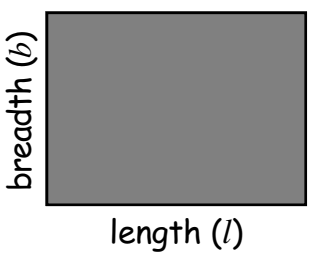
(b) Now write down the answer you get when you multiply its length by its breadth :-

=> 4 cm x 3 cm (do you get the same answer ?)

A really simple way of calculating the area of a rectangle is as follows :-

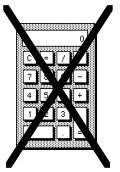
Area = length x breadth

or $\boxed{A = l \times b}$ for short.



It is VERY important that you learn how to use the formula,

$A = l \times b$ when calculating the area of a rectangle.

Exercise 2  no calculator in this exercise until Question 5.

1. (a) Draw a rectangle 5 centimetres long by 2 centimetres wide.

   (b) Divide the rectangle neatly into 1 cm square boxes and count the boxes to find the area of the rectangle.

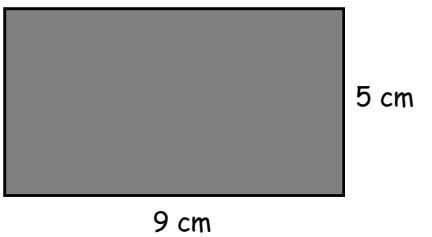
   (c) Use the formula $A = l \times b$ (width l = 5, b = 2) to calculate the area and check your answer is the same as that obtained in part (b).

2. This is a sketch of a rectangle.

   Use the formula

   $$A = l \times b$$

   to calculate its area (in cm^2).

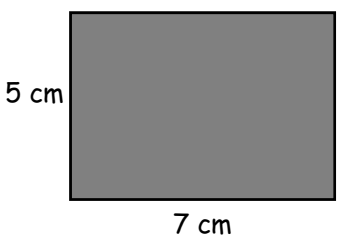


3. Calculate the area of each of the following rectangles.

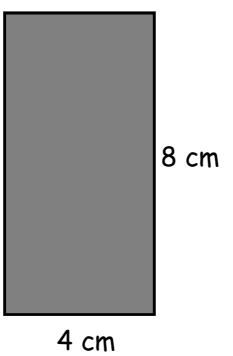
   (in each case, make a small "sketch" of the rectangle,

   write down the rule "$A = l \times b$" and calculate the area in cm^2.

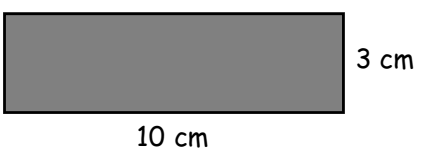
(a)



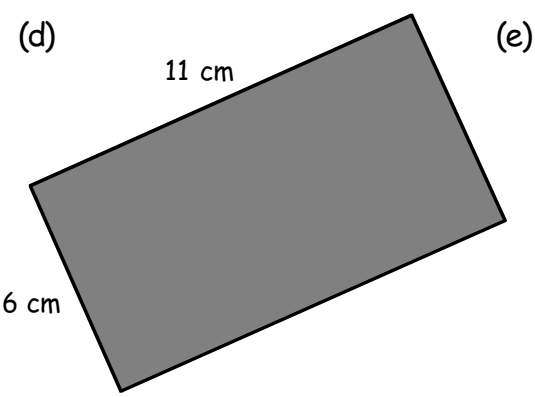
(b)



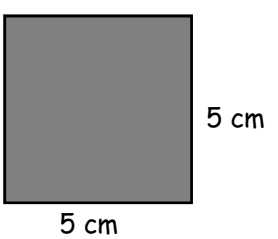
(c)



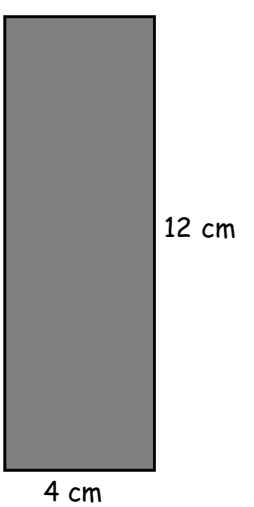
(d)



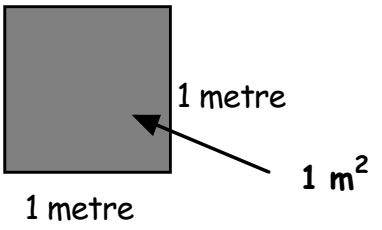
(e)



(f)



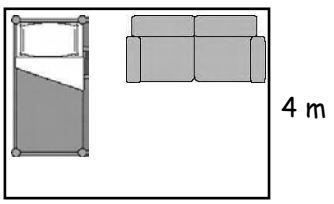
4. If the length and breadth are in metres, then the area will be in **square metres**.



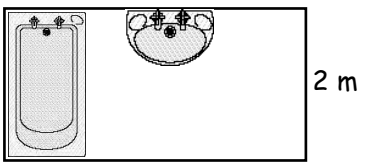
The area of this box would be 1 m²

Use your formula ($A = l \times b$) to calculate the areas of these rooms in square metres :-

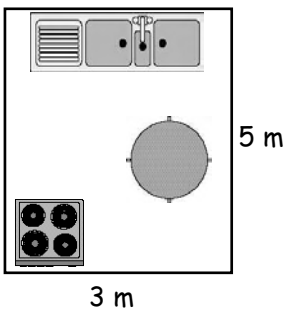
(a)



(b)



(c)



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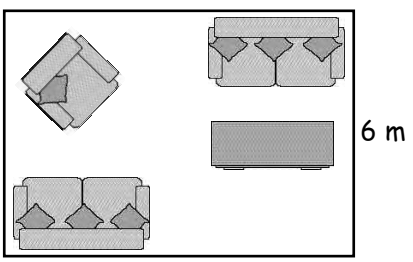

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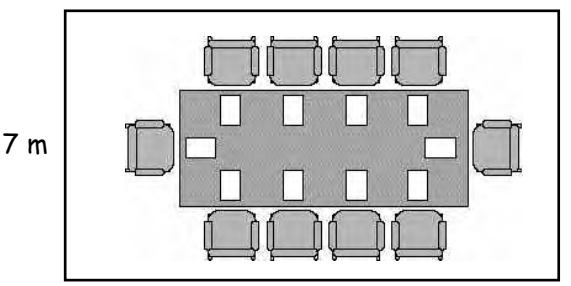
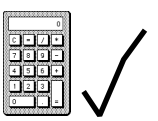
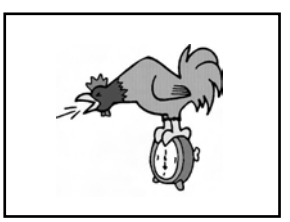


5. Calculate the areas of these rectangular fields in m^2 :-
(you may use a calculator here)

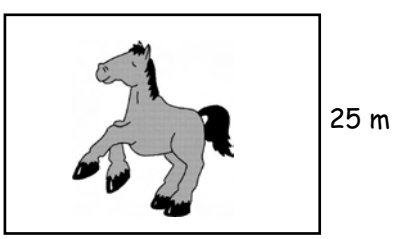


(a)

(b)



(c)



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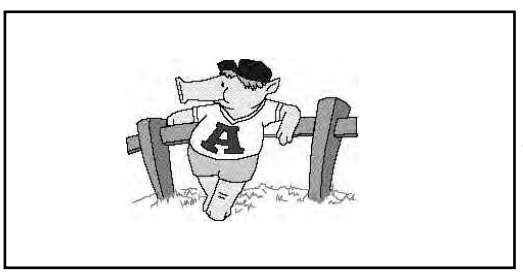

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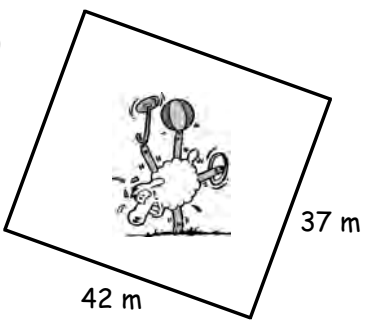
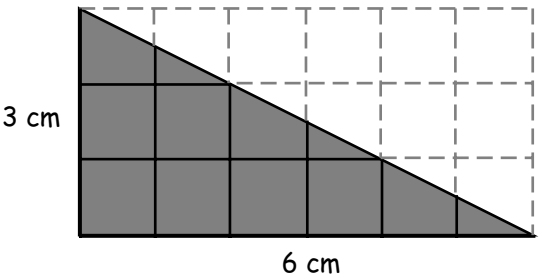


Area of a Right Angled Triangle

To calculate the area of a Right Angled Triangle :-

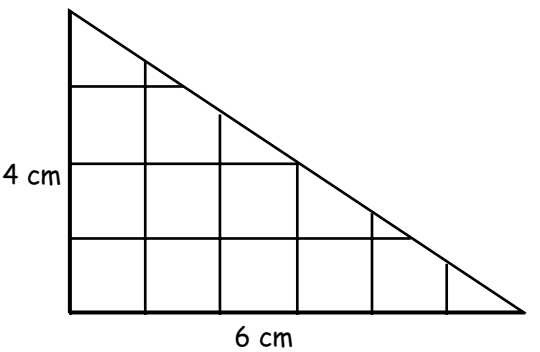
Step 1 – Look at the surrounding rectangle
=> Area = $6 \times 3 = 18$ cm^2.

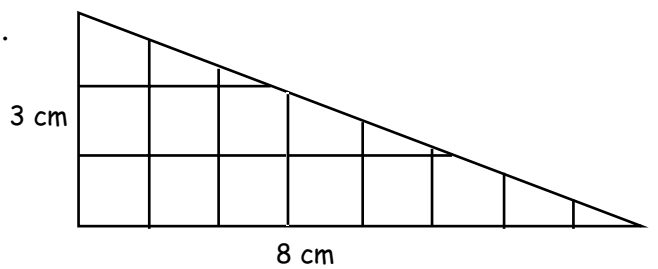
Step 2 – Halve your answer =>
=> Area = $\frac{1}{2}$ of $18 = 9$ cm^2.



Exercise 3

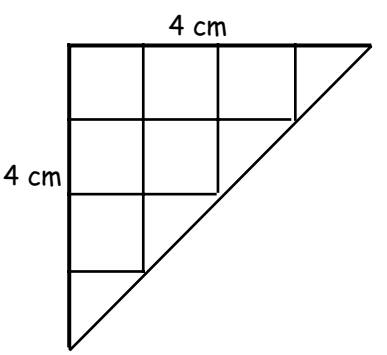
1. (a) Make an accurate drawing of this right angled triangle.
   (b) Complete the figure by drawing the surrounding rectangle.
   (c) Calculate the area of the rectangle.
   (d) Now write down the area of the triangle.



2. 

   (a) Make an accurate drawing of this right angled triangle.
   (b) Complete the figure by drawing the surrounding rectangle.
   (c) Calculate the area of the rectangle.
   (d) Now write down the area of the triangle.

3. (a) Make an accurate drawing of this right angled triangle.
   (b) Complete the figure by drawing the surrounding square.
   (c) Calculate the area of the square.
   (d) Now write down the area of the triangle.

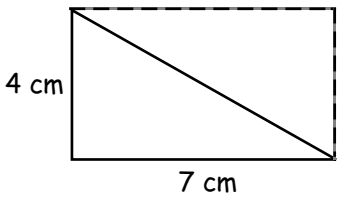


4. For the following right angled triangles :-

(i) Make a small neat sketch (ii) Draw the surrounding rectangle.

(iii) Find the area of the rectangle. (iv) Calculate the area of the triangle

(a)

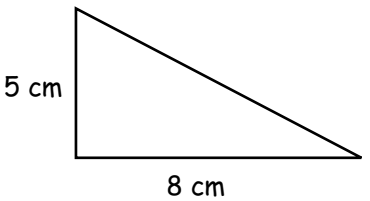


Area (rectangle) = $l \times b$ = 4 x 7

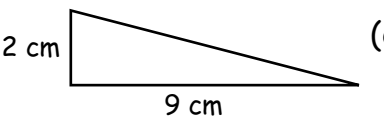
= 28 cm^2

Area (triangle) = $\frac{1}{2}$ of 28 = ? cm^2

(b)



(c)



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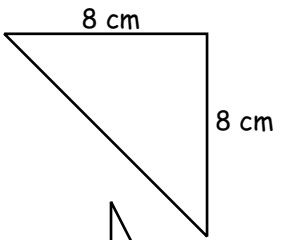
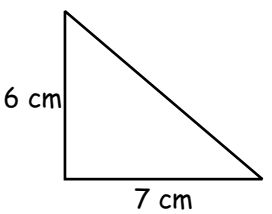
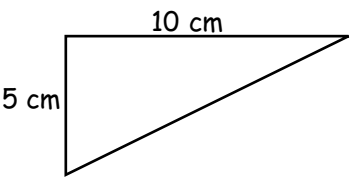


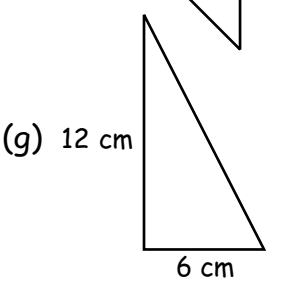
(e)



(f)



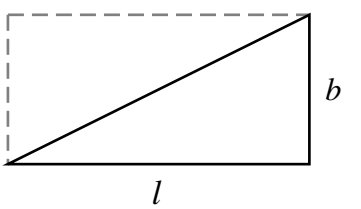
(g)



A Formula (Rule) for calculating the area of a Triangle

Remember ! the area of a rectangle is given by :-

$A = l \times b$



The area of a triangle is therefore given by :-

Area = $\frac{1}{2}$ length x breadth

or $A = \frac{1}{2}(l \times b)$ for short **To be learned !!!**

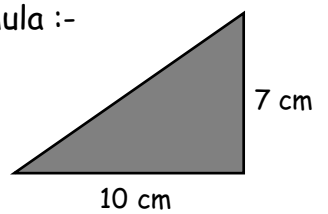
5. (a) Make a small (neat) sketch of this triangle.

(b) Copy this working and calculate its area using the formula :-

$A = \frac{1}{2}(l \times b)$

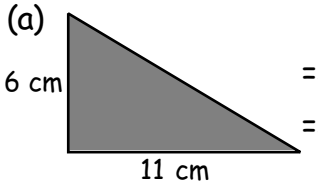
=> $A = \frac{1}{2}$ of (10×7)

=> $A =$? cm^2



6. Sketch each right angled triangle (roughly, but using a ruler).
Use the formula to calculate the area each time.

(a)

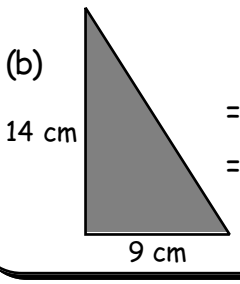


$A = \frac{1}{2}\ (l \times b)$

=> $A = \frac{1}{2}$ of (11×6)

=> $A =$? cm^2

(b)

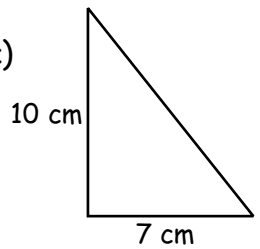


$A = \frac{1}{2}\ (l \times b)$

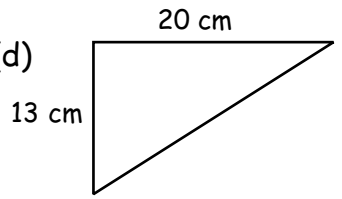
=> $A = \frac{1}{2}$ of $(9 \times ?)$

=> $A =$? cm^2

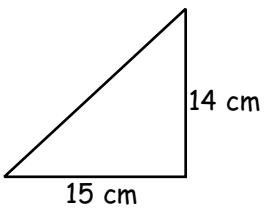
(c)



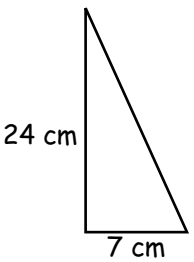
(d)



(e)



(f)



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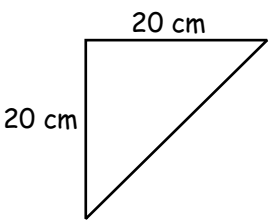
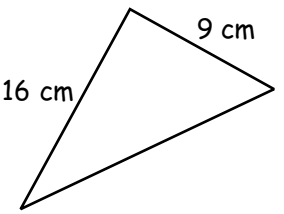
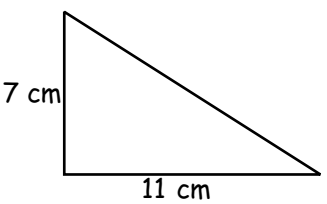


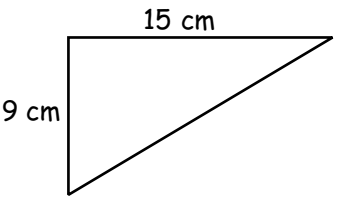
(h)



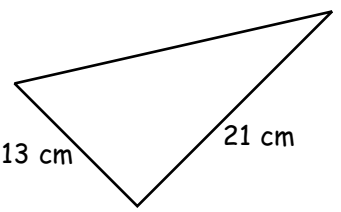
(i)



(j)



(k)

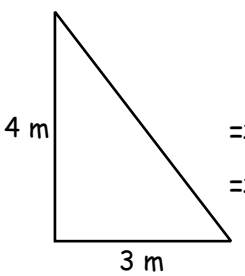


7. **Remember :-**

If the length and breadth are in cm	=>	Area is in **cm^2**.
If the length and breadth are in mm	=>	Area is in **mm^2**.
If the length and breadth are in m	=>	Area is in **m^2**.

Calculate the areas of these right angled triangles (in mm^2, cm^2 or m^2) :-
(Use the formula each time)

(a)

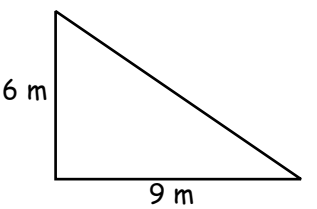


$A = \frac{1}{2}\ (l \times b)$

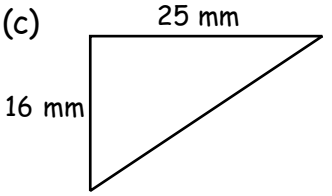
=> $A = \frac{1}{2}$ of $(3m \times 4m)$

=> $A =$? m^2

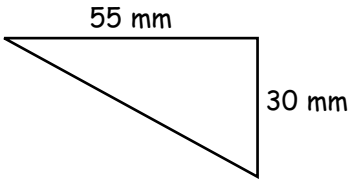
(b)



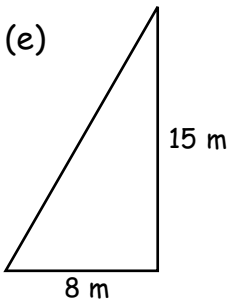
(c)



(d)



(e)



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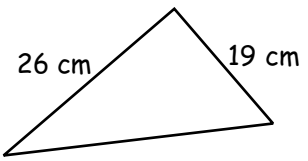
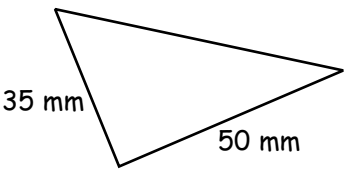
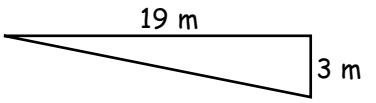


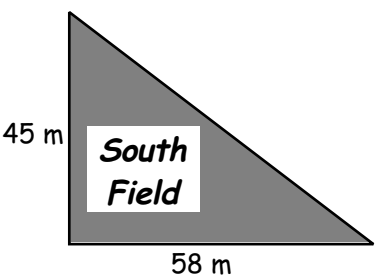
(g)

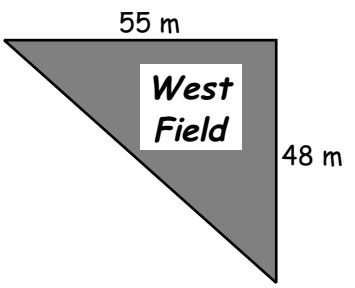


(h)



8. Farmer McDougall has 2 fields.
Each field is in the shape of a right angled triangle.

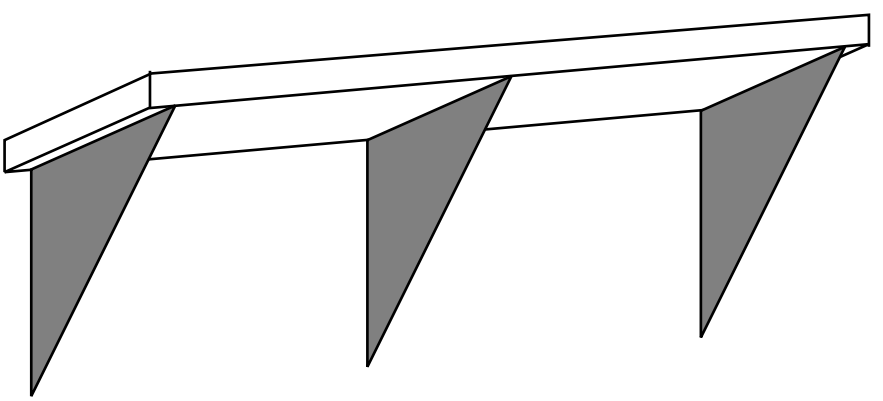


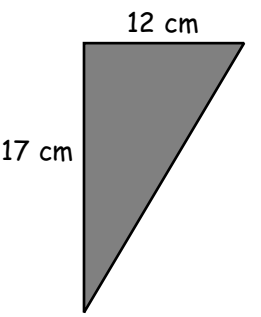


(a) Which of the 2 fields has the larger area ?

(b) By how much is one field bigger than the other ?

9. Three identical metal brackets are used to support a shelf.



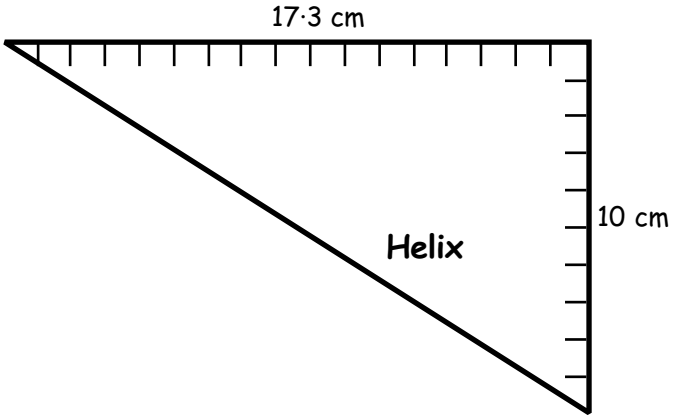


Each bracket is a right angled triangle.

Calculate the total area of metal needed to make all 3 brackets.

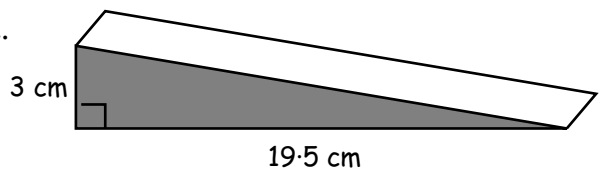
10. A plastic set-square measures 17·3 cm by 10 cm.

Calculate the area of the plastic.



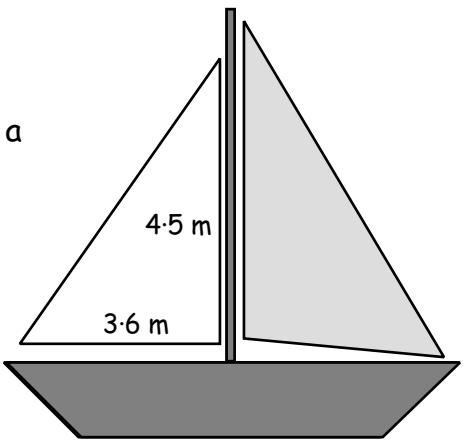
11. This side view of a wooden door wedge shows the height is 3 cm and the length is 19·5 cm.

Calculate the area of the shaded part.



12. The white sail of this yacht is in the shape of a right angled triangle.

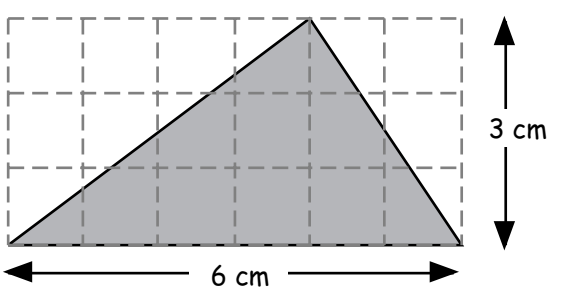
Calculate its area in m^2.



The Area of ANY Triangle

The formula (or rule) :- Area = $\frac{1}{2}$ ($l \times b$) works for ALL triangles.
(*not just right angled triangles*)

Can you see in this figure that the area of the surrounding rectangle is given by



Area $_{(rect)}$ = $l \times b$ = 6 cm × 3 cm
= 18 cm^2

Area $_{(triangle)}$ = $\frac{1}{2}$ ($l \times b$) = $\frac{1}{2}$ of (6 × 3)
= $\frac{1}{2}$ of 18
= 9 cm^2

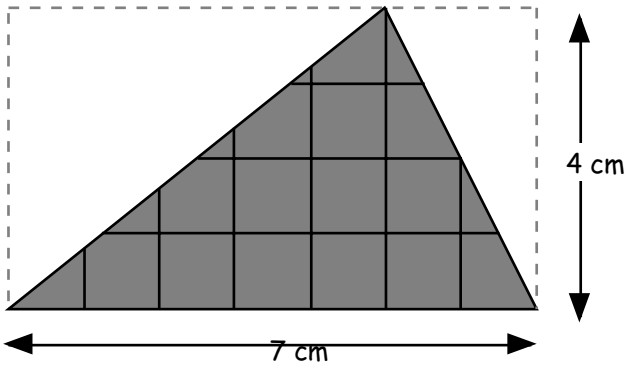
Exercise 4

1. (a) Make an accurate drawing of this triangle.

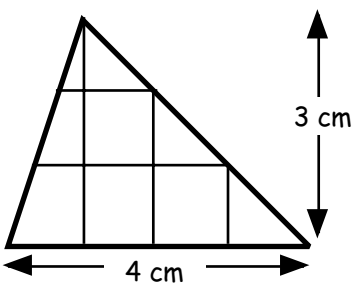
   (b) Draw the surrounding rectangle.

   (c) Calculate the area of the rectangle.

   (d) Now write down the area of the triangle.



2.

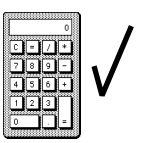


(a) Make an accurate drawing of this triangle.

(b) Draw the surrounding rectangle.

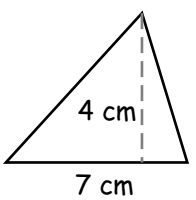
(c) Calculate the area of the rectangle.

(d) Now write down the area of the triangle.



3. Use the formula Area = $\frac{1}{2}$ $(l \times b)$ each time to calculate the areas of the following triangles (make a neat sketch of each triangle) :-

(a)

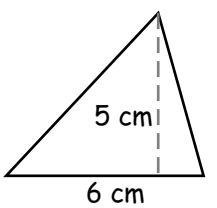


$A = \frac{1}{2}\ (l \times b)$

=> $A = \frac{1}{2}$ of (7×4)

=> $A =$? cm^2

(b)

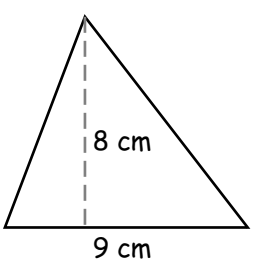


$A = \frac{1}{2}\ (l \times b)$

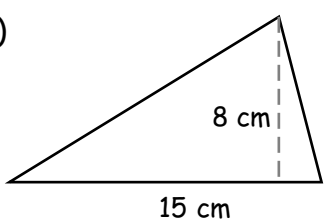
=> $A = \frac{1}{2}$ of $(6 \times ?)$

=> $A =$? cm^2

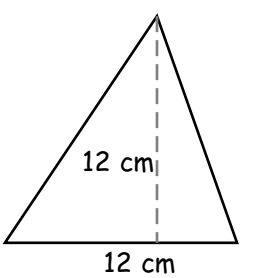
(c)



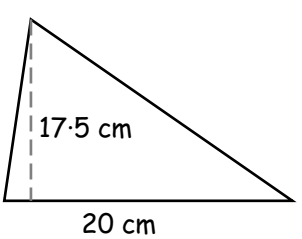
(d)



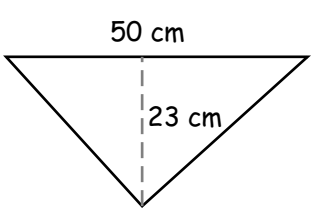
(e)



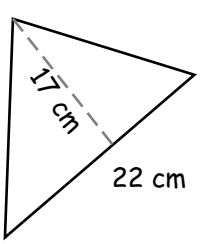
(f)



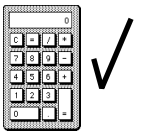
(g)



(h)

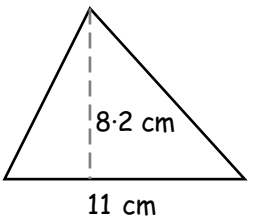


4. Calculate the areas of each of the following triangles :-

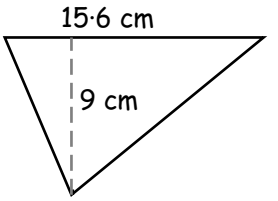


(you do not have to sketch them but you must write down the formula and show your working)

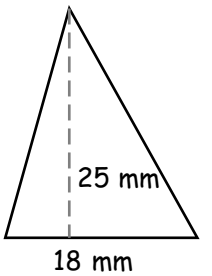
(a)



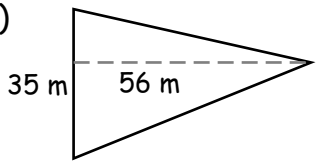
(b)



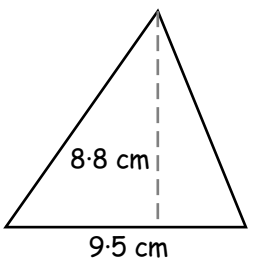
(c)



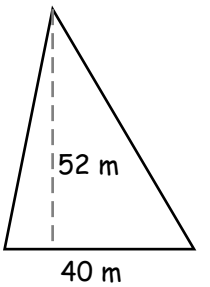
(d)



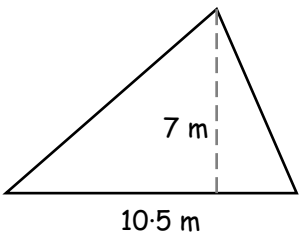
(e)



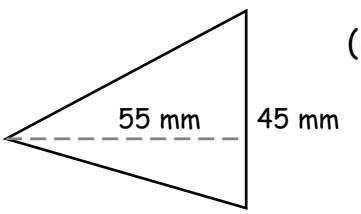
(f)



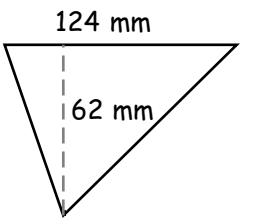
(g)



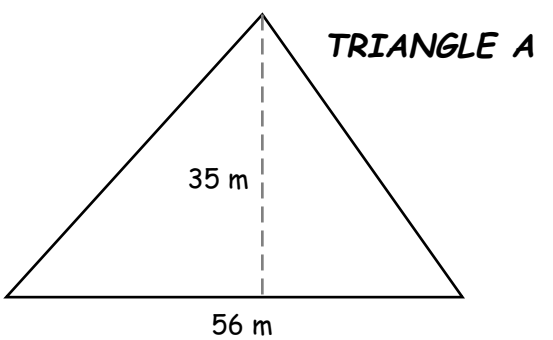
(h)

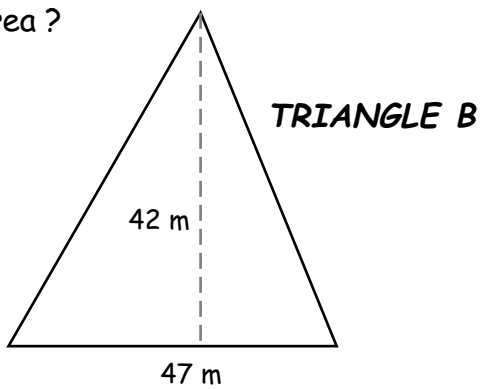


(i)

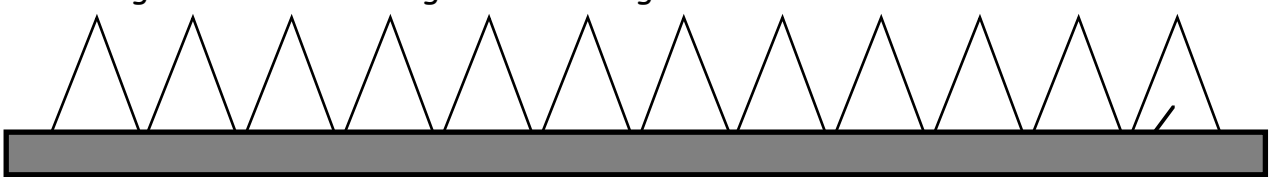


5. (a) Which of these triangles has the bigger area ?



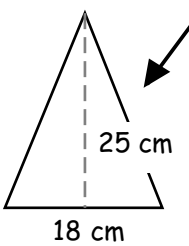


6. Triangular wooden fencing is used to edge a lawn.



Each triangle measures 18 cm wide by 25 cm high.

Calculate the TOTAL area of wood required to make all 12 triangular edging pieces.

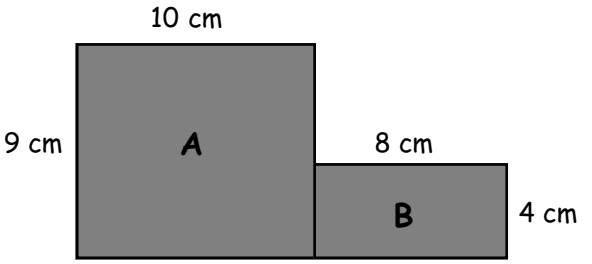


Combining Areas

If a shape is made up of 2 (or more) rectangles, to find its area, simply :-

Step 1 calculate the area of each rectangle

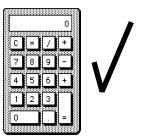
Step 2 add the areas together



=> Area (of A) = $l \times b$ = 10 × 9 = 90 cm^2

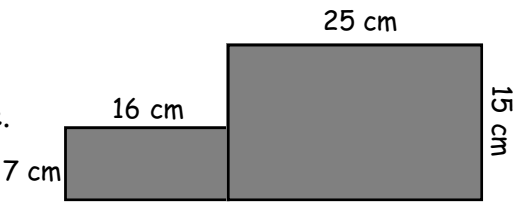
=> Area (of B) = $l \times b$ = 8 × 4 = 32 cm^2

Total Area = 90 + 32 = 122 cm^2

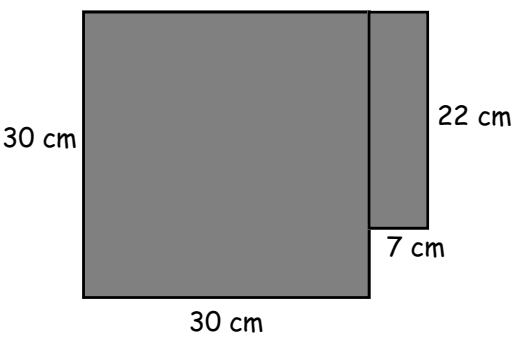


Exercise 5

1. (a) Calculate the area of the big rectangle.
   (b) Calculate the area of the small rectangle.
   (c) Calculate the **total** area of the shape.



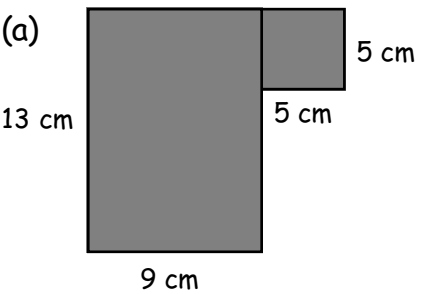
2.



(a) Calculate the area of the square.
(b) Calculate the area of the rectangle.
(c) Calculate the **total** area of the shape.

3. For each of these :-
   (i) Make a neat sketch.
   (ii) Calculate the area of each part (show working)
   (iii) Calculate the area of the whole shape.

(a)

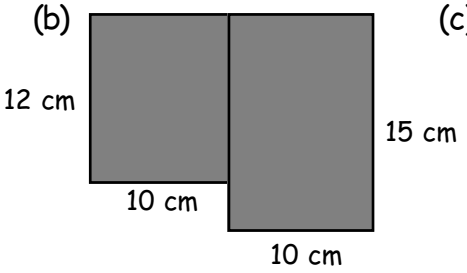


Area of square = $l \times b$ = 5 × 5 = ? cm^2

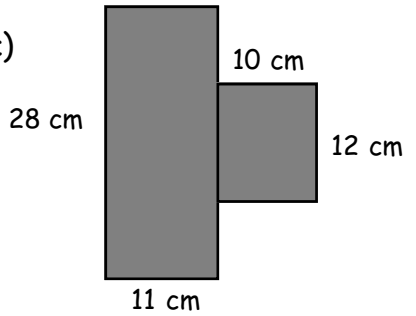
Area of rectangle = $l \times b$ = 9 × ? = ? cm^2

=> Total Area = ? + ? = ? cm^2

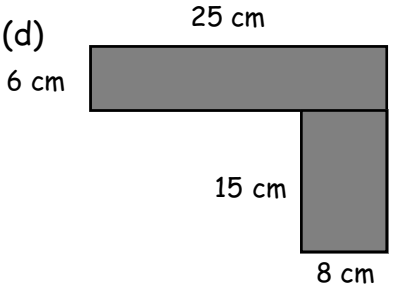
(b)



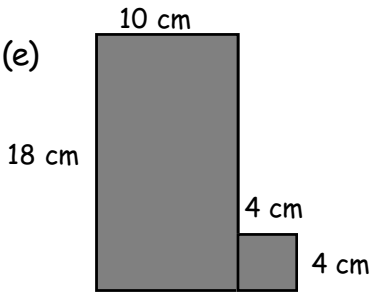
(c)



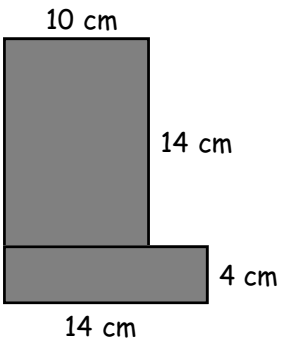
(d)



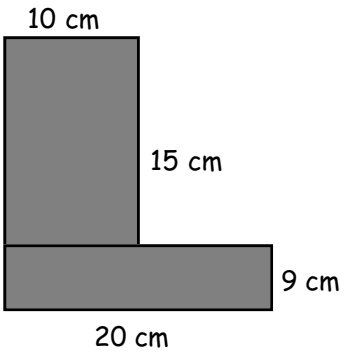
(e)



(f)

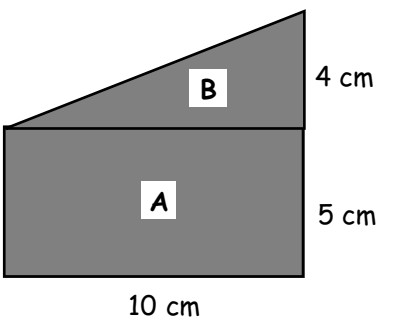


(g)



4. This shape consists of a rectangle and a right angled triangle.

Copy the working and complete it :-

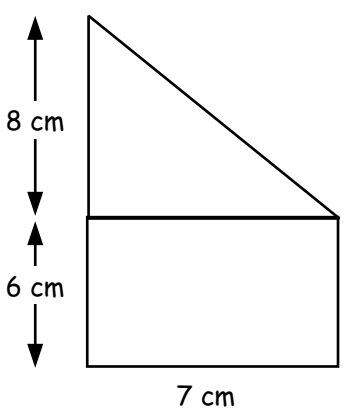


Area of rectangle A = $l \times b$ = 10 × 5 = ? cm^2

Area of triangle B = $\frac{1}{2}$ ($l \times b$) = $\frac{1}{2}$ of 10 × 4 = ? cm^2

=> Total Area = ? + ? = ? cm^2

5.



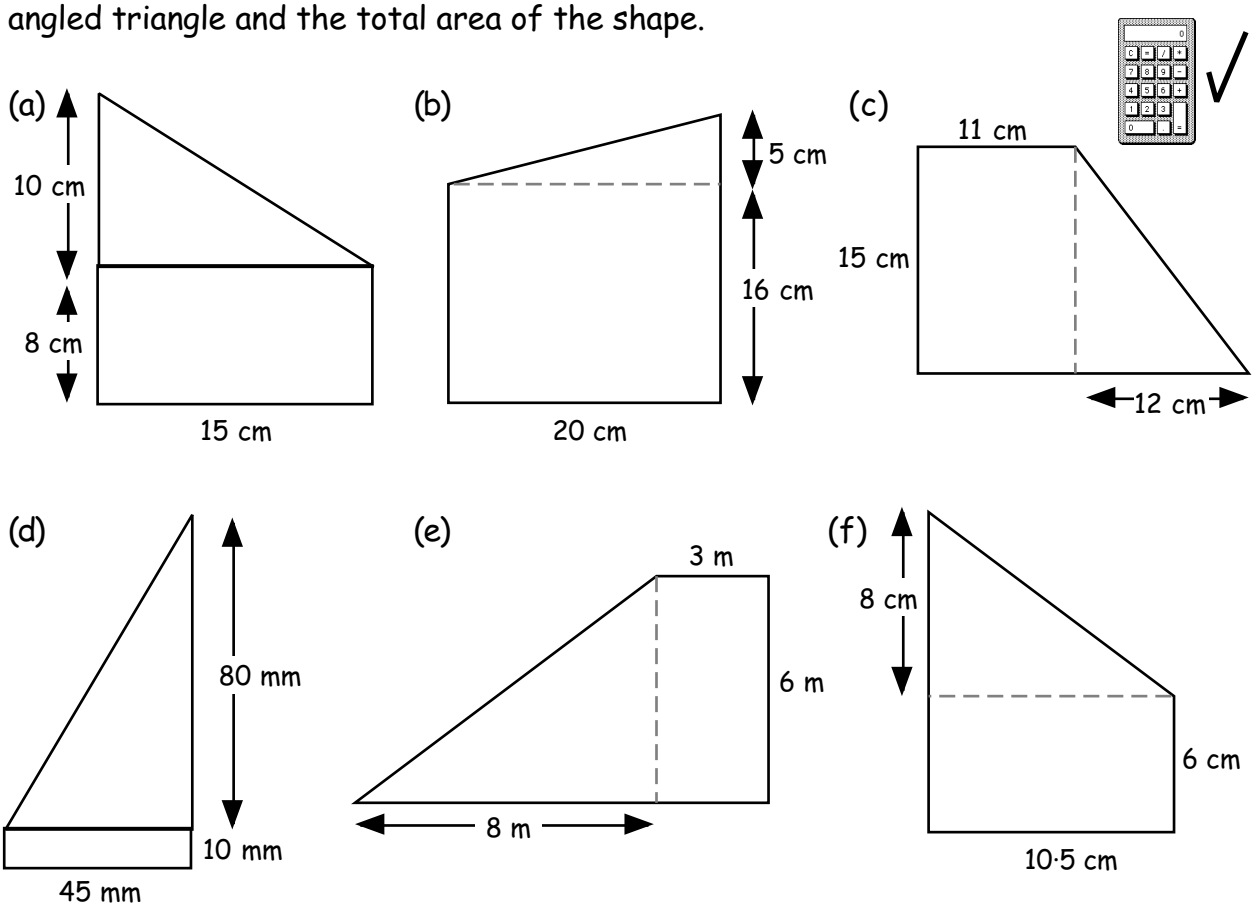
Copy and complete :-

Area of rectangle A = $l \times b$ = 7 cm x ? = ? cm^2

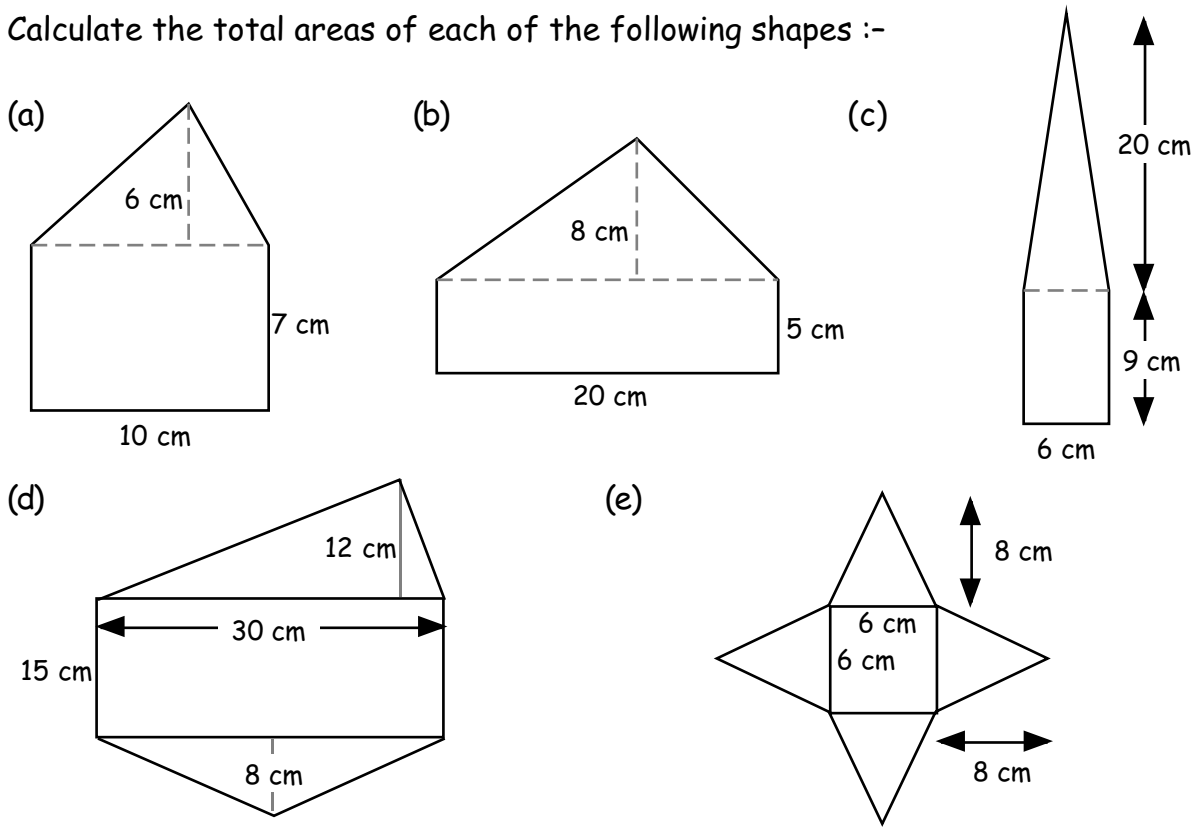
Area of triangle B = $\frac{1}{2}$ ($l \times b$) = $\frac{1}{2}$ of 7 × ? = ? cm^2

=> Total Area = ? + ? = ? cm^2

6. For each shape here, calculate the area of the rectangle, the area of the right angled triangle and the total area of the shape.

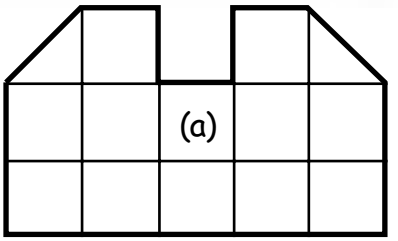


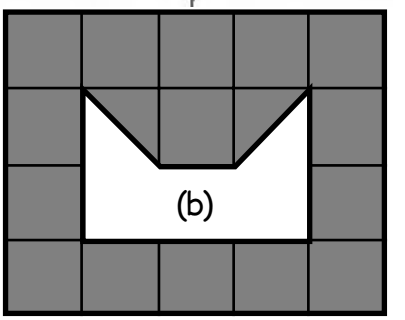
7. Calculate the total areas of each of the following shapes :-



What have I learned ?

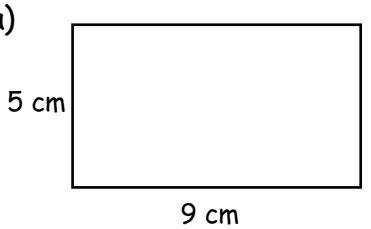
1. Write down the area of shape (a) and the area of the shaded part of shape (b).



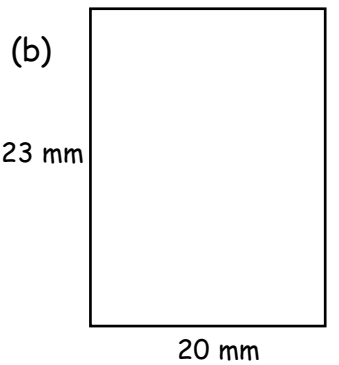


2. Calculate the areas of these rectangles :-
(*show your working*)

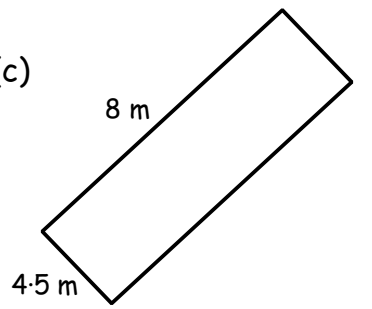
(a)



(b)



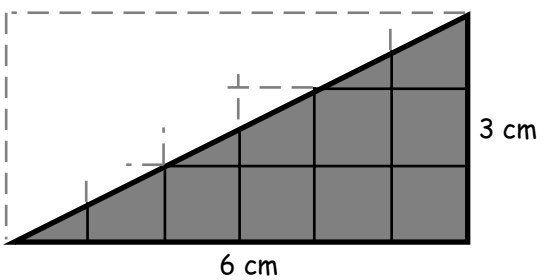
(c)



3. Write down the area of :-

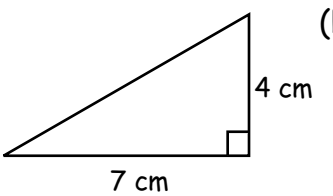
(a) the large rectangle.

(b) the shaded right angled triangle.

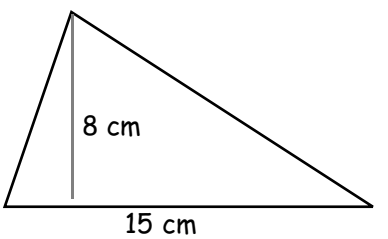


4. Calculate the areas of these triangles :-
(*show your working*)

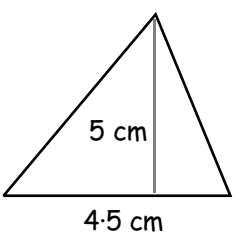
(a)



(b)

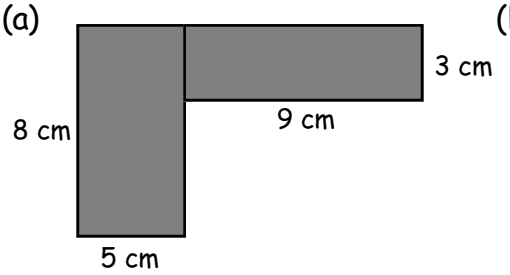


(c)

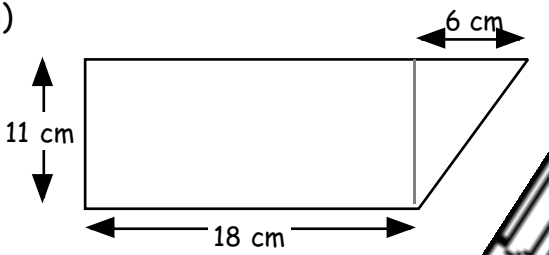


5. Calculate the areas of these two shapes :- (*show your working*)

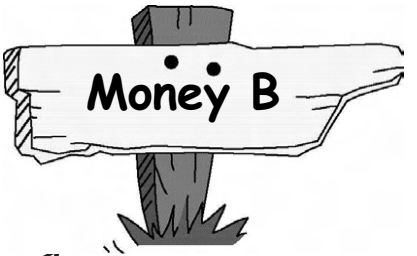
(a)



(b)



Chapter 15



Percentages (Revised)

Remember

50% = $\frac{1}{2}$ (means ÷ 2)
25% = $\frac{1}{4}$ (means ÷ 4)
$33\frac{1}{3}$% = $\frac{1}{3}$ (means ÷ 3)
10% = $\frac{1}{10}$ (means ÷ 10)
1% = $\frac{1}{100}$ (means ÷ 100)

a couple more

75% = $\frac{3}{4}$ (means ÷ 4 **then** × 3)
$66\frac{2}{3}$% = $\frac{2}{3}$ (means ÷ 3 **then** × 2)

and the rest

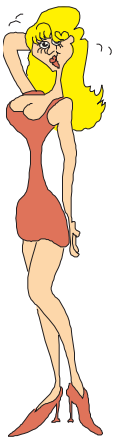
20% = $\frac{2}{10}$ (or $\frac{1}{5}$) (means ÷ 10 **then** × 2)
30% = $\frac{3}{10}$ (means ÷ 10 **then** × 3)
40% = $\frac{4}{10}$ (or $\frac{2}{5}$) (means ÷ 10 **then** × 4)
60% = $\frac{6}{10}$ (or $\frac{3}{5}$) (means ÷ 10 **then** × 6)
70% = $\frac{7}{10}$ (means ÷ 10 **then** × 7)
80% = $\frac{8}{10}$ (or $\frac{4}{5}$) (means ÷ 10 **then** × 8)
90% = $\frac{9}{10}$ (means ÷ 10 **then** × 9)
5% = $\frac{1}{2}$ of 10% (means ÷ 10 **then** ÷ 2)

Exercise 1  *no calculator*

1. Do the following (MENTALLY if possible) – use the above to help :-

(a) 50% of £160	(b) 25% of £1·20	(c) $33\frac{1}{3}$% of £1800
(d) 10% of £360	(e) 20% of £90	(f) 25% of £2·40
(g) $33\frac{1}{3}$% of £150	(h) 50% of £9	(i) 10% of 80p
(j) 30% of £70	(k) 20% of £190	(l) 75% of £40
(m) $66\frac{2}{3}$% of £90	(n) 100% of £7·50	(o) 40% of £120
(p) 90% of £60	(q) 1% of £3500	(r) 75% of £4000
(s) 10% of £640	(t) 5% of £640	(u) $66\frac{2}{3}$% of £3·60
(v) 70% of £80	(w) 80% of £2	(x) 2% of £600

2. A dress is priced at £150.
In a sale there is a **discount** of $33\frac{1}{3}$%.



(a) Calculate the discount.

(b) Calculate the sale price of the dress (£150 – discount).

3. I bought £800 of shares in "Sparks & Mencers".
Last year their value grew by 30%.

(a) By how much in value did they grow ?

(b) Calculate the new value of the shares.

4. 

Last year my salary was £16 000.
I received a rise of 5% this year.

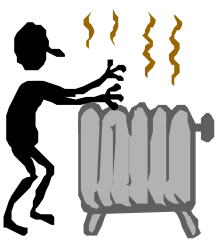
(a) Calculate my rise (find 10% and half it).

(b) Calculate my new salary this year.

5. A tank contained 120 litres of oil.
Mr Jones burned 75% of the oil last winter to heat his house.

(a) How many litres did he burn ?

(b) How many litres were left ?

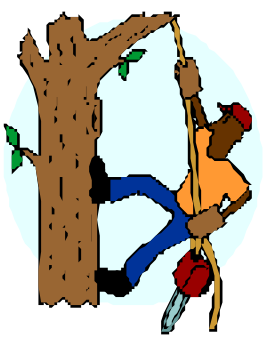
6. 

The temperature in a room at dawn was 16°C.
By 10 am the temperature had risen by 25%.

(a) By how many degrees had the temperature risen ?

(b) Calculate the new temperature at 10 am.

7. A tree was 20 metres tall.
Its owner decided to chop off 30% of it.



(a) How many metres were chopped off ?

(b) What was the new height of the tree ?

8. (a) Which is bigger :- 25% of 300 or $33\frac{1}{3}$% of 240 ?

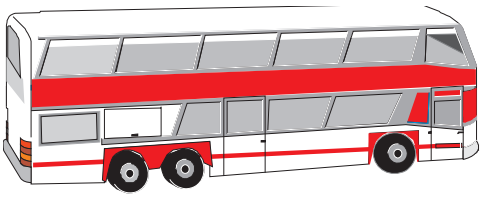
(b) By how much is one bigger than the other ?

9. Ryan's maths test was marked out of 80.
He got a mark of 75%.

What was Ryan's score out of 80 ?

10. An old people's home has 60 men and 90 women staying there.
80% of the men and $66\frac{2}{3}$% of the women went on a bus tour.

How many residents altogether went on the trip ?



Profit and Loss

If you buy a car for £1800 and sell it for £1300
you are said to have "made a **LOSS** of £500".

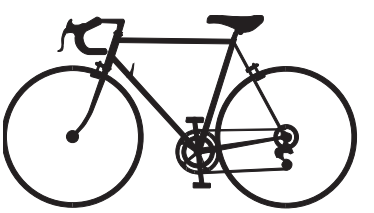
If you buy a flat for £24 000 and sell it for £27 000
you are said to have "made a **PROFIT** of £3000".

Profit	= Selling Price – Buying Price (if selling price > buying price)
Loss	= Buying Price – Selling Price (if buying price > selling price)

Exercise 2

1. I bought a racing bike for £350 and sold it
1 year later for £260.

How much of a **loss** did I make ?



2. I bought a pair of football boots for £32·50 and sold them to a friend for £20.

How much of a **loss** did I make ?

3. 

A man bought a painting for £12 000.
He sold it to a private collector for £18 500.

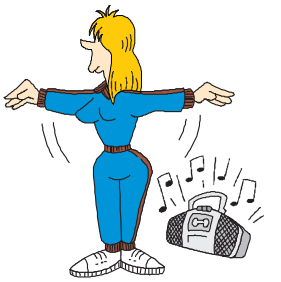
How much of a profit did he make ?

4. John built his own detached house for a total cost of £41750.
He advertised it and managed to sell it for £63 450.

How much of a profit did John make ?

5. Claire bought an exercise bike for £120 and
a rowing machine for £195.
One year later she sold the bike for £65
and the rowing machine for £88.

How much of a loss did she make altogether ?



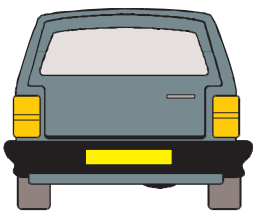
6. 

I bought 2 second hand office chairs for a TOTAL of £45.
I sold the "good" chair for £32 and the other for £19·50.

How much profit did I make altogether ?

7. I bought a second hand Vauxhall Astra for £4250.
When I sold it one year later, I found I had made a loss of £950.

For how much did I sell the car ?



8. I bought a piano for £375.
When I sold it 2 years later I did so at <u>a profit of £120</u>.

How much did I receive for the piano ?

9. I bought an old bicycle for £15.
It cost me £12·50 for 2 new tyres and £6·75 for a new chain.

(a) How much did the bicycle cost me altogether ?

(b) If I then sold the bicycle for £55, how much profit did I make ?

10. A small shopkeeper (the shop was small – not the man) bought a box
of 10 large Easter eggs for <u>a total of £32·50</u>.
He sold **each** egg for £4·50.

How much profit did he make altogether after selling all 10 eggs ?

11. "Tie Rack" in Edinburgh bought a box of 6 identical ties for £49·50.
The ties were all sold at £11·50 each.

How much profit was made when all the ties were sold ?

12. "Popworld" Record Shop bought 20 copies of the new "Hearwhat" C.D. for a total of £195.
They managed to sell all 20 copies at £11·50 each.

How much of a profit was made on the 20 C.D.'s ?

13. A shop bought 50 "Reindeer Antler" hats in November for a total cost of £75.
They sold 30 of them before Christmas at £2·50 each.
The other 20 were sold after Christmas at 60p each.

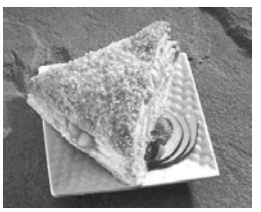
(a) How much money was made when all 50 were sold ?

(b) How much profit was made ?

14. A man bought a small publishing company in 1990 for £60 000.
In 2002, he sold the successful company for £1 500 000 (£1$\frac{1}{2}$ million).

How much profit did he make ?

15. (Hard)



I bought a box of 10 pastries for my shop at a total cost of £2·20.

After selling all the pastries, I found I had made a profit of £1·30 altogether.

What must I have charged for each pastry ?

16. A newsagent bought a box of 200 pencils for £6·50.
He tied them into bundles of 10 and sold each bundle for 60p.

(a) How many bundles of 10 pencils did he make ?

(b) How much money did he make if he sold all the pencils ?

(c) How much profit did he make altogether ?

17. Mick bought 300 blank C.D.'s for £150.
He packed them in envelopes holding 20 discs each and sold each pack for £11·50.

(a) How many packs of 20 C.D.'s did he sell ?

(b) How much money did he make if he sold all the packs ?

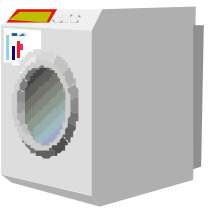
(c) How much profit did he make altogether ?

Hire Purchase

Imagine you had just bought a flat and wanted to buy a washing machine, but you did not have the cash to purchase it.

You can do a deal with the shop, whereby you leave a small deposit (say £40) and agree to pay up the balance each month over a year.

This is called a "**Hire Purchase**" agreement.



Indeset
£310

To work out how much you pay for the washing machine using hire purchase (H.P.)

Deposit –	=	£40
+ 12 payments of £25 =		£300
Total Cost =		£340

***Do you notice that this has worked out £30 dearer (£340 – £310).**
This is the DOWN-SIDE of Hire Purchase – it costs you more !!

Exercise 3

(Show all your working and set each question down as shown above)

1. I can buy this TELL – Computer for £750 cash.

   I can buy it using a Hire Purchase agreement by making

   - a deposit of £50
   - plus 12 monthly payments of £65.

Cash Price £750

H.P. – Deposit £50
+ 12 payments of £65

   (a) Copy this working and complete it.

Deposit –	£50
+ 12 payments x £65 =	£ ?
Total H.P. price =	£ ?

   (b) How much did it cost altogether using Hire Purchase ?

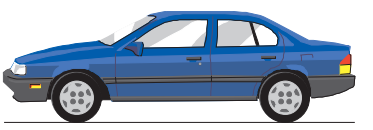
   (c) How much would I have saved by paying cash ?

2. I bought a second hand car from "Crafty Chris" using Hire Purchase.
   I left him a deposit of £250 and agreed to make **18** monthly payments of £105 each.

   (a) Copy the working and complete it.

Deposit –	£ ?
+ 18 payments x £105 =	£ ?
Total H.P. price =	£ ?

Crafty Chris's Autos



Cash Price – £1800

   (b) How much "**EXTRA**" had I paid for the car ?

3. I bought a new sofa from "Duncans Furnishers".

I paid a deposit of £75 and followed this with 9 monthly payments of £110·50.

(a) Calculate how much I paid in total using the Hire Purchase method.
(show your three lines of working)

(b) How much cheaper would it have been if I had paid cash ?

Duncans Furnishers

Sofa – Cash Price £950

4. **Larry's Carpets**

Special Price – £465

The carpet for my living room cost me £465.
I couldn't afford to pay cash so I took out a Hire Purchase agreement.
The deposit was only £40 and the 15 monthly payments were £32·20 each.

(a) How much did it cost me for the carpet on H.P. ?

(b) How much more was this than the cash price ?

5. When Sally and Nick had their first baby they bought a new pram from "Grannycare" priced £195.
They bought it on Hire Purchase by making a deposit of £20 followed by 26 weekly payments of £7·50.

(a) How much did they pay for the pram using H.P. ?

(b) How much more was this than the cash price ?

Gold Cross

£195

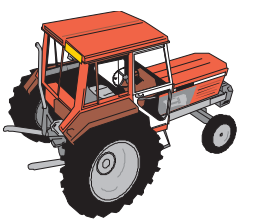
6. Farmer Jones bought a TOPYIELD tractor from "Farming Supplies".
He took out a Hire Purchase agreement.

The deposit was £500 followed by 24 monthly payments of £62·50.

(a) How much did it cost altogether for the tractor using H.P. ?

(b) How much more was this than the cash price ?

£1750



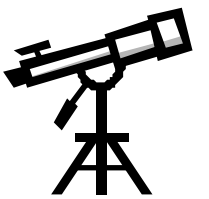
TOPYIELD

7. I bought a Refractor Telescope from Frank's for £365.
He allowed me to leave a deposit of £50 and make 6 monthly payments of £52·50 each.

(a) Calculate the total cost of the telescope using Hire Purchase.

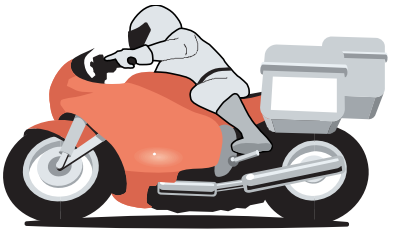
(b) Did it cost me any more using this method than if I had paid cash ?

(c) Why do you think some shops don't charge more when you take out a short term hire purchase agreement ?



8. Sometimes a hire purchase agreement doesn't cost you any more money.
David wanted to buy a new motorbike which was priced at £1500.

The salesman allowed him to make a deposit of £300 and pay the balance over 6 months at NO EXTRA COST.



(a) After making the £300 deposit, how much did David still owe ?

(b) If he paid this evenly over the 6 months, how much did he pay each month ?

9. 

Lucy bought her £650 wedding dress from "Weddings Are Us".

She agreed to pay a deposit of £80 and pay the balance over 10 months at no extra charge.

(a) After paying the deposit, how much did she still have to pay for her dress ?

(b) How much did this leave her to pay each month ?

10. Bill and Brenda bought a TRENDIX tumble drier for £345 from "Eric's Electrics".

(a) How much of a deposit had they to pay ?

(b) What were their monthly repayments ?

ERIC'S ELECTRICS
No Deposit !!!
Pay back in 15 months at no extra cost !!!

11. Judy bought a guitar from "Malcolms for Music" using their hire purchase agreement.

(a) Copy and set down the working as follows :-

Deposit :- 10% of £650	=	£ ?
+ 9 payments × £71·50	=	£ ?
Total H.P. price	=	£ ?

(b) How much would Judy have saved if she had paid cash ?

Malcolms for Music

"Fender" Electric Guitar £650

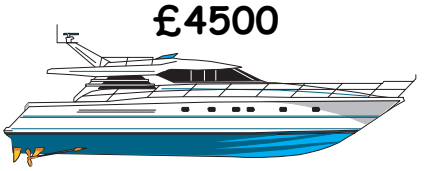
10% deposit + 9 monthly payments £71·50

12. Martin bought a STAEDLER Motorboat to cruise around the Mediterranean.
He paid a deposit of 20% of the cash price and 30 monthly payments of £145.

(a) Calculate how much this H.P. agreement cost Martin altogether.

(b) How much more expensive was this than paying cash ?

Boat Services
£4500



STAEDLER

Insurance – Household

Discussion Points :-

"Why would you want to insure your house ?"

"Why insure the contents – What can happen to them ?"

*"Why is **content rate** higher than **building rate** ?"*

"How can insurance companies offer to pay out £1000's for claims ?"

Hutton & Steel Insurance Company

Annual Premium Rates

Building – £2·35 per £1000
Content – £5·20 per £1000

Brown, Brown & Black Insurance Company

Yearly Premiums

Building – £2·50 per £1000
Content – £4·90 per £1000

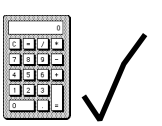
Example :- Mick and Elsie's flat was bought for £32 000.
How much would it cost to insure it with Hutton & Steel ?

Set down all examples like this =>

To insure it for £1000, the cost is £2·35
=> To insure it for £32 000, the cost is 32 x £2·35
= £75·20

Exercise 4

(Use the 2 sets of insurance rates shown above)
(Set each question down using the 2 lines in the example)



1. Bill and Patty's bungalow is worth £74 000.
   (a) How much would it cost each year to insure it with Hutton & Steel ?
   (b) How much would it cost each year to insure it with Brown, Brown & Black ?

2. John and Janice's detached villa is valued at £97 000.
   How much would it cost each year to insure it with Brown, Brown & Black ?

3. James and Pauline recently bought a new flat in George Square in Glasgow. They paid £180 000 for it.

   How much would the premium be each year to insure it with Hutton & Steel ?

4. Brian sold his villa, valued at £110 000, and moved to a small flat in Edinburgh for which he paid £55 000.
   His villa had been insured with Hutton & Steel.
   He insured his new flat with Brown, Brown & Black.

   (a) What was the yearly insurance on his old villa ?

   (b) What is the yearly insurance on his new flat ?

   (c) How much money did he save each year on insurance when he moved house ?

5. Ralph and Sheena met with an insurance agent from Hutton & Steel.
   He looked round their house and valued the CONTENTS at £24 000.

   How much would Ralph have to pay to insure the <u>contents</u> for 1 year with Hutton & Steel.

6. Each of the following couples insured the <u>contents</u> of their houses with Brown, Brown & Black for a year because their rates were lower (see table).

   Calculate the **annual premium** (payment due each year) for each.

   (a) Ann and Alan.
   Contents worth – £32 000

   (b) Donnie and Jean.
   Contents worth – £18 000

   (c) Tania and John.
   Contents worth – £36 000

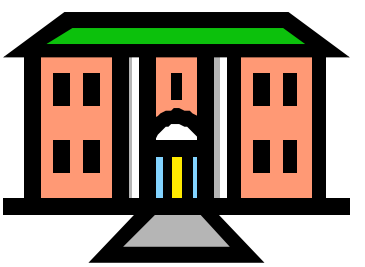
   (d) Sandy and Janet.
   Contents worth – £11 000

   (e) Ian and Sandra.
   Contents worth – £15 000

   (f) Dick and Tracey.
   Contents worth – £9 500

7. Eric and Carol's flat is valued at £66 000.
   The entire contents of their flat are valued at £24 000.

   They insure everything with Hutton & Steel.



   (a) How much will their annual **BUILDING** insurance be ?

   (b) How much will their annual **CONTENTS** insurance be ?

   (c) How much will their annual **TOTAL** insurance be ?

   (d) If they pay their insurance monthly, what will their payments be each month ?

8. Fred and Betty's bungalow is valued at £95 000.
The entire contents of their bungalow are valued at £37 000.

They insure everything with Brown, Brown & Black.

(a) What will their annual **BUILDING** insurance be ?

(b) What will their annual **CONTENTS** insurance be ?

(c) What will their annual **TOTAL** insurance be ?

(d) If they pay their insurance monthly, what will their payments be each month ?

9. Barney and Wilma's detached villa was valued at £62 000 in 1998.
By 2001, it had risen in value to £67 000.

(a) How much would their yearly insurance have been in 1998 with Brown, Brown & Black ?

(b) How much would it have been in 2001, still with Brown, Brown & Black ?

(c) How much of a rise in their premium was this ?

10. My semi-detached villa is valued at £64 000.
I estimate the furniture and contents to be worth £18 000.

(a) If I insure the BUILDING and the CONTENTS with Hutton & Steel, what will it cost me in insurance for the year ?

(b) If I choose to insure both BUILDING and the CONTENTS with Brown, Brown & Black, what will the total cost be ?

(c) Which of the two is dearer and by how much ?

(d) **Harder** :- Look at the answers to (b) and (c).
I can save money on insurance by insuring the building with one company and the contents with the other.

Calculate the CHEAPEST total I could pay for my insurance.

Insurance – Life

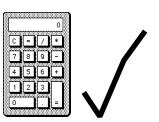
MONTHLY PREMIUMS FOR EVERY £1000 INSURED

BROWNLIE & HOBBS
Whole Life (with profits)

Age		*Non-smoker*	*Smoker*
Male	*Female*		
16-24	16-31	£1·10	£2·30
25	32	£1·90	£2·35
26	33	£1·95	£2·45
27	34	£1·95	£2·55
28	35	£2·00	£2·70
29	36	£2·05	£2·80
30	37	£2·10	£2·90
31	38	£2·20	£3·00

Exercise 5

1. (a) How much would it cost per month for Brian, aged 28 and a non-smoker, to insure his life for £1000 with Brownlie & Hobbs (see table) ?

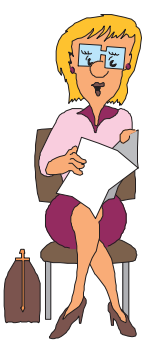


   (b) Brian insures his life for £50 000.
   Calculate his monthly premium.

   Set down like this :-

for £1000 of insurance, premium is	*£2·00*
for £50 000, it is 50 x £2·00 =	*£ ?*

2. Natalie is 25 years of age.
   She wants to take out insurance for £30 000.
   Calculate her monthly premium if she is a non-smoker.



3. Bobby is 31 years of age and insures his life for £40 000.
   If he is a smoker, calculate his monthly premium.

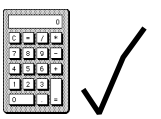
4. Calculate the monthly premium due for **Whole Life Policies** taken out by the following people :-
   (a) Ted, a smoker, is aged 26. He insures his life for £60 000.
   (b) Mariah, a smoker, is aged 34. She insures her life for £100 000.
   (c) Nicola, a non-smoker, is aged 19. She insures her life for £25 000.
   (d) Steven, a non-smoker, is aged 29. He insures his life for £45 000.
   (e) Alister, a smoker, is aged 22. He insures his life for £80 000.
   (f) Rachel, a non-smoker, is aged 38. She insures her life for £60 000.

BROWNLIE & HOBBS

Endowment (with profits)

Age		10 years		20 years	
male	*female*	*Non-smoker*	*Smoker*	*Non-smoker*	*Smoker*
16-24	16-31	£8·65	£10·29	£3·58	£5·13
25	32	£8·66	£10·30	£3·60	£5·14
26	33	£8·67	£10·31	£3·61	£5·15
27	34	£8·68	£10·32	£3·62	£5·16
28	35	£8·68	£10·33	£3·64	£5·17
29	36	£8·69	£10·34	£3·65	£5·18
30	37	£8·70	£10·34	£3·66	£5·19
31	38	£8·71	£10·35	£3·67	£5·20

MONTHLY PREMIUMS FOR EVERY £1000 INSURED



5. Barry is aged 30 and a non-smoker.
He wished to take out an **Endowment Policy** over 10 years with Brownlie & Hobbs.

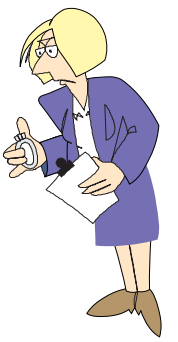
   (a) What is Barry's monthly premium for a policy of £1000 (see above table) ?

   (b) Now calculate his premium each month for a policy of £30 000.

6. Elaine is aged 33 and a heavy smoker.
She wants to take out an Endowment policy over a period of 20 years.

   (a) What is her monthly premium per £1000 ?

   (b) How much would it cost her each month for a policy of £50 000 ?



7. 

Robert is only 21 and hates smoking.
He wants to take out an Endowment policy over a period of 20 years.

   (a) What is Robert's monthly premium per £1000 ?

   (b) He wants to take out a policy for £80 000.
   Calculate his monthly premium.

8. Calculate the monthly premium due for **Endowment Policies** taken out by the following people :-

   (a) Karen, a non-smoker, is aged 32, and takes out a 10 year policy for £25 000.

   (b) Norman, a non-smoker, is aged 20, and takes out a 20 year policy for £40 000.

   (c) Lynsey, a non-smoker, is aged 37, and takes out a 10 year policy for £15 000.

   (d) Ryan, a smoker, is aged 31, and takes out a 10 year policy for £60 000.

   (e) Britney, a smoker, is aged 25, and takes out a 20 year policy for £45 000.

   (f) Will, a non-smoker, is aged 26, and takes out a 20 year policy for £100 000.

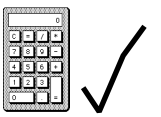
Foreign Exchange

Euros (€) are widely used throughout Europe.

To change £80 into Euros
simply **MULTIPLY** :-

£80 = 80 x 1·52€ = 121·60€

Best Exchange Rates in Town
£1 = 1·52€ (All Europe)
£1 = $1·42 (America)
£1 = 2·40 (Australian Dollars)



Exercise 6

1. Stef went to San Antonio in Ibiza.
   He changed £400 to euros before leaving.
   How many euros did he receive ?

2. 
   Nick went to Paris at Easter
   and changed £250 to euros.
   How many euros did Nick get ?

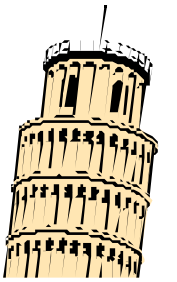
3. The MacDonalds flew to San Francisco (in America)
   and changed £800 into dollars.
   How many dollars did they get ?

4. Sheila and Billy went to Australia for a 3 week holiday.
   They changed £1200 to Australian dollars.
   How many dollars did they receive ?

5. Change the following :-
   (a) £600 to euros
   (b) £90 to euros
   (c) £540 to American dollars
   (d) £450 to Australian dollars
   (e) £65 to euros
   (f) £320 to American dollars

To change $710 back to pounds you **DIVIDE** :-

$710 = 710 ÷ 1·42 = £500



6. June returned from Pisa in Italy with 91·20 euros.
   How much would she get by changing them back to £'s ?

7. 

   Kylie also went to Italy, but stayed in Venice.
   She brought 646€ back and changed them back to £'s.
   How much did she receive ?

8. Neil returned from America with $177·50.
   How many £'s will he get when he exchanges his dollars ?

9. I brought 840 Australian dollars back from holiday.
   How many £'s will I receive for them ?

10. How much would be given when the following amounts were exchanged for £'s :-

    (a) 380 euros ?
    (b) 60·80 euros ?
    (c) $1278 ?
    (d) $3·55 ?
    (e) 204 Australian dollars ?
    (f) 4864 euros ?

11. I changed £400 to euros before travelling to Italy.
    (a) How many euros did I receive ?
    (b) I spent 450€ when I was in Italy.
    How many £'s did I have when I returned home (to the nearest pence) ?

12. In this country, an iMAC computer costs £810.
    In Spain, the same computer costs 1140€ .
    (a) If I bought the iMAC in Spain, how much would the equivalent cost be in £'s ?
    (b) How much would I have saved in £'s if I had bought the computer in Spain ?

What have I learned ?

1. Write down the answer to the following (no calculator) :-

   (a) 50% of £18 (b) 25% of £240 (c) 10% of £270
   (d) $33\frac{1}{3}$% of £180 (e) 75% of 80p (f) 40% of £60

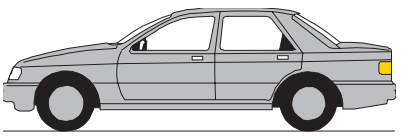
   You may use a calculator for the remainder of this exercise.

2. My salary in 2000 was £21 000. I received a rise of 4% in 2001.

   How much did I earn in 2001 ?

3. A Rover dealer buys Rover 45's for £9 800.
   He sells them for £11 250.

   How much profit does he make on each car ?



4. SAVECO buys in boxes of 48 tins of Meanz beans for £12·52 per box.
   Each tin sells for 34 pence.

   How much profit is made when a whole box of 48 tins is sold ?

5. I bought a KUZIWASHY scooter using a Hire Purchase agreement.
   I left a deposit of £250 and agreed to make 18 monthly payments of £172·50.

   (a) How much did it cost me altogether for the scooter using the H.P. terms ?

   (b) How much could I have saved by paying cash ?

KUZIWASHY

£2950

6. (a) My detached villa is valued at £94 000.
   How much would it cost me to insure it each year with INSUREWELL ?

   (b) The value of the contents of my house are £30 000.
   How much would it cost to insure the contents with INSUREWELL for a year ?

INSUREWELL Insurance
Annual Premium
Building - £1·90 per £1000
Contents - £4·85 per £1000

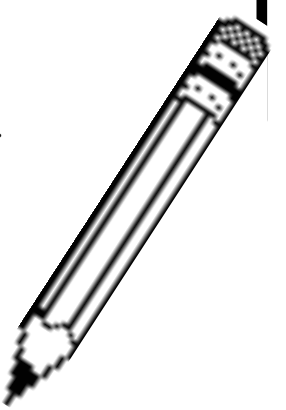
7. Look at the Whole Life Insurance table on page 191.
   Lucy is 34 and a heavy smoker.
   She wishes to take out a Whole Life Insurance policy for £15 000.

   Calculate her monthly premium (how much she pays each month).

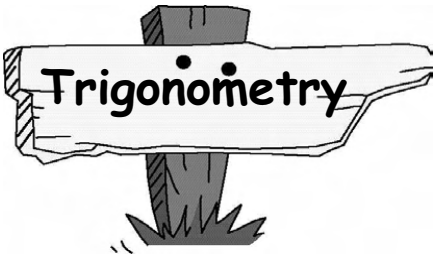
8. Look at the exchange rates on page 193.

   (a) If I change £720 to euros, how many will I receive ?

   (b) If I change $497 back to £'s, how many will I receive ?



Chapter 16

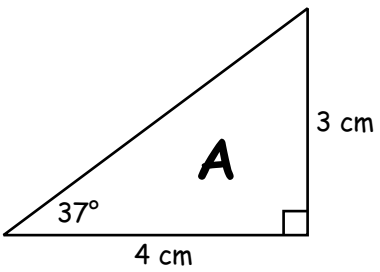


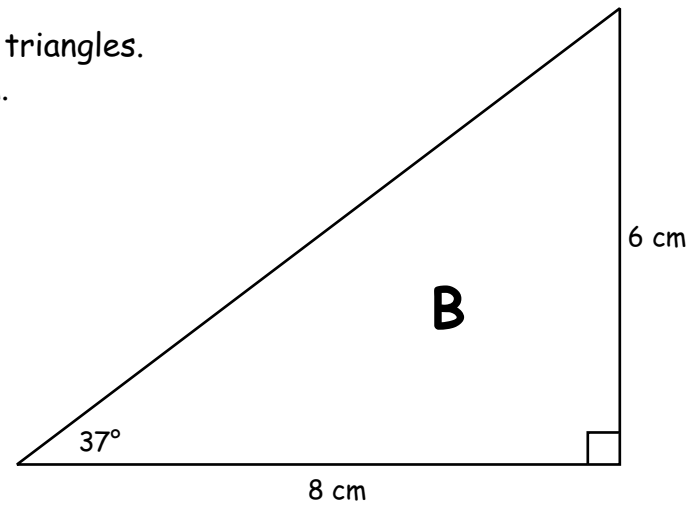
Trigonometry

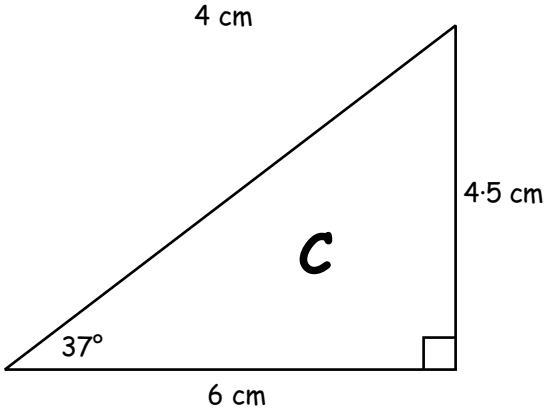
Introduction :-

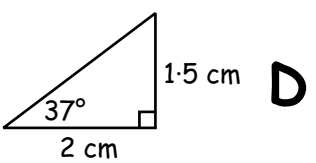
Trigonometry is the branch of mathematics that helps you calculate the size of an unknown side in a right angled triangle. (so can Pythagoras) - it can also help calculate the size of an unknown angle in the right angled triangle.

Look at the following 4 right angled triangles.
They all have **TWO** things in common.









The first is pretty obvious - they all have an angle of 37° at the bottom left corner.

The **second** thing they have in common is NOT so easy to see.

Introductory Exercise

1. Draw up the following table and use your calculator to fill in the bottom row.

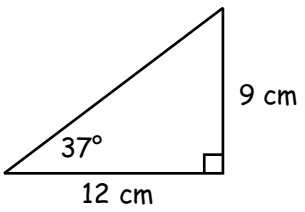
Triangle	**A**	**B**	**C**	**D**
Vertical side	3 cm	6 cm	4 cm	? cm
Horizontal Side	4 cm	8 cm	6 cm	? cm
$\frac{\text{Vertical Side}}{\text{Horizontal Side}}$	$\frac{3}{4} = 0{\cdot}75$	$\frac{6}{8} = ?$	$\frac{4{\cdot}5}{6} = ?$	?

2. Did you find the other thing the four triangles have in common ?

=> for the R.A.T. with an angle of 37°, the answer obtained by dividing the vertical side by the horizontal side was always 0·75

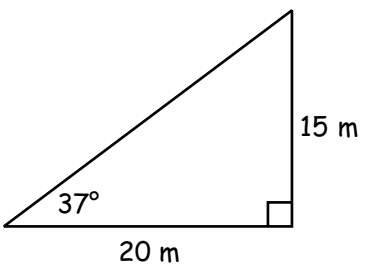
Check this out using your calculator here :-

(a)



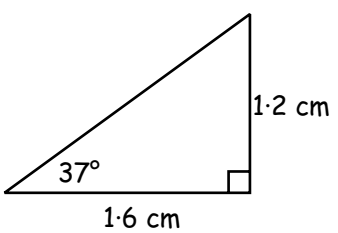
Check that 9 cm ÷ 12 cm = 0·75

(b)



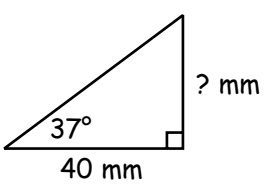
Find the value of 15 m ÷ 20 m

(c)



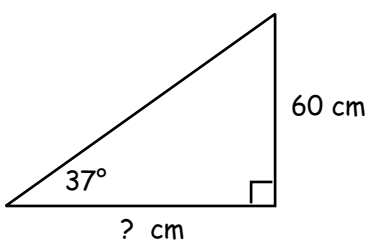
Calculate the value of 1·2 cm ÷ 1·6 cm

3. (a)



Use your calculator to work out what the length of the vertical side might be in this right angled triangle.

(b) Use your calculator to work out what the length of the horizontal side might be in this right angled triangle.

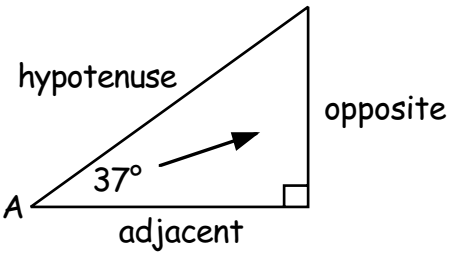


Fact :- For every Right Angled Triangle with an angle of 37°, it is always true that when you divide the vertical side of the triangle by the horizontal side, you get an answer of 0·75.

Name :- This number, 0·75 has a special name

It is called the **TANGENT** of 37° or **tan** 37° for short

Naming Sides and the Tangent :-



Instead of vertical and horizontal, we use 3 names to describe the sides of a right angled triangle.

They are **hypotenuse** - the longest side

opposite - directly across from the angle

adjacent - right next to the angle

The **Tangent** is defined as follows :-

=> **Tangent** of angle A = $\frac{\text{opposite}}{\text{adjacent}}$

or **Tan** A = $\frac{\text{opp}}{\text{adj}}$ for short.

From the first triangles we looked at we saw that :- tan 37° = $\frac{3}{4}$ = 0·75

Note Every angle from 0° to 90° has its own tangent value.

These values can be found from tables * or from a Scientific Calculator.

*** See tables at back of book**

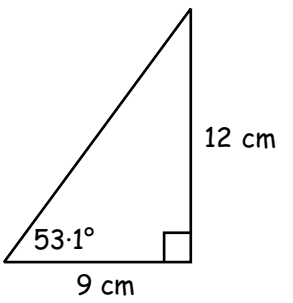
Exercise 1

1. Use the tangent (or tan) button on a scientific calculator or look up tables to find the following tangents, and answer to **3 decimal places** :-

(a) tan 25°	(b) tan 42°	(c) tan 59°	(d) tan 81°
(e) tan 51°	(f) tan 18°	(g) tan 7°	(h) tan 66°
(i) tan 87°	(j) tan 28°	(k) tan 11°	(l) tan 15·5°
(m) tan 44·7°	(n) tan 61·3°	(o) tan 10·8°	(p) tan 45°

2. Check with your calculator that tan 37° really is 0·75 (to 2 decimal places).

3. Look at this right angled triangle with angle Q = 53·1°.



   (a) What is the length of the "opposite" side ?

   (b) What is the length of the "adjacent" side ?

   (c) Divide :- (opposite ÷ adjacent) to get => tan53·1°.

   (d) Look up tan53·1° on your calculator (or tables) to check you get the same angle.

Using Trigonometry to Calculate the Opposite Side :-

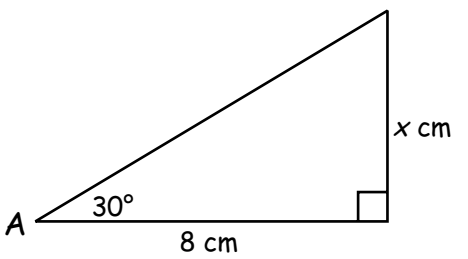
This is an **IMPORTANT** bit of the chapter.

You can use your calculator along with **tangents** to very quickly and very easily calculate the length of the **opposite** side of a right angled triangle as long as you already know the **angle** and the **adjacent** side.

Here's how you do it :-

Example :- This right angled triangle has angle A = 30° and adjacent side = 8 cm.

To calculate the length of the opposite side we proceed as follows.



$$\tan A = \frac{\text{opp}}{\text{adj}}$$

$$\Rightarrow \tan 30° = \frac{x}{8}$$

$$\Rightarrow 0{\cdot}577\ldots = \frac{x}{8}$$

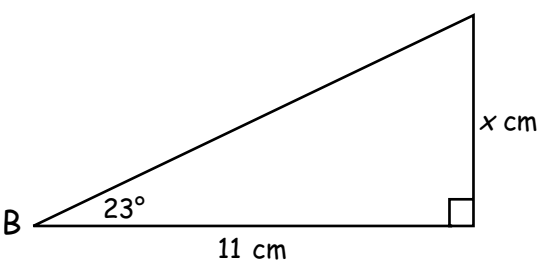
From tables or calculator

$$\Rightarrow x = 8 \times 0{\cdot}577\ldots = 4{\cdot}6188\ldots$$

$$\Rightarrow x = 4{\cdot}6 \text{ cm to 1 decimal place}$$

Exercise 2

1. Make a sketch of this right angled triangle and use the method shown above to calculate the size of the opposite side in the triangle.



$$\tan B = \frac{\text{opp}}{\text{adj}}$$

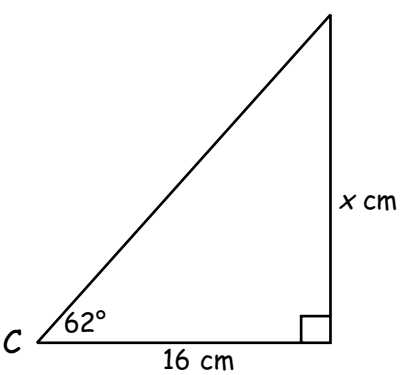
$$\Rightarrow \tan 23° = \frac{x}{11}$$

$$\Rightarrow 0{\cdot}424\ldots = \frac{x}{11}$$

$$\Rightarrow x = 11 \times 0{\cdot}424\ldots$$

$$\Rightarrow x = ? \text{ cm (to 1 decimal place)}$$

2. Calculate the size of the opposite side (marked x) in this right angled triangle :-



$$\tan C = \frac{\text{opp}}{\text{adj}}$$

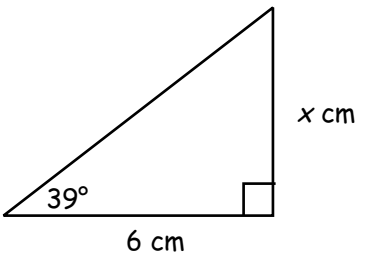
$$\Rightarrow \tan 62° = \frac{x}{16}$$

$$\Rightarrow 1{\cdot}880\ldots\ldots = \frac{x}{16}$$

$$\Rightarrow \text{etc.}$$

3. Sketch each of these right angled triangles and use **tangents** to calculate the length of the opposite side each time to 1 decimal place :-

(a)

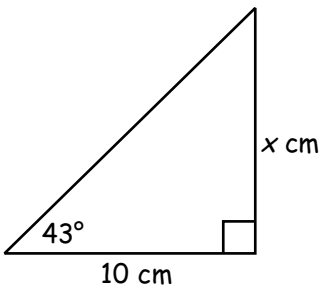


$\tan 39° = \frac{x}{6}$

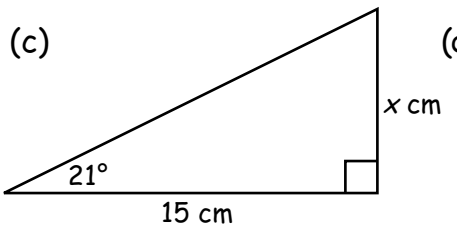
$\Rightarrow \quad 0{\cdot}809\ldots = \frac{x}{6}$

$\Rightarrow \quad x = 6 \times 0{\cdot}809\ldots = ?\ \text{cm}$

(b)



(c)



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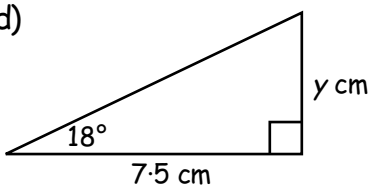
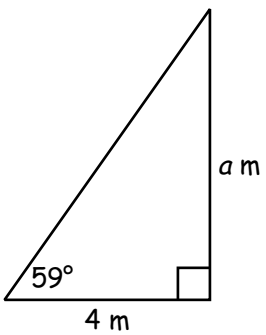


(e)



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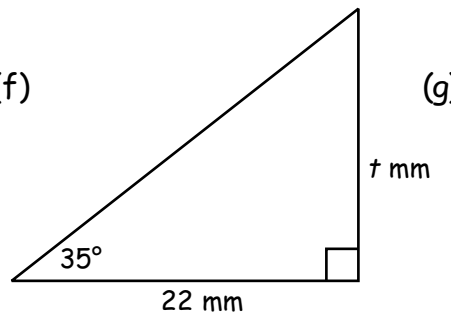
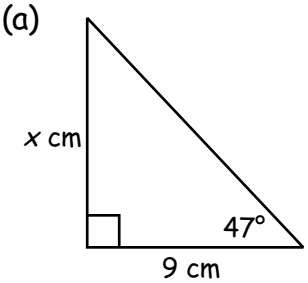


(g)

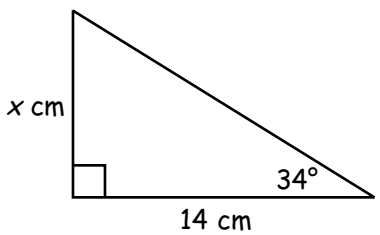
4. The following triangles have been turned around a bit but the calculations are just the same as for the questions shown above.

Calculate the size of the opposite side in each right angled triangle :-

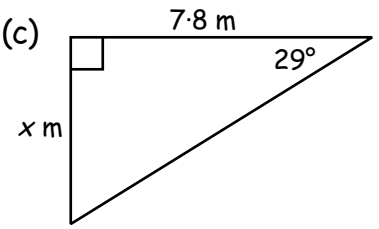
(a)



(b)



(c)



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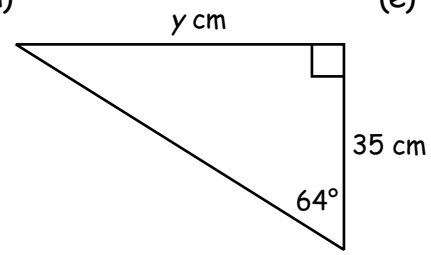
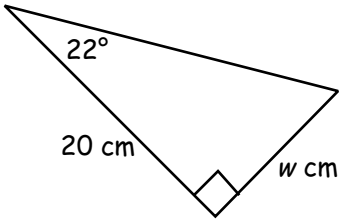
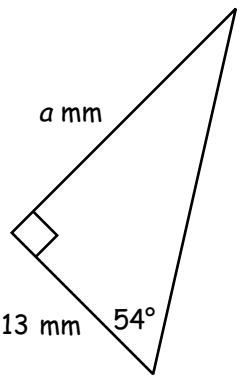


(e)

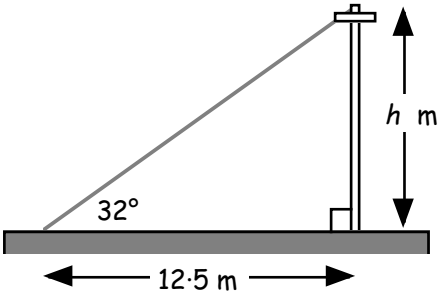


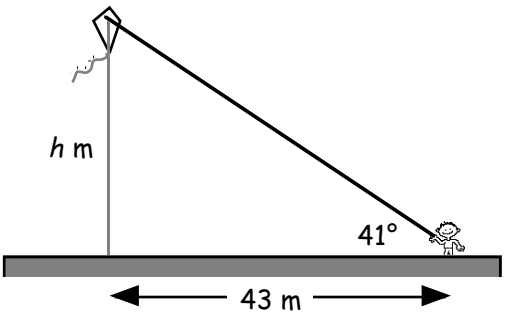
(f)



5. The telephone pole shown opposite has a support cable attached from its top to a point 12·5 metres from the base of the pole.
The cable makes an angle of 32° with the ground.

Calculate the height of the pole to 1 decimal place.



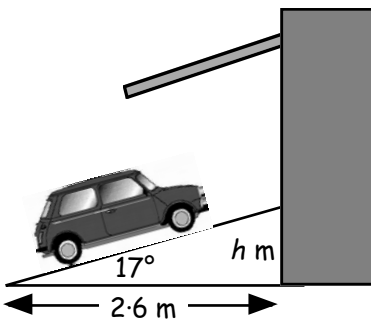
6. 

A boy flies his kite and the wire makes an angle of 41° with the ground. (see figure opposite)

Calculate the height of the kite above the ground.

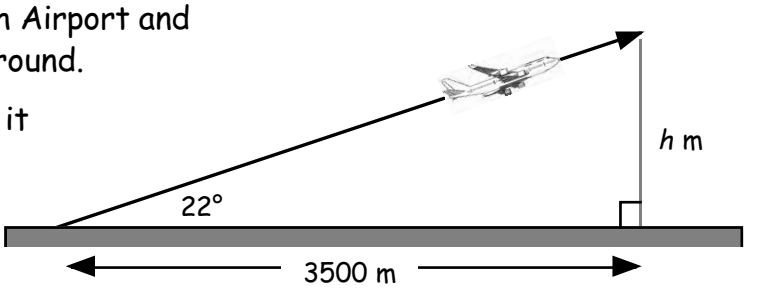
7. Look at the ramp which leads up to a garage.
The angle the ramp makes with the ground is 17°.

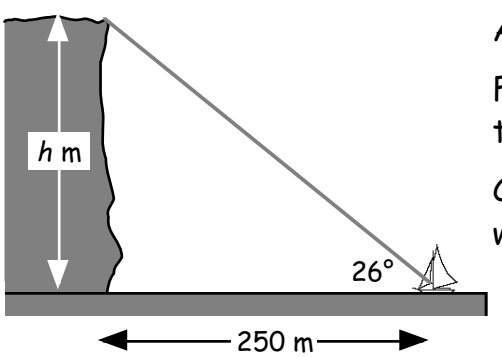
Calculate the height of the ramp at the wall.



8. A plane takes off from Edinburgh Airport and rises at an angle of 22° to the ground.

How high will the plane be after it has travelled a distance of 3500 metres from the runway ?



9. 

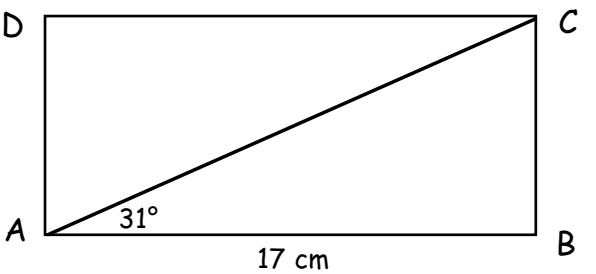
A yacht is 250 metres from the foot of a cliff.

From the yacht, the angle of elevation of the top of the cliff is 26°.

Calculate the height of the cliff above the water.

10. This rectangle has side AB = 17 cm.
Diagonal AC makes an angle of 31° with side AB.

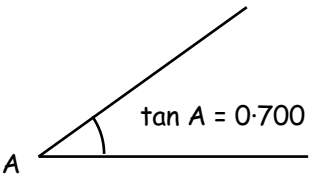
Calculate the length of side BC.



Using Trigonometry in Reverse to find an Angle :-

Qu. Imagine you already know that tan A = 0·700

How could you work backwards to find the size of $\angle A$?



Ans. You either use your tables in reverse (see teacher) or

you press two buttons [shift] [tan] 0·700 and the answer 35° appears.

In some calculators it is [2nd] [tan] and in others it is [inv] [tan]

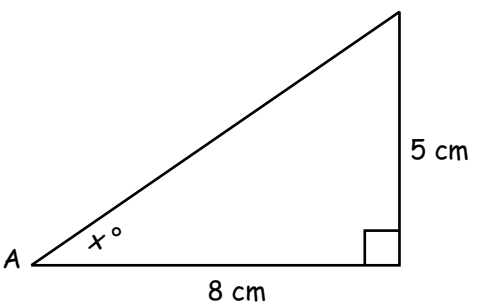
Exercise 3

1. Look up your tables or use the two buttons on your calculator needed to find the sizes of the angles A, B, C ..... :-

(a)	tan A = 0·466 (25°)	(b)	tan B = 0·268	(c)	tan C = 1·000
(d)	tan X = 1·732	(e)	tan Y = 5·671	(f)	tan Z = 1·280
(g)	tan P = 2·475	(h)	tan Q = 0·194	(i)	tan R = 0·404
(j)	tan I = 1·842	(k)	tan J = 0·759	(l)	tan K = 8·915
(m)	tan D = 0·863	(n)	tan E = 0·132	(o)	tan F = 28·636

2. Copy this example which shows how to calculate a missing angle in a right angled triangle :-

From this triangle :-

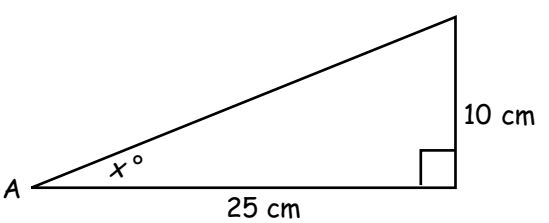


copy :- $\tan A = \frac{\text{opp}}{\text{adj}}$

=> $\tan x° = \frac{5}{8} = 5 \div 8 = 0{\cdot}625$

=> $x = 32°$ (* remember to press <u>2 buttons</u> - shift and tan)

3. Calculate the size of this angle (marked x°).

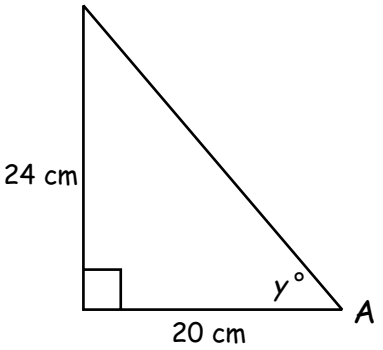


start :- $\tan A = \frac{\text{opp}}{\text{adj}}$

=> $\tan x° = \frac{10}{25} = 10 \div 25 = ?$

=> $x = ?°$ remember to press <u>2 buttons !!!</u>

4. Calculate the size of the angle marked $y°$.



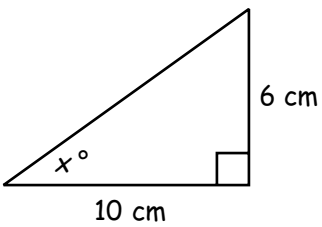
start :- $\tan A = \frac{\text{opp}}{\text{adj}}$

=> $\tan y° = \frac{24}{20} = 24 \div 20 = ?$

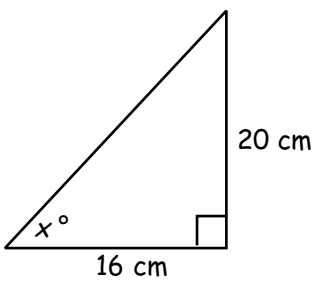
=> $y = ?°$ (2 buttons !!!)

5. Make sketches of these triangles and use your calculators and/or tables to calculate the sizes of the angles (marked $x°$) :-

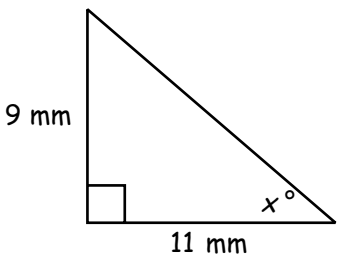
(a)



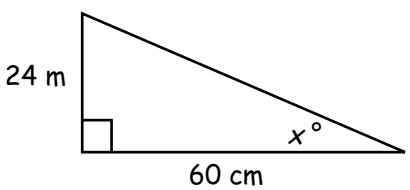
(b)



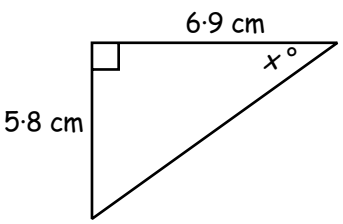
(c)



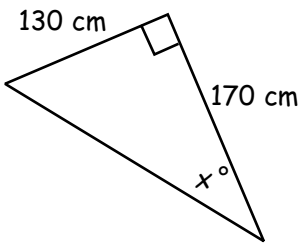
(d)



(e)

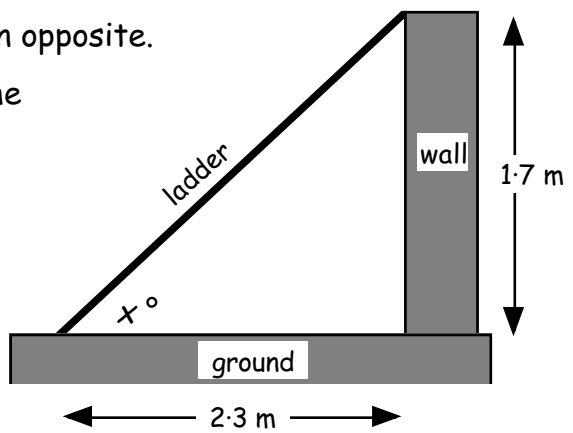


(f)

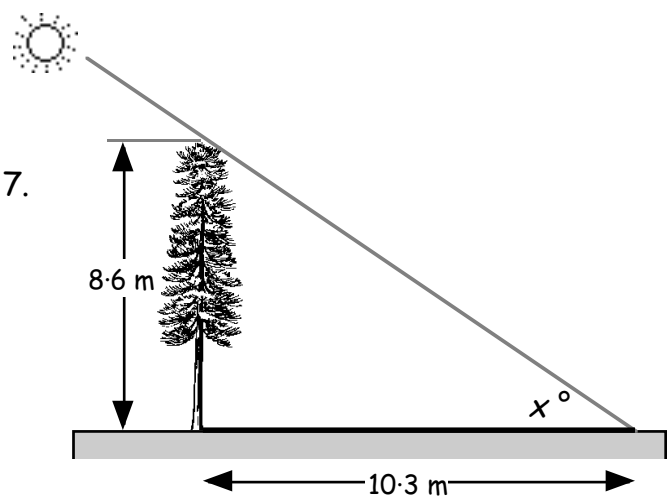


6. A ladder has fallen against a wall as shown opposite.

Calculate the size of the angle between the ladder and the ground.



7.



When the sun shines on the tree shown, it casts a shadow 10·3 metres long.

The tree is 8·6 metres high.

Calculate the size of the angle the sun's rays make with the ground. (angle $x°$)

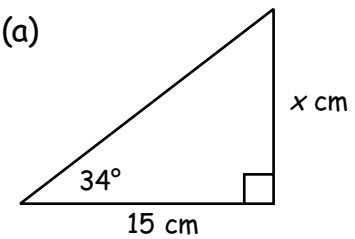
What have I learned ?

1. Use your calculator (or tables) to find the values of :-

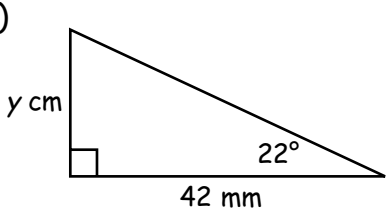
   (a) $\tan 40°$ (b) $\tan 75°$ (c) $\tan 23{\cdot}8°$

2. Calculate the value of x, y and z in these right angled triangles :-
   (*Show each step of your working*)

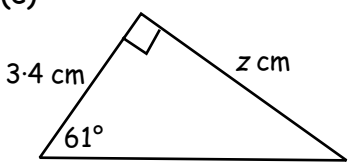
(a)



(b)



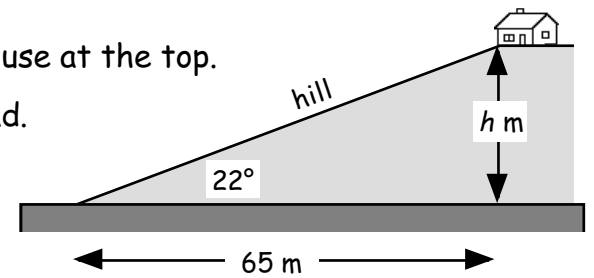
(c)



3. A hill runs up from a main road to the house at the top.

   The hill makes an angle of 22° to the road.

   Calculate how high the house is above the road.

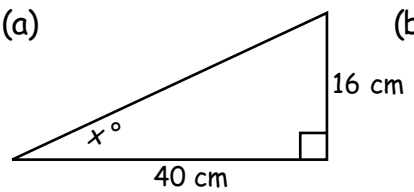


4. Use your calculator (or tables) to calculate the size of the angle ($x°$) given :-

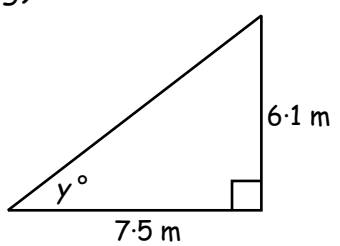
   (a) $\tan x° = 0{\cdot}601$ (b) $\tan x° = 3{\cdot}271$ (c) $\tan x° = 1{\cdot}257$

5. Calculate the sizes of the angles marked x, y and z in these triangles :-
   (*Show each step of your working*)

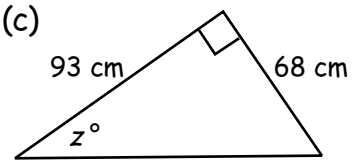
(a)



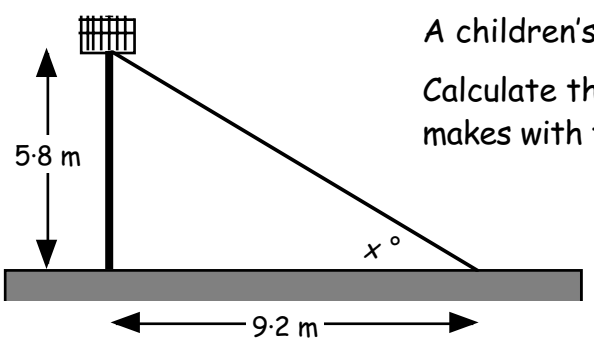
(b)



(c)

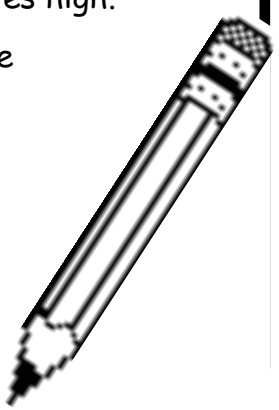


6.

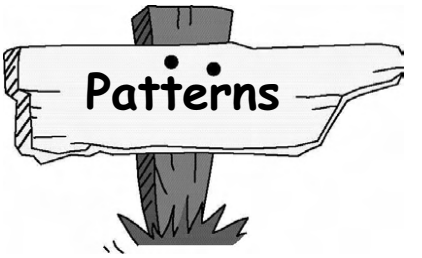


A children's slide, in a park, is 5·8 metres high.

Calculate the size of the angle the slide makes with the ground.



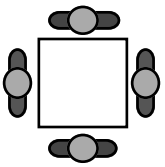
Chapter 17



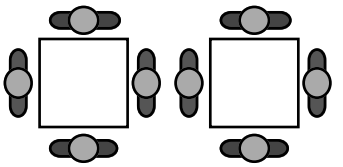
Simple Linear Patterns

It is sometimes easy to spot a **NUMBER PATTERN** from a diagram or from a table.

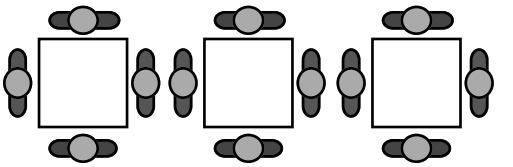
Example. In a restaurant, 4 people can sit around each table.



1 table
4 customers



2 tables
8 customers



3 tables
12 customers

Drawing up a table helps see the patterns :-

No. of tables (T)	1	2	3	4	5	6
No. of customers (C)	4	8	12	16	?	?

4 4 4

Can you see that for every new table the number of customers **rises by 4** ?

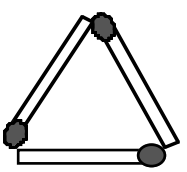
=> we can write, in words :-

no. of customers = 4 x no. of tables

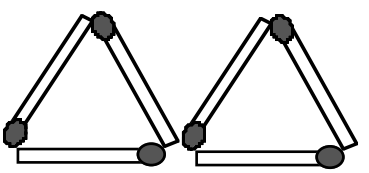
=> or in symbol form :- $C = 4 \times T$

Exercise 1

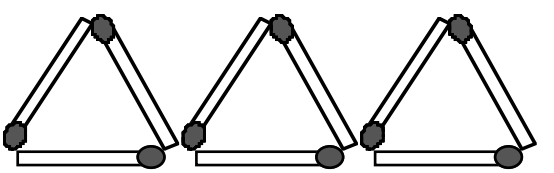
1. A pattern is made using matchsticks as seen below :-



1 triangle
3 matchsticks



2 triangles
6 matchsticks



3 triangles
9 matchsticks

(a) Draw the next pattern of matchsticks using 4 triangles.

cont'd .....

...cont'd

(b) Copy the following table and complete it :-

No. of triangles (T)	1	2	3	4	5	6
No. of matches (M)	3	6	?	?	?	?
			?	?	?	

(c) For every extra triangle, how many extra matches are needed ?

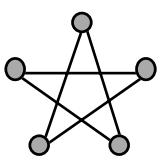
(d) Write down the formula for calculating the number of matches needed assuming you know the number of triangles :-

copy this :- **number of matches = ? × number of triangles**

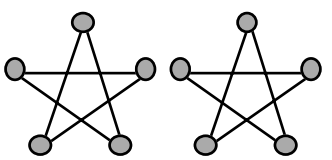
(e) Now write down the formula in **symbols** $M = ? \times T$.

(f) Use your formula to decide how many matches are needed to make 40 triangles.

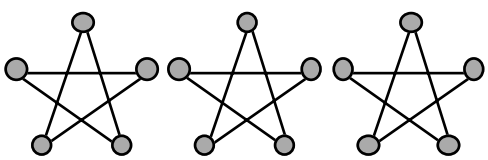
2. Look at the pattern of "pentagrams" and circles :-



1 pentagram
5 circles



2 pentagrams
? circles



3 pentagrams
? circles

(a) Draw the next pattern of pentagrams and circles.

(b) Copy the following table and complete it :-

No. of pentagrams (P)	1	2	3	4	5	6
No. of circles (C)	5	?	?	?	?	?
		?	?	?		

(c) For every extra pentagram, how many extra circles are needed ?

(d) Write down the formula for calculating the number of circles needed assuming you know the number of pentagrams :-

copy this :- **number of circles = ? × number of pentagrams**

(e) Now write down the formula in **symbols** $C = ? \times ?$.

(f) Use your formula to decide how many circles are needed if you have 20 pentagrams.

3.

6 windows

(a) Complete and complete this table listing the number of **windows** in these houses.

No. of houses (H)	1	2	3	4	5	6
No. of windows (W)	6	?	?	?	?	?
		?	?	?		

(b) Copy and complete :- "the number of windows = ? x the number of houses".

(c) Write the formula using symbols connecting *W* and *H*.

(d) Use this "**rule**" to say how many windows there would be in **10 houses**.

4. Look at the cost of buying footballs for a Junior football club :-

1 ball cost = £8 | 2 balls cost = £16 | 3 balls cost = £? | 4 balls cost = £?

(a) Complete and complete this table listing the costs of buying footballs.

No. of footballs (F)	1	2	3	4	5	6
Total Cost (£C)	8	?	?	?	?	?
		?	?	?		

(b) Copy and complete :- " Total Cost = ? x the number of footballs".

(c) Write the formula using symbols connecting *C* and *F*.

(d) Use this formula to find the cost of 15 footballs.

5. Copy and complete this table which shows the number of minutes it takes to walk various distances :-

No. of kilometres (K)	1	2	3	4	5
Time taken in minutes (M)	12	24	?	?	?
		?	?	?	

(a) How many extra minutes does it take for each extra kilometre ?

(b) Write a formula connecting the time and the no. of kilometres => *M* = ? x ?.

(c) Use your formula to decide how long it would take to travel 30 kilometres.

6. A primary classroom has several copies of a child's picture book.
The table indicates the total number of pages for various books :-

No. of books (B)	3	4	5	6	7	8
No. of pages (P)	18	24	30	36	?	?
		?	?	?		

(a) Given that 3 books have 18 pages, how many pages are there in 1 book ?

(b) Write a formula connecting the number of pages and the number of books :- => $P = ? \times ?$.

(c) Use your formula to decide how many pages there are in 20 books.

7. For each of these tables, determine a formula or rule connecting the two letters :-

(a)

No. of trees (T)	1	2	3	4	5	6
No. of apples (A)	40	80	120	160	?	?
		?	?	?		

$A = ? \times T$

(b)

Lengths swam (L)	1	2	3	4	5	6
Time in mins (T)	7	14	21	28	?	?
		?	?	?		

$T = ? \times L$

(c)

No. of cakes made (C)	1	2	3	4	5	6
Grams of flour (G)	120	240	360	?	?	?
		?	?	?		

$G = ? \times ?$

(d)

No. of inches (I)	1	2	3	4	5	6
No. of centimetres (C)	2·5	5·0	7·5	?	?	?
		?	?	?		

$C = ? \times ?$

(e)

No. of bottles (B)	2	3	4	5	6
No. of millilitres (M)	660	990	1320	?	?

$M = ? \times ?$

NOT $M = 660 \times B$

(f)

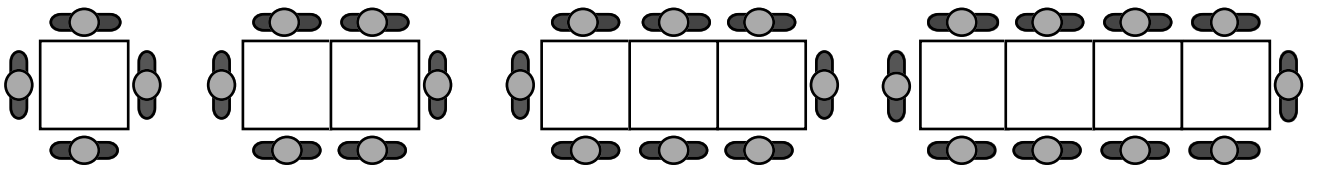
No. of orbits (O)	3	4	5	6	7
Time in hours (H)	15	20	25	?	?

$H = ? \times ?$

Trickier Linear Patters

In all the patterns we have met so far, the numbers on the bottom line of the table were part of the 2 x, 3 x, 4 x, etc. tables and were easily recognisable.

Look at this different type of pattern, again to do with restaurant tables :-



1 table
4 customers

2 tables
6 customers

3 tables
8 customers

4 tables
10 customers

Drawing up a table helps see the patterns :-

No. of tables (T)	1	2	3	4	5	6
No. of customers (C)	4	6	8	10	12	14

2 2 2

Can you see that for every new table the number of customers **rises by 2** ?

step 1 => we can **begin** to write, in symbols :-

C* = 2 x *T - but this **doesn't work !**

step 2 => we need a **correction number** to make the pattern work.

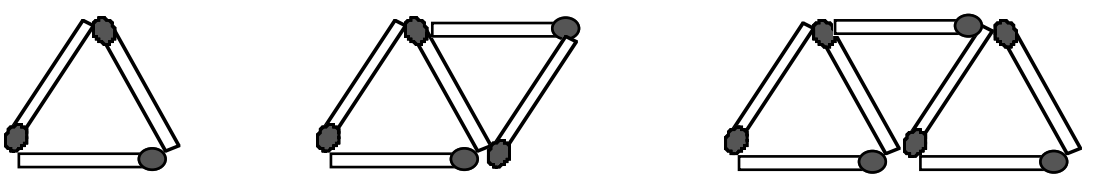
look at the (*T* =) **3** and (*C* =) **8** values - can you see that 2 x **3** ≠ **8**

but 2 x 3 **+ 2** gives 8 (check that 2 x 4 **+ 2** = 10, 2 x 5 **+ 2** = 12)

so our real formula is **$C = 2 \times T + 2$**

Exercise 2

1. A pattern is used using matchsticks as seen below :-



1 triangle
3 matchsticks

2 triangles
5 matchsticks

3 triangles
7 matchsticks

cont'd ....

(a) Draw neatly the next set of matchsticks patterns with 4 triangles

(b) Copy the following table and complete it :-

No. of triangles (T)	1	2	3	4	5	6
No. of matches (M)	3	5	?	?	?	?
		2	?	?		

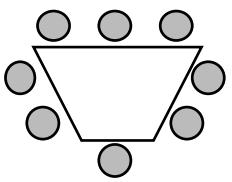
(c) For every extra triangle, how many extra matches are needed ?

(d) Write down the formula using **symbols** for calculating the number of matches needed if you know the number of triangles :-

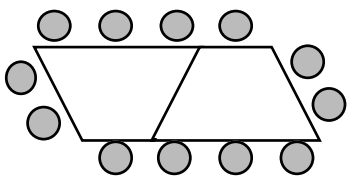
copy :- $M = ? \times T + ?$ ← remember the correction number

(e) Use your formula to decide how many matches are needed to make 10 triangles.

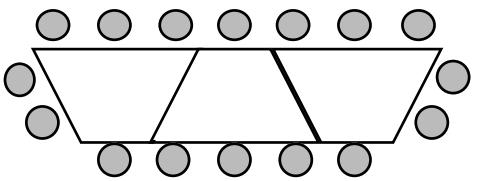
2. Look at the pattern of TRAPEZIUM shaped tables and customers in a restaurant.



1 table
8 customers



2 tables
12 customers



3 tables
16 customers

(a) Draw the next pattern showing 4 tables with customers around them.

(b) Copy the following table and complete it :-

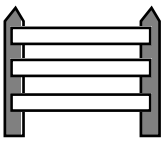
No. of tables (T)	1	2	3	4	5	6
No. of customers (C)	8	12	16	?	?	?
		?	?	?		

(c) For every extra table, how many extra customers can be seated ?

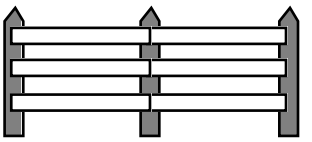
(d) Write down the formula using **symbols** $C = ? \times T + ?$.

(e) Use your formula to decide how many customers can sit around 12 tables placed in a straight row as in the pattern above.

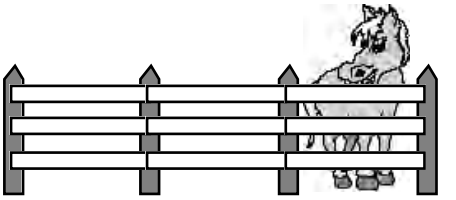
3. Look at the pattern of "fence posts" and "fence boards" :-



2 posts
3 boards



3 posts
6 boards



4 posts
9 boards

(a) Draw the next pattern of fence posts and boards.

(b) Copy the following table and complete it :-

No. of posts (P)	2	3	4	5	6	7
No. of boards (B)	3	6	9	?	?	?

3 ? ?

This time the correction number has to be subtracted

(c) For every extra post, how many extra boards are needed ?

(d) Write down the formula using **symbols** $B = ? \times P - ?$.

(e) Use your formula to decide how many boards are needed with 15 posts.

4. This table shows the cost of hiring a cement mixer for several days :-

No. of days hired (D)	1	2	3	4	5	6
Cost in £'s (C)	8	13	18	23	28	?

? ? ?

(a) How much will it cost to hire the mixer for (i) 6 days (ii) 7 days ?

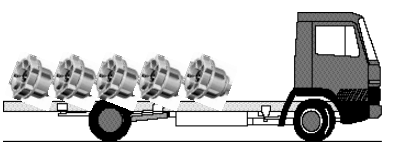
(b) How much **extra** does it cost for each additional day of hire ?

(c) Write down the formula for determining the cost of hiring the mixer

$$C = ? \times D + ?$$

(d) How much will it cost to hire the mixer for 10 days ?

5. The weight of a lorry carrying identical turbos is given below :-



No. of turbos (T)	1	2	3	4	5
Total weight in tonnes (W)	1·4	1·7	2·0	2·3	2·6

? ? ?

(a) How much does each extra turbo weigh ?

(b) Find a formula for the total weight $W = ? \times T + ?$

6. Shown below are some tables of values connecting pairs of letters.

Use the method shown to determine a formula or rule connecting the second letter in the table to the first letter.

(a)

Number (N)	1	2	3	4
Cost (C)	6	9	12	15

$C = ? \times N + ?$

(b)

Length (b)	1	2	3	4
Area (A)	13	18	23	28

$A = ? \times b + ?$

(c)

Number (N)	1	2	3	4
Weight (W)	50	54	58	62

$W = ? \times N + ?$

(d)

Temp. (T)	1	2	3	4
Volume (V)	19	26	33	40

$V = ? \times T + ?$

(e)

Distance (D)	1	2	3	4
Time (T)	8·5	10·5	12·5	14·5

$T = ? \times D + ?$

(f)

Time (T)	1	2	3	4
Depth (D)	2	8	14	20

$D = ? \times T - ?$

(g)

Paces (P)	1	2	3	4
Distance (D)	5	16	27	38

$D = ? \times P - ?$

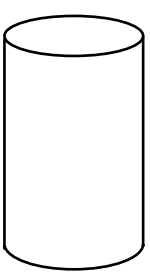
(h)

Diameter (D)	1	2	3	4
Perimeter (P)	93	108	123	138

$P = ? \times D + ?$

7. Rainwater begins to pour into a barrel from the roof of a hut.
The depth of water is given in the table below.

Time in mins (T)	1	2	3	4	5
Depth in cm (D)	32	35	38	41	44



(a) By how many centimetres is the depth of water increasing every minute ?

(b) Find a formula for the depth (D) in terms of the time (T) :-

=> $D = ? \times T + ?$

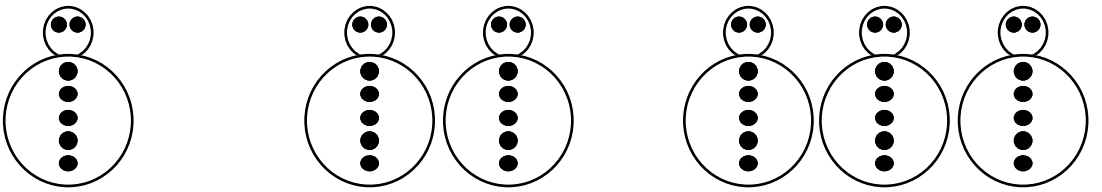
(c) Calculate the depth after 10 minutes.

(d) (Difficult)* The barrel is 74 centimetres in height.

If the water continues to pour into the barrel at the same rate, after how many minutes will it be full and begin to overflow ?

What have I learned ?

1. Look at these Gingerbread Men :-



1 gingerbread man
7 chocolate drops

2 gingerbread men
? chocolate drops

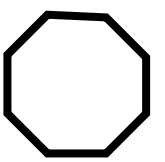
3 gingerbread men
? chocolate drops

(a) How many extra chocolate drops (D) are needed for each gingerbread man (*G*) ?

(b) Write a formula connecting them of the form :- $D = ? \times G$.

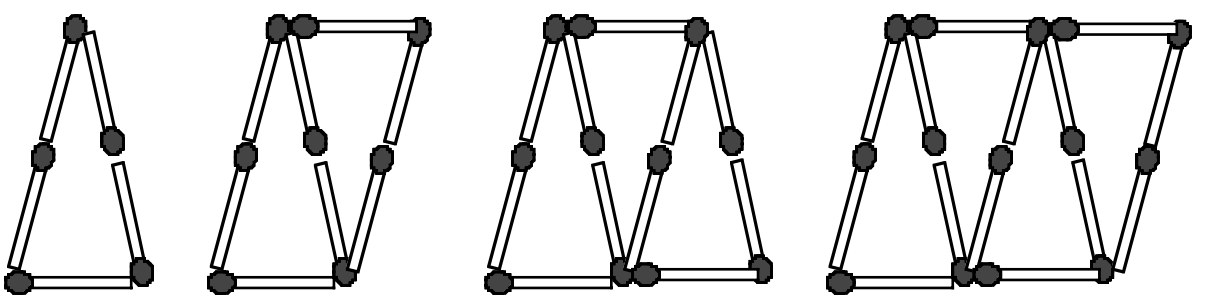
2. This table tells how many corners there are in various octagons :-

No. of octagons (*N*)	1	2	3	4	5	6
No. of corners (*C*)	8	16	24	?	?	?



From the table construct a formula connecting the number of corners to the number of octagons :- $C = ? \times N$.

3. Shown is a pattern of triangles made with matches :-



1 triangle
5 matches

2 triangles
8 matches

3 triangles
11 matches

4 triangles
? matches

(a) How many extra matches are needed for every new triangle added ?

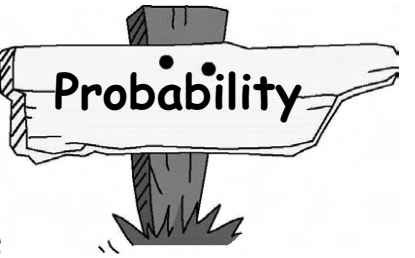
(b) Make up a formula for calculating the number of matches (*M*) needed to make (*T*) triangles.

4. Make up a formula showing the connection between *C* and *N* here :-

Number (*N*)	1	2	3	4
Cost (*C*)	7	11	15	19

$C = ? \times N + ?$

Chapter 18



Probability - what does it mean ?

The **PROBABILITY** of something happening simply means the **FRACTION** of times it would happen "in the long run".

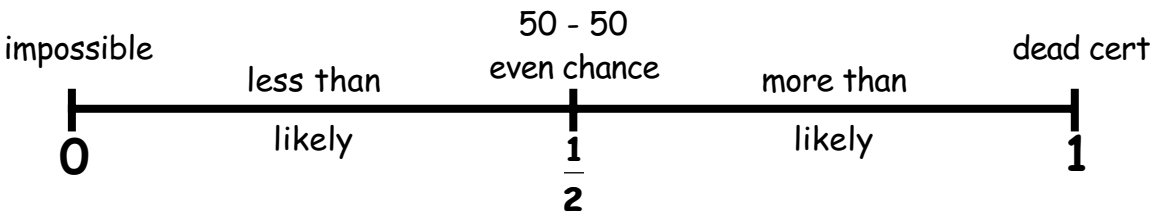
Probability is a fraction and can only take values from 0 to 1

For example :- the probability of meeting someone over 3 metres tall is **0**

the probability a tossed coin will end up showing heads is $\frac{1}{2}$

the probability the day after Monday is Tuesday is **1**.

A **probability line** is any line numbered from 0 to 1 representing all probabilities.



Introductory Exercise **(to be done orally)**

For each of these statements, say whether the probability of it happening is :-

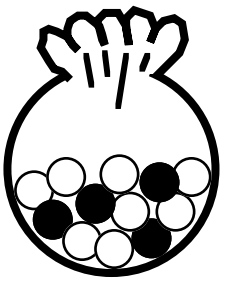
impossible - less than likely - evens - more than likely - a dead cert.

1. Choose a card from a pack and it's red.
2. Go on a diet and lose 2 stones overnight because of it.
3. Go on a diet and lose at least 1 pound overnight because of it.
4. It will be a sunny day <u>every</u> day in January.
5. If I jump in the swimming pool, I will get wet.
6. If I toss a coin, it will end up showing a tail.
7. If I choose a day at random, it will be one from the week-end.
8. The next person I bump into will be a female.
9. If today is Friday, tomorrow will turn out to be Sunday.
10. A new born baby boy will weigh less than 1 stone (6·4 kilograms).
11. If I choose a bead at random from a bag containing only blue beads, the bead will be blue.
12. If I choose a bead at random from a bag containing only blue beads, the bead will be red.

Probability - some calculations ?

The **PROBABILITY** of something happening can be thought of as a simple fraction.

$$\text{Probability of event happening} = \frac{\text{number of favourable ways}}{\text{number of possible ways}}$$



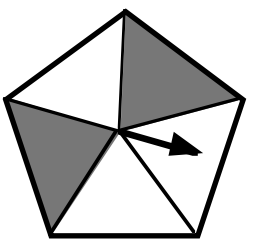
Example:- This bag contains 4 black beads and 8 white beads

If a bead is chosen at random, what is the probability I will have chosen a black bead ?

Solution :- Look at this simple notation :-

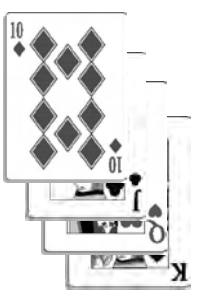
$$\mathbf{P(black)} = \frac{\mathbf{4\ (black\ beads)}}{\mathbf{12\ (beads\ altogether)}} = \frac{\mathbf{4} \div 4}{\mathbf{12} \div 4} = \frac{\mathbf{1}}{\mathbf{3}}$$

Exercise 1



1. This pentagonal spinner is spun and the colour noted.
   Calculate, as a fraction, the probability it will point to :-
   (a) a grey segment ? P(grey)
   (b) a white segment ? P(white)

2. A normal dice is rolled and the number on top is noted.
   (a) How many numbers are there on a standard dice ?
   (b) What is the probability it will show a five ? P(5) = ?
   (c) What is the probability it will show a one ? P(1) = ?
   (d) What is the probability it will show an even number ? P(even) = ?
   (e) What is the probability it will show a number bigger than 2 ? P(> 2) = ?
   (f) What is the probability it will show a seven ? P(7) = ?



3. A pack of cards is shuffled and the top card turned over.
   (a) How many cards are there in a standard pack ? (no jokers)
   (b) What is the probability the card is red ? P(Red).
   (c) What is the probability the card is an Ace ? P(Ace).
   (d) What is the probability the card is a face card ? P(Face).
   (e) What is the probability the card is a number from 2 to 10 ? P(2 to 10).
   (f) What is the probability the card is the Queen of Hearts ? P(Q❤).

4. Six men and nine women write their names on pieces of paper, fold them up and put them in a hat.

If a name is pulled at random from the hat, what is the probability

(a) it will be a man's name ? (b) it will be a woman's name ?

5. A gardener has 4 white, 6 yellow and 10 red pansy seeds, but they are mixed up and he can't tell which is which.

If he picks one at random and plants it in a pot, what is the probability he has chosen a pansy which is :-

(a) white ? (b) red ? (c) not white ?

(d) yellow or white ? (e) red, white or yellow ? (f) purple ?

6. At the fairground, one of the stalls contains the 4 by 4 grid shown opposite. People pay 20p and throw a counter onto the grid to try to win a prize.

lose	20 p	lose	£1
lose	10 p	lose	£1
£1	lose	30 p	lose
lose	50 p	lose	£1

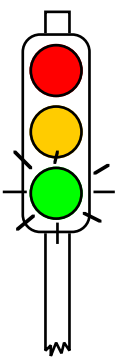
Assuming your counter actually lands <u>on a square</u> on the board, what is the probability :-

(a) you lose ? (b) you win a prize ?

(c) you win a 50p ? (d) you win £1 ?

(e) you end up with less than your initial stake ?

7. A driver notes the times a set of traffic lights is at red, green, etc., and in a full "cycle" the times are as follows :-



red - 20 seconds **red/amber** - 5 seconds

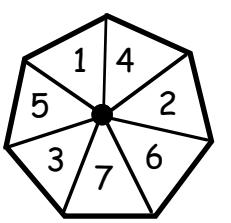
green - 25 seconds **amber** - 10 seconds

If a motorist drives up to the set of lights, what is the probability the lights will be showing :-

(a) red ? (b) green ? (c) amber or red/amber ?

(*try to simplify your fractions as far as possible*)

8. This 7-sided spinner is spun and the number it lands at is noted. What is the probability it stops at :-



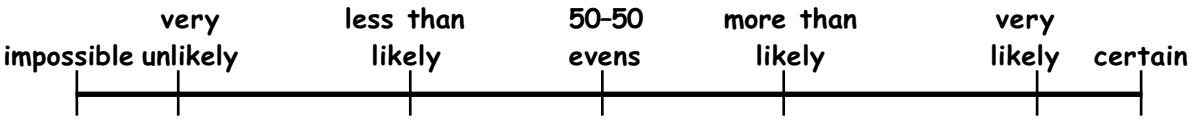
(a) the number 6 ? (b) an even number ?

(c) a number less than 5 (d) a multiple of 3 ?

9. If the probability of something happening is $\frac{3}{8}$, what is the probability it will NOT happen ?

What have I learned ?

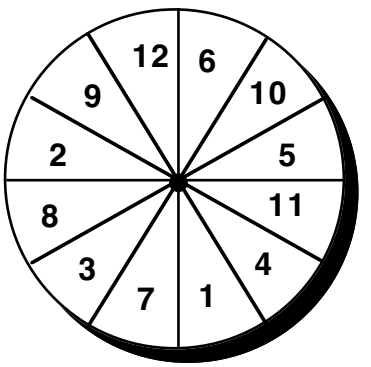
1. Neatly draw this "**Probability Line**".



For each of the following, put the capital letter below the line in the correct place to represent the probability.

A – The next person I meet will be **male**.
B – It is mid-January. It will rain at least **once** in the next week.
C – The sun will **NOT** rise tomorrow.
D – The rabbit that I am holding is a **male** or a **female**.
E – In a class of 18 boys and 11 girls a name is chosen at random and it will be that of a **girl**.
F – If I choose a card from a pack it will be the **ace of spades**.
G – The month showing on my calendar will have a "**y**" in it.

2. Look at this simplified dartboard.



If I throw a dart at it and it <u>does land</u> on the board, what is the probability it will :–

(a) be a **5** ?
(b) be an **even number** ?
(c) **not** be a 7 ?
(d) be a number **smaller** than 4 ?
(e) be a **16** ?
(f) be **any** number from 1 – 12 ?

3. In a race around a circular track,

4 of the cars are **green**.
6 of the cars are **blue**.
12 of the cars are **red**.
2 of the cars are **yellow**.

If I am standing at the edge of the track, what is the probability the next car to pass me will :–

(a) be **blue** ?
(b) be **yellow** ?
(c) **not** be red ?

4. There are 20 coloured cubes in a bag – only pink ones and blue ones.
The probability of picking a blue cube is $\frac{7}{10}$.

(a) What is the probability of picking a **pink** cube ?

(b) How many blue cubes and how many pink ones are there ?

answers to GENERAL 3A

Answers to Chapter 0

1. Learn tables

2. (a) 1001 (b) 10732 (c) 6748 (d) 7782
(e) 1519 (f) 6456 (g) 20508 (h) 12858
(i) 1603 (j) 339 (k) 67 (l) 438

3. (a) 64 (b) 100 (c) 400

4. (a) 170 (b) 230 (c) 1160 (d) 3700
(e) 21300 (f) 15000 (g) 365000 (h) 289
(i) 570 (j) 38 (k) 2150 (l) 265

5. (a) 360 (b) 1290 (c) 1440 (d) 3450
(e) 2790 (f) 10650 (g) 10170 (h) 42210
(i) 16200 (j) 12600 (k) 12400 (l) 86100
(m) 76000

6. (a) 16 (b) 18 (c) 44 (d) 130
(e) 32 (f) 210 (g) 1090 (h) 35000
(i) 7 (j) 32 (k) 52 (l) 55
(m) 13200

7. (a) 11 (b) 14 (c) 4 (d) 16
(e) 28 (f) 34 (g) 12 (h) 11
(i) 11 (j) 14 (k) 7 (l) 5

8. (a) 300 km (b) 16 kg (c) 80
(d) (i) 100 (ii) 110

9. ∠ABC acute ∠PQR acute ∠IJK obtuse
∠TLM right ∠DPJ reflex ∠MSD straight
∠XWV obtuse ∠UVD acute

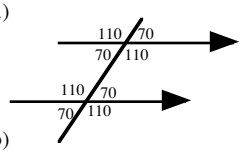
10. ∠ABC 67° ∠PQR 115° ∠STV 140°

11. Check drawings

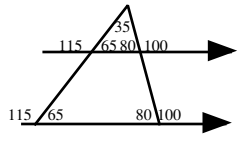
12. a = 70 b = 145 c = 70 d = 50
e = 70 f = 70 g = 130 h = 51

13. (a) f (b) g (c) d
(d) b (e) g (f) h

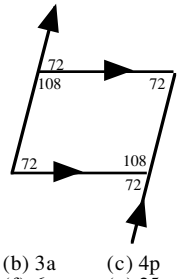
14. (a)



(b)



(c)



15. (a) 7x (b) 3a (c) 4p (d) 4m
(e) 7t (f) 6x (g) 25m (h) 30g

16. (a) 7a + 10b (b) 4p + 13q (c) m + 8n
(d) 6x + 12 (e) 8y + 6 (f) 7t + 3

17. (a) 3x + 12 (b) 5x – 10 (c) 4a + 12
(d) 10p – 20 (e) 6x + 10 (f) 20x – 12
(g) 12 + 18x (i) 32 – 24a

18. (a) 1 (b) 8 (c) 18 (d) 20
(e) 0 (f) 30 (g) 15 (h) 25

19. (a) 9 (b) 51 (c) 54 (d) 258
(e) 16 (f) 30 (g) 66 (h) 360
(i) 140

20. (a) 9 (b) 9 (c) 23 (d) 40
(e) 9 (f) 4 (g) 45 (h) 16
(i) 7 (j) 20 (k) 26 (l) 18

21. (a) 10 (b) –10 (c) 4 (d) 2
(e) –2 (f) –8 (g) –10 (h) 4
(i) –5 (j) –3 (k) 0 (l) –5
(m) –6 (n) –45 (o) –32

22. (a) 4 (b) –7 (c) –3 (d) –7

23. (a) 84 cm² (b) 55 cm² (c) 81 cm²
(d) 21 cm² (e) 48 cm² (f) 30 cm²
(g) 165 cm² (h) 35 cm² (i) 240 cm²

24. (a) 528 cm³ (b) 840 cm³ (c) 180 cm³
(d) (i) 50000 cm³ (ii) 50 litres

25. (a) x = 5 (b) x = 8 (c) x = 12 (d) x = 11
(e) x = 5 (f) x = –2

26. (a) x = 5 (b) x = 10 (c) x = 25 (d) x = 8
(e) x = 60 (f) x = 8·5

27. (a) x = 10 (b) x = 9 (c) x = 3 (d) x = 3
(e) x = 1 (f) x = 0 (g) x = 6 (h) x = 0
(i) x = 2

28. (a) $\frac{2}{3}$ (b) $\frac{1}{2}$ (c) $\frac{2}{5}$ (d) $\frac{3}{5}$
(e) $\frac{1}{4}$ (f) $\frac{3}{4}$ (g) $\frac{3}{4}$ (h) $\frac{3}{5}$

29. (a) 1,5 (b) 1,2,4,8 (c) 1,2,3,4,6,12
(d) 1,3,5,15 (e) 1,3,7,21 (f) 1,2,4,5,10,20
(g) 1,2,3,4,6,8,12,24 (h) 1,2,5,10,25,50
(i) 1,13 (j) 1,11 (k) 1,2,4,8,16
(l) 1,2,3,6,9,18

30. (a) (b) (e) (f) (j) are prime

31. 2,3,5,7,11,13,17,19,23,29

Answers to Chapter 1

Ex 1

1. (a) 3 (b) 8 (c) 5 (d) 16
(e) 30 (f) 62 (g) 15 (h) 3
(i) 23 (j) 73 (k) 64 (l) 27
(m) 8 (n) 42 (o) 87

2. (a) 16 (b) 23 (c) 14 (d) 96
(e) 78 (f) 40 (g) 3 (h) 62
(i) 30 (j) 64 (k) 1 (l) 40

3. (a) 13 (b) 5 (c) 35 (d) 82
(e) 20 (f) 82 (g) 18 (h) 39

Ex 2

1. (a) 80 (b) 60 (c) 20 (d) 50
(e) 60 (f) 80 (g) 60 (h) 80
(i) 10 (j) 20 (k) 260 (l) 250
(m) 740 (n) 900 (o) 2010

2. (a) 40 cm (b) 60 cm (c) 80 cm (d) 80 cm
(e) 90 cm (f) 150 cm (g) 350 cm (h) 610 cm
(i) 730 cm (j) 500 cm

3. (a) 100 (b) 500 (c) 800 (d) 200
(e) 600 (f) 800 (g) 400 (h) 100
(i) 5500 (j) 3600 (k) 6600 (l) 4300
(m) 7100 (n) 3400 (o) 5400

4. (a) 9000 (b) 14000 (c) 24000 (d) 20000
(e) 63000 (f) 64000 (g) 2000 (h) 44000
(i) 66000 (j) 83000 (k) 70000 (l) 124000
(m) 215000 (n) 147000 (o) 300000

Ex 3

1. (a) 2500 (b) 2400 (c) 6000 (d) 8000
(e) 15000 (f) 60000 (g) 20 (h) 20
(i) 10 (j) 300 (k) 200 (l) 200

2. 2058

3. (a) 1209 (b) 1278 (c) 12017 (d) 7562

Ex 4

1. (a) 170 (b) 80 (c) 290 (d) 640
(e) 810 (f) 1150 (g) 2330 (h) 1200
(i) 9600 (j) 9080 (k) 12340 (l) 76080

2. (a) 1600 (b) 3700 (c) 8100 (d) 6000
(e) 12300 (f) 23700 (g) 45000 (h) 20600

3. (a) 8000 (b) 23000 (c) 56000 (d) 84000
(e) 70000 (f) 125000 (g) 260000 (h) 300000

Ex 5

1. (a) 9 (b) 6 (c) 12 (d) 47
(e) 99 (f) 120 (g) 630 (h) 482
(i) 100 (j) 2300 (k) 4630 (l) 1287

2. (a) 4 (b) 8 (c) 16 (d) 47
(e) 90 (f) 140 (g) 230 (h) 654

3. (a) 8 (b) 14 (c) 29 (d) 40
(e) 135 (f) 180 (g) 270 (h) 300

Ex 6

1. (a) 960 (b) 680 (c) 1260 (d) 2170
(e) 3360 (f) 5650 (g) 4280

2. (a) 4800 (b) 9300 (c) 6500 (d) 12600
(e) 12600 (f) 6900 (g) 6800 (h) 5200
(i) 168800 (j) 62000

Ex 7

1. (a) 28 (b) 8 (c) 25 (d) 30
(e) 280 (f) 61 (g) 240

2. (a) 41 (b) 123 (c) 32 (d) 45
(e) 70 (f) 20 (g) 610

Answers to Chapter 2

Ex 1

1. (a) acute (b) obtuse (c) right
(d) acute (e) obtuse (f) straight
(g) reflex (h) obtuse

2. (a) acute (b) obtuse (c) right
(d) acute (e) obtuse (f) right
(g) acute (h) obtuse

3. obtuse – between 90° and 180°
right – exactly 90°
reflex – between 180° and 360°
straight – exactly 180°
acute – smaller than 90°

4. (a) acute – 70°, 89°, 14°, 71°
(b) obtuse – 105°, 137°, 91°, 179°
(c) right – 90°
(d) reflex – 200°, 310°
(e) straight – 180°

Ex 2

1. (a) ∠ABC (b) ∠FDG (c) ∠LMP
(d) ∠QTV (e) ∠DTW (f) ∠LCR
(g) ∠LFT (h) ∠WUZ

2. (a) ∠FRT is right (b) ∠ATS is acute
(c) ∠MYD is acute (d) ∠ATC is obtuse
(e) ∠DVF is straight (f) ∠BHJ is reflex
(g) ∠CJL is acute (h) ∠ZFT is obtuse

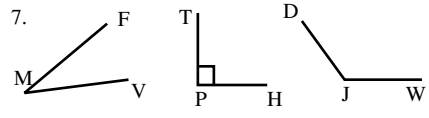
3. (a) ∠FVP (b) ∠VPF (c) ∠VFP
(d) ∠DMR (e) ∠RDM (f)∠DRM

4. ∠ALC, ∠AFC, ∠FAL, ∠LCY

5. (a) ∠DBC (b) ∠ABD

6. (a) ∠PHS (b) ∠TGF (c) ∠TGH
(d) ∠GHJ

7.



Ex 3

1. (a) 60° (b) 30° (c) 110° (d) 140°
(e) 50° (f) 160°

2. (a) 25-35 (b) 60-70 (c) 15-25 (d) 100-110
(e) 85-95 (f) 15-25 (g) 115-125
(h) 210-220

3. (a) 40° (b) 75° (c) 115°

4. (a) ∠DLT 60° (b) ∠AMZ 32°
(c) ∠HWV 99° (d) ∠RNJ 133°
(e) ∠HFX 115° (f) ∠QPK 47°

5. (a) ∠PQR 49° (b) ∠ARC 76°
(c) ∠IJK 120° (d) ∠LMN 66°
(e) ∠PQR 92° (f) ∠STV 75°

6. (a) 50° (b) 65° (c) 65°

7. (a) ∠PQR 135° (b) ∠QRP 20°
(c) ∠QPR 25°

Ex 4

1. (a) 360° (b) 360°

2. (a) 220° (b) 140°

3. (a) 120° (b) 150° (c) 90° (d) 140°
(e) 130° (f) 90° (g) 90° (h) 60°

4. (a) 180° (b) 180°

5. 180°

6. 40°

7. (a) 130° (b) 60° (c) 125° (d) 65°
(e) 40° (f) 120°

8. x = y always

9. 35°

10. (a) 45° (b) 115° (c) 62° (d) 123°
(e) $22\frac{1}{2}°$ (f) 90°

11. (a) 20° (b) 150° (c) 150°

Ex 5

1 - 5. Check drawings

Ex 6

1. (a) 100° (b) 80°

2. (a) 50° (b) 130° (c) 110° (d) 40°
(e) 45° (f) 40° (g) 145° (h) 35°

3. (a) 50° (b) 60°

4. "ISOSCELES"

5. (a) 35° (b) 110°

6. (a) ∗ = 70° • = 40° (b) ∗ = 50° • = 80°
(c) ∗ = 55° • = 70° (d) ∗ = 65° • = 50°
(e) ∗ = 40° • = 100° (f) ∗ = 72° • = 36°
(g) ∗ = 37° • = 106° (g) ∗ = 85° • = 10°

7. (a) 140° (b) 70° (both)

8. (a) 65° (b) 50° (c) 30° (d) 60°
(e) 35° (f) 75° (g) 25° (h) 67°

9. (a) 50° (b) 50° (c) 80°

10. (a) 52° (b) 52° (c) 76°

11. (a) "EQUILATERAL" (b) 60°

Answers to Chapter 3

Ex 1

1. (a) 0·5 (b) 0·3 (c) 1·2 (d) 2·3
(e) 3·4 (f) 4·4

2. Check sketches

3. (a) 0·8 (b) 1·3 (c) 2·5

4. (a) 0·82 (b) 0·47 (c) 0·56 (d) 1·24
(e) 2·69 (f) 0·08

5. Check sketches

Ex 2

1. (a) 8·3 (b) 13·8 (c) 8·8 (d) 19·4
(e) 2·8 (f) 0·9

2. (a) 6·4 (b) 13·3 (c) 25·8 (d) 12·0

3. (a) 2·36 (b) 4·83 (c) 3·45 (d) 12·26
(e) 0·24 (f) 1·74

4. (a) 0·68 (b) 2·44 (c) 1·83 (d) 3·65
(e) 1·84 (f) 0·25

Ex 3

1. (a) 6·24 & 6·25 —> 6·25
(b) 4·83 & 4·84 —> 4·83
(c) 2·71 & 2·72 —> 2·72
(d) 1·65 & 1·66 —> 1·65
(e) 10·20 & 10·21 —> 10·21
(f) 0·58 & 0·59 —> 0·58
(g) 6·89 & 6·90 —> 6·90
(h) 0·02 & 0·03 —> 0·03

2. (a) 5·33 (b) 8·26 (c) 1·94 (d) 0·68
(e) 12·28 (f) 3·01 (g) 1·70 (h) 0·04

3. (a) 2·35 (b) 1·87 (c) 8·22 (d) 7·28
(e) 9·33 (f) 4·04 (g) 5·86 (h) 6·05
(i) 3·90 (j) 0·25 (k) 10·10 (l) 0·07

4. (a) 5·38 (b) 7·41 (c) 2·69 (d) 11·92
(e) 2·57 (f) 0·85 (g) 2·09 (h) 2·98
(i) 2·89

5. (a) 0·38 (b) 0·64 (c) 0·26 (d) 0·71
(e) 0·44 (f) 0·67 (g) 0·76

6. (a) £6·56 (b) 20·83kg (c) £4·57
(d) $\frac{7}{9}$ largest $\frac{9}{13}$ smallest

Ex 4

1. (a) 26·54 (b) 55·03 (c) 55·57 (d) 33·23
(e) 77·47 (f) 45·91 (g) 12·15 (h) 16·76
(i) 37·59 (j) 5·55 (k) 36·43 (l) 37·22

2. (a) 19·14 (b) 29·25 (c) 13·21 (d) 18·32
(e) 32·67 (f) 1·52

3. (a) 11·77 (b) 1·08 (c) 10·92 (d) 9·85
(e) 23·52 (f) 19·28

4. (a) 6·24m (b) (i) 10·81kg (ii) 0·91kg

Ex 5

1. (a) 25·38 (b) 14·70 (c) 40·48 (d) 57·19
(e) 36·72 (f) 7·29 (g) 66·92 (h) 75·72
(i) 47·43 (j) 84·15 (k) 55·62 (l) 10·80

2. (a) 22·92kg (b) 23·10m (c) £80·73
(d) 29·36 l (e) 95·26kg (f) 195·90m

Ex 6

1. (a) 8·24 (b) 5·55 (c) 5·89 (d) 4·77
(e) 8·25 (f) 5·43 (g) 6·32 (h) 3·42
(i) 0·72 (j) 8·65 (k) 2·73 (l) 1·91

2. (a) £14·54 (b) 4·16m (c) 2·34kg
(d) 3·69 l (e) 43·12 secs
(f) (i) 3·74kg (ii) 11·22kg extra

Ex 7

1. (a) 63·4 (b) 41·7 (c) 7·8 (d) 123·4
(e) 59 (f) 6 (g) 123·4 (h) 87·8
(i) 639 (j) 1148·7 (k) 2·1 (l) 450

2. (a) 82·1 (b) 13·7 (c) 9·3 (d) 62
(e) 141·5 (f) 287 (g) 0·4 (h) 10·5

3. (a) 631 (b) 247 (c) 135·8 (d) 92·7
(e) 1416 (f) 103·7 (g) 0·2 (h) 250

4. (a) 2·7g (b) 27g

5. (a) 17·5 l (b) 175 l

6. (a) 2134 (b) 376 (c) 15180 (d) 3·61
(e) 1 (f) 30·3

Ex 8

1. (a) 0·64 (b) 1·94 (c) 0·321 (d) 0·065
(e) 6·8 (f) 0·003 (g) 1·47 (h) 2·263
(i) 0·9 (j) 0·231 (k) 2·89 (l) 12·31
(m) 0·483 (n) 0·2981 (o) 0·067 (p) 0·98
(q) 2·7 (r) 0·065 (s) 0·531 (t) 1·65
(u) 0·037

2. (a) move all the figures <u>2 places</u> to the right
(b) move all the figures <u>3 places</u> to the right

3. (a) 0·2653 (b) 3·625 (c) 0·0581 (d) 0·2931
(e) 0·062 (f) 5·87 (g) 0·48 (h) 18·625
(i) 0·0693

4. (a) £0·23 (b) £0·15 (c) 0·00585kg
(d) 9·5cm (e) 8·75g

5. (a) 1·8cm (b) 3·7cm (c) 0·89cm (d) 0·6cm
(e) 0·04cm

6. (a) 3·55m (b) 6·02m (c) 0·88m (d) 0·253m
(e) 0·064m

7. (a) 32·37km (b) 0·965km (c) 0·472km
(d) 0·0859km (e) 0·0097km

Answers to Chapter 4

Ex 1

1. (a) $\frac{23}{100} = 0·23$ (b) $\frac{45}{100} = 0·45$
(c) $\frac{51}{100} = 0·51$ (d) $\frac{19}{100} = 0·19$
(e) $\frac{72}{100} = 0·72$ (f) $\frac{8}{100} = 0·08$
(g) $\frac{2}{100} = 0·02$ (h) $\frac{9}{100} = 0·09$
(i) $\frac{17·5}{100} = 0·175$ (j) $\frac{6·5}{100} = 0·065$

2. (a) $\frac{7}{20}$ (b) $\frac{7}{10}$ (c) $\frac{17}{20}$ (d) $\frac{9}{10}$
(e) $\frac{1}{2}$ (f) $\frac{1}{4}$ (g) $\frac{3}{4}$ (h) $\frac{1}{10}$
(i) $\frac{1}{20}$ (j) $\frac{4}{25}$ (k) $\frac{12}{25}$ (l) $\frac{24}{25}$
(m) $\frac{1}{50}$ (n) $\frac{3}{5}$ (o) $\frac{3}{20}$ (p) $\frac{13}{50}$
(q) $\frac{4}{5}$

3. (a) 14% (b) 25% (c) 16% (d) 80%
(e) 70% (f) 65% (g) 50% (h) 10%
(i) 95% (j) 68% (k) $12\frac{1}{2}$% (l) $37\frac{1}{2}$%
(m) 90% (n) 1%

4. (a) 90% (b) 90% (c) 60% (d) 70%
(e) 76% (f) 70% (g) 75% (h) 50%

5. Science 80%, English 75%, History 72%, Maths 70%

Ex 2a

1. (a) £6·40 (b) £9·80 (c) £2·53 (d) £240
(e) £477 (f) £9·60 (g) £2852 (h) £7·98
(i) £0·27 (j) £6·50 (k) £2·70 (l) 45p
(m) £1·10 (n) £0·98 (o) £14 (p) £2·75

2. (a) (i) 99 (ii) 121 (b) 42 l
(c) sugar 165g, starch 345g, protein 60g, fibre 67·5g, fat 37·5g
(d) 58·5kg (e) £210 (f) 6 hours

Ex 2b

1. £880 2. £350 3. 92 pdls 4. 1560ft
5. 1·68m 6. 54kg 7. 35km/hr 8. 678°C
9. £13·80 10. 7·2kg 11. £18720
12. £11340 13. 3840 cu cm
14. (a) £378 (b) £504
(c) (i) £1040 (ii) £52 (iii) £1092 – ???

Ex 2c

1. £18 2. £68 3. £607·20
4. 13000ft 5. 18°C 6. 84mph
7. 59·5kg 8. 3·4 l 9. 5·74cm
10. £10
11. (a) £16·80 (b) £45·50 (c) £11·20
(d) £11·55 (e) £21 (f) £84

Answers to Chapter 5

Ex 1

1. Check diagrams

2. Check diagrams

Ex 2

1. (a) 15 m (b) 22·5 m

2. (a) 80 cm (b) 60 cm (c) 100 cm

3. (a) 200 cm (b) 125 cm

4. 60 m by 90 m (b) 300 m

5. 160 cm = 1·6 m

6. 3·5 m

7. (a) 7·5 m (b) 6·5 m

8. (a) 6 cm by 3 cm (b) 72 ins by 36 ins

9. (a) 3·5 cm (b) 28 m

10. 105 cm (1·05m)

11. (a) 4 cm (b) 14 m

12. (a) 140 miles
(b) (i) 200 miles (ii) 215 miles
(iii) 375 miles (iv) 475 miles
(v) 215 miles
(c) (i) 11·3 cm, 6 cm, 5·7 cm
(ii) 565, 300, 285 miles
(iii) 1150 miles

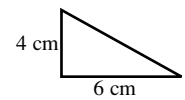
Ex 3

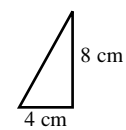
1. Rectangle 4 cm by 3 cm

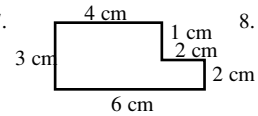
2. Rectangle 6 cm by 10 cm

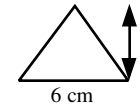
3. Rectangle 8 cm by 6 cm

4. Rectangle 2 cm by 10 cm

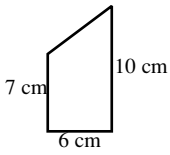
5. 

6. 

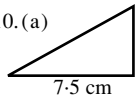
7. 

8. 

9.

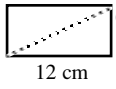


10. (a)



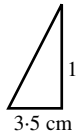
(b) 8·5 cm (c) 170 km

11. (a) (b)



(c) 15 cm (d) 75 m

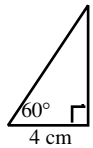
12. (a)



(b) 12·5 cm (c) 25 m

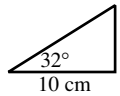
Ex 4

1. (a)



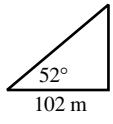
(b) 14 m

2. (a)



(b) 12·5 m

3. (a)



(b) 12·5 m

4. (a) 13 m (b) 43 m (c) 494 m
(d) 104 m (e) 62 m (f) 320 m

5. (a) Check drawing
(b) 12·5 cm (c) 125 m

Ex 5

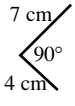
1. Check compass

2. (a) 180° (b) 90° (c) 45°
(d) 135° (e) 270° (f) 90°
(g) 90° (h) 270° (i) 135°
(j) 180°

3. (a) East (b) North (c) S.E.
(d) N.E.

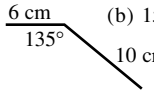
4. (a) (i) Creepy Woods (ii) Volcano
(iii) Black Isle (iv) Airport
(b) (i) S (ii) NE (iii) E (iv) SW

5. (a)



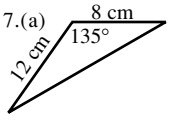
(b) 8 cm (c) 81 km

6. (a)



(b) 15 cm (c) 300 km

7. (a)



(b) 18·5 cm (c) 92·5 km

Answers to Chapter 6

Ex 1a

1. £230
2. (a) £168 (b) (i) £201·60 (ii) £33·60
3. £492 4. £353·60
5. (a) Ted £178·20, Bill £207·90, Nick £252·45, Tam £168·30, Dave £198
(b) £1004·85
6. £66
7. (a) £247·20 (b) £211·15 (c) £36·05
8. (a) Susie £148·50, Sandra £156 (b) £7·50
9. £397·60 10. £682·50

Ex 1b

1. £6·25 2. £4·10
3. (a) £4·35 (b) £174
4. (a) £8·45 (b) £211·25
5. (a) 162 hrs (b) £5·50
6. Andy £12·30, Val £5·70, Thomas £9·40, Jenny £4·05
7. (a) £6·75 (b) £249·75 8. 36 hrs
9. 40 hrs
10. Ian £6·40, Simon £6·25, Ian better
11. No, she got 10p per hour less

Ex 2a

1. £13440 2. £10203 3. £10953
4. £177 5. £2210 6. £7722
7. £10940·80 8. £10075
9. (a) £150·50 (b) £7826
10. (a) £218 (b) £11336
11. (a) £15126 (b) £14833 (c) £293
12. (a) Arthur £11674, Sally £11835
(b) (i) Jenny (ii) Arthur
13. No, both paid same

Ex 2b

1. £1655 2. £1965 3. £1524·50
4. £3500 5. £1365·50 6. £163·25
7. £278·75 8. £223·50 9. £185·25
10. (a) £254·50
11. (a) £350·50 (b) £701
12. (a) £988 (b) £228
13. (a) £260 (b) £6·50
14. (a) £110 (b) £4·40

Ex 3

1. £13144 2. £11124 3. £46
4. (a) £17220 (b) £9975 (c) £7560
5. (a) £19610 (b) yes
6. Norrie
7. (a) £162 (b) £170·10
8. (a) £8·19
(b) (i) £312 (ii) £327·60 (iii) £15·60
9. (a) £294 (b) £180 (c) £474
(d) £545·10

Ex 4

1. (a) £195 (b) £324 (c) £558
2. £1645 3. £240 4. £102
5. (a) £532 (b) £1182
6. £1355
7. (a) £2135 (b) £20635
8. £112
9. (a) £110 (b) £235·50
10. £130

Ex 5

1. (a) £10 (b) £60
2. (a) £12·80 (b) £51·20
3. (a) £11·20 (b) £89·60
4. (a) (i) £14·40 (ii) £72
(b) (i) £8·20 (ii) £49·20
(c) £176 (d) £177·60 (e) £92·40
5. (a) £7·50 (b) £30
6. (a) £7·95 (b) £95·40
7. (a) £6·60 (b) £79·20
8. (a) £6·54 (b) £39·24
9. (a) (i) £12·20 (ii) £61
(b) (i) £9·15 (ii) £45·75
(c) £15·25
10. B/P = £248, O/t = £55·80, Tot = £303·80
11. B/P = £201·60, O/t = £84, Tot = £285·60
12. B/P = £395·20, O/t = £109·20, Tot = £504·40
13. B/P = £4, Wage = £160,
£8 £32 Tot = £210
£6 £18

Ex 6

1. (a) £1135 (b) £1111 (c) £10105
(d) £797·10 (e) £23026 (f) £289
(g) £19020 (h) £405·25 (i) £369·05
(j) £590·85
2. £687·35
3. (a) £17544 (b) £1462
4. £346·75 5. £1486·75
6. (a) £272 (b) £224·50
7. (a) £385 (b) £308·52
8. (a) £218·50 (b) £170·05
9. (a) £718·80 (b) £163·96 (c) £554·84
10. (a) £713·05, £210·70, £502·35
(b) £528·75, £118·18, £410·57
(c) £795·47, £226·82, £568·65
(d) £874·70, £243·42, £631·28
(e) £739·15, £207·76, £531·39
11. (a) £1260 (b) £2135·50 (c) £1511·90

Answers to Chapter 7

Ex 1

1. (a) 8x (b) 5x (c) 10x (d) 2x
(e) 11x (f) 12x (g) 3x (h) 3x
(i) 5p (j) 8a (k) 12t (l) 9g
(m) d (n) y (o) 3m (p) 6x
(q) 0 (r) 6a (s) 4f (t) 2f
(u) 14f

2. (a) x (b) 3y (c) 11x + 2
(d) 9x + 1 (e) 8a – 1 (f) 4w + 8
(g) a + 8 (h) y (i) 6x + 8y
(j) 7a + 10b (k) 3p + 2q (l) 6g + 5h
(m) 3x + 2y (n) 13a + 1 (o) 8x + 4y
(p) 6p + 3q (q) 4g + 5h (r) x + y + 7
(s) $p^2 + q^2$

Ex 2

1. (a) 5a (b) 3p (c) 2t (d) 7y
(e) 8m (f) 2w (g) ab (h) cf
(i) dy (j) a^2 (k) b^2 (l) m^2
(m) 2de (n) 5pq (o) 7mn (p) $4a^2$
(q) $7b^2$ (r) 6rs (s) 15uv (t) 35gh
(u) $6a^2$ (v) $14m^2$ (w) $3f^2$ (x) $32w^2$

Ex 3

1. (a) 2x + 2 (b) 3x – 6 (c) 4x + 28
(d) 5x - 15 (e) 7y – 7 (f) 9t – 18
(g) 10a + 70 (h) 20w + 100 (i) 17y + 17
(j) 3x – 3y (k) 5a + 5b (l) 2p – 2q
(m) 8g + 8h (n) 2x + 2y + 4
(o) 6x + 6y + 6 (p) 5x – 5y – 10
(q) 6x + 3 (r) 18a – 12 (s) 12p – 8
(t) 14t + 35 (u) 20q – 4 (v) 500v – 200
(w) 6x + 9y + 3 (x) 8x – 2y + 10
2. (a) 2x + 3 (b) 3x + 10 (c) 4w + 3
(d) 5v (e) 3x + 8 (f) 7y + 8
(g) 8g + 14 (h) w – 6 (i) x – 3
(j) 7y – 5 (k) 12x + 24 (l) 13h – 6
(m) 3x + 5 (n) 2x + 14 (o) 2x + 4
(p) 4x + 2 (q) 4x + 6 (r) 7y + 12
(s) 11y + 5 (t) 15w + 15 (u) 5a + 24
(v) 8c + 2 (w) 5x + 14 (x) 8x + 2
(y) 8x (z) 10x + 2

Ex 4

1. (a) x = 2 (b) x = 4 (c) x = 8 (d) x = 12
(e) x = 4 (f) x = 20 (g) x = 10 (h) x = 90
(i) x = 0 (j) x = 4 (k) x = 1 (l) x = 200
(m) x = 3 (n) x = 4 (o) x = 6 (p) x = 63
(q) x = 5 (r) x = 0

2. (a) x = 6 (b) m = 8 (c) p = 7 (d) q = 5
(e) t = 3 (f) a = 10 (g) b = 8 (h) d = 3
(i) $x = 3\frac{1}{2}$ (j) $p = 5\frac{1}{2}$ (k) $p = 3\frac{1}{2}$
(l) $m = 3\frac{1}{2}$ (m) $x = 10\frac{1}{2}$ (n) $t = 2\frac{1}{2}$
(o) $p = 2\frac{1}{2}$ (p) $b = 4\frac{1}{2}$ (q) $c = 3\frac{3}{4}$
(r) $n = 11\frac{1}{2}$

Ex 5

1. (a) x = 3 (b) x = 5 (c) x = 2 (d) x = 7
(e) x = 3 (f) x = 5 (g) x = 7 (h) x = 7
(i) x = 8 (j) x = 8 (k) x = 3 (l) x = 5
(m) x = 3 (n) x = 1 (o) x = 0 (p) x = 22
(q) x = 1 (r) $x = \frac{1}{2}$ (s) $x = 2\frac{1}{2}$
(t) $x = 2\frac{1}{2}$ (u) x = 6

Ex 6

1. (a) x = 1 (b) x = 2 (c) y = 3 (d) p = 4
(e) w = 2 (f) m = 6 (g) a = 3 (h) x = 7

(i) p = 8 (j) g = 3 (k) x = 2 (l) x = 30
(m) d = 3 (n) p = 6 (o) r = 4

Ex 7

1. (a) x = 2 (b) x = 5 (c) x = 6 (d) x = 8
(e) x = 6 (f) x = 10 (g) x = 10 (h) x = 20
(i) x = 1 (j) x = 5 (k) x = 3 (l) x = 4
(m) x = 2 (n) x = 5 (o) x = 7 (p) x = 7
(q) x = 22 (r) x = 5

Answers to Chapter 8

Ex 1

1. Earn Interest, Security
2. £240 3. £1050
4. (a) £260 (b) £230 (c) £399 (d) £280·85
5. (a) £540 (b) £756
6. Brian £192·40, Julie £192, Brian 40p more
7. (a) £240 (b) £6240
8. (a) £119 (b) £3519
9. (a) £4200 (b) £824 (c) £2261·60
(d) £18567·50
10. (a) 2·9% (b) £203
11. (a) £16·10 (b) £352 (c) £130·50
(d) £768
12. (a) £120 (b) £10 (c) £80
13. (a) £144 (b) £12 (c) £60
14. (a) £60 (b) £12 (c) £180·60
(d) £5500
15. (a) £630 (b) £420 (c) £15420

Ex 2

1. (a) £1·26 (b) £2·38 (c) £4·30
(d) £4·42 (e) £2·66 (f) £2·45
(g) £4·98 (h) £4·60 (i) £3·74
(j) £3·11 (k) £4·63 (l) £6·30
2. £152·75
3. (a) £653·30 (b) £126·72 (c) £194·87
(d) £69·33 (e) £130·72 (f) £117·56
4. (a) £75·20 (b) £893 (c) £224·90
(d) £581·63 (e) £82·25 (f) £64·16
(g) £282

Ex 3

1. (a) 360 (b) (i) 4824p (ii) £48·24
(c) £3·86 (d) £52·10
2. Units 720, Charge £96·48, Due £104·20
3. (a) Units 560, Charge £78·96, Due £85·28
(b) Units 555, Charge £89·91, Due £97·10
approx.
(c) Units 410, Charge £64·78, Due £69·96
(d) Units 482, Charge £84·35, Due £91·10
(e) Units 516, Charge £81·53, Due £88·05
approx.
(f) Units 470, Charge £82·25, Due £88·83

Answers to Chapter 9

Ex 1

1. Check drawing
2. (a) radius (b) diameter (c) radius
(d) diameter
3. (a) TG (b) OG (or OT) (or OP)
4. Check drawing D = 8 cm = 2 x AO
5. (a) 14 cm (b) 10 cm (c) 15 $\frac{1}{2}$ cm
(d) 8·6 cm

Practical Exercise ?

1. To show that in all cases C ÷ D = 3·14
2. To show that in all cases C ÷ D = 3·14
3. 4 x 3·14 = 12·56 cm

Ex 2

1. 18·8 cm 2. 34·5 cm 3. 25·11 cm
4. (a) 15·7 cm (b) 69·1 cm (c) 12·6 cm
(d) 116 cm (e) 14·8 cm (f) 29·2 cm
(g) 40·8 cm (h) 2·51 cm
5. 37·7 cm
6. (a) 4·2 cm (b) 13·2 cm
7. 5·02 cm
8. (a) 18·8 cm (b) 94·2 cm (c) 19·5 cm
(d) 534 cm (e) 15·7 cm (f) 40·2 mm
(g) 100 mm
9. 320 cm 10. 151 cm 11. 113 cm
12. 100 cm 13. 133 cm 14. 138 cm
15. 163 cm
16. (a) 141·(3) m (b) 3532·5 m
17. 58·1 cm 18. 45·5 m 19. 15·7 cm
20. (a) 42·39 cm (b) 423·(9) cm

Answers to Chapter 9

Ex 1

1. (a) 0330 (b) 0145 (c) 0400 (d) 1330
(e) 1515 (f) 1700 (g) 0515 (h) 2040
(i) 0245 (j) 0725 (k) 1200 (l) 0050
(m) 1250 (n) 2130 (o) 0355 (p) 2010
(q) 2255 (r) 0935 (s) 2320 (t) 1032
(u) 2150
2. (a) 1·30 am (b) 11·20 am (c) 9·05 am
(d) 1·30 pm (e) 3·40 pm (f) 10·15 pm
(g) 2·50 am (h) 7·35 pm (i) 6·10 pm
(j) 4·01 pm (k) noon (l) 8·30 am
(m) 5·50 am (n) 2·20 pm (o) 11·05 pm
(p) 7·55 pm (q) 12·30 am (r) 7·35 am
(s) 11·35 am (t) 8·20 pm (u) 11·55 pm

Ex 2

1. (a) 3 hrs (b) 3 $\frac{1}{2}$ hrs
(c) 5 $\frac{1}{2}$ hrs (d) 3 hrs 45 mins
(e) 1 hr 35 mins (f) 7 hrs 55 mins
(g) 2 hrs 5 mins (h) 25 mins
(i) 1 hr 50 mins (j) 1 hr 50 mins
2. 2 hrs 45 mins
3. (a) (i) 1 hr 05 mins (ii) 45 mins
(iii) 6 hrs 35 mins
(b) (i) 2·45 pm (ii) 3·30 pm
4. (a) 1 hr 20 mins, 1 hr 25 mins
(b) 1·45 pm, 1·10 am
(c) Pitlochry, 1 hr 10 mins
Kingussie, 45 mins
(d) Pitlochry, 15 mins
Perth, 24 mins
(e) John O'Groats -> Stirling 10 mins longer
(f) Daytime Stirling -> John O'Groats as it
takes least time
5. 4 $\frac{1}{2}$ hours
6. (a) 6 hrs 45 mins
(b) 10 mins after midnight
7. (a) BBC2 (b) 25 mins (c) 3 hrs 25 mins
(d) 15 mins
(e) not possible, programme lasts 10 mins
to long

Ex 3

1. (a) 8 km (b) 20 km (c) 27 km
(d) 160 km
2. (a) 96 miles (b) 480 miles (c) 1440 miles
(d) 42 miles
3. (a) 25 miles (b) 12 miles (c) 100 miles
(d) 140 km (e) 1650 miles
4. (a) 2 miles (b) 6 miles (c) 15 miles
(d) 30 km (e) 21 km
5. (a) 3 hrs, 960 miles (b) 32 miles
(c) 15 km

Ex 4

1. (a) 5 mph (b) 4 km/hr (c) 14 mph
(d) 175 km/hr
2. (a) 15 km/hr (b) 50 mph (c) 20 m/s
(d) 7·5 km/hr (e) 6000 mph (f) 70000 km/hr
3. (a) 60 mph (b) 750 mph (c) 91 mph
(d) 9 mph (e) 61 mph
4. (a) 39 mph (b) 30 mph (c) 18 mph
(d) 8 mph (e) 1 metre/hr
5. (a) 8 km/hr (b) 48 mph (c) 36 km/hr
(d) 40 km/hr (e) 440 mph
6. 60 km/hr
7. (a) 1 $\frac{1}{2}$ hrs (b) 200 mph
8. 2·5 mph

Ex 5

1. (a) 1 hr 30 mins (b) 3 hrs 30 mins
(c) 5 hrs 15 mins (d) 4 hrs 45 mins
(e) 6 hrs 30 mins (f) 8 hrs 15 mins
(g) 3 hrs 30 mins (h) 2 hrs 30 mins
(i) 4 hrs 15 mins (j) 1 hr 15 mins
(k) 2 hrs 45 mins (l) 45 mins
2. (a) 3 $\frac{1}{2}$ hrs (b) 2 $\frac{1}{4}$ hrs (c) 5 $\frac{3}{4}$ hrs
(d) 1·25 hrs (e) 6·5 hrs (f) 4·5 hrs
(g) 1·75 hrs (h) 7·75 hrs
3. (a) 1 hr (b) 6 hrs (c) 20 secs
(d) 8 hrs (e) 5 hrs (f) 2 hrs
(g) 2 hrs (h) 1 $\frac{1}{2}$ hrs
4. (a) 1 pm (b) 5 pm (c) 8·45 am
5. (a) 1 hr 30 mins (b) 2 hrs 30 mins
(c) 100 secs (d) 2 hrs 30 mins
6. (a) 80 miles, 2 hrs (b) 50 miles, 1 hr
(c) 90 miles, 1 $\frac{1}{2}$ hrs
7. (a) 1 $\frac{1}{2}$ hrs (b) 8·15 am
8. (a) 4 $\frac{1}{2}$ hrs (b) 8 pm
9. (a) 5 secs

Ex 6

1. (a) 4 hrs (b) 25 km/hr (c) 160 miles
(d) 40 km/hr (e) 2 hrs 30 mins (f) 10 m
2. 110 km/hr 3. 2 hrs 30 mins
4. 63 km 5. 160 mph
6. 1 hr 15 mins 7. 38750 miles
8. (a) 4 mph (b) 15 mins
9. 3000 miles 10. 6 minutes
11. All three

Ex 7

1. (a) 1 hour (b) $\frac{1}{2}$ hour (c) 1430
(d) 1530
(e) (i) 50 mph (ii) 0 mph (iii) 30 mph
2. (a) 1 hour (b) 40 mph, 60 mph
(c) return
3. (a) 20 km/hr (b) 60 km/hr (c) 11·45 am
(d) 15 km
4. (a) B
(b) (i) 80 km/hr (ii) 80 km/hr (c) 9·30
5. (a)

L	B	H	K
4pm	5pm 5·30pm	6·30pm 6·50pm	7·50pm

(b) (i) 120 km (ii) 100 km
(c) (i) 120 km/hr (ii) 80 km/hr
(iii) 100 km/hr (iv) 80 km/hr
6. (a) Spiers (b) S(40 secs) G(47·5 secs)
(c) Goodman (d) S(80 secs) G(47·5 secs)
(e) 60 sesc (f) 25 secs
(g) 5 m/secs (h) 2·5 m
(i) 4·2 m/sec (j) Spiers

Answers to Chapter 11

Ex 1

1. (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{6}$
(e) $\frac{1}{5}$ (f) $\frac{3}{4}$ (g) $\frac{7}{10}$ (h) $\frac{5}{6}$
(i) $\frac{2}{3}$ (j) $\frac{5}{8}$
2. (a) Any 6 boxes shaded (b) Any 3
(c) Any 4 (d) Any 9 (e) Any 10
(f) Any 7
3. (a) $\frac{1}{3}$ (b) $\frac{1}{3} = \frac{2}{6}$

4. (a) $\frac{1}{2} = \frac{2}{4}$ (b) $\frac{1}{3} = \frac{2}{6}$ (c) $\frac{9}{12} = \frac{3}{4}$

5. (a) $\frac{10}{15}$ (b) $\frac{12}{18}$
(c) $\frac{4}{6}$, $\frac{6}{9}$, $\frac{8}{12}$, $\frac{14}{21}$, $\frac{20}{30}$, etc.

6. (a) eg $\frac{2}{4}$ (b) eg $\frac{6}{8}$ (c) eg $\frac{4}{10}$
(d) eg $\frac{10}{12}$ (e) eg $\frac{2}{6}$ (f) eg $\frac{6}{30}$

7. (a) (i) $\frac{5}{6}$ (ii) $\frac{4}{5}$ (iii) $\frac{10}{11}$
(iv) $\frac{7}{12}$ (v) $\frac{8}{15}$ (vi) $\frac{9}{13}$
(b) (i) $\frac{3}{4}$ (ii) $\frac{4}{5}$ (iii) $\frac{1}{6}$
(iv) $\frac{7}{8}$ (v) $\frac{10}{11}$ (vi) $\frac{5}{9}$
(c) (i) $\frac{1}{2}$ (ii) $\frac{4}{5}$ (iii) $\frac{9}{20}$
(iv) $\frac{3}{10}$ (v) $\frac{5}{11}$ (vi) $\frac{40}{41}$

8. (a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$
(e) $\frac{3}{4}$ (f) $\frac{4}{5}$ (g) $\frac{3}{4}$ (h) $\frac{1}{4}$
(i) $\frac{2}{3}$ (j) $\frac{3}{10}$ (k) $\frac{1}{3}$ (l) $\frac{3}{4}$
(m) $\frac{2}{3}$ (n) $\frac{2}{5}$ (o) $\frac{3}{4}$ (p) $\frac{1}{4}$
(q) $\frac{3}{8}$ (r) $\frac{1}{2}$ (s) $\frac{2}{3}$ (t) $\frac{4}{5}$

Ex 2

1. (a) 9 (b) 5 (c) 7 (d) 20
(e) 7 (f) 2 (g) 4 (h) 5
(i) 2 (j) 4 (k) 13 (l) 4
2. (a) 62 (b) 73 (c) 105 (d) 256
(e) 336 (f) 273 (g) 300 (h) 121
(i) 32
3. (a) 20 (b) 18 (c) 6 (d) 24
(e) 15 (f) 12 (g) 24 (h) 4
(i) 12 (j) 35 (k) 35 (l) 6
(m) 63 (n) 180
4. (a) 96 (b) 210 (c) 80 (d) 420
(e) 1190 (f) 51 (g) 150 (h) 156
(i) 560 (j) 160 (k) 576
5. (a) (i) 510 (ii) 340
(b) (i) 96 (ii) 160
(c) (i) 84 (ii) 12

Ex 3

1. 25% = $\frac{1}{4}$, 50% = $\frac{1}{2}$, 20% = $\frac{1}{5}$, 10% = $\frac{1}{10}$
100% = 1, $33\frac{1}{3}\%$ = $\frac{1}{3}$, 1% = $\frac{1}{100}$, 5% = $\frac{1}{20}$

2.

%	100	50	$33\frac{1}{3}$	25	20	10	5	2
fr	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{100}$

3. (a) £40 (b) 12 (c) 900
4. (a) £5 (b) £100 (c) £4 (d) 60
5. (a) £3 (b) £102 (c) £500
6. (a) £80 (b) £8 (c) £11 (d) £8
(e) £37 (f) £20 (g) £3 (h) £4
(i) £90 (j) £600 (k) £40 (l) £2
7. 420
8. (a) £90 (b) £270
9. (a) £15 (b) £30

Ex 4

1. (a) $\frac{3}{4}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{4}{5}$
(e) $\frac{2}{3}$ (f) $\frac{3}{10}$ (g) $\frac{7}{10}$ (h) $\frac{9}{10}$
2. LEARNED
3. (a) £12 (b) £32 (c) £12 (d) £14
4. (a) (i) £20 (ii) £60
(i) £3 (ii) £9
(i) £8 (ii) £32
4. (d) (i) £6 (ii) £12
(e) (i) £9 (ii) £63
(f) (i) £12 (ii) £36
(g) (i) £30 (ii) £60
(h) (i) £30 (ii) £270
(i) (i) £14 (ii) £7
(j) (i) £6 (ii) £42
5. (a) £9 (b) £14 (c) £9 (d) £24
(e) £21 (f) £35 (g) £27 (h) £12
(i) £60 (j) £120
6. (a) £90 (b) £30

Answers to Chapter 12

Ex 1

1. (a) School bus (b) Train (c) 60
(d) 9 (e) $\frac{1}{2}$
2. (a) 2500
(b) Flight simulator (c) 500
(d) Faldo sold 2000 less ?? (e) $\frac{1}{5}$
3. (a) 4 (b) Liverpool (c) Spurs
(d) Arsenal & Chelsea (e) 1
(f) 20 (g) $\frac{1}{4}$
4. (a) SKY MOVIES (b) Disney
(c) Sky1 & ITV4 (d) 100 million
(e) Sky Sports
5. (a) 30000 (b) 20000
(c) Peugot Bar Graph is lower in 2002
(d) 310000 (e) Vauxhall & Rover
(f) Peugot
6. (a) 10 am – 11 am (b) 3 pm (c) 3°C
(d) 9 am – 3 pm (e) 100·5 °F
7. (a) 8 am (b) 24°C at 1 pm
(c) Pupils out of class for lunch, leave doors open.
(d) 12°C (e) 3 pm
8. (a) Decent weather (b) Oct/Nov
(c) (i) Sept/Oct (ii) Feb/Mar
(d) Jan, wet weather (e) weather improves
(f) 100
(g) falling
9. (a) Fish, chicken, Pizza with sausage
(b) Pizza, sausage
(c) (i) $\frac{1}{2}$ (ii) $\frac{1}{4}$ (iii) $\frac{1}{8}$
(d) (i) 20 (ii) 10 (iii) 5
10. (a) Bugs Bunny (b) RoadRunner
(c) (i) $\frac{1}{4}$ (ii) $\frac{1}{6}$ (iii) $\frac{1}{12}$ (iv) $\frac{1}{8}$
(d) (i) 6 (ii) 4 (iii) 2 (iv) 3
(e) 9
11. (a) (i) 20 (ii) 40
(b) 80 (c) 340 apples

Ex 2

1. (a) 60 kg (b) 120 cm
(c) Sam & Gary (d) Dave & Joe
(e) Sam (f) Joe (g) 42·5 kg
(h) 5 kg (i) 5 cm
2. (a) As temperature rises, sales of soup falls
(b) 8 (c) 22 (d) 10-12°C
3. (a) More miles travelled, higher the cost
(b) not more – no cost
(c) 1 mile (d) £3 (£3·25)
4. (a) Check answers
(b) (i) Tony Blair (ii) Tiger Woods
(iii) Madonna
5. £pd.sq
6. (a) When will we meet (b) Bye for now

Ex 3

1. (a) 24, 25, 26, 26, 27, 28
(b) (i) 17 (ii) 2
(c) 37 (d) 12 (e) "twenties"
2. (a) £1·40, £1·70, £2·00, £2·20, £2·20, £2·40, £2·70, £2·80, £2·90, £3·10, £3·10, £3·10, £3·40, £3·90, £4·30, £5·50, £5·60, £5·70, £5·80
(b) £2 level
(c) £3·10 (d) 6 (e) 19
3. (a) (i) 1 (ii) 0 (iii) 2
(b) 21 (c) 30 (d) 47
4. (a) Check diagram
(b) (i) 30 (ii) 77
(c) nobody in their "40"s
5. (a) seventies
(b) 232 (c) 278
(d) those in their "70"'s

Ex 4

1. Check pictograph
2. Check graph
3. (a) Check graph (b) Xmas sales
4. Check diagram (b) Joe
5. Check diagram

Ex 5

1. (a) 12 - 2 = 10
(b) 95 – 21 = 74
(c) 8·4 – 1·9 = 6·5
2. (a) 5 (b) 2 (c) 241
3. (a) 5 (b) 29 (c) 11
(d) 5 (e) £17 (f) 25·5
4. (a) 6 (b) 16 (c) £14
(d) 22 cm (e) 4·8 (f) 3·60
5. (a) 18 cm (b) 181 cm (c) 182 cm
6. (a) (i) 52·5 (ii) No mean says 52
(b) 52·5 (c) 54
7. (a) 103 (b) 104
8. (a) 44 (b) 40 (c) 49
9. 35 kg
10. 12 11. 9 12. 7 cm

Answers to Chapter 13

Ex 1

1. (a) 36 (b) 16 (c) 4 (d) 25
(e) 81 (f) 100 (g) 1 (h) 9
(i) 0 (j) 64
2. (a) 256 (b) 484 (c) 361 (d) 1681
(e) 1024 (f) 2500 (g) 289 (h) 2809
(i) 7225 (j) 8649 (k) 10201 (l) 40000
3. (a) 64 cm^2 (b) 144 cm^2 (c) 225 cm^2
(d) 25 cm^2
4. (a) 473 cm^2
5. (a) 25 (b) 85 (c) 125 (d) 68
(e) 202 (f) 29 (g) 245 (h) 394
6. (a) 1, 3, 5, 7, 9, 11, 13 (b) 15
(c) 17, 19, 21
7. (a) 225 cm^2 (b) 81 cm^2 (c) 144 cm^2
8. (a) 48 cm^2

Ex 2

1. (a) 5 (b) 4 (c) 3 (d) 8
(e) 11 (f) 2
2. (a) 6 (b) 1 (c) 9 (d) 10
3. (a) 8 (b) 9 (c) 11 (d) 20
(e) 25 (f) 30 (g) 16 (h) 13
(i) 1·2 (j) 1·8
4. (a) 3·74 (b) 4·36 (c) 6·08 (d) 8·25
(e) 9·64 (f) 10·72 (g) 14·39 (h) 17·32
(i) 22·80 (j) 27·11
5. 8·94 cm 6. 11·83 cm

Ex 3

1. (a) 36, 64, 100 (b) 100 (c) OK
2. (a) 25, 144, 169 (b) 169 (c) OK
3. (a) 64, 225, 289 (b) 289 (c) OK
4. (a) 81, 144, 225 (b) 225 (c) OK
5. (a) 100, 576, 676 (b) 676 (c) OK
6. (a) 225, 400, 625 (b) 625 (c) OK

Ex 4

1. (a) 5 cm 2. 13 cm
3. (a) 20 cm (b) 17 cm (c) 25 cm
4. 8·94 cm 5. 11·18 cm 6. 15·81 cm
7. 20·81 cm 8. 18·77 cm
9. (a) 10·82 cm (b) 16·12 cm (c) 17·46 cm
(d) 7·28 m (e) 33·02 mm (f) 27·78 cm
(g) 41·34 mm (h) 90·79 m (i) 11·01 cm
(j) 126·13 cm (k) 117·65 m (l) 22·83 cm

Ex 5

1. 25 m 2. 7·5 m 3. 89·02 km
4. 142·13 m 5. 25·71 m 6. 30·02 cm
7. 35·51 cm 8. 75 m 9. 3·52 m
10. 17 cm 11. 21·93 cm 12. 13·13 m

Ex 6

1. 36 cm
2. (a) 10·39 cm (b) 18·33 cm (c) 16·52 cm
(d) 8·49 m (e) 20·66 mm (f) 26·53 cm
(g) 12·96 cm (h) 41·08 m

Answers to Chapter 14

Ex 1

1. (a) 12 (b) 12 cm^2
2. (a) 5 cm^2 (b) 8 cm^2 (c) 8 cm^2
(d) 9 cm^2 (e) 15 cm^2 (f) 10 cm^2
(g) 14 cm^2 (h) 10 cm^2 (i) 14 cm^2
(j) 11 cm^2 (k) 14·5 cm^2
3. (a) 8 cm^2 (b) 14 cm^2 (c) 8 cm^2
(d) 24 cm^2 (e) 8 cm^2
4. (a) 4·5 cm^2 (b) 7 cm^2 (c) 15 cm^2
(d) 16 cm^2 (e) 14 cm^2 (f) 8 cm^2
(g) 15 cm^2 (h) 21 cm^2
5. (a) 25 cm^2 (b) 25 cm^2 (c) 28 cm^2
(d) 32-33 cm^2

Ex 2

1. (a) Check drawing
(b) 10 boxes (c) 10 cm^2
2. 45 cm^2
3. (a) 35 cm^2 (b) 32 cm^2 (c) 30 cm^2
(d) 66 cm^2 (e) 25 cm^2 (f) 48 cm^2
4. (a) 20 m^2 (b) 8 m^2 (c) 15 m^2
(d) 60 m^2 (e) 98 m^2
5. (a) 270 m^2 (b) 391 m^2 (c) 875 m^2
(d) 3145 m^2 (e) 1554 m^2

Ex 3

1. (a) Check drawing
(b) 24 cm^2 (c) 12 cm^2
2. (a) Check drawing
(b) 24 cm^2 (c) 12 cm^2
3. (a) Check drawing
(b) 16 cm^2 (c) 8 cm^2
4.

	Area Rect	Area Triangle
(a)	28 cm^2	14 cm^2
(b)	40 cm^2	20 cm^2
(c)	18 cm^2	9 cm^2
(d)	64 cm^2	32 cm^2
(e)	42 cm^2	21 cm^2
(f)	50 cm^2	25 cm^2
(g)	72 cm^2	36 cm^2

5. (a) Check sketch (b) 35 cm^2
6. (a) 33 cm^2 (b) 63 cm^2 (c) 35 cm^2
(d) 130 cm^2 (e) 105 cm^2 (f) 84 cm^2
(g) 200 cm^2 (h) 72 cm^2 (i) 38·5 cm^2
(j) 67·5 cm^2 (k) 136·5 cm^2
7. (a) 6 m^2 (b) 27 m^2 (c) 200 mm^2
(d) 825 mm^2 (e) 60 m^2 (f) 247 cm^2
(g) 875 mm^2 (h) 28·5 m^2
8. (a) 1305 m^2 & 1320 m^2 West field larger
(b) 15 m^2
9. 306 cm^2 10. 86·5 cm^2 11. 29·25 cm^2
12. 8·1 m^2

Ex 4

1. (a) (b) Check drawing
(c) 28 cm^2 (d) 14 cm^2
2. (a) 12 cm^2 (b) 6 cm^2
3. (a) 14 cm^2 (b) 15 cm^2 (c) 36 cm^2
(d) 60 cm^2 (e) 72 cm^2 (f) 175 cm^2
(g) 575 cm^2 (h) 187 cm^2
4. (a) 45·1 cm^2 (b) 70·2 cm^2 (c) 225 mm^2
(d) 980 m^2 (e) 41·8 cm^2 (f) 1040 m^2
(g) 36·75 m^2 (h) 1237·5 mm^2 (i) 3844 mm^2
5. B 6. 2700 cm^2

Ex 5

1. (a) 375 cm^2 (b) 112 cm^2 (c) 487 cm^2
2. (a) 900 cm^2 (b) 154 cm^2 (c) 1054 cm^2
3. (a) 142 cm^2 (b) 270 cm^2 (c) 428 cm^2
(d) 270 cm^2 (e) 196 cm^2 (f) 196 cm^2
(g) 330 cm^2
4. 70 cm^2 5. 70 cm^2
6. (a) 195 cm^2 (b) 370 cm^2 (c) 255 cm^2
(d) 2250 mm^2 (e) 42 m^2 (f) 105 cm^2
7. (a) 100 cm^2 (b) 180 cm^2 (c) 114 cm^2
(d) 750 cm^2 (e) 132 cm^2

Answers to Chapter 15

Ex 1

1. (a) £80 (b) £0·30 (c) £600
(d) £36 (e) £18 (f) £0·60
(g) £50 (h) £4·50 (i) 8p
(j) £21 (k) £38 (l) £30
(m) £60 (n) £7·50 (o) £48
(p) £54 (q) £35 (r) £3000
(s) £64 (t) £32 (u) £2·40
(v) £56 (w) £1·60 (x) £12
2. (a) £50 (b) £100
3. (a) £240 (b) £1040
4. (a) £800 (b) £16800
5. (a) 90 litres (b) 30 litres
6. (a) 4°C (b) 20°C
7. (a) 6 m (b) 14 m
8. (a) 33 $\frac{1}{3}$% of 240 (b) 5
9. 60
10. 108 people

Ex 2

1. £90 2. £12·50 3. £6500
4. £21700 5. £162 6. £6·50
7. £3300 8. £495
9. (a) £34·25 (b) £20·75
10. £12·50 13. £19·50 12. £35
13. (a) £87 (b) £12
14. £1440000 15. 35p
16. (a) 20 (b) £12 (c) £5·50
17. (a) 15 (b) £172·50 (c) £22·50

Ex 3

1. (a) (b) £830 (c) £80
2. (a) £2140 (b) £340
3. (a) £1069·50 (b) £119·50
4. (a) £523 (b) £58
5. (a) £215 (b) £20
6. (a) £2000 (b) £250
7. (a) £365 (b) No
(c) They want the sale
8. (a) £1200 (b) £200
9. (a) £570 (b) £57
10. (a) Nil (b) £23
11. (a) £708·50 (b) £58·50
12. (a) £5250 (b) £750

Ex 4

1. (a) £173·90 (b) £185
2. £242·50 3. £423
4. (a) £258·50 (b) £137·50 (c) £121
5. £124·80
6. (a) £156·80 (b) £88·20 (c) £176·40
(d) £53·90 (e) £73·50 (f) £46·55
7. (a) £155·10 (b) £124·80 (c) £279·90
(d) £23·33
8. (a) £237·50 (b) £181·30 (c) £418·80
(d) £34·90
9. (a) £155 (b) £167·50 (c) £12·50
10. (a) £244 (b) £248·20
(c) – (b) by £4·20
(d) £238·60

Ex 5

1. (a) £2·00 (b) £100
2. £33 3. £120
4. (a) £147 (b) £255 (c) £27·50
(d) £92·25 (e) £184 (f) £132
5. (a) £8·70 (b) £261
6. (a) £5·15 (b) £257·50
7. (a) £3·58 (b) £286·40
8. (a) £216·50 (b) £143·20 (c) £130·50
(d) £621 (e) £230·85 (f) £361

Ex 6

1. (a) 608€ 2. 380€ 3. $1136
4. 2880 dollars
5. (a) 912€ (b) 136·80€ (c) $766·80
(d) 1080 (e) 98·80€ (f) $454·40
6. £60 7. £425 8. £125
9. £350
10. (a) £250 (b) £40 (c) £900
(d) £2·50 (e) £85 (f) £3200
11. (a) 608€ (b) £103·95
12. (a) £750 (b) £60

Answers to Chapter 16

INTRO EXERCISE

1. All 4 answers in the bottom row are 0·75
2. All answers 0·75
3. (a) 30 mm (b) 80 cm

Ex 1

1. (a) 0·466 (b) 0·900 (c) 1·664
(d) 6·314 (e) 1·235 (f) 0·325
(g) 0·123 (h) 2·246 (i) 19·081
(j) 0·532 (k) 0·194 (l) 0·277
(m) 0·990 (n) 1·827 (o) 0·191
(p) 1·000
2. OK
3. (a) 12 cm (b) 9 cm (c) 1·333
(d) 1·333

Ex 2

1. (a) 4·7 cm 2. 30·1 cm
3. (a) 4·9 cm (b) 9·3 cm (c) 5·8 cm
(d) 2·4 cm (e) 6·7 m (f) 15·4 mm
(g) 5·5 m
4. (a) 9·7 cm (b) 9·4 cm (c) 4·3 m
(d) 71·8 cm (e) 8·1 cm (f) 17·9 mm
5. 7·8 m 6. 37·4 m 7. 0·8 m
8. 1414·1 m 9. 121·9 m 10. 10·2 cm

Ex 3

1. (a) 25° (b) 15° (c) 45° (d) 60°
   (e) 80° (f) 52° (g) 68° (h) 11°
   (i) 22° (j) 61·5° (k) 37·2° (l) 83·6°
   (m) 40·8° (n) 7·5° (o) 88°
2. Copy
3. 21·8° 4. 50·2°
5. (a) 31° (b) 51·3° (c) 39·3° (d) 21·8°
   (e) 40° (f) 37·4°
6. 36·5° 7. 39·9°

Answers to Chapter 17

Ex 1

1. (a) Check drawing (b) 3, 6, 9, 12, 15, 18
   (c) 3 (d) 3 (e) M = 3 x T
   (f) 120
2. (a) Check drawing (b) 5, 10, 15, 20, 25, 30
   (c) 5 (d) 5 (e) C = 5 x P
   (f) 100
3. (a) Check table (b) 6
   (c) W = 6 x H (d) 60
4. (a) Check table (b) 8
   (c) C = 8 x F (d) £120
5. (a) 12 (b) M = 12 x K
   (c) 360 minutes
6. (a) 6 (b) P = 6 x B
   (c) 120 pages
7. (a) A = 40 x T (b) T = 7 x L
   (c) G = 120 x C (d) C = 2·5 x I
   (e) M = 330 x B (f) H = 5 x O

Ex 2

1. (a) Check drawing (b) Check table
   (c) 2 (d) M = 2 x T + 1 (e) 21
2. (a) Check drawing (b) Check table
   (c) 4 (d) C = 4 x T + 4 (e) 52
3. (a) Check drawing (b) Check table
   (c) 3 (d) B = 3 x P – 3 (e) 42
4. (a) (i) £33 (ii) £38
   (b) £5 (c) C = 5 x D + 3 (d) £53
5. (a) 0·3 tonnes (b) W = 0·3 x T + 1·1
6. (a) C = 3 x N + 3 (b) A = 5 x b + 8
   (c) W = 4 x N + 46 (d) V = 7 x T + 12
   (e) T = 2 x D + 6·5 (f) D = 6 x T – 4
   (g) D = 11 x P – 6 (h) P = 15 x D + 78
7. (a) 3 (b) D = 3 x T + 29
   (c) 59 cm (d) 15 minutes

Answers to Chapter 18

Introduction Exercise

1. E 2. I 3. ML 4. LL
5. DE 6. E 7. LL 8. E
9. I 10. ML 11. DC 12. I

Ex 1

1. (a) $\frac{2}{5}$ (b) $\frac{3}{5}$
2. (a) 6 (b) $\frac{1}{6}$ (c) $\frac{1}{6}$ (d) $\frac{3}{6}$ ($\frac{1}{2}$)
   (e) $\frac{4}{6}$ ($\frac{2}{3}$) (f) 0
3. (a) 52 (b) $\frac{1}{2}$ (c) $\frac{1}{13}$ (d) $\frac{3}{13}$
   (e) $\frac{9}{13}$ (f) $\frac{1}{52}$
4. (a) $\frac{6}{15}$ ($\frac{2}{5}$) (b) $\frac{9}{15}$ ($\frac{3}{5}$)
5. (a) $\frac{4}{20}$ ($\frac{1}{5}$) (b) $\frac{10}{20}$ ($\frac{1}{2}$)
   (c) $\frac{16}{20}$ ($\frac{4}{5}$) (d) $\frac{10}{20}$ ($\frac{1}{2}$)
   (e) 1 (f) 0
6. (a) $\frac{8}{16}$ ($\frac{1}{2}$) (b) $\frac{8}{16}$ ($\frac{1}{2}$) (c) $\frac{1}{16}$
   (d) $\frac{4}{16}$ ($\frac{1}{4}$) (e) $\frac{9}{16}$
7. (a) $\frac{20}{60}$ ($\frac{1}{3}$) (b) $\frac{25}{60}$ ($\frac{5}{12}$) (c) $\frac{15}{60}$ ($\frac{1}{4}$)
8. (a) $\frac{1}{7}$ (b) $\frac{3}{7}$ (c) $\frac{4}{7}$ (d) $\frac{2}{7}$
9. $\frac{5}{8}$

Appendix

Table of Tangents
0° to 90°

Tangents (0° - 44·9°)

Angle	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
0	0·000	0·002	0·003	0·005	0·007	0·009	0·010	0·012	0·014	0·016
1	0·017	0·019	0·021	0·023	0·024	0·026	0·028	0·030	0·031	0·033
2	0·035	0·037	0·038	0·040	0·042	0·044	0·045	0·047	0·049	0·051
3	0·052	0·054	0·056	0·058	0·059	0·061	0·063	0·065	0·066	0·068
4	0·070	0·072	0·073	0·075	0·077	0·079	0·080	0·082	0·084	0·086
5	0·087	0·089	0·091	0·093	0·095	0·096	0·098	0·100	0·102	0·103
6	0·105	0·107	0·109	0·110	0·112	0·114	0·116	0·117	0·119	0·121
7	0·123	0·125	0·126	0·128	0·130	0·132	0·133	0·135	0·137	0·139
8	0·141	0·142	0·144	0·146	0·148	0·149	0·151	0·153	0·155	0·157
9	0·158	0·160	0·162	0·164	0·166	0·167	0·169	0·171	0·173	0·175
10	0·176	0·178	0·180	0·182	0·184	0·185	0·187	0·189	0·191	0·193
11	0·194	0·196	0·198	0·200	0·202	0·203	0·205	0·207	0·209	0·211
12	0·213	0·214	0·216	0·218	0·220	0·222	0·224	0·225	0·227	0·229
13	0·231	0·233	0·235	0·236	0·238	0·240	0·242	0·244	0·246	0·247
14	0·249	0·251	0·253	0·255	0·257	0·259	0·260	0·262	0·264	0·266
15	0·268	0·270	0·272	0·274	0·275	0·277	0·279	0·281	0·283	0·285
16	0·287	0·289	0·291	0·292	0·294	0·296	0·298	0·300	0·302	0·304
17	0·306	0·308	0·310	0·311	0·313	0·315	0·317	0·319	0·321	0·323
18	0·325	0·327	0·329	0·331	0·333	0·335	0·337	0·338	0·340	0·342
19	0·344	0·346	0·348	0·350	0·352	0·354	0·356	0·358	0·360	0·362
20	0·364	0·366	0·368	0·370	0·372	0·374	0·376	0·378	0·380	0·382
21	0·384	0·386	0·388	0·390	0·392	0·394	0·396	0·398	0·400	0·402
22	0·404	0·406	0·408	0·410	0·412	0·414	0·416	0·418	0·420	0·422
23	0·424	0·427	0·429	0·431	0·433	0·435	0·437	0·439	0·441	0·443
24	0·445	0·447	0·449	0·452	0·454	0·456	0·458	0·460	0·462	0·464
25	0·466	0·468	0·471	0·473	0·475	0·477	0·479	0·481	0·483	0·486
26	0·488	0·490	0·492	0·494	0·496	0·499	0·501	0·503	0·505	0·507
27	0·510	0·512	0·514	0·516	0·518	0·521	0·523	0·525	0·527	0·529
28	0·532	0·534	0·536	0·538	0·541	0·543	0·545	0·547	0·550	0·552
29	0·554	0·557	0·559	0·561	0·563	0·566	0·568	0·570	0·573	0·575
30	0·577	0·580	0·582	0·584	0·587	0·589	0·591	0·594	0·596	0·598
31	0·601	0·603	0·606	0·608	0·610	0·613	0·615	0·618	0·620	0·622
32	0·625	0·627	0·630	0·632	0·635	0·637	0·640	0·642	0·644	0·647
33	0·649	0·652	0·654	0·657	0·659	0·662	0·664	0·667	0·669	0·672
34	0·675	0·677	0·680	0·682	0·685	0·687	0·690	0·692	0·695	0·698
35	0·700	0·703	0·705	0·708	0·711	0·713	0·716	0·719	0·721	0·724
36	0·727	0·729	0·732	0·735	0·737	0·740	0·743	0·745	0·748	0·751
37	0·754	0·756	0·759	0·762	0·765	0·767	0·770	0·773	0·776	0·778
38	0·781	0·784	0·787	0·790	0·793	0·795	0·798	0·801	0·804	0·807
39	0·810	0·813	0·816	0·818	0·821	0·824	0·827	0·830	0·833	0·836
40	0·839	0·842	0·845	0·848	0·851	0·854	0·857	0·860	0·863	0·866
41	0·869	0·872	0·875	0·879	0·882	0·885	0·888	0·891	0·894	0·897
42	0·900	0·904	0·907	0·910	0·913	0·916	0·920	0·923	0·926	0·929
43	0·933	0·936	0·939	0·942	0·946	0·949	0·952	0·956	0·959	0·962
44	0·966	0·969	0·972	0·976	0·979	0·983	0·986	0·990	0·993	0·997

Tangents (45° - 89·9°)

Angle	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
45	1·000	1·003	1·007	1·011	1·014	1·018	1·021	1·025	1·028	1·032
46	1·036	1·039	1·043	1·046	1·050	1·054	1·057	1·061	1·065	1·069
47	1·072	1·076	1·080	1·084	1·087	1·091	1·095	1·099	1·103	1·107
48	1·111	1·115	1·118	1·122	1·126	1·130	1·134	1·138	1·142	1·146
49	1·150	1·154	1·159	1·163	1·167	1·171	1·175	1·179	1·183	1·188
50	1·192	1·196	1·200	1·205	1·209	1·213	1·217	1·222	1·226	1·230
51	1·235	1·239	1·244	1·248	1·253	1·257	1·262	1·266	1·271	1·275
52	1·280	1·285	1·289	1·294	1·299	1·303	1·308	1·313	1·317	1·322
53	1·327	1·332	1·337	1·342	1·347	1·351	1·356	1·361	1·366	1·371
54	1·376	1·381	1·387	1·392	1·397	1·402	1·407	1·412	1·418	1·423
55	1·428	1·433	1·439	1·444	1·450	1·455	1·460	1·466	1·471	1·477
56	1·483	1·488	1·494	1·499	1·505	1·511	1·517	1·522	1·528	1·534
57	1·540	1·546	1·552	1·558	1·564	1·570	1·576	1·582	1·588	1·594
58	1·600	1·607	1·613	1·619	1·625	1·632	1·638	1·645	1·651	1·658
59	1·664	1·671	1·678	1·684	1·691	1·698	1·704	1·711	1·718	1·725
60	1·732	1·739	1·746	1·753	1·760	1·767	1·775	1·782	1·789	1·797
61	1·804	1·811	1·819	1·827	1·834	1·842	1·849	1·857	1·865	1·873
62	1·881	1·889	1·897	1·905	1·913	1·921	1·929	1·937	1·946	1·954
63	1·963	1·971	1·980	1·988	1·997	2·006	2·014	2·023	2·032	2·041
64	2·050	2·059	2·069	2·078	2·087	2·097	2·106	2·116	2·125	2·135
65	2·145	2·154	2·164	2·174	2·184	2·194	2·204	2·215	2·225	2·236
66	2·246	2·257	2·267	2·278	2·289	2·300	2·311	2·322	2·333	2·344
67	2·356	2·367	2·379	2·391	2·402	2·414	2·426	2·438	2·450	2·463
68	2·475	2·488	2·500	2·513	2·526	2·539	2·552	2·565	2·578	2·592
69	2·605	2·619	2·633	2·646	2·660	2·675	2·689	2·703	2·718	2·733
70	2·747	2·762	2·778	2·793	2·808	2·824	2·840	2·856	2·872	2·888
71	2·904	2·921	2·937	2·954	2·971	2·989	3·006	3·024	3·042	3·060
72	3·078	3·096	3·115	3·133	3·152	3·172	3·191	3·211	3·230	3·251
73	3·271	3·291	3·312	3·333	3·354	3·376	3·398	3·420	3·442	3·465
74	3·487	3·511	3·534	3·558	3·582	3·606	3·630	3·655	3·681	3·706
75	3·732	3·758	3·785	3·812	3·839	3·867	3·895	3·923	3·952	3·981
76	4·011	4·041	4·071	4·102	4·134	4·165	4·198	4·230	4·264	4·297
77	4·331	4·366	4·402	4·437	4·474	4·511	4·548	4·586	4·625	4·665
78	4·705	4·745	4·787	4·829	4·872	4·915	4·959	5·005	5·050	5·097
79	5·145	5·193	5·242	5·292	5·343	5·396	5·449	5·503	5·558	5·614
80	5·671	5·730	5·789	5·850	5·912	5·976	6·041	6·107	6·174	6·243
81	6·314	6·386	6·460	6·535	6·612	6·691	6·772	6·855	6·940	7·026
82	7·115	7·207	7·300	7·396	7·495	7·596	7·700	7·806	7·916	8·028
83	8·144	8·264	8·386	8·513	8·643	8·777	8·915	9·058	9·205	9·357
84	9·514	9·677	9·845	10·02	10·20	10·39	10·58	10·78	10·99	11·20
85	11·43	11·66	11·91	12·16	12·43	12·71	13·00	13·30	13·62	13·95
86	14·30	14·67	15·06	15·46	15·89	16·35	16·83	17·34	17·89	18·46
87	19·08	19·74	20·45	21·20	22·02	22·90	23·86	24·90	26·03	27·27
88	28·64	30·14	31·82	33·69	35·80	38·19	40·92	44·07	47·74	52·08
89	57·29	63·66	71·62	81·85	95·49	114·6	143·2	191·0	286·5	578·0