



Coatbridge High School
Mathematics Department



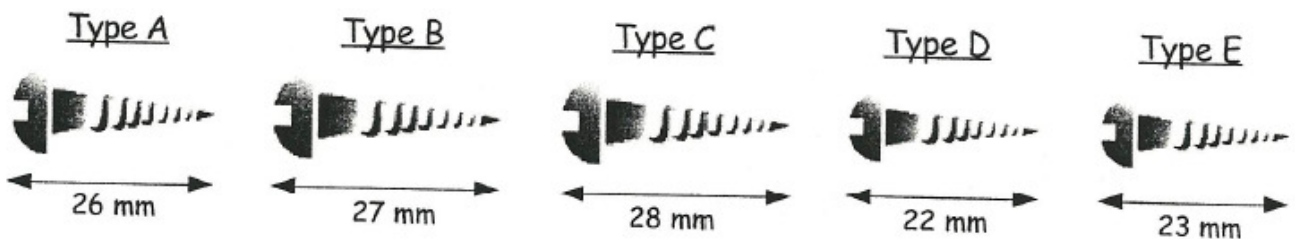
Homework Booklet

CfE Level 4

MNU 4-01a: Having investigated the practical impact of inaccuracy and error, I can use my knowledge of tolerance when choosing the required degree of accuracy to make real-life calculations.

Exercise 1

- For each of the following tolerances, write down the minimum and maximum allowable sizes :-
 - (10 ± 1) cm
 - (15 ± 2) mm
 - (100 ± 4) kg
 - (250 ± 20) km
 - (12 ± 0.2) cm
 - (3 ± 0.1) m
 - (5.5 ± 0.2) g
 - (0.5 ± 0.01) cm
- A joiner needs a type of wood screw with length (25 ± 2) mm to complete a cabinet.
 - Write down the min. and max. length the joiner requires.
 - State which of these wood screws he can use for the cabinet.



- The spark plug gap for a Rover car is (1.00 ± 0.05) mm.
 - Write the minimum and maximum distance for the gap.
 - State which of these gaps is not acceptable.
 - 1.03 mm
 - 1.1 mm
 - 1.04 mm
 - 0.6 mm
 - 0.9 mm
 - 0.99 mm.



Exercise 2

- Write each of the following in tolerance form :-
 - min = 20 m
max = 22 m
 - min = 150 cm
max = 160 cm
 - min = 15 kg
max = 16 kg
 - min = 100 mm
max = 106 mm
 - min = 5 g
max = 5.2 g
 - min = 0.5 ml
max = 0.7 ml
 - min = 0.1 cm
max = 0.12 cm
 - min = 10 cm
max = 10.01 cm.
- A car has its idle speed set at a minimum of 775 revs/min and a maximum of 875 revs/min. Write this in tolerance form.
- The dosage of a special vaccine must be between 5.3 ml and 5.4 ml. Write this in tolerance form.
- The temperature in Majorca one day ranged from a minimum of 68°F to a maximum of 102°F. Write this in tolerance form.

MNU 4-03a: Having recognised similarities between new problems and problems I have solved before, I can carry out the necessary calculations to solve problems set in unfamiliar contexts.

Exercise 1

- Round these numbers to the number of decimal places shown in the brackets :-

(a) 5.13 (1)	(b) 7.851 (1)	(c) 8.736 (2)	(d) 6.3492 (2)
(e) 4.8912 (3)	(f) 3.2915 (3)	(g) 47.999 24 (3)	(h) 3.999 88 (3).
- Use your calculator to do the following and give your answer correct to 2 decimal places :-

(a) $4.36 + 6.447$	(b) 23.82×16.35	(c) $37.1 \div 68.3$	(d) $16 \div 7$.
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- Do these calculations and round your answer to the number of decimal places shown in the brackets :-

(a) 2.58×0.247 (3)	(b) 0.394×6.555 (2)	(c) 6.274×1.983 (3)
(d) $0.58 \div 3.267$ (3)	(e) $16.27 \div 19.443$ (1)	(f) $0.7 \times 0.19 \times 0.87$ (4).

Exercise 2



- Write down the answers to each of the following :-

(a) $3 - 5$	(b) $(-3) - 6$	(c) $(-12) - 5$	(d) $4 - 8 - 7$
(e) $(-10) - 3$	(f) $(-3.2) + 1.6$	(g) $5.7 + (-8.8)$	(h) $(-7) + (-8) + 9$
(i) $(-3) + (-2)$	(j) $(-3.1) + (-6.7)$	(k) $(-7.8) + (-6.8)$	(l) $(-3.1) + 4.2 + (-2.7)$
- Find :-

(a) $2 - (-3)$	(b) $4 - (-5)$	(c) $7 - (-7)$	(d) $14 - (-8)$
(e) $-1 - (-2)$	(f) $-3 - (-7)$	(g) $-5 - (-16)$	(h) $-17 - (-18)$
(i) $-3 - (-48)$	(j) $-7 - (-25)$	(k) $-1.7 - (-2.6)$	(l) $-3.8 - (-7.7)$
- Find :-

(a) $30 \div (-3)$	(b) $54 \div (-6)$	(c) $80 \div (-4)$	(d) $36 \div (-6)$
(e) $84 \div (-3)$	(f) $225 \div (-25)$	(g) $74 \div (-37)$	(h) $30 \div (-4)$
- Calculate :-

(a) $(-3) \times (-4)$	(b) $(-5) \times (-5)$	(c) $(-7) \times (-2)$	(d) $(-7) \times (-12)$
(e) $(-15) \times (-4)$	(f) $(-8) \times (-12)$	(g) $(-50) \times (-20)$	(h) $(-100) \times (-30)$
(i) $(-6) \div (-2)$	(j) $(-9) \div (-3)$	(k) $(-16) \div (-4)$	(l) $(-1000) \div (-50)$

5. Find :-

- (a) $(3 \times (-6)) \div 2$ (b) $((-3) \times (-4)) \div 6$ (c) $((-6) \times (-4)) \div 12$ (d) $((-4) + (-6)) \div 2$
(e) $(5 - (-5)) \times 4$ (f) $((-6) + (-6)) \div 4$ (g) $(-8) \times (4 - 6)$ (h) $((-3) - (-9)) \div (-2)$
(i) $(-4)^3$ (j) $(-2)^2 + (-1)^2$ (k) $(-5)^3 - (-3)^4$ (l) $(-2)^5 - (-2)^3$

Exercise 3



1. Write down the answers to :-

- (a) 6×0.3 (b) 8×0.9 (c) 15×0.4 (d) 0.6×250
(e) 60×0.5 (f) 0.9×90 (g) 0.9×600 (h) 7000×0.3 .

2. Find :-

- (a) $6 \times (-0.8)$ (b) $8 \times (-0.8)$ (c) $0.6 \times (-3)$ (d) $0.7 \times (-8)$
(e) $15 \times (-0.4)$ (f) $(-25) \times (-0.9)$ (g) $(-0.5) \times (-120)$ (h) $(-0.7) \times (-90)$.

3. Calculate :-

- (a) $4.6 \div 2$ (b) $7.5 \div 5$ (c) $4.8 \div 8$ (d) $7.2 \div 9$
(e) $18 \div 30$ (f) $42 \div 60$ (g) $64 \div 80$ (h) $45 \div 90$
(i) $540 \div 600$ (j) $350 \div 500$ (k) $630 \div 900$ (l) $490 \div 700$

4. Find :-

- (a) $(-7.4) \div 2$ (b) $6.5 \div (-5)$ (c) $7.2 \div (-8)$ (d) $(-6.3) \div 9$
(e) $28 \div (-40)$ (f) $72 \div (-90)$ (g) $(-54) \div 60$ (h) $(-2.8) \div (-700)$.

Exercise 4



1. Calculate :-

- (a) 0.8×6 (b) 0.8×60 (c) 0.8×600 (d) 0.8×6000
(e) 0.8×0.6 (f) 0.08×0.6 (g) 0.008×0.6 (h) 0.0008×0.6
(i) $(0.7)^2$ (j) 0.09×0.3 (k) 0.03×0.3 (l) 0.006×0.7
(m) $0.08 \times 30\,000$ (n) 400×0.0005 (o) $0.3 \times 0.4 \times 0.5$ (p) $20 \times 0.8 \times 0.6$
(q) $60 \times 0.1 \times 700$ (r) $0.8 \times 50 \times 0.8$ (s) $0.7 \times 500 \times 0.3$ (t) $0.6 \times 5000 \times 0.4$.

2. Try these trickier examples :-

- (a) 0.03×0.03 (b) 0.06×0.07 (c) 0.08×0.09 (d) 0.05×0.04
(e) $(-0.8) \times 0.7$ (f) $0.02 \times (-0.04)$ (g) $(-0.08) \times (-0.01)$ (h) 0.009×0.003 .

3. Find :-

- (a) $6 \div 0.3$ (b) $36 \div 0.9$ (c) $100 \div 0.4$ (d) $2.4 \div 0.8$
(e) $4.55 \div 0.5$ (f) $22.33 \div 0.7$ (g) $6 \div 0.03$ (h) $5.2 \div 0.04$
(i) $0.54 \div 0.006$ (j) $0.045 \div 0.009$ (k) $0.0174 \div 0.003$ (l) $12 \div 20$

(m) $45 \div 500$ (n) $56 \div 7000$ (o) $720 \div 8000$ (p) $350 \div 5000$.

4. Have a go at these :-

(a) $20 \div 0.0004$ (b) $(-0.54) \div 0.3$ (c) $(-0.72) \div (-0.8)$ (d) $(-0.007) \div (-0.07)$.

Exercise 5

1. How many significant figures are there in each of these numbers :-

(a) 62.0 (b) 3.00 (c) 1.009 (d) 40.7
(e) 26.30 (f) 0.741 (g) 0.027 (h) 0.00090?

2. Round each number to 1 significant figure :-

(a) 53 (b) 2679 (c) 0.251 (d) 0.000815.


3. Round each number to 2 significant figures :-

(a) 308 (b) 5229 (c) 48.55 (d) 0.003281.

4. Round each number to 3 significant figures :-

(a) 9812 (b) 72091 (c) 0.28745 (d) 0.019999.

5. What is the total volume, (in ml), of 25 bottles of juice, each containing 675 ml ?
(Give your answer in millilitres to 3 significant figures)

6.  Harriet's restaurant bill came to £86.33 + VAT at 17.5%.
Calculate the VAT in £'s, correct to 4 sig. fig.

7. A jar of jam weighs 0.345 kg.
Round the weight to 2 sig. figs. and estimate
the total weight of 200 jars.



MNU 4-03b: I have investigated how introducing brackets to an expression can change the emphasis and can demonstrate my understanding by using the correct order of operations when carrying out calculations

Exercise 1

1. Find the value of each expression below when $a = 2$, $b = 3$ and $c = 4$:-

(a) $a + b - c$ (b) $2a + 4b - 3c$ (c) $5b - 4c + a$

(d) $a^2 + b^2 + c^2$ (e) $(c - a)^2 - 2b$ (f) $a^3 - (b - c)^3$.

2. Find the value of each expression below when $x = -1$, $y = 5$ and $z = -2$:-

(a) $x + y + z$

(b) $3x + 4y - 3z$

(c) $x^2 + (y - z)^2$.

3. Find the value of each expression when $a = -1$, $b = 2$, $c = 3$, $d = 4$ and $e = -2$:-

(a) $b + c + e$

(b) $ab + cd$

(c) $2b + 3c - 4e$

(d) $abcde \div 4$

(e) $a^2 + b^2 + c^2$

(f) $a^2 - b^2$

(g) $(ab + cd)^2 - e^2$

(h) $\sqrt{(ae)^2 - c}$.

MNU 4-06a: I have developed my understanding of the relationship between powers and roots and can carry out calculations mentally or using technology to evaluate whole number powers and roots, of any appropriate number.

Exercise 1

1. Find :-

(a) 3^2

(b) 5^2

(c) 2^2

(d) 1^2

(e) 10^2

(f) 9^2

(g) 11^2

(h) 12^2

(i) 20^2

(j) 100^2

(k) $(\frac{1}{2})^2$

(l) $(\frac{1}{3})^2$

(m) $(\frac{1}{5})^2$

(n) $(0.1)^2$

(o) $(0.01)^2$.

2. Find :-

(a) 2^3

(b) 2^5

(c) 3^4

(d) 8^2

(e) 9^1

(f) 1^{15}

(g) 10^5

(h) five squared.

3. Find the difference between :-

(a) 3^2 and 2^3

(b) 2^7 and 2^6

(c) 5^3 and 4^3

(d) 1^9 and 1^8 .

4. Find the value of b^4 when :-

(a) $b = 2$

(b) $b = 3$

(c) $b = 10$

(d) $b = 0$.

5. Find :-

(a) $\sqrt{36}$

(b) $\sqrt{25}$

(c) $\sqrt{100}$

(d) $\sqrt{169}$

(e) $\sqrt{4}$

(f) $\sqrt{225}$

(g) $\sqrt{10000}$

(h) $\sqrt{900}$

(i) $\sqrt{1600}$

(j) $\sqrt{1}$.

6. Use a calculator and write down to two decimal places :-

(a) $\sqrt{20}$

(b) $\sqrt{50}$

(c) $\sqrt{56}$

(d) $\sqrt{179}$

(e) $\sqrt{14.4}$.

7. Calculate the length of the side of a square with area :-

(a) 49 cm^2

(b) 81 cm^2

(c) 9 m^2

(d) 1 mm^2

(e) 0.25 m^2 .

MNU 4-06b: Within real-life contexts, I can use scientific notation to express large or small numbers in a more efficient way and can understand and work with numbers written in this form.

Exercise 1

- Write the following numbers in scientific notation :-

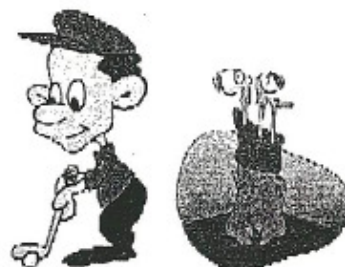
(a) 4800	(b) 6780	(c) 31000
(d) 35 200	(e) 54 350	(f) 970 000
(g) 487 000	(h) 109 100	(i) 4 400 000.
- Write out each of the following in full, then write each in scientific notation :-

(a) 7 million = 7 000 000 = $7.0 \times 10^{\dots}$	(b) 2.5 million	(c) 9.19 million	(d) $4\frac{1}{2}$ million
(e) 17 million	(f) 27 million	(g) 2.8 million	
(h) 1.97 million	(i) $12\frac{1}{2}$ million	(j) $15\frac{1}{2}$ million	
- This table gives the areas of various stretches of water throughout the world. Write each of the areas in scientific notation.

<i>Sea / Ocean</i>	<i>Area (km²)</i>
Pacific Ocean	165 380 000
Atlantic Ocean	82.21 million
Indian Ocean	73.6 million
Mediterranean	2 510 000
River Clyde	2 130
Loch Ness	56
English Channel	103 600



Nessie ?



- A golf caddie earns £250 000 per annum. Write his earnings in scientific notation.

5.



The population of Canada in May 2004 was 31 million and 629 thousand.

Write this number in scientific notation.

Exercise 2

1. Change each of the following from scientific notation to number form :-

- (a) 3.8×10^4 (b) 7.5×10^2 (c) 3.24×10^5 (d) 6.47×10^3
 (e) 1.478×10^4 (f) 3×10^1 (g) 9×10^6 (h) 2.9×10^6
 (i) 6.014×10^4 (j) 7×10^7 (k) 5.37×10^7 (l) 8.888×10^8 .

2. This table shows the transfer fee paid for five football players (correct up to August 2012).

Write each transfer fee out in full.



Player	Transfer Fee
F. Torres	$£5 \times 10^7$
C. Ronaldo	$€9.39 \times 10^7$
W. Rooney	$£2.56 \times 10^7$
M. Balotelli	$£1.754 \times 10^7$
V. Wanyama	$£9.68 \times 10^5$

3. Rewrite this passage replacing each number with scientific notation.

"Light travels 6000000000000 miles in a year.

We call this distance a light year.

Our galaxy, the Milky Way is 100000 light years across and our sun is 30000 light years from its centre."



Exercise 3

1. Write the following small numbers in scientific notation :-

- (a) 0.003 (b) 0.000074 (c) 0.0286 (d) 0.000006
 (e) 0.000482 (f) 0.287 (g) 0.00393 (h) 0.00007.

2. Write the following numbers in full :-

- (a) 5.1×10^{-2} (b) 3.6×10^{-4} (c) 2.74×10^{-3} (d) 5.06×10^{-5}
 (e) 3.2741×10^{-1} (f) 4×10^{-3} (g) 7×10^{-5} (h) 8.009×10^{-6} .

3. A box of toffees weighs 5.81×10^{-2} kilograms.

Is this more or less than 58 grams ?





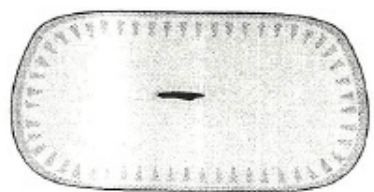
4. A molecule of water weighs 2.88×10^{-26} kg. Write this out in full.

MNU 4-07a: I can choose the most appropriate form of fractions, decimal fractions and percentages to use when making calculations mentally, in written form or using technology, then use my solutions to make comparisons, decisions and choices.

Exercise 1

- Find the following (remember - no calculator) :-
 - 10% of £34
 - 70% of £20
 - 20% of £6.50
 - 80% of 20p
 - 25% of £4200
 - $33\frac{1}{3}\%$ of £18
 - 5% of £7.20
 - 1% of £9
 - 2.5% of £6.
- Write each of the following as a fraction **AND** as a decimal :-
 - 36%
 - 45%
 - 8%
 - 11%
 - 12.5%.
- Write these percentages as fractions and simplify :-
 - 15%
 - 30%
 - 4%
 - 96%
 - 22%.


Exercise 2

- Express £20 as a percentage of :-
 - £80
 - £50
 - £1000
 - £4000.
- Express :-
 - £39 as a percentage of £78
 - £40 as a percentage of £120
 - £2.60 as a percentage of £40
 - 90p as a percentage of £7.20.
- From a monthly wage of £1450, I pay £94.25 in council tax.
What percentage of my wage goes on council tax ? 
-  The local paper girl got paid £15.25 per week last year.
This year her pay has risen to £17.99.
What percentage pay rise did she receive ? (to 1 decimal place)
- "Greenland", the frozen food outlet chain, buy "Granny's mince pies" in boxes of 20 for a total cost of £30.
The mince pies are then sold to shops for £1.80 each.
Calculate the percentage profit made by "Greenland", when they sell a full box of Granny's pies. 

Exercise 3

1. After a 20% pay rise Donald's wage for his part-time job rose to £72.
Calculate Donald's wage before his pay rise.




2.  A jumper's price is reduced by 15%. It was on sale for £68.
What was the original price of the jumper?

3. McGyll's Bus Company increased all of its ticket prices by 4%.

What was the original cost for a bus ticket which now costs £1.30?



4.  A detached villa has appreciated in value by 14.5%.
It is now valued at £148 850.
Calculate the original value of the villa.

5. A lawn mower's price was reduced by 25% in a sale.
I bought one in the sale for £90.
What was the cost of a lawn mower before the sale?



Exercise 4

1. Fares on the Subway Trains are expected to rise soon by 8%.
What will be the new cost of a ticket which just now is priced £1.25?



2. In a sale, a polo shirt, normally priced at £25.50,
is reduced by 30%.



What is the sale price of the shirt?

3. (a) Increase £70 by 3%. (b) Decrease £620 by 4.5%.
(c) Increase £1220 by 17.5%. (d) Decrease £80 000 by 7.25%.

4. A petrol lawn mower bought for £180 in 2001 has depreciated
in value over the past few years.
It is now worth 84% less than its original value.

What is the mower worth today?



5. Mildred borrows £2500 from a Finance Company.
They add on interest of 12% in the first month, 20%
in 2nd month and 25% in the third month.



Including the amount she borrowed, how much will Mildred owe after 3 months?

Exercise 5E

- Calculate the amount of money in each bank account after the given length of time:-
 - £500 after 3 years in an account paying 5% p/a
 - £12000 after 4 years in an account paying 3% p/a
 - £7500 after 5 years in an account paying 1.5% p/a
 - £2250 after 3 years in an account paying 2.25% p/a.



MNU 4-07b: I can solve problems involving fractions and mixed numbers in context, using addition, subtraction or multiplication.

Exercise 1

- Copy each of the following and simplify (where possible) :-


(a) $\frac{1}{5} + \frac{3}{5}$	(b) $\frac{2}{7} + \frac{1}{7}$	(c) $\frac{5}{8} - \frac{2}{8}$	(d) $\frac{8}{11} - \frac{5}{11}$
(e) $\frac{4}{5} - \frac{3}{5}$	(f) $\frac{7}{8} - \frac{5}{8}$	(g) $\frac{1}{8} + \frac{3}{8}$	(h) $\frac{4}{10} + \frac{6}{10}$

- Copy each and simplify :-

(a) $4\frac{1}{2} + 2\frac{1}{2}$	(b) $6\frac{1}{4} + 1\frac{1}{4}$	(c) $4\frac{3}{4} + 2\frac{3}{4}$	(d) $5\frac{7}{8} + \frac{5}{8}$
(e) $2\frac{3}{4} - 2\frac{1}{4}$	(f) $7\frac{5}{8} - 4\frac{3}{8}$	(g) $10\frac{7}{10} - 5\frac{3}{10}$	(h) $2\frac{13}{15} - 1\frac{8}{15}$

- Jerry mixed $2\frac{3}{4}$ kg's of currants and $1\frac{1}{4}$ kg's of raisins into a bowl.
What is the total weight of currants and raisins ?



-  Bill jogged $5\frac{3}{4}$ km of an eight kilometre run.
How far has Bill still to jog ?

Exercise 2

- Copy and complete each of the following calculations and simplify where possible :-

(a) $\frac{1}{2} + \frac{1}{8}$	(b) $\frac{2}{3} + \frac{1}{6}$	(c) $\frac{3}{4} - \frac{5}{12}$	(d) $\frac{5}{16} - \frac{1}{4}$
(e) $\frac{7}{10} + \frac{3}{5}$	(f) $\frac{5}{6} - \frac{7}{12}$	(g) $\frac{9}{16} + \frac{3}{4}$	(h) $\frac{9}{51} - \frac{3}{17}$
(i) $\frac{2}{3} + \frac{1}{2} + \frac{1}{4}$	(j) $\frac{5}{12} + \frac{1}{4} - \frac{1}{2}$	(k) $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$	

- Copy and simplify :-

(a) $3\frac{1}{2} + 1\frac{1}{3}$	(b) $1\frac{1}{3} + 3\frac{1}{4}$	(c) $4\frac{1}{2} + 1\frac{2}{5}$	(d) $4\frac{1}{2} - 1\frac{2}{5}$
(e) $6\frac{7}{8} - 4\frac{3}{4}$	(f) $1\frac{3}{5} - \frac{7}{15}$	(g) $4\frac{9}{10} - 3\frac{3}{4}$	(h) $4\frac{9}{10} + 3\frac{3}{4}$

Exercise 3

1. Copy and complete each calculation (simplifying where possible) :-

(a) $\frac{2}{3} \times \frac{5}{7}$

(b) $\frac{1}{2} \times \frac{3}{5}$

(c) $\frac{3}{4} \times \frac{7}{8}$

(d) $\frac{5}{8} \times \frac{2}{3}$

(e) $\frac{7}{8} \times \frac{1}{14}$

(f) $\frac{2}{3} \times \frac{15}{16}$

(g) $\frac{7}{10} \times \frac{5}{14}$

(h) $\frac{5}{4} \times \frac{8}{15}$

2. Simplify :-

(a) $2\frac{1}{4} \times 3\frac{1}{2}$

(b) $4\frac{2}{3} \times 3\frac{1}{2}$

(c) $2\frac{3}{4} \times 3\frac{1}{2}$

(d) $1\frac{2}{5} \times 2\frac{3}{5}$

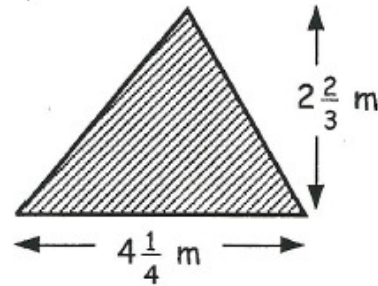
(e) $5\frac{4}{5} \times 1\frac{2}{3}$

(f) $1\frac{1}{7} \times 2\frac{4}{5}$

(g) $1\frac{4}{9} \times 4\frac{1}{2}$

(h) $5\frac{3}{5} \times \frac{6}{7}$

3. A triangle has dimensions as shown.
Calculate the area of the triangle.



Exercise 4

1. Copy and complete each calculation (simplifying where possible) :-

(a) $\frac{3}{5} \div \frac{3}{4}$

(b) $\frac{4}{5} \div \frac{2}{15}$

(c) $\frac{1}{8} \div \frac{1}{4}$

(d) $\frac{4}{9} \div \frac{4}{15}$

(e) $\frac{7}{11} \div \frac{7}{22}$

(f) $\frac{8}{15} \div \frac{2}{3}$

(g) $\frac{11}{36} \div \frac{22}{24}$

(h) $\frac{10}{33} \div \frac{25}{36}$

2. Copy and complete :-

(a) $6\frac{2}{3} \div 2\frac{1}{2}$

(b) $4\frac{1}{5} \div 3\frac{1}{2}$

(c) $1\frac{5}{7} \div 1\frac{1}{5}$

(d) $1\frac{2}{3} \div 2\frac{2}{9}$

(e) $4\frac{4}{5} \div 1\frac{1}{15}$

(f) $1\frac{1}{2} \div 1\frac{3}{7}$

(g) $5\frac{2}{5} \div 6\frac{2}{5}$

(h) $2\frac{5}{8} \div 1\frac{2}{5}$

3. A twenty metre length of rope is cut into $1\frac{5}{8}$ metre pieces.

How much of the rope would be left over ?

MNU 4-08a: Using proportion, I can calculate the change in one quantity caused by a change in a related quantity and solve real-life problems.

Exercise 1

1. Copy each ratio and simplify as far as possible :-

(a) 5 : 10

(b) 12 : 36

(c) 4 : 20

(d) 5 : 35

(e) 27 : 3

(f) 36 : 16

(g) 100 : 8

(h) 240 : 30

(i) 25 : 625

(j) 12 : 16 : 24

(k) 8 : 40 : 72

(l) 6 : 81 : 333

2. Simplify each of the following to unitary ratios :-

(a) $\frac{1}{2} : 6$

(b) $\frac{1}{3} : 9$

(c) 12 : 0.2

(d) $\frac{1}{17} : 10$

3. Change each quantity to similar units and simplify :-

- (a) $\frac{1}{2}$ kg : 200 g (b) $\frac{1}{3}$ hour : 10 mins (c) 50 mm : $\frac{1}{5}$ cm (d) $\frac{1}{8}$ litre : 250 ml

4. Farmer Ellis uses the table of ratios to feed his chickens using chicken feed and corn.

Mix in the ratio	
Strength	Feed : Corn
Weak	10 : 1
Light	7 : 1
Medium	7 : 2
Strong	5 : 3
Very Strong	4 : 5

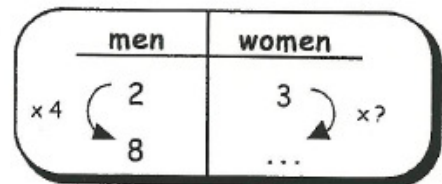
Which feed strength will he get if he mixes :-

- (a) 70g of feed and 10g of corn ?
 (b) 210g of feed and 60g of corn ?
 (c) 1 kg of feed and 1250g of corn ?
 (d) 600g of corn and 1 kg of feed ?

Exercise 2

1. On a small aircraft, the ratio of men to women is 2 : 3.

If there are 8 men on the aircraft, how many women are there ?



2. The ratio of girls to boys in 3C₂ is 4 : 5.

- (a) If there are 12 girls, how many boys are there ?
 (b) If there are 20 boys, how many girls are there ?

3. Show all your working for each of the following :-

- (a) Share £1500 between Bill and Ben in the ratio 3 : 2.
 (b) Share 360 sweets between May and Matt in the ratio 5 : 7.
 (c) Share 1250 €'s between Tom and Tim in the ratio 7 : 3.
 (d) Share ten thousand pounds between Dan and Fran in the ratio 23 : 27.

Exercise 3

1.



The cost of ten calculators is £50.
 How much would it cost for :-

- (a) one calculator (b) nine calculators ?

2. A photocopy machine can produce 300 copies in 2 minutes.

How many copies will the machine make in :-

- (a) 3 minutes (b) 11 minutes
 (c) 30 seconds (d) 20 seconds ?



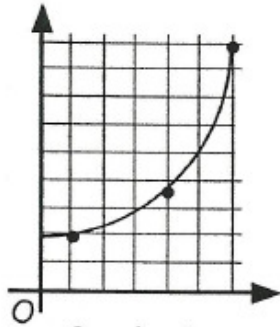
3. Water poured into an empty barrel at a steady rate.

In 10 minutes the water level had risen by 3 centimetres.

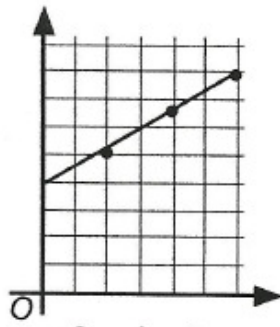
How long should the barrel take to fill if it is 120 centimetres tall ?

Exercise 4

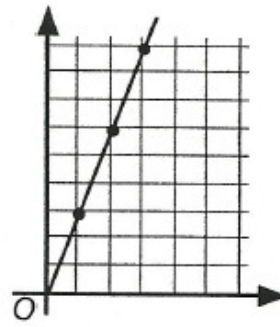
1. State which graph shows two quantities which are in direct proportion. Explain.



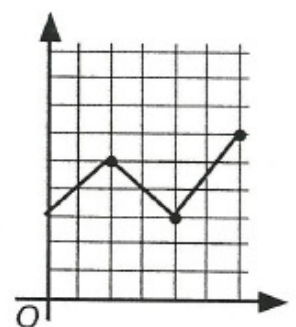
Graph 1



Graph 2



Graph 3



Graph 4

2. Which of the following tables indicate direct proportion?

(a)

x	1	2	3	4
y	7	14	21	28

(b)

x	1	2	3	4
y	6	11	17	24

(c)

x	2	4	6	8
y	3	6	9	12

(d)

x	2	4	6	8
y	13	17	21	25

Exercise 5

- If it took two men 6 hours to build a wall, how long would it have taken 3 men?
(Remember : more men - less time)
- If it took 7 park wardens 6 hours to clear away litter, how long would it have taken 3 wardens?
- Six men take 6 hours to build a kit car. How long will it take eight men?

4.



Nine scouts have eight days rations.
How many days rations would there then be if three more scouts join them?

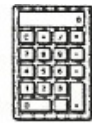
- Oliver and his 5 friends take an hour to wrap all the presents for the church tombola. How long would it have taken if 4 more friends had helped with the wrapping?
- Five bees take eight days to make 5 millilitres of honey.
How many bees would it take to make the same amount in ten days?
- At 30 miles per hour, it takes me 24 minutes to drive to my work.
How long should it take if I were to average 40 miles per hour?



MNU 4-09b: I can source information on earnings and deductions and use it when making calculations to determine net income.

Exercise 1

1. Travis works in a sports shop and gets a basic pay of £4.50 per hour.
If he worked 35 hours last week, how much was he paid?



2. Simone works as a radiographer.
Her hourly rate of pay is £14.50.
She worked for 30 hours last week.
How much did she earn?



3. Jane works for an Insurance Company and her friend Pete is a mechanic.
Jane earns £8.70 per hour whereas Pete is paid £7.90 per hour.
Last week, Jane worked 30 hours and Pete 34 hours.

- (a) Calculate Jane's pay and Pete's pay for the week.
(b) How much LESS did Jane earn than Pete?

4. Fraser's payslip last week showed he earned £322.
He knew he had worked for 35 hours.

Calculate Fraser's hourly rate.

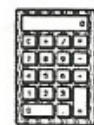
5. Danny works as a cook in a bistro.
He earned £545.60 last week for his 44 hours.

- (a) Calculate his hourly rate of pay.
(b) This week he only worked for 30 hours.
How much pay is he due this week?



Exercise 2

1. Polly's monthly pay at The Art Shop is £584.
Calculate her annual (yearly) pay.



2. Danny has a part-time job as a milk boy. He is paid £38.50 per week.
Calculate Danny's pay for a year.

3. Debbie and her sister Ashley are both dress designers.
Debbie is paid monthly and earns £1280.50 per month.
Ashley is paid weekly and gets £295.25 per week.

- (a) Calculate Debbie's annual pay.
(b) Calculate Ashley's annual pay.
(c) Who's annual pay is greater, and by how much?

4. Bob earns £25 800 per year as a train driver.
Calculate his monthly salary.
5. Hazel works as a shop assistant for More Stores.
She is paid £8 216 per year.
Calculate Hazel's weekly wage.
6. Faisal is offered a job as an assistant baker. His salary is £8 892 per year.
He can choose to be paid weekly or monthly.
- (a) How much would his monthly salary be ?
- (b) Now calculate how much he would earn weekly if this was his chosen method of payment.

Exercise 3

1. Here is Bobby Wright's payslip for a week.

Employee No. 432	Name B. Wright	Tax Code 416L	Week 09
Basic Pay £210	Overtime £25	Commission -	Gross Pay
Income Tax £51	Pension -	Nat Ins £23.40	Total Deductions
			Net Pay



Calculate Bobby's :-

- (a) Gross Pay (b) Total Deductions (c) Net Pay.
2. John Packhard is a computer salesman.
Here is his monthly salary slip :-

Employee No. 086	Name J. Packhard		Tax Code 621L	Month 03
Basic Pay £1000	Overtime -	Commission -	Bonus ?	Gross Pay ?
Income Tax £250	Pension ?	Nat Ins £120	Other Deductions -	Total Deductions £400
				Net Pay £1500



Use the information in the payslip to calculate John's :-

- (a) Gross Pay. [use his net pay and total deductions]
- (b) Pension contribution.
- (c) Bonus.

MNU 4-10b: I can use the link between time, speed and distance to carry out related calculations.

Exercise 1

1. Find the unknown quantity in each of the following :-

- (a) Distance = ? km. Speed = 20 km/hr. Time : $3\frac{1}{2}$ hours.
(b) Distance = 90 miles. Speed = ? m.p.h. Time : $1\frac{1}{2}$ hours.
(c) Distance = 100 km. Speed = 40 km/hr. Time : ? hours.

2. (a) A tortoise walks at 2 metres per minute.

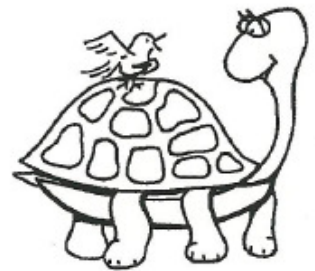
How long will it take to walk 9 metres ?

(b) Addison can sprint at 4 metres per second.

How far will he travel in ten and a half seconds ?

(c) A bus journey, 60 kilometres long, takes one and a half hours.

How fast is the bus travelling ?



3. A jet has a 400 mile journey to complete.

How long would it take at a speed of :-

- (a) 200 m.p.h. (b) 800 m.p.h. (c) 600 m.p.h. ?



4.  Jane ran round a 1500 metre track and took 6 minutes.

- (a) At what speed in metres per minute was Jane running ?
(b) Bob beat Jane's time by a minute.
What was Bob's speed ?

5. A rocket ship is 4200 km from Earth.

The rocket then travels away from Earth at its maximum speed of 2400 km/hr for $4\frac{1}{2}$ hours.

- (a) How far away from Earth is the spaceship now ?
(b) How quickly can the spaceship then return to Earth, travelling at its maximum speed ?



6. Ryan cycled from home to school (8 km) at a speed of 16 km/hr. He had to walk home from school due to a puncture.

If Ryan walked at a speed of 6 km/hr, how much quicker was he cycling than walking ?



Exercise 2

1. Change the following to decimals of an hour :-

- (a) 45 minutes (b) 24 minutes (c) 36 minutes (d) 27 minutes.

2. Change the following to decimals of a hour giving your answer to two decimal places :-

- (a) 7 minutes (b) 40 minutes (c) 8 minutes (d) 124 minutes.

3. Change each time to decimal form :-

- (a) 2 hrs 33 mins (b) 1 hr 48 mins (c) 5 hrs 6 mins (d) 3 hrs 3 mins.



4. Change the calculator displays (shown in hours) to hours and minutes :-

- (a)  (b)  (c) 

5. Change each of the following to hours and minutes :-

- (a) 4.6 hours (b) 8.15 hours (c) 3.05 hours (d) 1.125 hours.

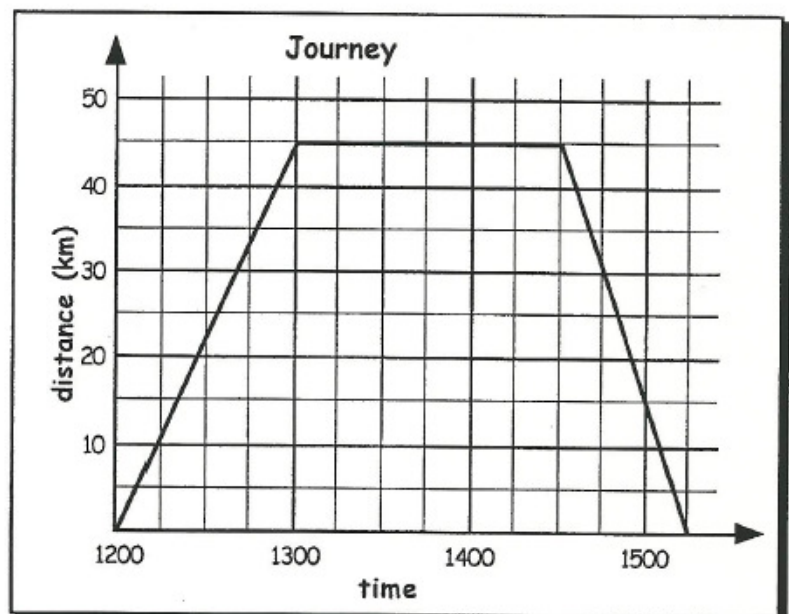
6. Calculate the unknown quantity in each of the following :-

- (a) Distance = ? km Speed = 80 km/hr Time : 2 hrs 45 mins.
 (b) Distance = 70 miles Speed = ? m.p.h. Time : 1 hr 24 mins.
 (c) Distance = 420 km Speed = 50 km/hr Time : ? hrs ? mins .

Exercise 3

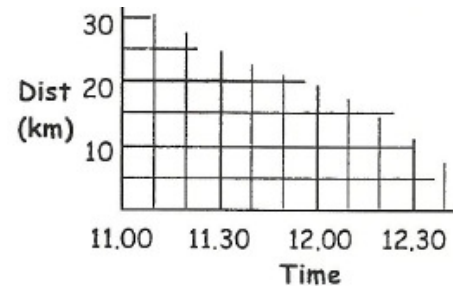
1. The distance-time graph shows the journey Maggie made from her house to her favourite clothes shop and home again.

- (a) How long did the drive to the shop take ?
 (b) How far away is the shop from her house ?
 (c) How long did she stay at the shop ?
 (d) Calculate Maggie's speed :-
 (i) going to the shop.
 (ii) on the journey home.



3. Billy set off at 11:00 am on Sunday and drove 50 miles to Edinburgh at an average speed of 40 mph. He shopped for 45 minutes in Edinburgh, then drove home at an average speed of 50 mph.

Show Billy's journey on a Distance - Time graph.



MNU 4-11b: I can apply my knowledge and understanding of measure to everyday problems and tasks and appreciate the practical importance of accuracy when making calculations.

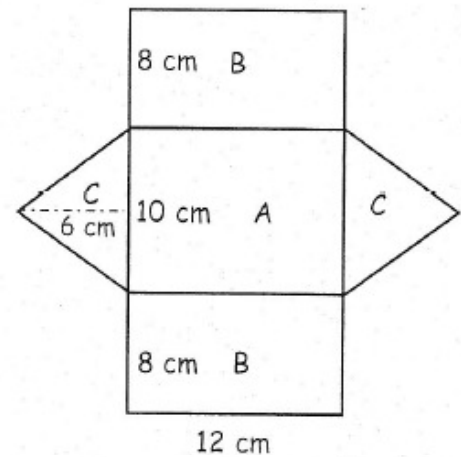
Exercise 1

1. For the triangular prism shown, calculate :-

- (a) (i) the area of the rectangle A.
(ii) the areas of rectangles B.

- (b) the areas of triangles C.

- (c) the total surface area.

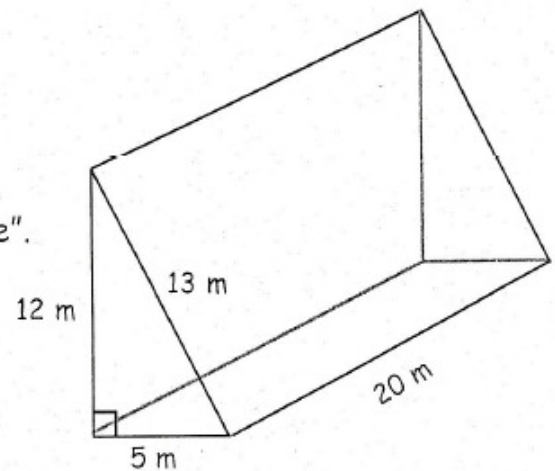


2. Calculate :-

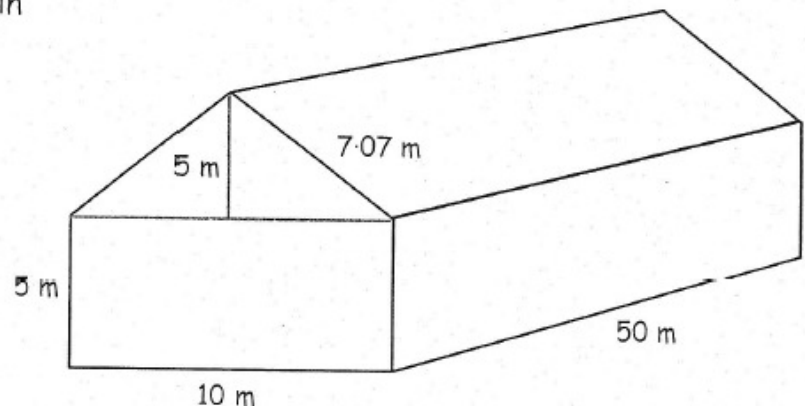
- (a) (i) the area of the rectangular floor.
(ii) the area of the rectangular "back".
(iii) the area of the rectangular "sloping side".

- (b) the area of the 2 right angled triangles.

- (c) the total surface area.



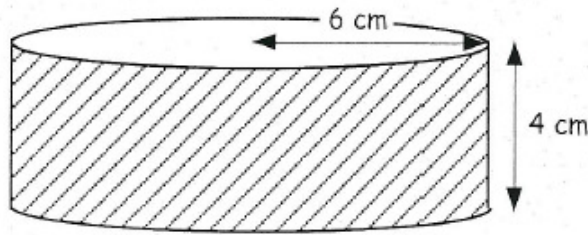
3. A wedding reception was held in a large marquee as shown.



- (a) Calculate the area of each end of the marquee.

- (b) Calculate the total surface area of the marquee including the canvas floor.

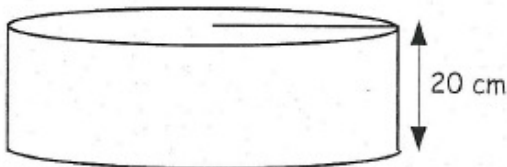
4. (a) Calculate the circumference of this circular top. ($C = \pi D$ or $C = 2\pi r$)
 (b) Calculate the curved surface area of this cylinder.



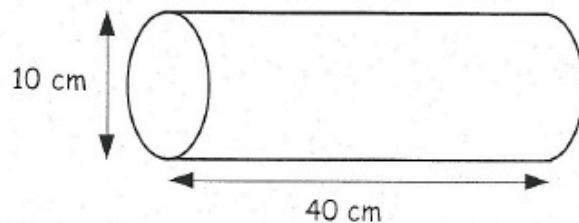
5. For each cylinder find :-

- (i) the area of the circular ends. ($A = \pi r^2$ twice !)
 (ii) the curved surface area.
 (iii) the total surface area.

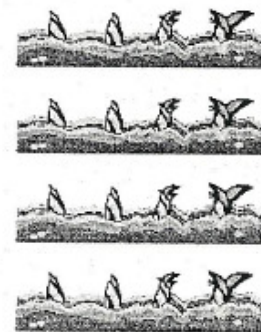
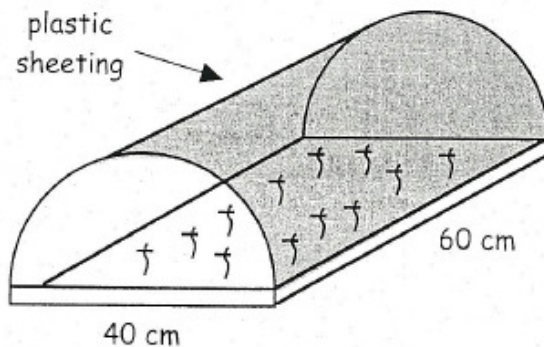
(a) 40 cm



(b)



6. Shown is a box of flowering seeds covered by a curved piece of clear plastic.

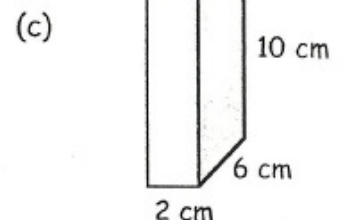
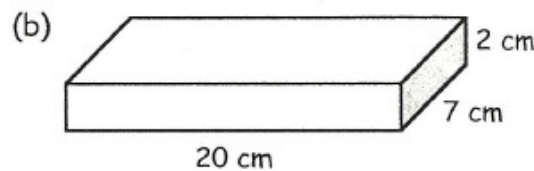
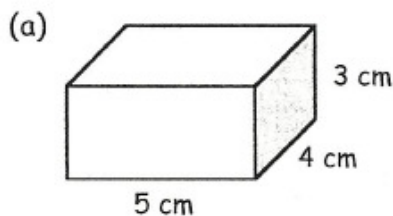


Calculate the area of curved clear plastic needed to cover the seed box.

MNU 4-11c: I have explored with others the practicalities of the use of 3D objects in everyday life and can solve problems involving the volume of a prism, using a formula to make related calculations when required.

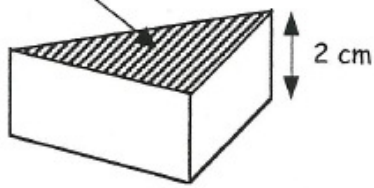
Exercise 1

1. Calculate the volumes of each of the cuboids (show all your working) :-

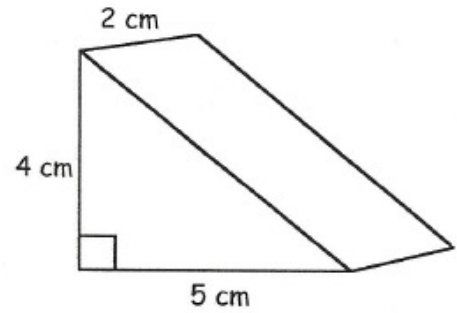


2. Calculate the volume of the following triangular prisms.

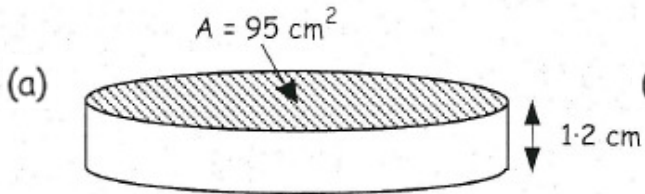
(a) Area = 20 cm^2



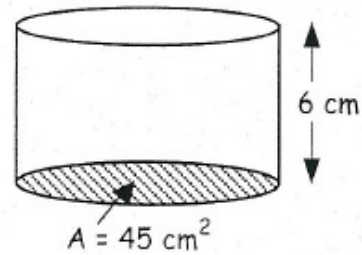
(b)



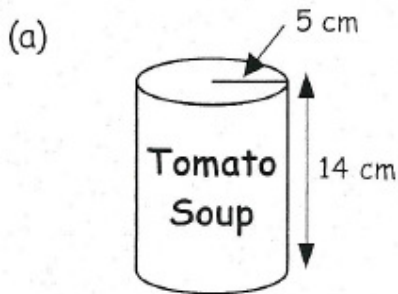
3. Find the volume of each of the following cylinders :-
(the areas of the circular bases are given)



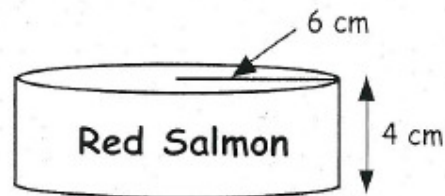
(b)



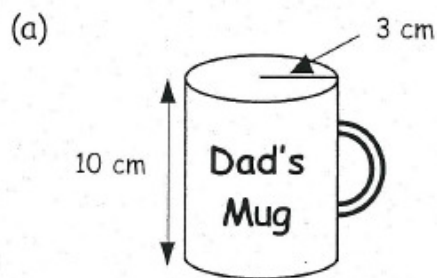
4. Use the formula $V = \pi r^2 h$ to find the volumes of the following cylinders, giving you answers to 2 decimal places :-



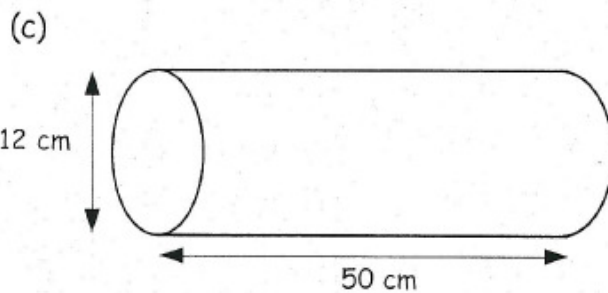
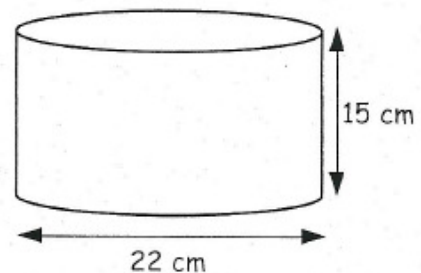
(b)



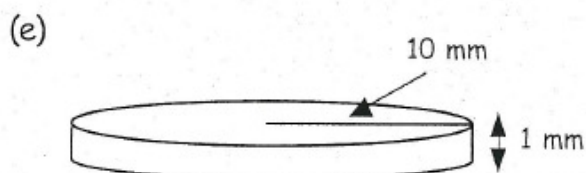
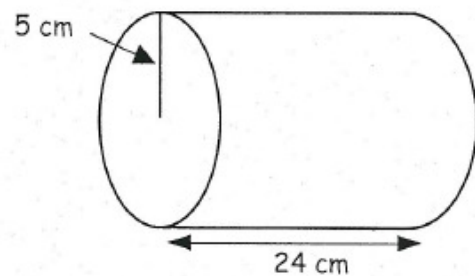
5. Calculate the volumes of the following cylinders :-



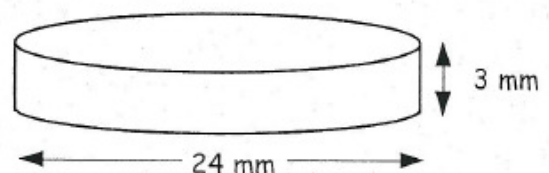
(b)



(d)



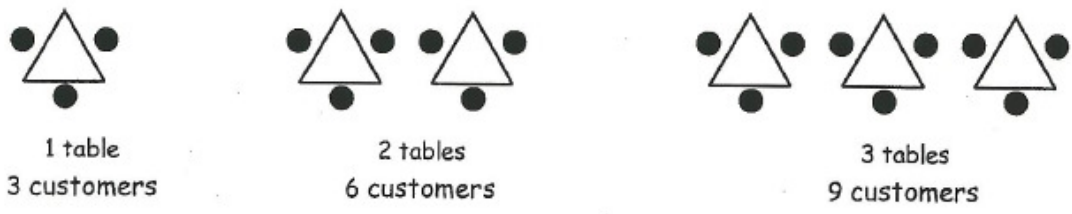
(f)



MNU 4-13a: Having explored how real-life situations can be modelled by number patterns, I can establish a number sequence to represent a physical or pictorial pattern, determine a general formula to describe the sequence, then use it to make evaluations and solve related problems.

Exercise 1

1. A restaurant has triangular tables. Each table seats 3 customers.



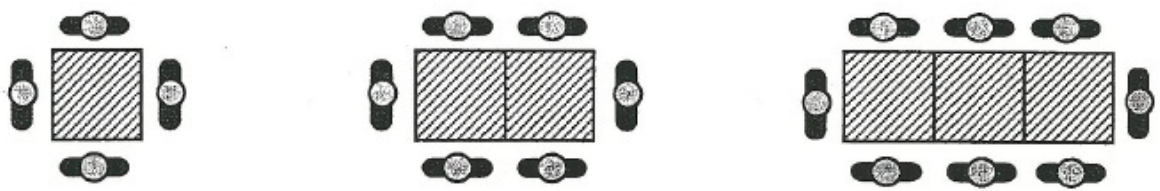
(a) Copy and complete the table :-

No. of Tables (T)	1	2	3	4	5	6
No. of Customers (C)	3	6	9	?	?	?

$\underbrace{\hspace{1.5cm}}_3$
 $\underbrace{\hspace{1.5cm}}_3$
 $\underbrace{\hspace{1.5cm}}_3$

- (b) For every extra table, how many extra customers are there ?
- (c) Copy and complete : - " number of Customers = x number of Tables "
- (d) Write down a formula using symbols to show this. ($C = \dots \times \dots$).

2. A school dining room is laid out as shown.



- (a) Draw neatly the next table pattern with 4 square tables.
- (b) Copy and complete the following table :-

No. of tables (T)	1	2	3	4	5	6
No. of pupils (P)	4	6	8	?	?	?

$\underbrace{\hspace{1.5cm}}_2$
 $\underbrace{\hspace{1.5cm}}_2$
 $\underbrace{\hspace{1.5cm}}_?$



- (c) For every extra table, how many extra pupils can be seated ?
- (d) Write down the formula using **symbols** for calculating the number of pupils that can be seated if you know the number of tables :-

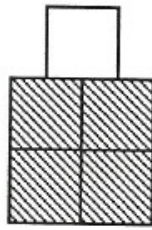
copy :- $P = ? \times T + ?$ ← remember the correction number

- (e) Use your formula to decide how many pupils can be seated with 12 tables.
 (f) How many pupils can be seated with 50 tables ?

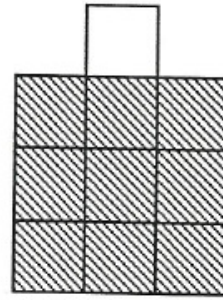
3. A boy uses building blocks to make these patterns.



Pattern No. 1
Blocks - 2



Pattern No. 2
Blocks - 5



Pattern No. 3
Blocks - 10

- (a) Draw the above 3 patterns and add pattern numbers 4 and 5.
 (b) Copy and complete this table.

Pattern No. (N)	1	2	3	4	5	6	7	8	9
Blocks (B)	2	5	10	?	?	?	?	?	?

- (c) Write down a formula linking the pattern number (N) with the number of Blocks (B).

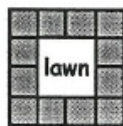
4. Look at this pattern of square garden slabs surrounding a square lawn.

pattern 1



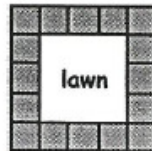
8 slabs

pattern 2



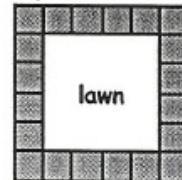
12 slabs

pattern 3



? slabs

pattern 4



? slabs

- (a) How many slabs are needed for patterns number 3 and 4 ?
 (b) Draw pattern 5 and say how many slabs are needed.
 (c) Can you see that
 Pattern 1 $\Rightarrow 3^2 - 1^2 = 9 - 1 = 8$?
 Pattern 2 $\Rightarrow 4^2 - 2^2 = 16 - 4 = 12$?

Express each of the next 3 patterns in the same way.

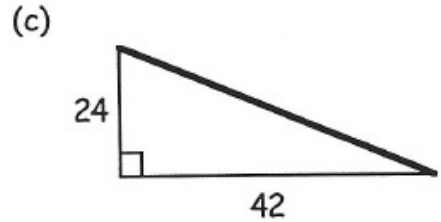
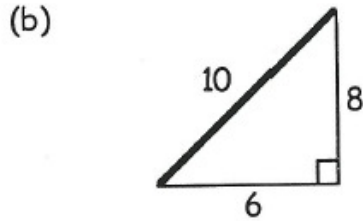
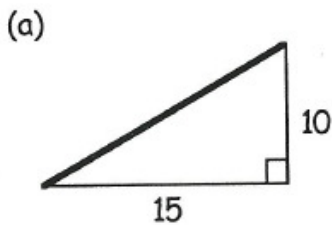
- (d) Use this to find how many slabs are needed for :-
 (i) pattern 10 (ii) Pattern 20.



MNU 4-13b: I have discussed ways to describe the slope of a line, can interpret the definition of gradient and can use it to make relevant calculations, interpreting my answer for the context of the problem.

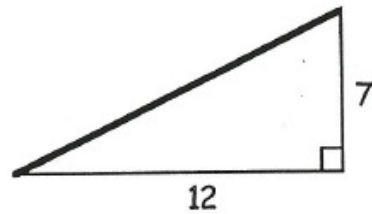
Exercise 1

1. Write down the gradients of each of these lines :- (simplify your fractions)

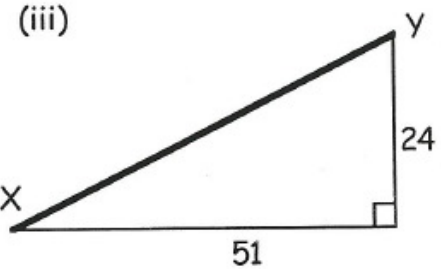
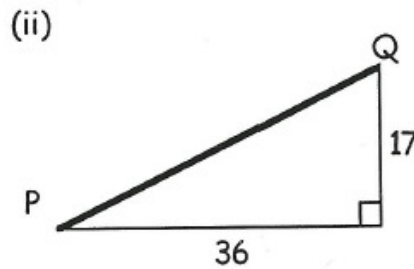
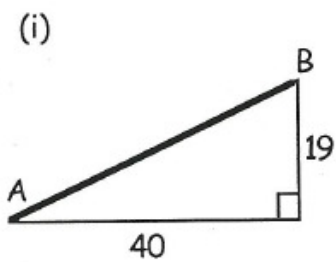


2. The gradient of this line is given by

$$\text{gradient} = \frac{7}{12} = 7 \div 12 = 0.5833\dots$$



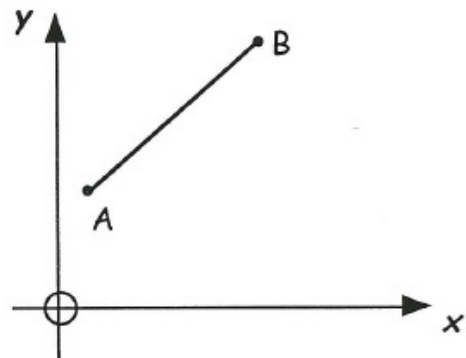
(a) Find the gradients of these three lines :-
(Give them as decimals correct to 3 decimal places)



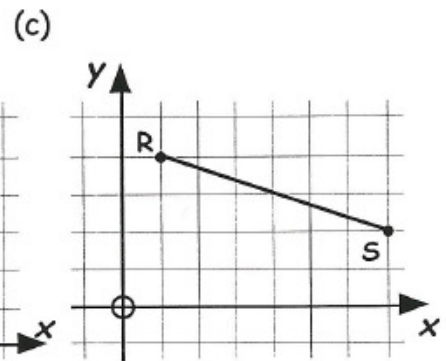
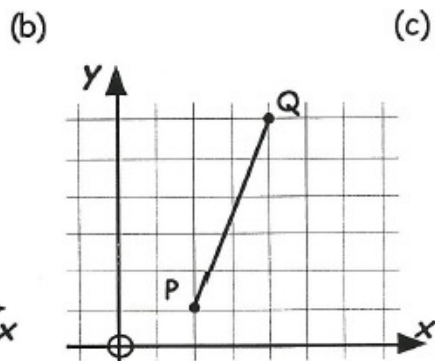
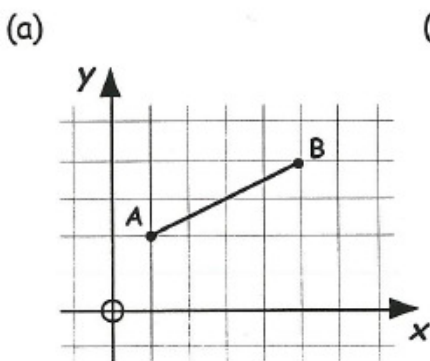
Exercise 2

The gradient of the line AB can be represented by the letter m.

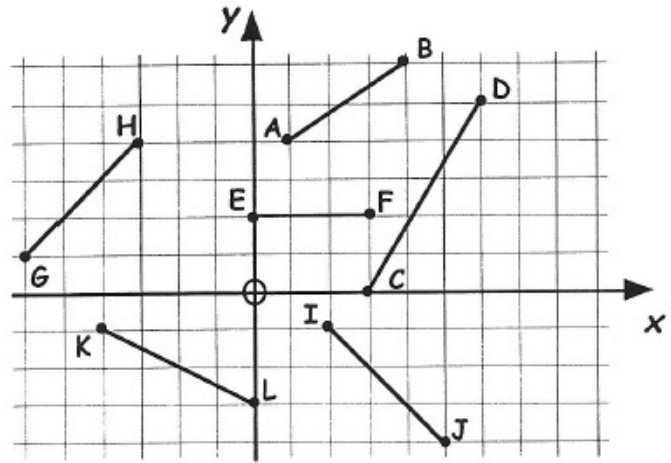
$$m_{AB} = \frac{y\text{-difference}}{x\text{-difference}} = \frac{\text{vertical}}{\text{horizontal}}$$



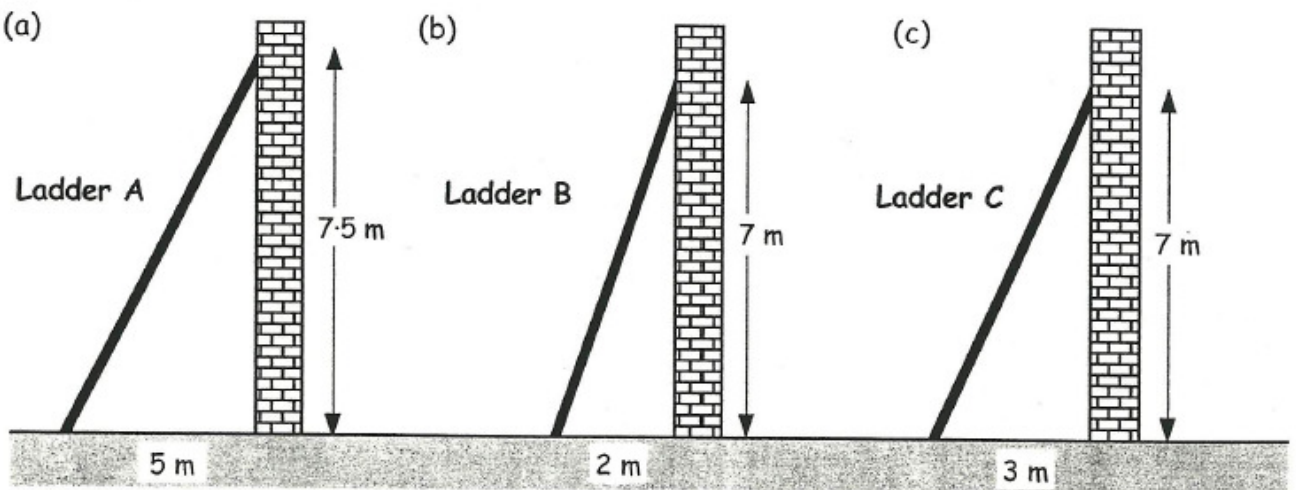
1. Use the formula to calculate the gradients of these lines.
(Remember - lines sloping "downwards" have a negative gradient).



2. Calculate the gradient of each of the lines shown. [remember the negative sign where required].



3. Plot the 4 points A(1,3), B(4,4), P(2,0), Q(8,2) on a coordinate diagram. Join A to B and P to Q.
- (a) Calculate the gradient of line AB. (leave as a fraction)
- (b) Calculate the gradient of line PQ. (simplify your fraction)
- (c) What can you now say about the 2 lines AB and PQ?
4. Find the gradient of each of these ladders:



5. A ladder is "SAFE" if it has a gradient with a value between 3 and 4. Which of the above three ladders is safe and which is unsafe?

MNU 4-13c: Having investigated the pattern of the coordinate points lying on a horizontal or vertical line, I can describe the pattern using a simple equation.

Exercise 1

1. State the gradient of:
- (a) any horizontal line
- (b) any vertical line

2. M is the point (4, -3).
- (a) Write down the coordinates of any point P so that the line MP is **vertical**.
- (b) Write down the coordinates of any point Q so that the line MQ is **horizontal**.
3. (a) On a coordinate diagram, draw the lines $x = 1$, $x = 10$, $y = -2$ and $y = 5$.
- (b) Write down the coordinates of the corners of the rectangle on your diagram.
4. A kite is formed by joining the points A (-2, 3), B (1, 8), C (10, 3) and D (1, -2).
- (a) Write down the equation of: (i) diagonal AC
(ii) diagonal BD
- (b) Write down the equation of the vertical line passing through point A
- (c) **TRICKY!** Without drawing the kite, write down the coordinates of the point where the two diagonals cross over.

MNU 4-13d: I can use a given formula to generate points lying on a straight line, plot them to create a graphical representation then use this to answer related questions.

Exercise 1

1. (a) Look at the table for the line $y = 2x$.

x	0	1	2	3	4
$y = 2x$	0	2	4

- (b) Copy and complete the list of coordinates: (0, 0), (1, 2), (2, 4), (.....), (.....).
- (c) Draw a coordinate diagram, plot the 5 points and complete the line.
2. Make a table, list and plot the coordinates on a diagram and draw the line
- (a) $y = 4x$.
- (b) $y = \frac{1}{2}x$.

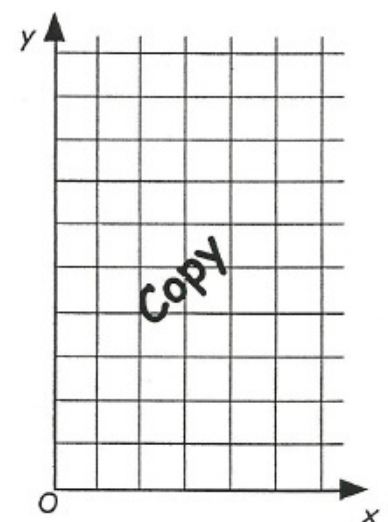
Exercise 2

1. Draw the line $y = 2x + 1$ as follows:

- (a) Copy and complete this table:

x	0	1	2	3	4
$y = 2x + 1$	$2 \times 0 + 1$	$2 \times 1 + 1$	$2 \times 2 + 1$

- (b) Copy and complete the list of coordinates:
(0, 1), (1, 3), (2, 5), (3,.....), (...., ...).
- (c) Copy the coordinate diagram, plot the points and draw the line. Label the line $y = 2x + 1$ on your diagram.



2. Draw the line $y = \frac{1}{2}x + 1$ by repeating the process from question 1.

x	0	2	4	6	8
$y = \frac{1}{2}x + 1$	$\frac{1}{2}$ of 0 + 1	$\frac{1}{2}$ of 2 + 1	$\frac{1}{2}$ of 4 + 1

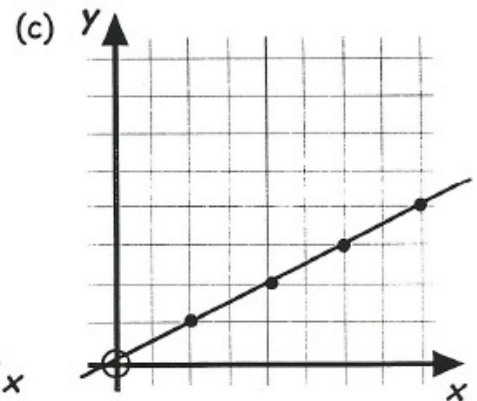
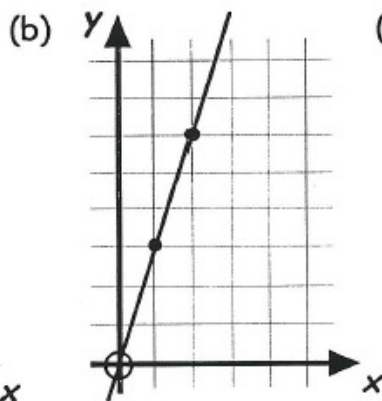
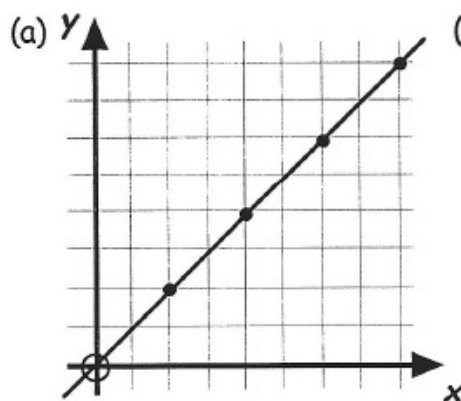
3. Draw the lines: (a) $y = 2x + 2$ (b) $y = 3x - 2$ (c) $y = \frac{1}{3}x - 1$

Exercise 3

1. For each of the following lines :-

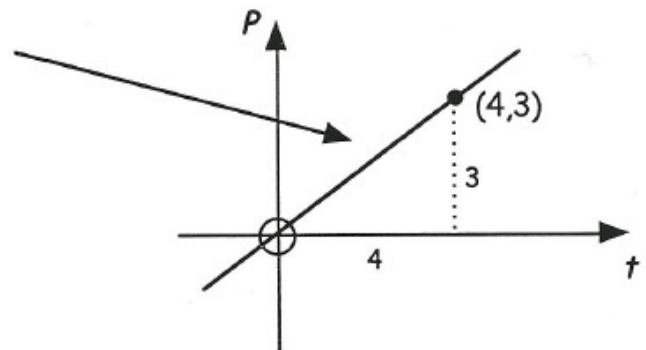
(i) Calculate the gradient of the line.

(ii) Write down the equation of the line in the form $y = \dots x$



The gradient of this line is $\frac{3}{4}$.

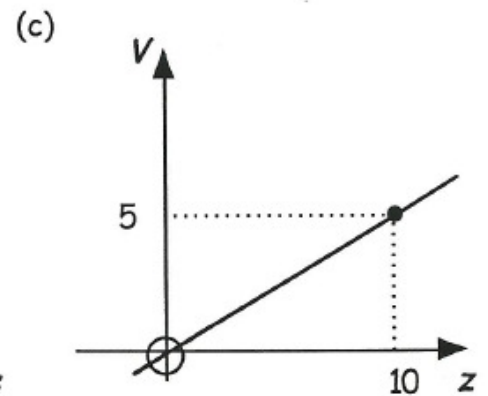
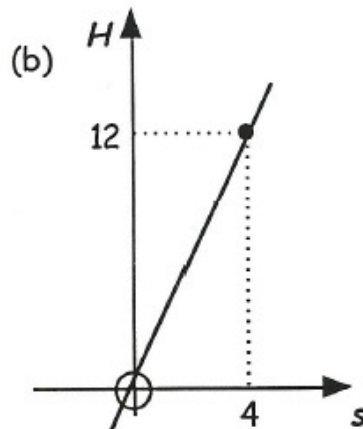
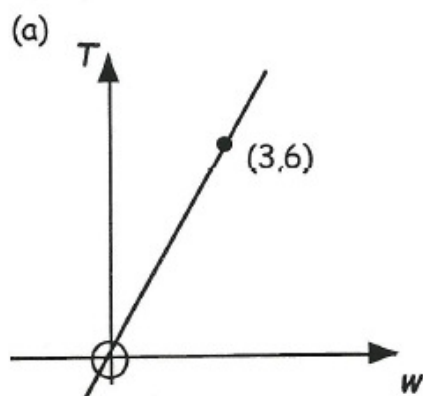
Its equation is $P = \frac{3}{4}t$ (not $y = \frac{3}{4}x$).



2. For each of these,

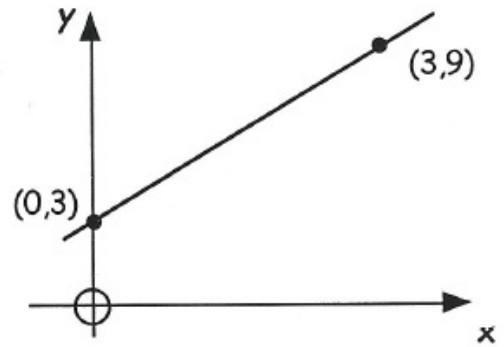
(i) Calculate the gradient of the line.

(ii) Write down the equation of each.

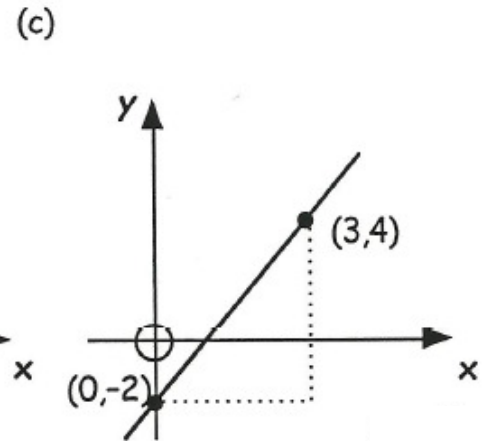
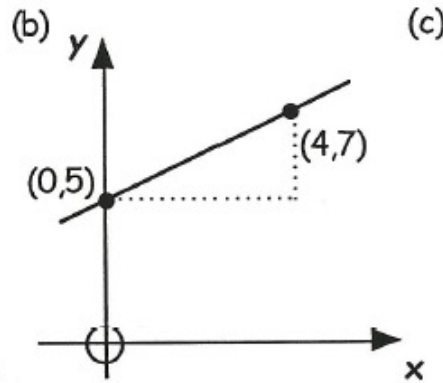
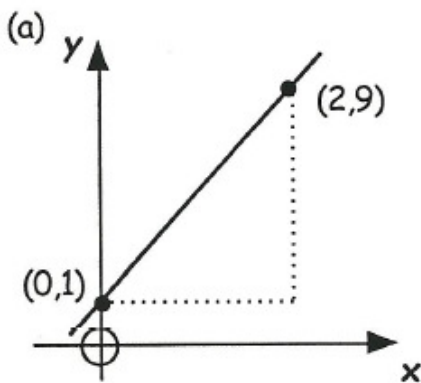


Exercise 4

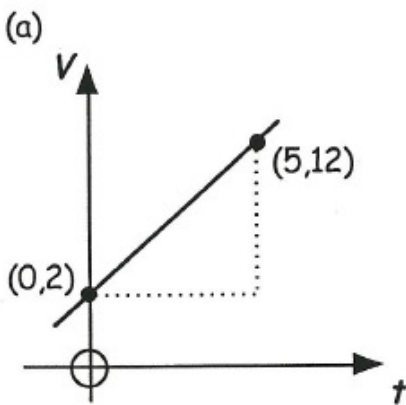
- Write down the coordinates of the point where this line cuts the y-axis.
 - Calculate the gradient of the line.
 - Now write down its equation in the form $y = \dots x + \dots$



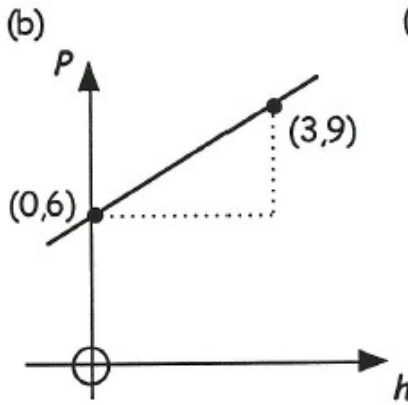
- Write down the equations of these lines :-
(Find the gradients and the points where they cut the y-axis)



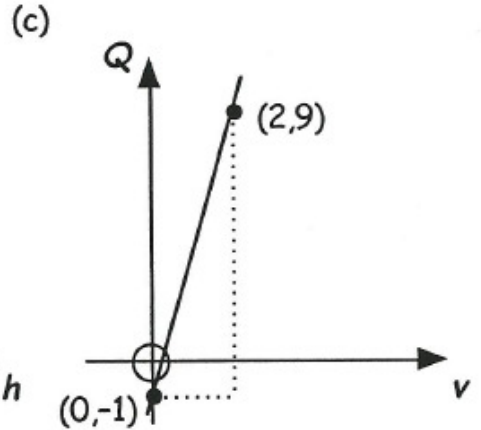
- Write down the equations of these lines :-



$$V = \dots t + \dots$$



$$P = \dots$$

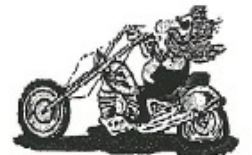


$$Q = \dots$$

Exercise 5

- This table shows the cost of hiring a motor cycle for several days.

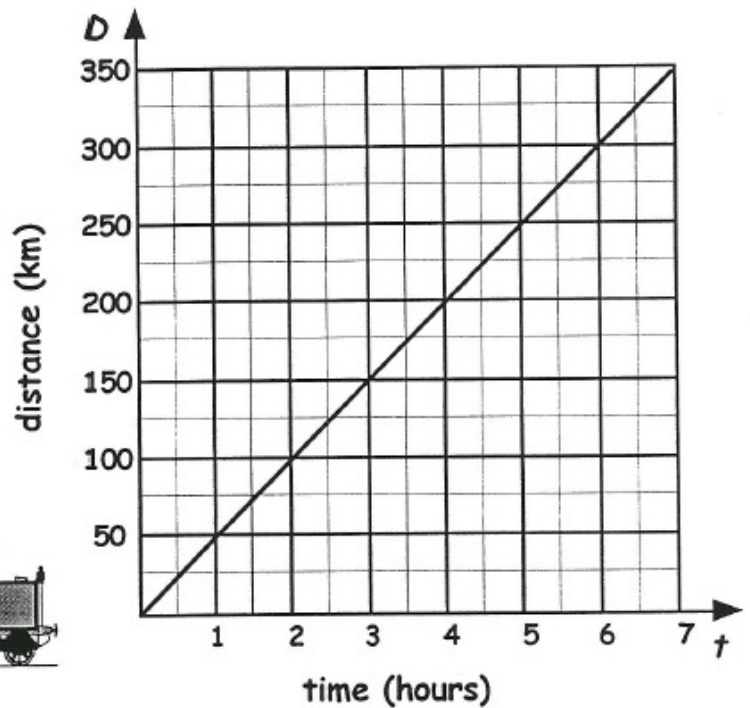
No. of Days hired (D)	1	2	3	4	5	6
Cost in £'s (C)	12	20	28	?	?	?



- How much will it cost to hire a motor cycle for (i) 6 days (ii) 1 week ?
- How much **extra** does it cost for each additional day of hire ?
- Write down the formula for determining the cost of hiring the motor cycle.
- How much will it cost to hire a motor cycle for 10 days ?
- Mrs Able paid £116 to hire a motor cycle. For how many days had she hired it ?

2. This chart shows the distance covered by a train during a 7 hour journey.

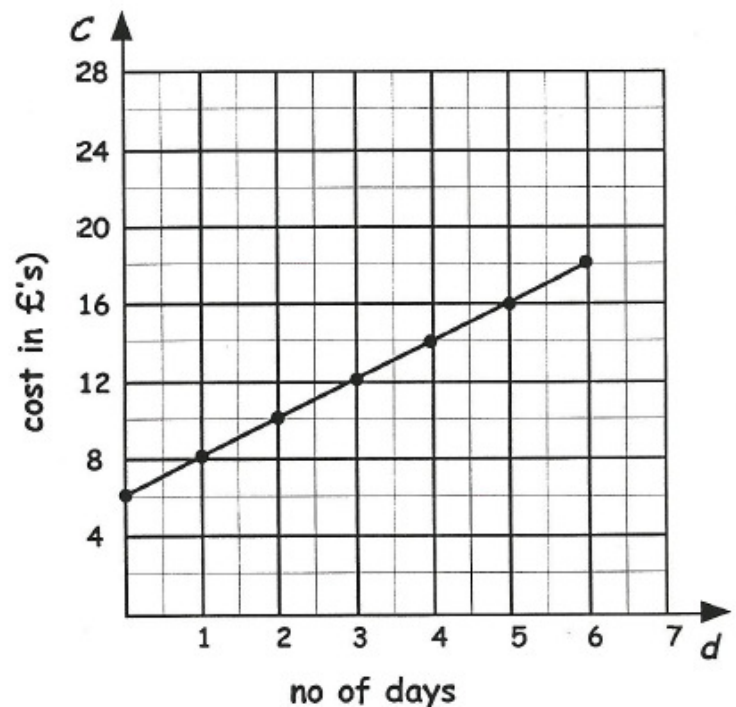
- How far did it travel in :-
 - 1 hour ?
 - 2 hours ?
 - 7 hours ?
- Find the gradient of the line.
- Write down the equation of the line. ($D = \dots\dots\dots$)



3. This graph shows the cost (£ C) of hiring a ladder for (d) days.

- How much does it cost to hire it for 3 days ?
- Calculate the gradient of the line.
- Write down the equation

$C = \dots d + \dots$
- Use your formula from (c) to find the cost of hiring it for a fortnight (14 days).



Exercise 6

- For each data set, construct a scattergraph and draw a line of best fit :-

(a)

Engine size (1000cc)	1.1	1.1	1.1	1.4	1.4	1.4	1.6	1.6	1.6	1.8	1.8	1.8	2.0	2.0
km / litre	50	60	55	50	40	45	40	30	35	35	25	30	30	20

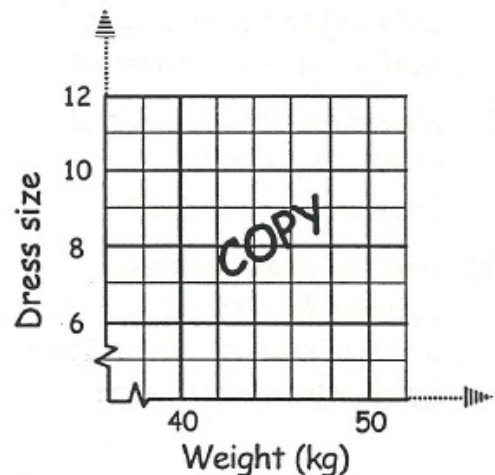
(b)

Age (years)	5	6	6	7	7	8	9	9	9	10	10	10	11	11	12	12	12	12
Javelin throw (m)	4	5	6	7	5	6	6	8	9	11	12	9	10	11	14	18	15	12

2. This table shows the connection between the weights of a group of women and their dress sizes.

Weight (kg)	40	60	64	70	50	60	48	44	64	68	74	76	42	42	72
Dress size	6	12	14	18	10	14	8	10	16	16	16	20	6	8	16

- Neatly draw the set of axis showing weights from 40 kg to 80 kg and dress sizes from size 6 to size 20.
- Neatly plot the information about the 15 women in your graph.
- Draw the line of best fit, trying to have as many points above as there is below the line.
- From your line, estimate the size of dress worn by Millie who weighs 54 kilograms.



MNU 4-14a: Having explored the distributive law in practical contexts, I can simplify, multiply and evaluate simple algebraic terms involving a bracket.

Exercise 1

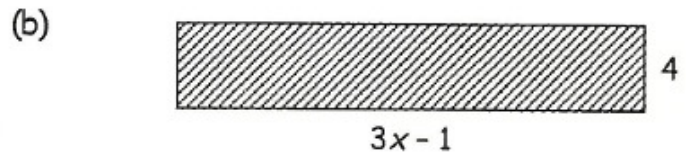
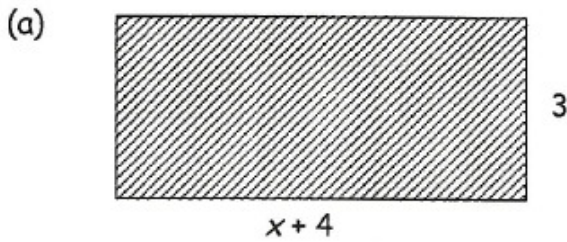
1. Multiply out the brackets :-

- | | | | |
|---------------|---------------|---------------|------------------|
| (a) $3(x+2)$ | (b) $4(t+4)$ | (c) $5(a-1)$ | (d) $10(w-2)$ |
| (e) $2(2a+1)$ | (f) $3(4e+5)$ | (g) $7(2g-1)$ | (h) $8(2h+4g-1)$ |

2. Remove these brackets :-

- | | | | |
|----------------|----------------|-----------------|-------------------|
| (a) $-2(a+3)$ | (b) $-5(6+2c)$ | (c) $-3(5-4g)$ | (d) $-(4a-6)$ |
| (e) $x(x+4)$ | (f) $t(2t-5)$ | (g) $-p(5p+2)$ | (h) $-k(-3+6k-m)$ |
| (i) $2y(3y+1)$ | (j) $4x(3x-7)$ | (k) $-2w(7+3w)$ | (l) $-4p(6p-2+k)$ |

3. Find the areas of each shape below :-



Exercise 2

Multiply out the brackets and simplify :-

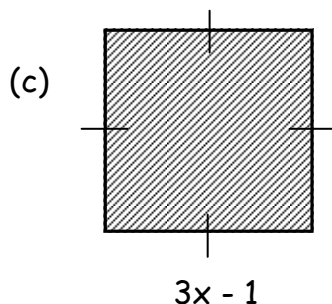
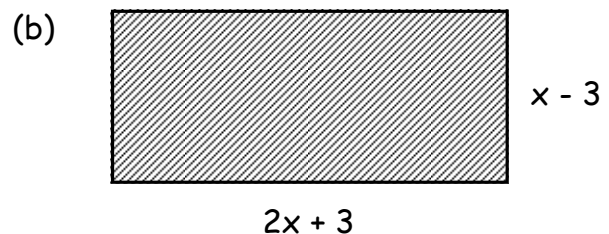
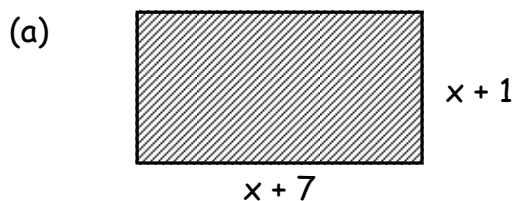
- (a) $2(x + 3) + 1$ (b) $3(y + 4) + 5$ (c) $7(k - 1) + 10$
 (d) $5(t - 2) - 5$ (e) $3(2g + 4) + 8$ (f) $4(w + 1) - 4w$.
- (a) $2(f + 3) + 3(f + 1)$ (b) $4(y + 2) + 7(y + 1)$ (c) $6(b + 3) + 2(b - 5)$
 (d) $5(2g + 2) + 4(g - 3)$ (e) $7(p + 3) - 5(p + 1)$ (f) $7(2q + 3) - 4(3q - 5)$
 (g) $12 - 3(2b + 4)$ (h) $4(3p - 4) - 3(4p - 5)$ (i) $5u(2u + 3) - 2u(u - 7)$.

Exercise 2E

Expand:

- (a) $(x + 1)(x + 3)$ (b) $(x - 2)(x + 4)$ (c) $(x + 3)(x - 3)$ (d) $(x - 7)(x - 5)$
 (e) $(2x + 1)(x + 3)$ (f) $(x - 4)(4x + 9)$ (g) $(3x - 2)(2x + 5)$ (h) $(3x - 2)(2x + 5)$
 (i) $(x + 7)(4 - x)$ (j) $(x - 2)(5 - x)$ (k) $(x + 12)^2$ (l) $(x - 4)^2$
 (m) $(7 - x)^2$ (n) $(3x - 2)^2$ (o) $(x + 1)(x^2 + 3x - 5)$
 (p) $(x + 3)(x^2 - 4x - 2)$

2. Find the area of each shape below:



MNU 4-14b: I can find the factors of algebraic terms, use my understanding to identify common factors and apply this to factorise expressions.

Exercise 1

1. Factorise :-

- (a) $2a + 4$ (b) $3x + 12$ (c) $5k - 40$ (d) $6p + 6q$
(e) $12x + 15$ (f) $16y + 24$ (g) $24k - 15$ (h) $9a + 21b$
(i) $3x + 9y + 6$ (j) $4d + 6e + 10f$ (k) $12w + 30h - 18$ (l) $15q - 45p + 75m$.

2. Factorise fully :-

- (a) $3ab + 21b$ (b) $12cd + 15c$ (c) $30pqr - 24pq$
(d) $5x - 15xy + xz$ (e) $x^2 + 4x$ (f) $3y^2 + 6y$
(g) $8x^2 + 4x$ (h) $12y - y^2$ (i) $x^2 + x$
(j) $12x^2 + 4x$ (k) $x^3 + x$ (l) $y^3 + y^2 + y$.

Exercise 2E

1. Use the difference of two squares to factorise:-

- (a) $x^2 - 1$ (b) $x^2 - 16$ (c) $x^2 - 100$ (d) $4 - x^2$
(e) $169 - g^2$ (f) $16h^2 - 25$ (g) $49 - 25q^2$ (h) $81m^2 - 225n^2$

2. Factorise fully:-

- (a) $5x^2 - 20$ (b) $36x^2 - 9$ (c) $18 - 8x^2$ (d) $x^3 - 49x$
(e) $4x^3 - 4x$ (f) $3x - 147x^3$ (g) $x^3y - xy^3$ (h) $3x^2y - 27y^3$

Exercise 3E

1. Factorise:-

- (a) $x^2 + 3x + 2$ (b) $x^2 + 5x + 6$ (c) $x^2 + 6x + 9$ (d) $x^2 + 7x + 12$
(e) $x^2 - 12x + 20$ (f) $x^2 - 5x + 14$ (g) $x^2 - 10x + 24$ (h) $x^2 - 20x + 100$
(i) $x^2 + 8x - 20$ (j) $x^2 - x - 20$ (k) $x^2 + 11x - 26$ (l) $x^2 + x - 12$
(m) $x^2 - 3x - 70$ (n) $x^2 + 25x - 26$ (o) $x^2 - 7x + 60$ (p) $x^2 - x - 420$

2. Factorise:-

- (a) $15 - 2x - x^2$ (b) $27 + 2x - x^2$ (c) $36 - 9x - x^2$ (d) $2x^2 + 11x + 5$
(e) $2x^2 + 5x + 2$ (f) $3x^2 - 7x + 6$ (g) $4x^2 + 20x + 9$ (h) $3x^2 + 2x - 8$

Exercise 4E

1. Factorise fully:-

(a) $12 - 2b$

(b) $h^2 - 7h + 10$

(c) $2x^2 + 12x + 18$

(d) $pq^2 - 2p^2q$

(e) $3x^2 - 12y^2$

(f) $12r - 4rt$

(g) $x^3 - 5x^2 - 36x$

(h) $2j^2 - 14j - 36$

(i) $35 - 28a - 7a^2$

(j) $x^5 - x^3$

(k) $28 - 7g^2$

(l) $xy^2 + 3xy - 10x$

MNU 4-15a: Having discussed the benefits of using mathematics to model real-life situations, I can construct and solve inequalities and an extended range of equations.

Exercise 1

1. Find the value of x in the following equations (*Show each step of working carefully*).

(a) $4x + 1 = 21$

(b) $3x + 5 = 29$

(c) $9x - 3 = 15$

(d) $7x - 6 = 29$

(e) $6x - 12 = 0$

(f) $5x - 1 = 44$

(g) $9x - 20 = 34$

(h) $3x + 42 = 87$

(i) $2x - 7 = 32$

(j) $9x + 9 = 0$

(k) $2x - 19 = 0$

(l) $3x + 5 = -7$

2. Solve the following equations :-

(a) $5x + 3 = 3x + 5$

(b) $8x + 9 = 7x + 17$

(c) $7x - 1 = 3x + 15$

(d) $5x - 3 = 2x + 18$

(e) $12x - 5 = 8x + 7$

(f) $10x - 1 = 8x + 6$

(g) $10x = 9x + 41$

(h) $3x = x + 17$

(i) $5x - 26 = 3x$

(j) $7x - 48 = x$

(k) $3x + 17 = x$

(l) $10x - 30 = 6x$

Exercise 2

Solve for x :-

1. $\frac{1}{2}x - 3 = 1$

2. $\frac{1}{4}x + 7 = 10$

3. $\frac{1}{8}x - 5 = 0$

4. $\frac{2}{3}x - 1 = 9$

5. $1 + \frac{3}{5}x = 13$

6. $\frac{3}{8}x + 4 = 4$

7. $\frac{x + 1}{4} = 3$

8. $\frac{x + 4}{5} = 4$

9. $\frac{x + 2}{3} - 2 = 5$

Exercise 3

1. Solve these inequalities, leaving your answers in the form $x < 1$, etc. :-

(a) $x + 4 > 7$

(b) $x + 8 < 14$

(c) $x - 9 \leq 20$

(d) $9x \geq 54$

(e) $7x \leq 98$

(f) $100x > 1400$

2. Solve the following inequalities :-

(a) $3x + 5 < 23$

(b) $2x + 11 > 27$

(c) $6x - 8 < 4$

(d) $7x + 3 \geq 52$

(e) $10x - 9 \leq 81$

(f) $5x - 23 > 7$

(g) $4x + 4 \leq 4$

(h) $3x - 2 < 25$

(i) $2x + 5 \leq 22$

Exercise 4E

1. Solve these equations by multiplying out the brackets first :-

(a) $2(x + 7) = 18$

(b) $3(x + 4) = 30$

(c) $5(x - 6) = 10$

(d) $4(x + 9) = 48$

(e) $6(x + 3) = 66$

(f) $2(x + 5) = 18$

(g) $9(x - 4) = 36$

(h) $9(x + 1) = 9$

(i) $2(x - 1) = 11$

2. Solve these equations :-

(a) $2(4x + 3) = 14$

(b) $5(2x - 1) = 45$

(c) $3(6x - 1) = 33$

(d) $2(7x + 4) = 50$

(e) $3(2x - 8) = 0$

(f) $4(5x - 8) = 88$

(g) $2(3x - 1) = 4x + 14$

(h) $5(2x + 1) = 7x + 14$

(i) $3(1 + 2x) = 5x + 17$

3. Solve the equations :-

(a) $2(x + 5) - x - 4 = 7$

(b) $4(x + 2) + 3x - 3 = 12$

(c) $3(x - 3) + 2(x + 5) = 21$

(d) $5(2x + 1) - 2(x - 2) = 6x + 13$

4. Solve the equations by multiplying out brackets first:

(a) $(x + 5)(x + 1) = x(x + 1)$

(b) $(x + 4)(x - 4) = (x - 4)(x + 2)$

(c) $(x + 2)(x - 3) = x(x - 5)$

(d) $(x + 5)(x - 3) - (x - 1)^2 = 4$

Exercise 5E

Change the subject of each formula to the letter shown in brackets. SHOW ALL WORKING!

1. $x + v = w$ (x)

2. $\frac{p}{3} = q$ (P)

3. $\frac{x}{p} = r$ (x)

4. $mx = n$ (x)

5. $2x + r = s$ (x)

6. $\sqrt{vx} - w = t$ (x)

7. $x^2 = a$ (a)

8. $T = \frac{D}{S}$ (S)

9. $w - p = q$ (p)

10. $2h - 5p = q$ (h)

11. $A = \pi r^2$ (r)

12. $m = 2(n + 1)$ (n)

MNU 4-16a: I have explored the relationships that exist between the sides, or sides and angles, in right-angled triangles and can select and use an appropriate strategy to solve related problems, interpreting my answer for the context.

Exercise 1

1. Find :-

(a) 3^2

(b) 5^2

(c) 2^2

(d) 1^2

(e) 10^2

- (f) 9^2 (g) 11^2 (h) 12^2 (i) 20^2 (j) 100^2
 (k) $(\frac{1}{2})^2$ (l) $(\frac{1}{3})^2$ (m) $(\frac{1}{5})^2$ (n) $(0.1)^2$ (o) $(0.01)^2$.

2. Calculate the area of a square with side :-

- (a) 5 cm (b) 10 cm (c) 7 mm (d) 0.5 m (e) 1 km.

3. Find :-

- (a) $\sqrt{36}$ (b) $\sqrt{25}$ (c) $\sqrt{100}$ (d) $\sqrt{169}$ (e) $\sqrt{4}$
 (f) $\sqrt{225}$ (g) $\sqrt{10000}$ (h) $\sqrt{900}$ (i) $\sqrt{1600}$ (j) $\sqrt{1}$.

4. Use a calculator and write down to two decimal places :-

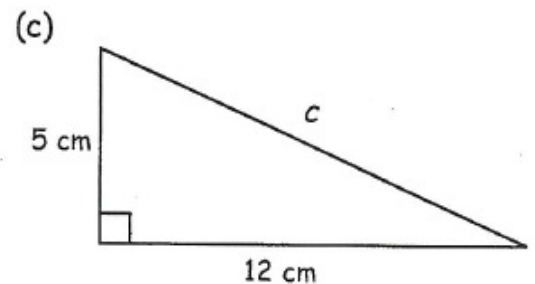
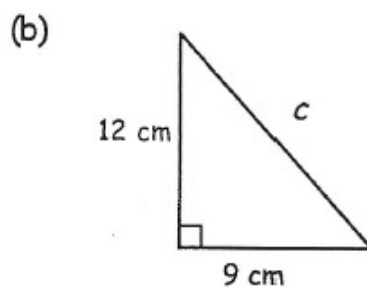
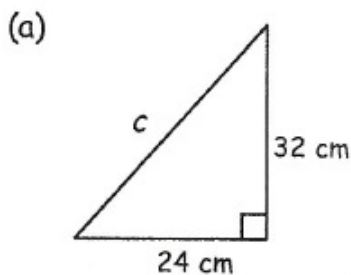
- (a) $\sqrt{20}$ (b) $\sqrt{50}$ (c) $\sqrt{56}$ (d) $\sqrt{179}$ (e) $\sqrt{14.4}$.

5. Calculate the length of the side of a square with area :-

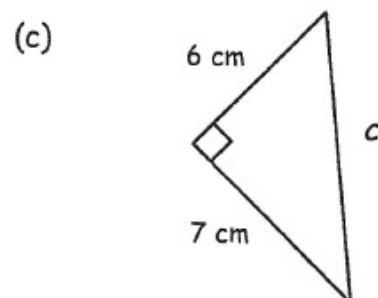
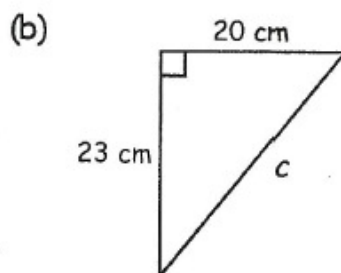
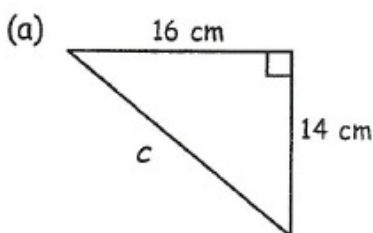
- (a) 49 cm^2 (b) 81 cm^2 (c) 9 m^2 (d) 1 mm^2 (e) 0.25 m^2 .

Exercise 2

1. For each right angled triangle shown, use **Pythagoras' Theorem** to calculate the length of each hypotenuse :-



2. For each right angled triangle shown, use **Pythagoras' Theorem** to calculate the length of each hypotenuse (correct to two decimal places) :-

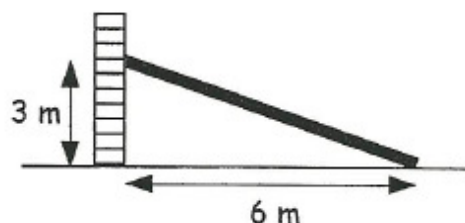


Exercise 3

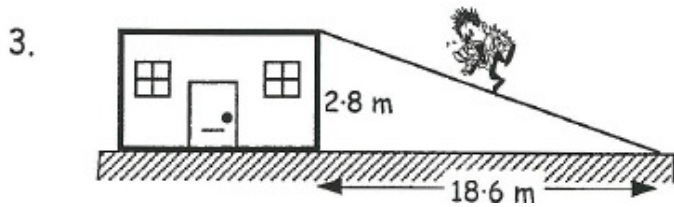
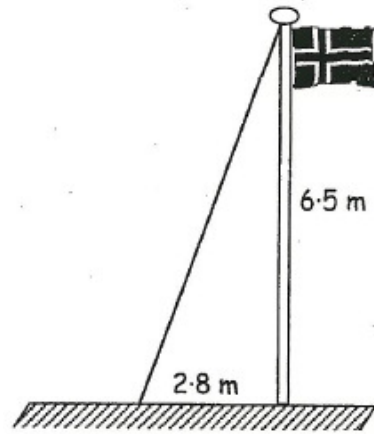
(In this exercise, round all answers to two decimal places where necessary).

1. A long wooden beam is required to prop up a wall which is deemed unsafe.

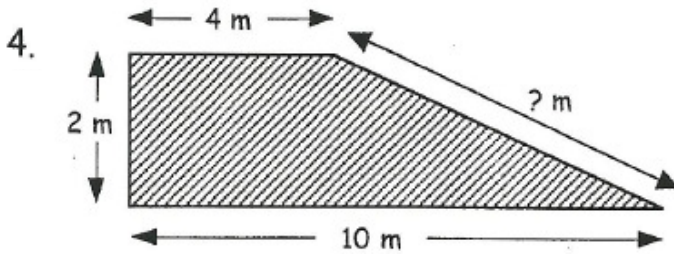
How long is the required beam ?



2. A metal wire is attached to the top of a flagpole to help keep it rigid.
Calculate the length of the metal wire.

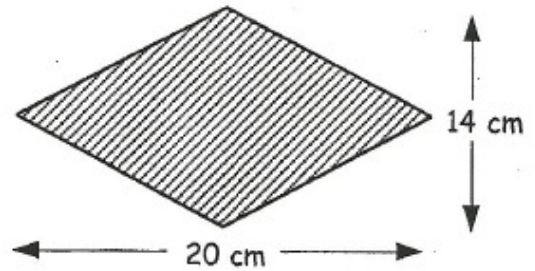


A tightrope walker is to walk from a roof-top to the ground along a rope.
Calculate the length of the rope.



A skateboard ramp has dimensions as shown.
Calculate the length of the sloping side of the ramp.

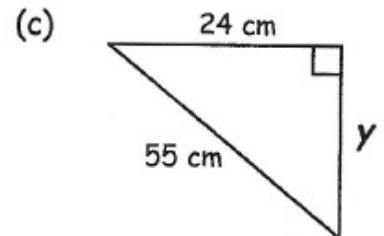
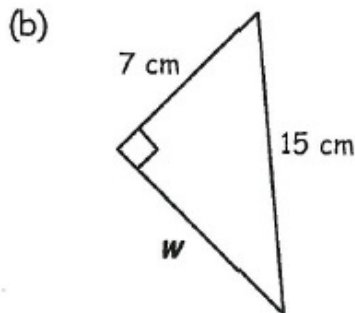
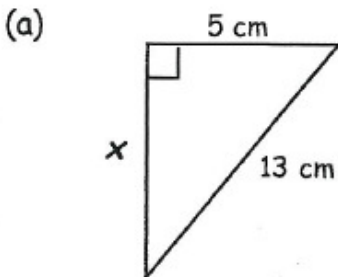
5. A rhombus has its diagonal lengths 20 centimetres and 14 centimetres.
Calculate the perimeter of the rhombus.



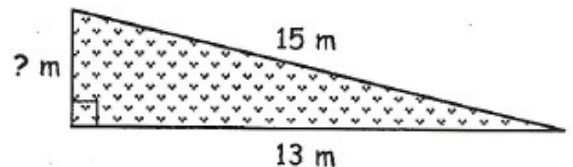
Exercise 4

1. In each of the following right angled triangles, calculate the size of each unknown smaller side :-

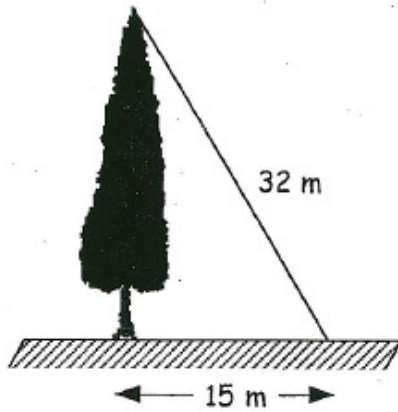
(Give your answer to two decimal places where necessary).



2. A triangular garden has dimensions as shown.
Find the breadth of the garden.



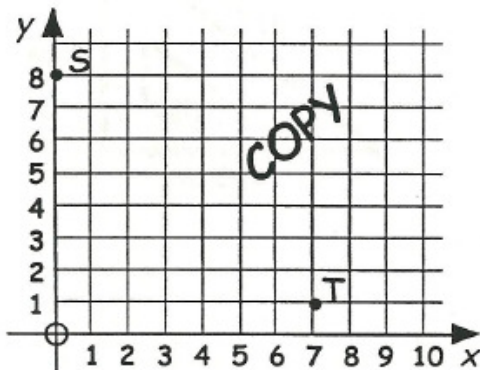
3.



Calculate the height of the tree.

Exercise 5

1.



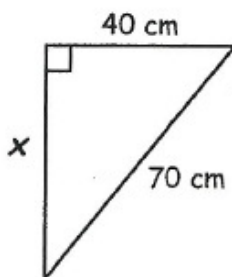
- Write down the coordinates of the points S and T.
- Copy the figure accurately showing the 2 points, S and T.
- Join S to T, complete the right angled triangle and calculate the length of the line ST.

- Draw your own coordinate diagram measuring 8 boxes across by 8 boxes upwards.
 - Mark on it the x-axis, the y-axis and the origin.
 - Plot the 2 points, J(1,3) and K(7,7).
 - Create a right angled triangle and calculate the length of the line JK.

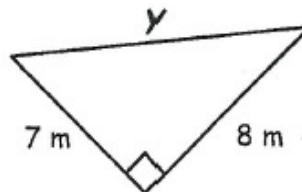
Exercise 6

1. For each question below, use an appropriate formula to find the values of x , y and z :-

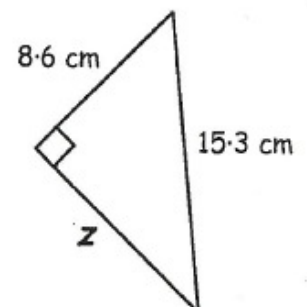
(a)



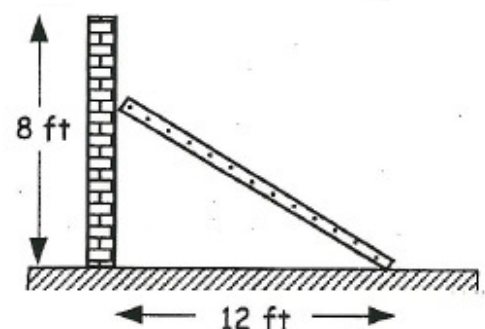
(b)



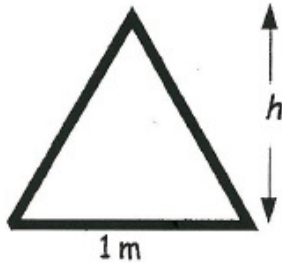
(c)



- The top of a ladder is placed **three quarters** of the way up an eight foot high wall. Find the length of the ladder.



3.



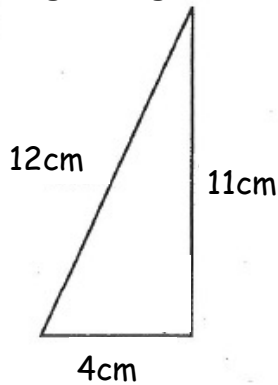
The road sign is in the shape of an equilateral triangle with side 1 metre.

Find the height of the sign (h metres).

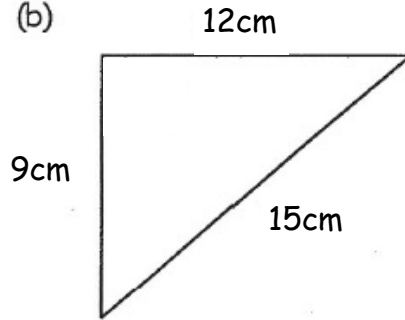
Exercise 7

1. Use the **Converse of Pythagoras' Theorem** to determine if these triangles are right-angled:-

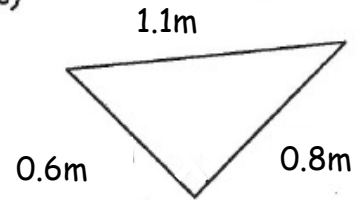
(a)



(b)



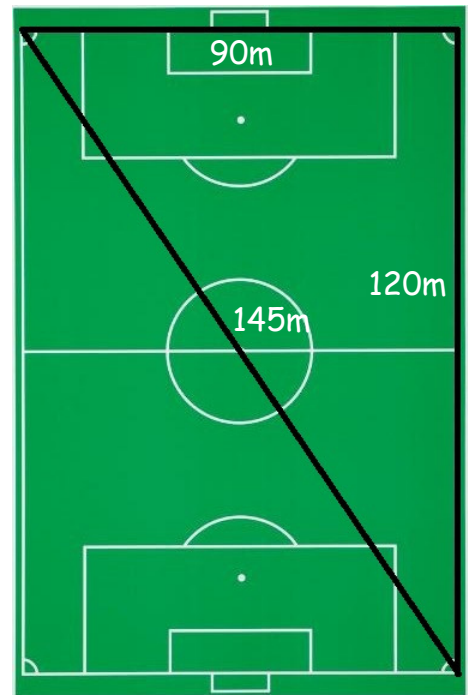
(c)



2. After the grass was replaced on the football pitch at Hampden, Shuggie the groundsman paints the lines back on. To check that the new pitch is rectangular, he measures the length of one of the diagonals.

The pitch is 120 metres long and 90 metres wide. The diagonal is 145 metres in length.

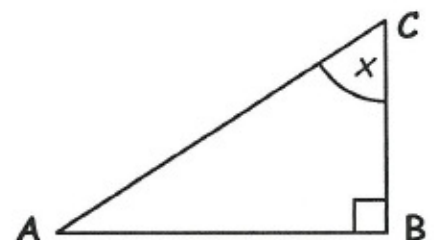
Is the pitch rectangular? Explain your answer!



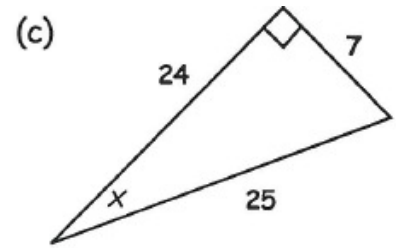
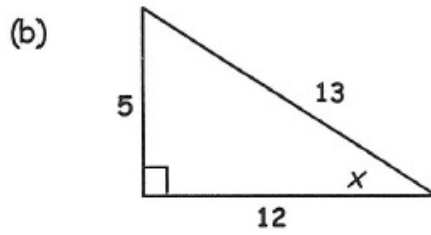
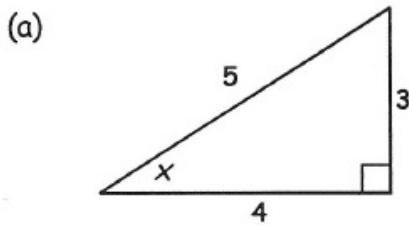
Exercise 8

1. Look at this triangle with angle x marked.

- Name the hypotenuse.
- Name the opposite side.
- Name the adjacent side.



2. Write down the value of $\sin x$ (as a fraction) each time here :-



3. Use your **sine** button to write down the value of the following to three decimal places :-

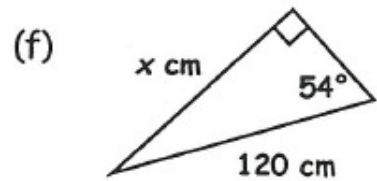
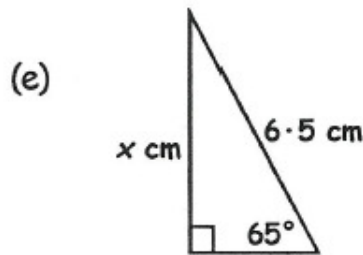
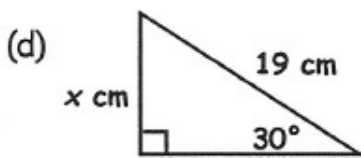
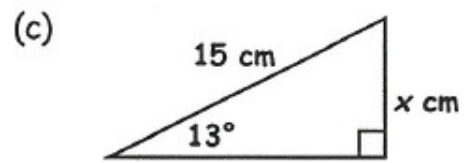
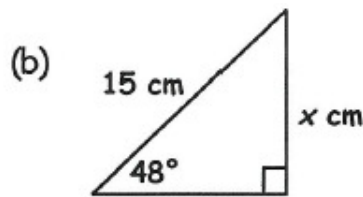
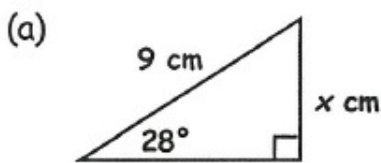
(a) $\sin 15^\circ$

(b) $\sin 46^\circ$

(c) $\sin 18^\circ$

(d) $\sin 65.4^\circ$

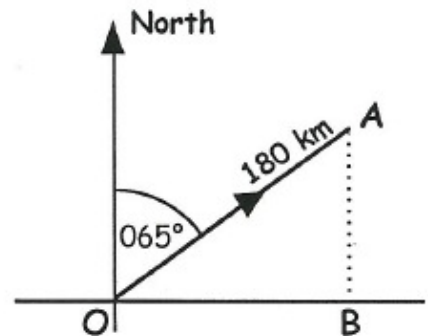
4. Calculate x each time :-



5. A plane flies from O for 180 kilometres to A on a bearing of 065° .

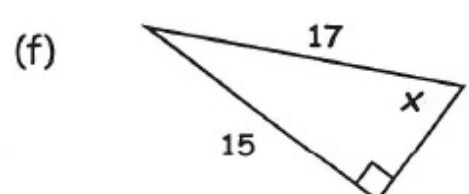
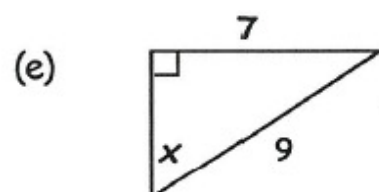
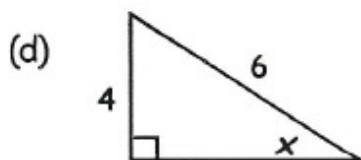
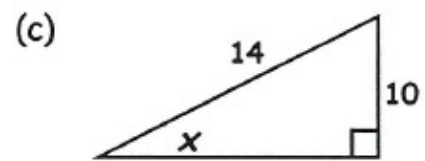
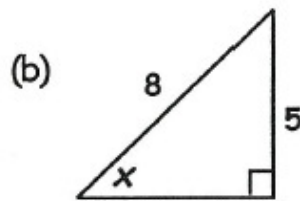
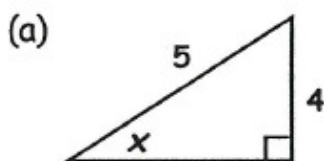
(a) Calculate the size of $\angle AOB$.

(b) Calculate how far north the plane now is from O . (i.e. find AB)



Exercise 9

1. Calculate the size of the angle marked x each time :-

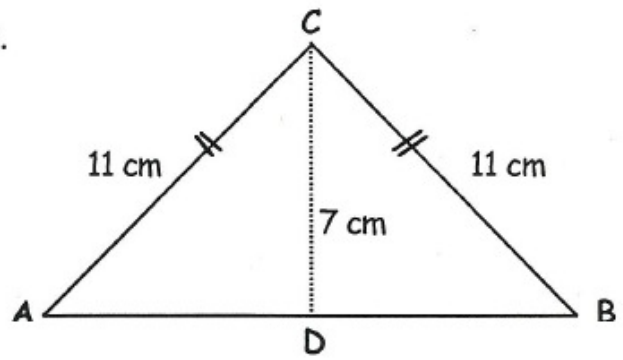


2. This isosceles triangle $\triangle ABC$ can be split into 2 identical right angled triangles.

$AC = BC = 11 \text{ cm.}$

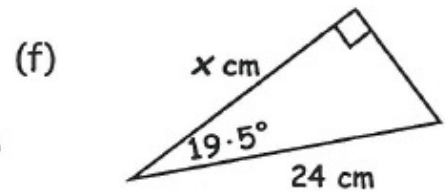
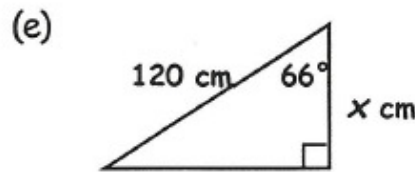
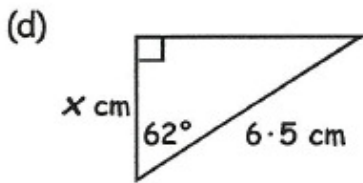
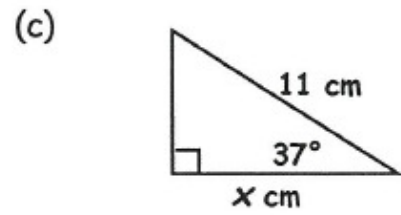
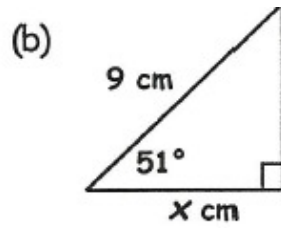
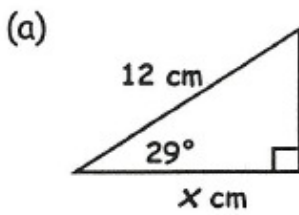
Height $CD = 7 \text{ cm.}$

- (a) Calculate the size of $\angle CAD$.
 (b) Now calculate the sizes of the other 2 angles in $\triangle ABC$.



Exercise 10

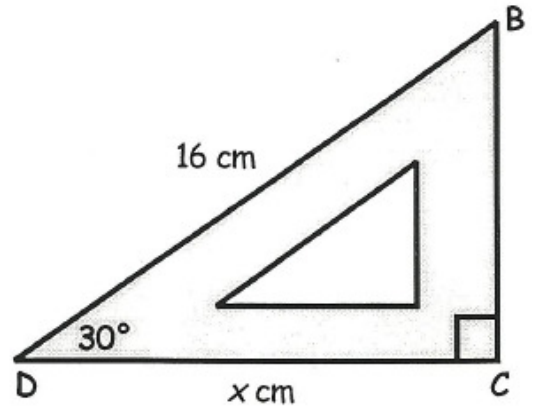
1. Calculate x each time :-



2. A set square has an angle of 30° in one corner.

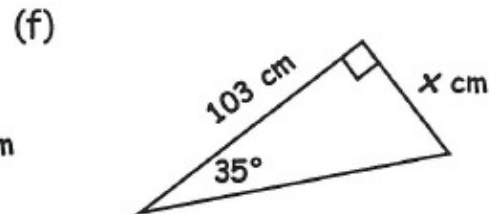
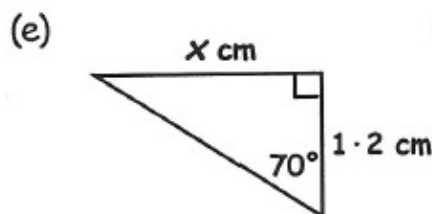
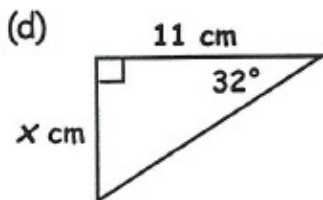
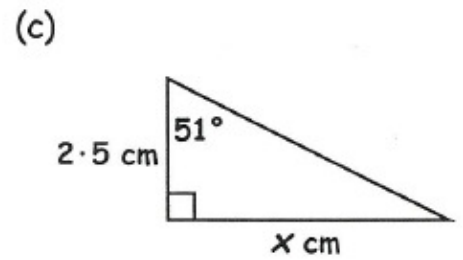
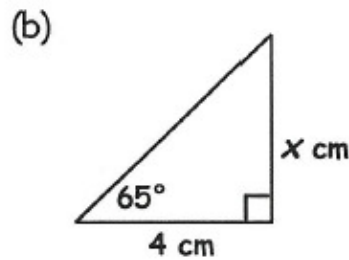
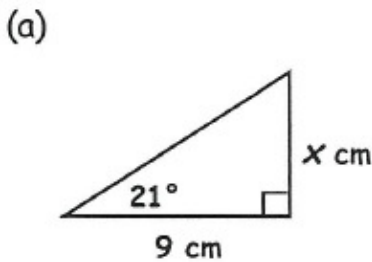
One of its sides is 16 centimetres as shown.

- (a) Calculate the length of line DC .
 (to 3 decimal places)
 (b) Now use Pythagoras Theorem to calculate the length of BC .

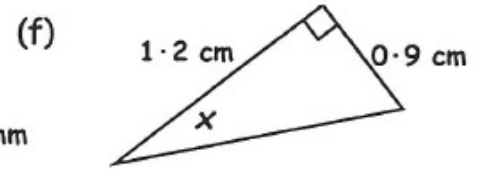
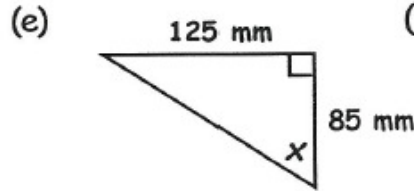
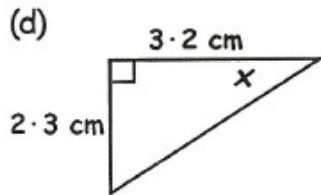
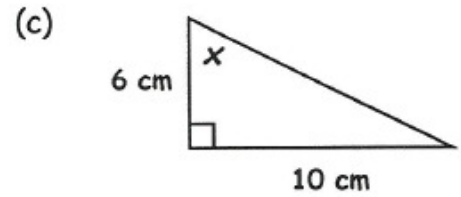
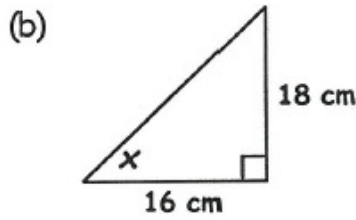
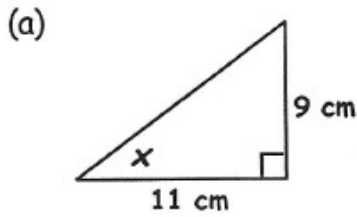


Exercise 11

1. Calculate x each time :-

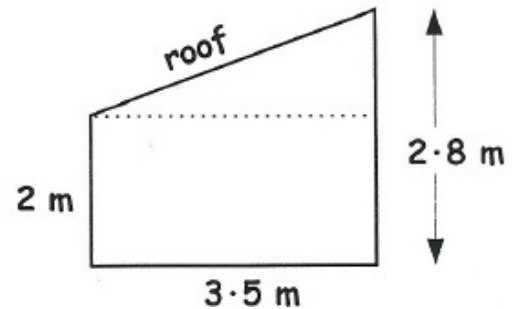


2. Calculate the size of the angle marked x each time :-



3. This picture shows the side view of a "lean-to" shed.

Calculate the size of the angle the roof makes with the horizontal.



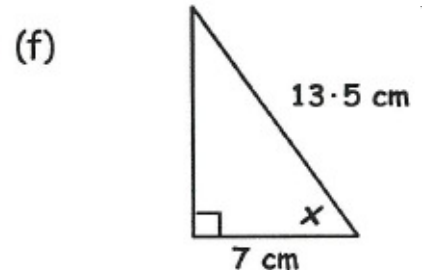
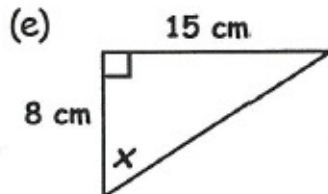
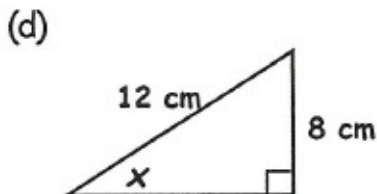
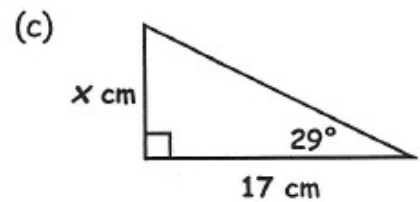
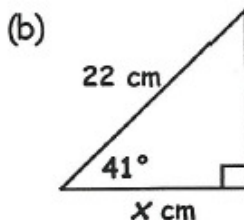
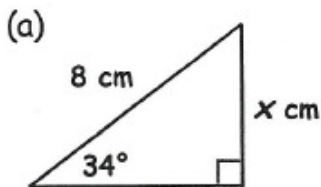
Exercise 12 (A mixture)

In this exercise, you must decide :-

- which 2 sides you are dealing with. (opp. hyp, adj)
- which trig ratio to use. (sin, tan, cos)

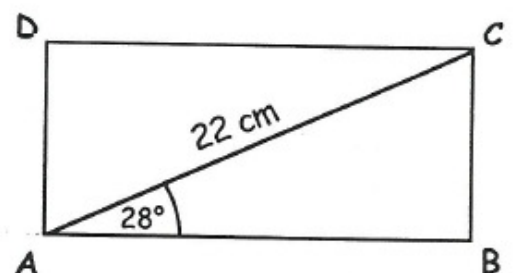


1. Calculate x each time :-



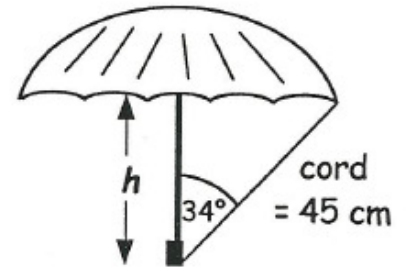
2. The diagonal of this rectangle is 22 cm long.

- Calculate the length of the small side BC .
- Calculate the length of the larger side AB .



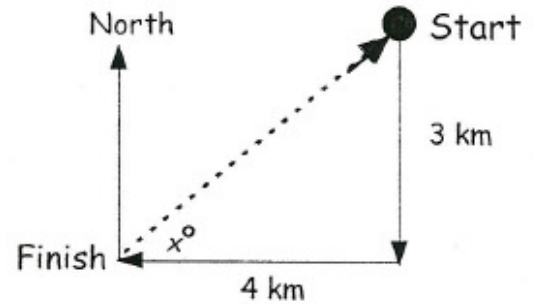
3. This umbrella has a cord joining the end of the handle to one of the "prongs" of the cover.

Calculate the length of the handle shown.



4. A hiker walks 3 km south then 4 km west.

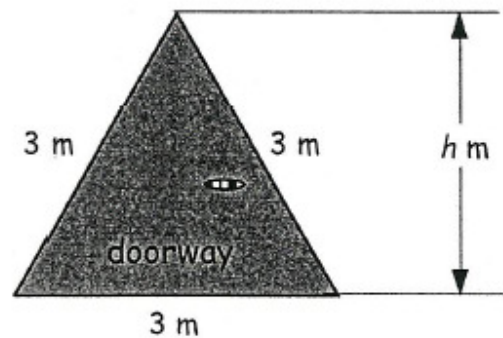
- (a) Calculate the size of the angle marked x .
 (b) Write the 3 figure bearing of the direction he must take from the finish to head back to the start.



5. A doorway in the shape of an equilateral triangle is to be built for a funhouse.

- (a) Write down the size of each of the three angles of the triangle.
 (b) Use trigonometry to find the height of the doorway.

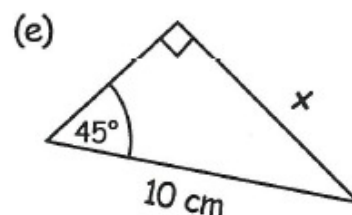
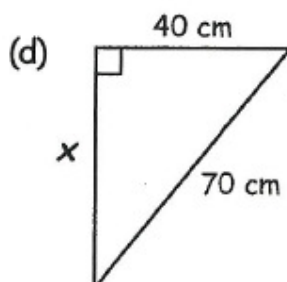
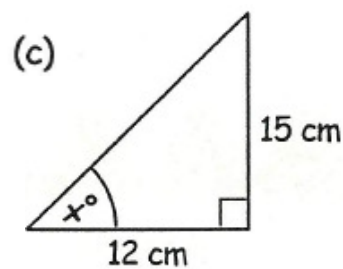
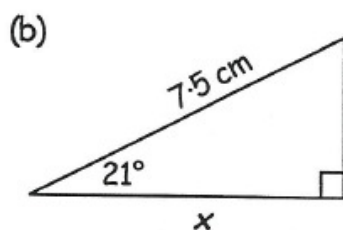
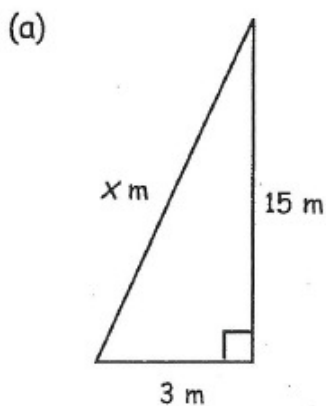
(Show all your working).



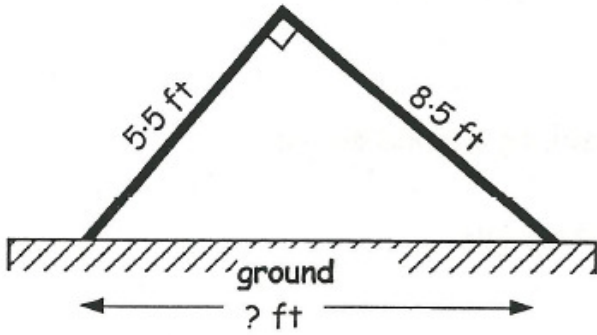
Exercise 13

- In each question below: (a) decide whether to use Pythagoras or trigonometry
 (b) find the missing side or angle.

1. Find x in each triangle below:-



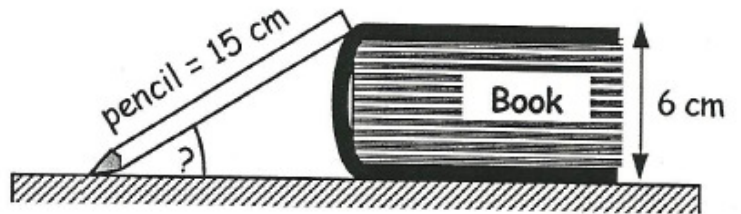
2.



This metal frame, in the shape of a right angled triangle, is placed on the ground ready for a tent canvas to be spread over it.

Calculate the distance, along the ground, between the ends of the 2 metal poles.

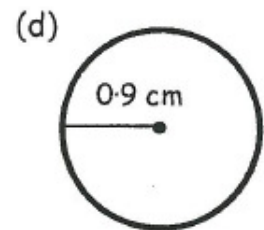
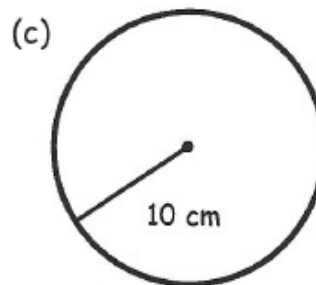
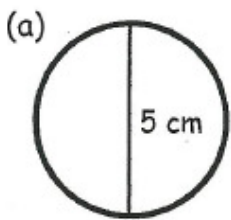
3. This pencil lies with its end just resting against a book.
If the pencil is 15 cm long, calculate the size of the angle between the tip of the pencil and the table top.



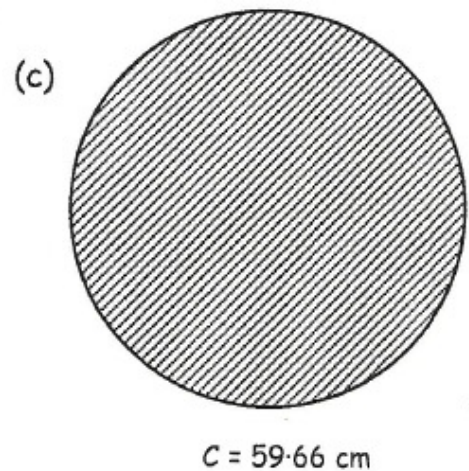
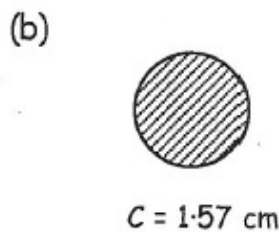
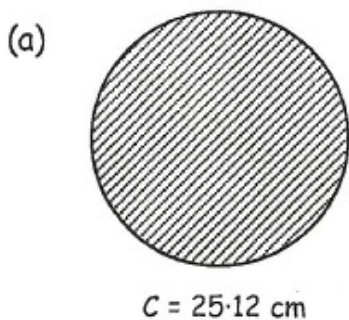
MNU 4-16b: Having investigated the relationships between the radius, diameter, circumference and area of a circle, I can apply my knowledge to solve related problems.

Exercise 1

1. Calculate the circumference of each of these circles:-



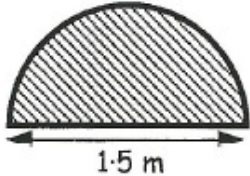
2. Calculate the diameter of each circle below :-



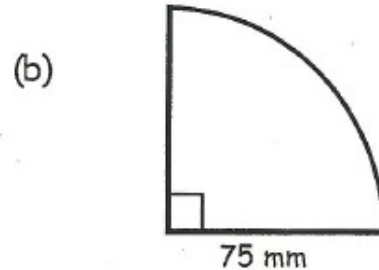
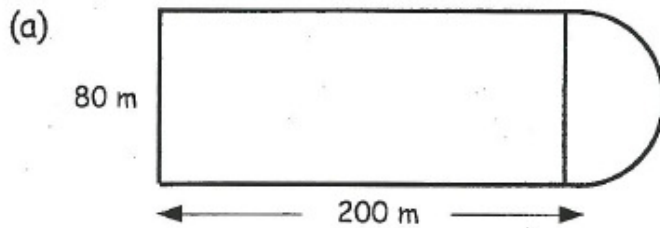
3. The circumference of a tyre from a child's toy motorbike is 7.85 centimetres.
Find the radius of the tyre.



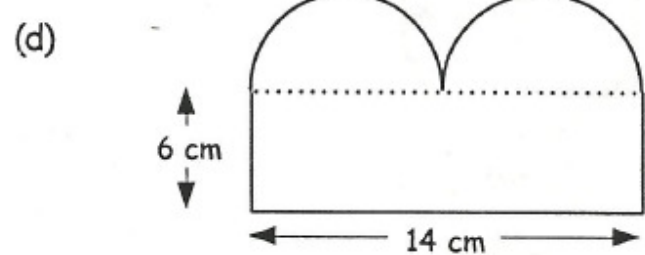
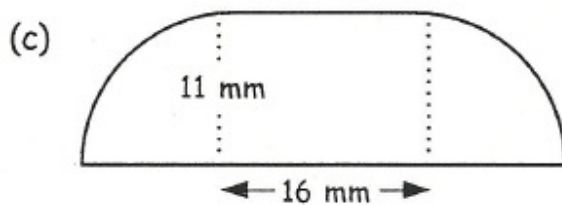
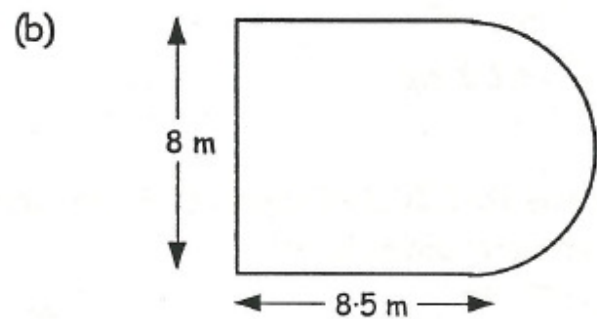
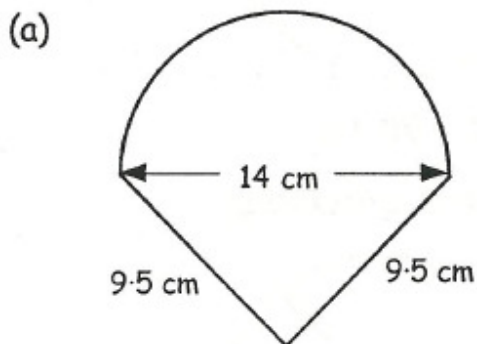
Exercise 2

1.  A semi-circular doorstep has a diameter of 1.5 metres. Calculate the perimeter of the doorstep.

2. Calculate the perimeter of both shapes :-

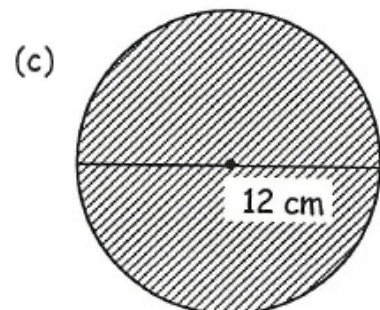
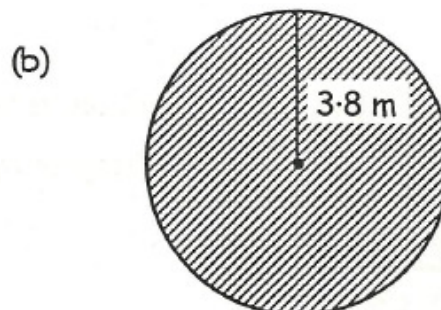



3. Calculate the PERIMETER of each of these shapes :-



Exercise 3

1. For following circles, calculate their areas :-



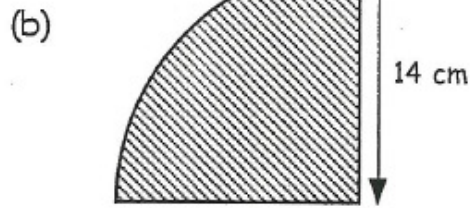
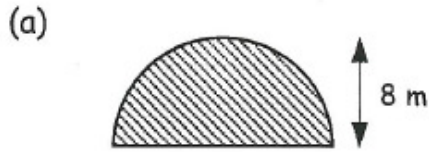
2.  Work out the area of this coloured counter which has diameter 1.8 metres. (Round your answer to 2 dec. pl.)

3. A ten pence piece has a diameter of 24 mm. What is its area?

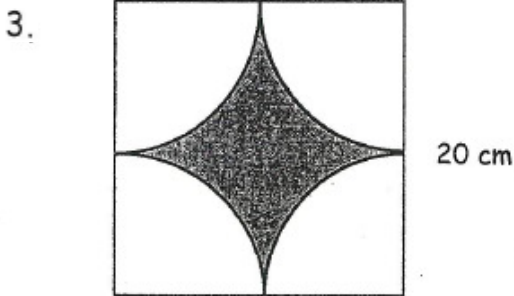
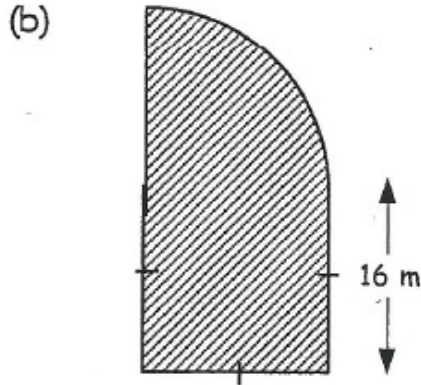
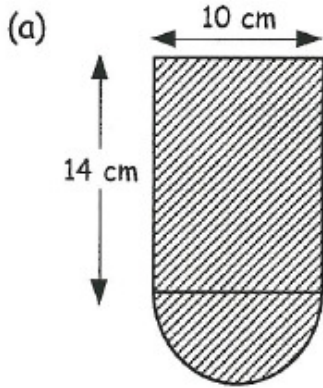


Exercise 4

1. Calculate the area of these shapes :-



2. Calculate the area of these shapes :-

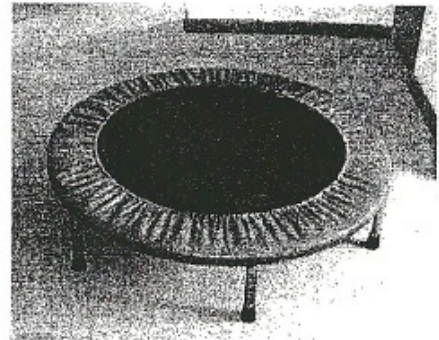


A square with side 20 centimetres has four identical quarter circles cut out from each corner as shown.

Work out the shaded area.

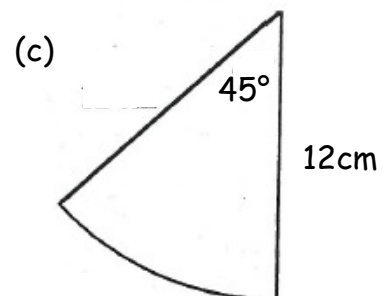
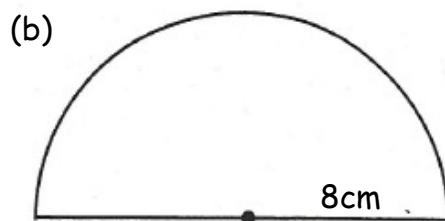
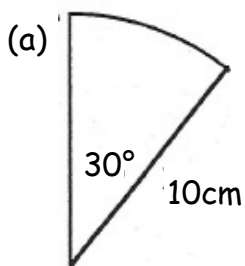
4. A circular trampoline has a circumference of 10.99 m.

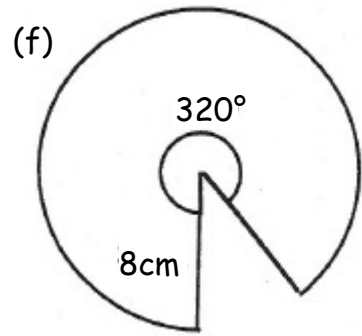
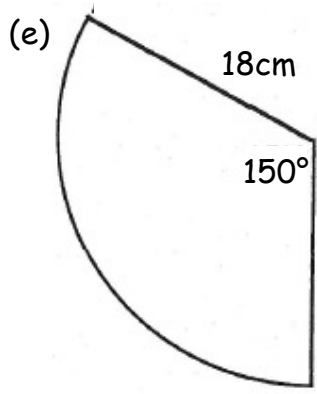
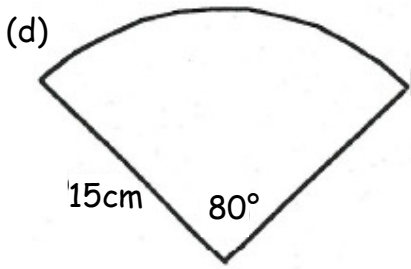
Calculate its area, to the nearest m^2 .



Exercise 5E

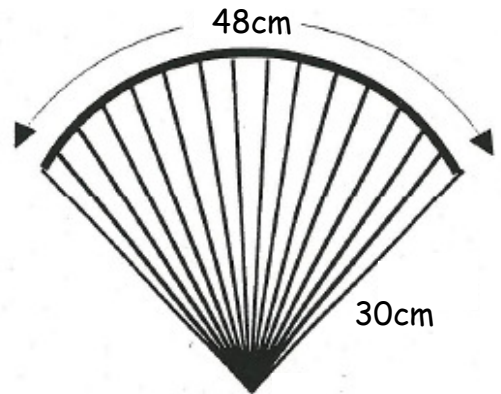
1. Calculate the length of the arc in each diagram:-





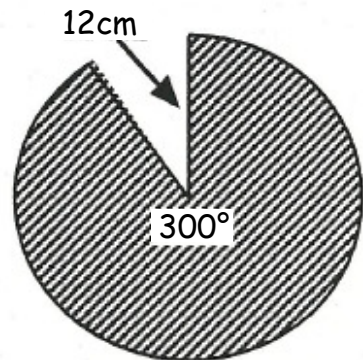
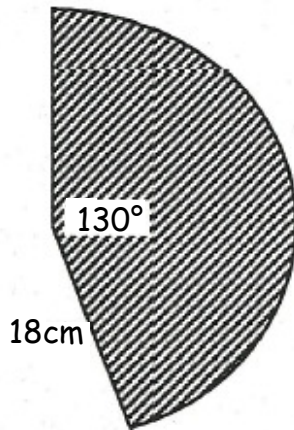
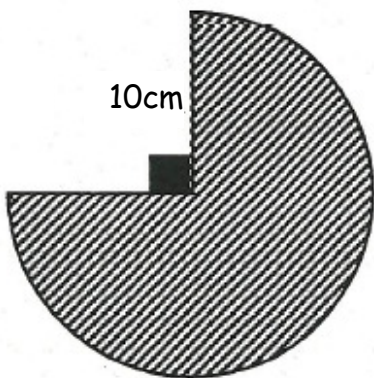
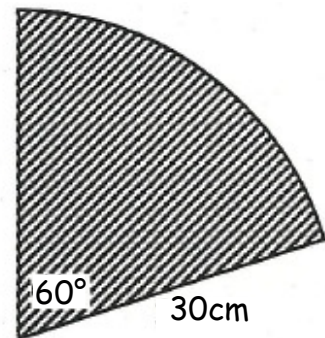
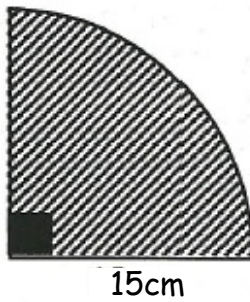
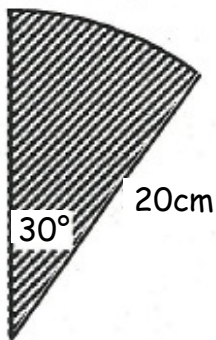
2. The edge of this fan is 48 cm long, and is the arc of a circle with a radius of 30 cm.

Find the size of the angle at the centre of the fan (accurate to 1 d.p.)



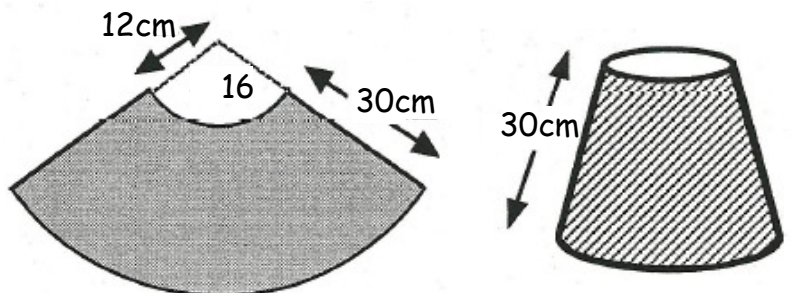
Exercise 6E

1. Calculate the area of the sector in each diagram:-



2. A lamp shade is made from the sector of a large circle with a smaller sector removed.

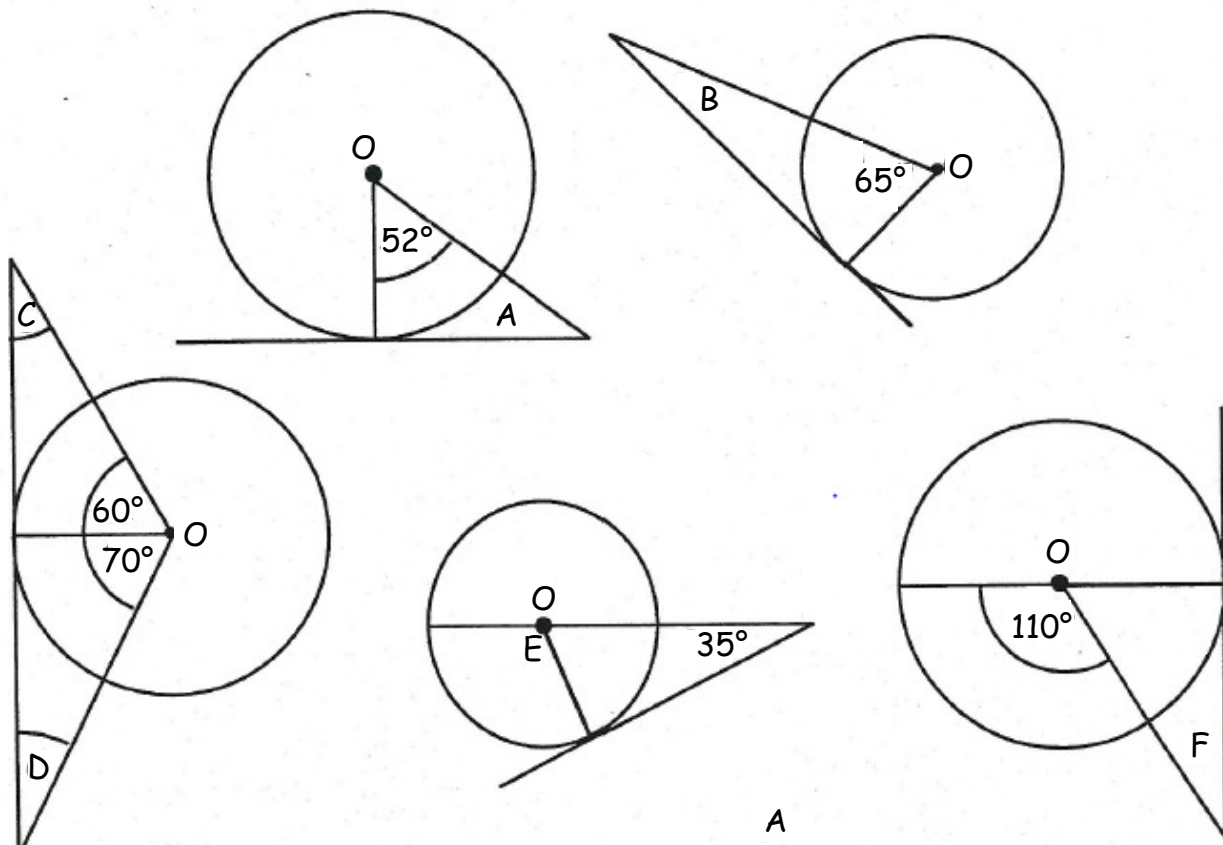
Calculate the area of the lamp shade.



MNU 4-17a: Having investigated the relationship between a radius and a tangent and explored the size of the angle in a semi-circle, I can use the facts I have established to solve related problems.

Exercise 1

1. Copy the diagrams below and find the sizes of the angles marked with a letter:-

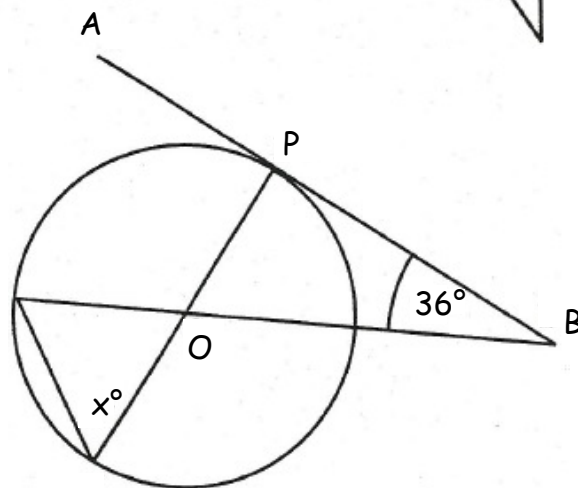


2. AB is a tangent to the circle with centre O .

It meets the circle at point P .

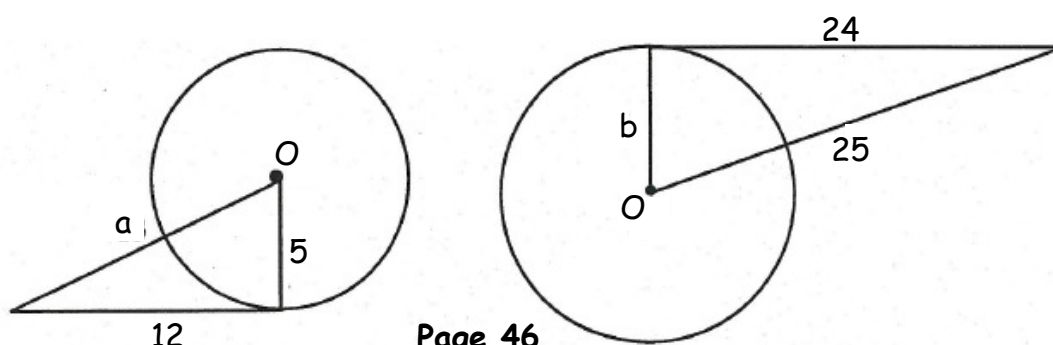
Angle $CBP = 36^\circ$.

Find the size of angle x .



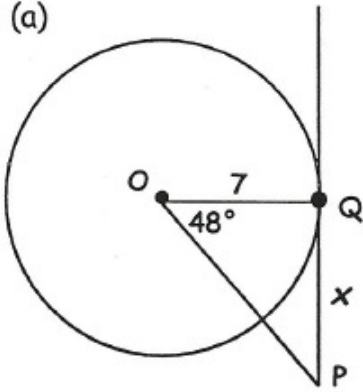
Exercise 2

1. Use Pythagoras' Theorem to find the lengths of a and b (all lengths are in cm).

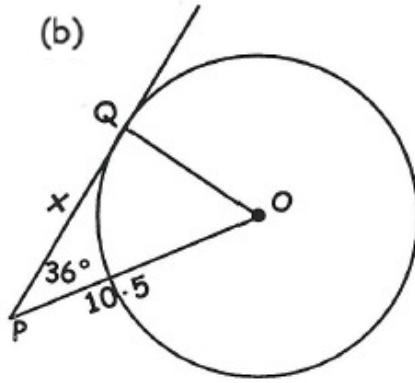


2. Use trigonometry to find x in each diagram below:-

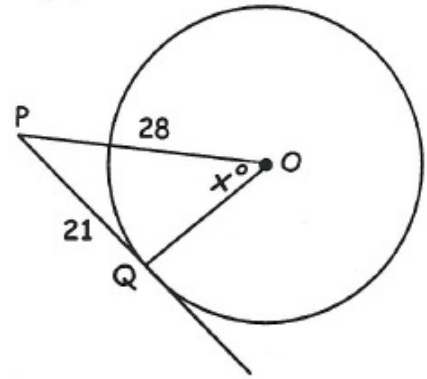
(a)



(b)



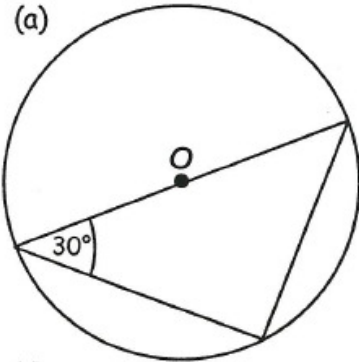
(c)



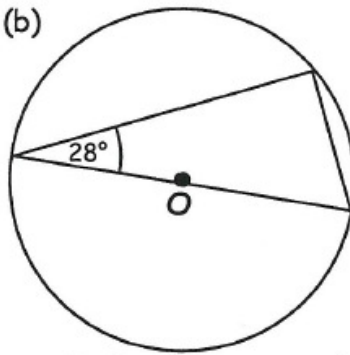
Exercise 3

1. Make a neat sketch of the following circles, filling in the missing angles :-

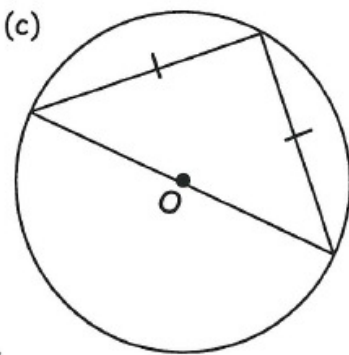
(a)



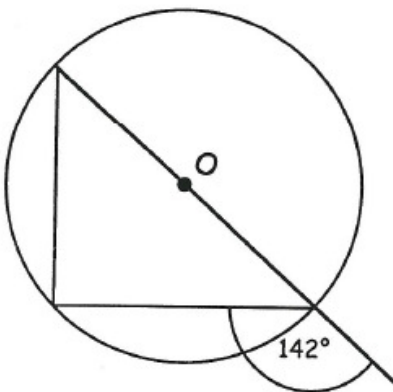
(b)



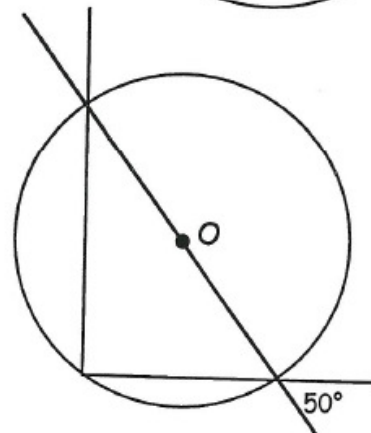
(c)



(d)

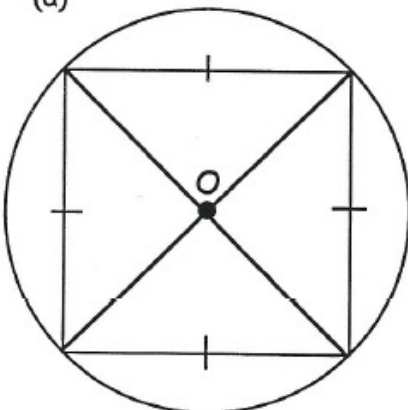


(e)

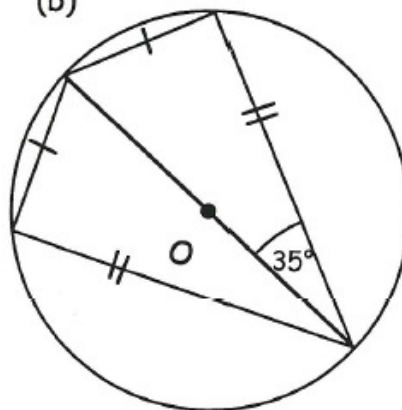


2. Make a neat sketch of the following circles. Name the 4 sided shapes inside the circles and use their properties to calculate all the missing angles.

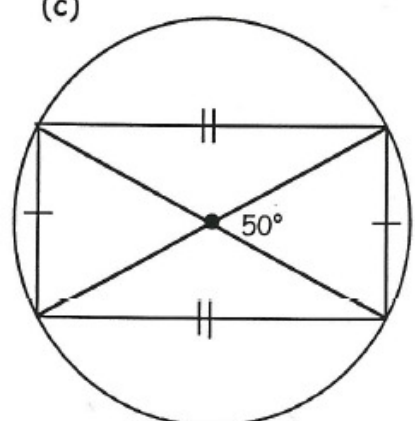
(a)



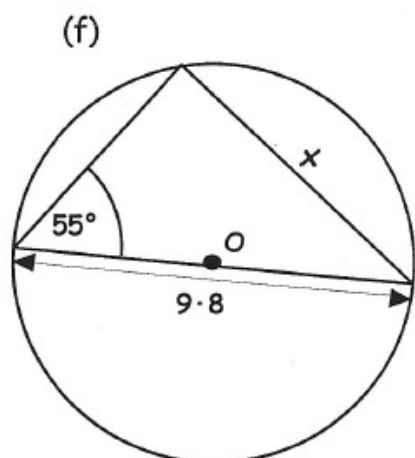
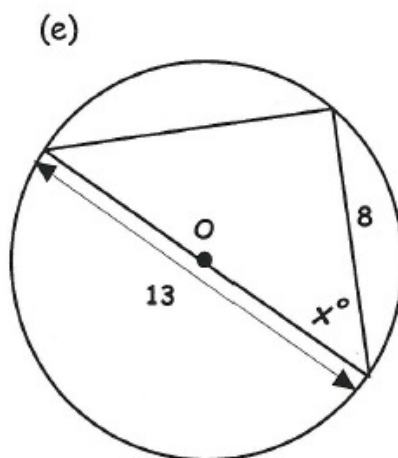
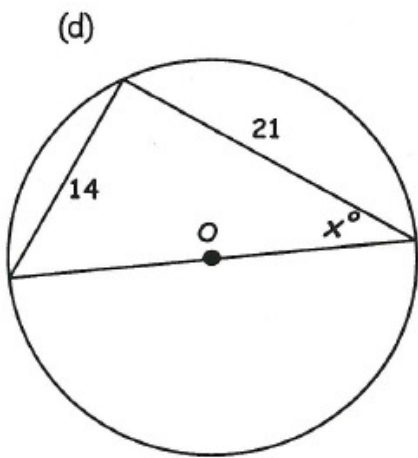
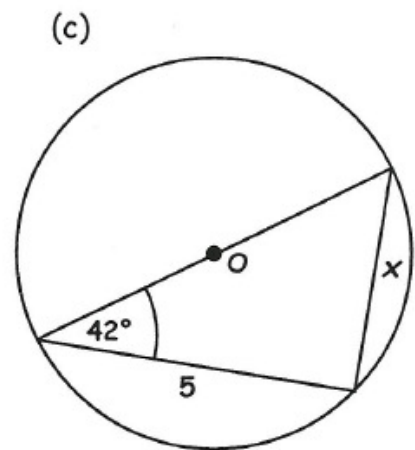
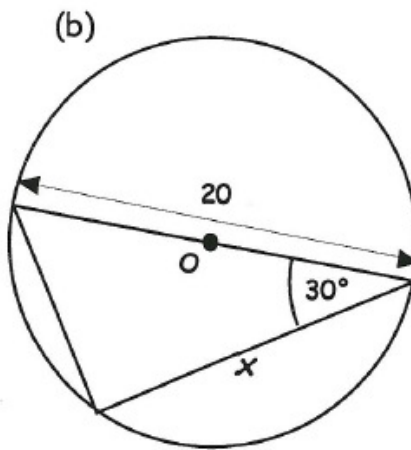
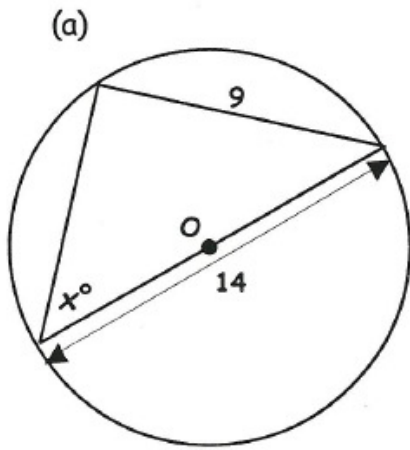
(b)



(c)



3. For each of the following diagrams, copy the triangle and mark in the right angle before calculating x (correct to 1 decimal place) :-

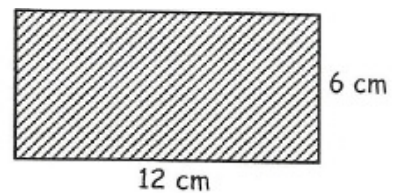
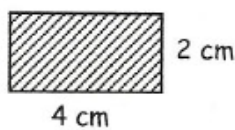


MNU 4-17b: I can apply my understanding of the properties of similar figures to solve problems involving length and area.

Exercise 1

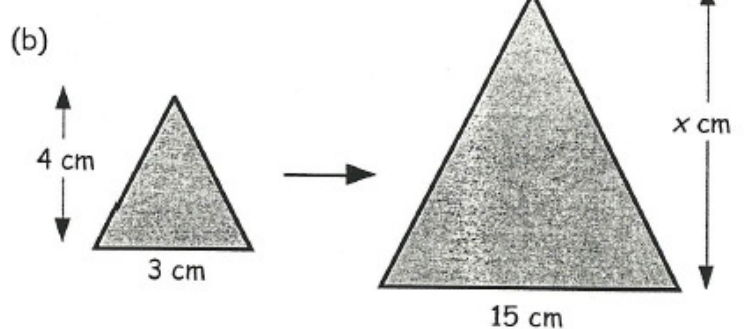
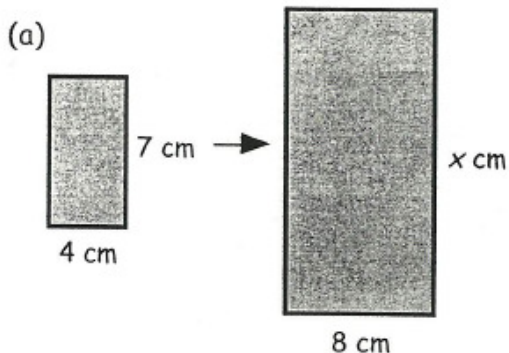
1. These rectangles are similar.

Compare their sides and write down the scale factor.

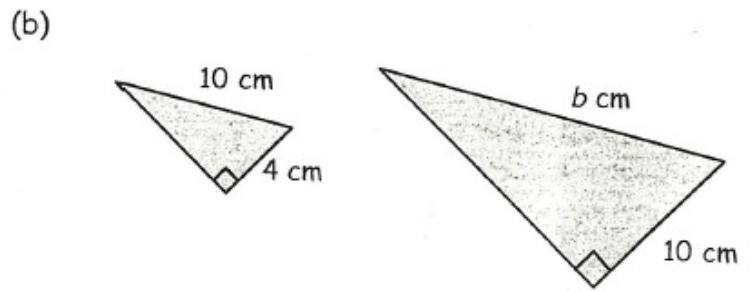
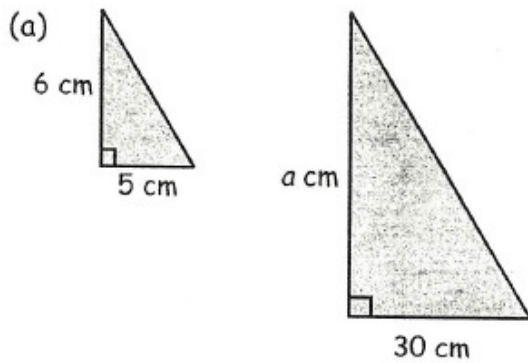


2. In each of the following pairs of similar figures, calculate

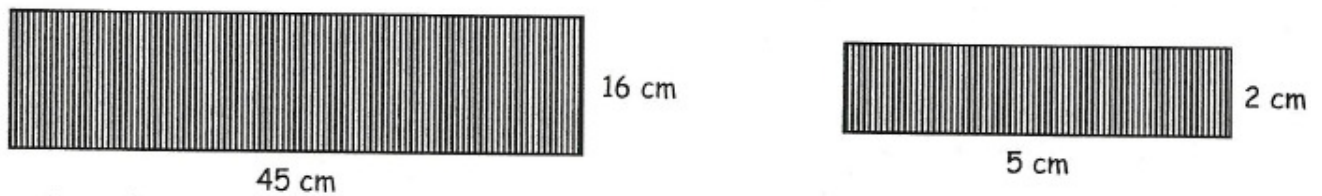
(i) the scale factor (ii) the value of x .



3. Each of the following pairs of right angled triangles are similar. In each case, find the scale factor and calculate the value of a and b .



4. Are these two rectangles similar? (Show all your working).

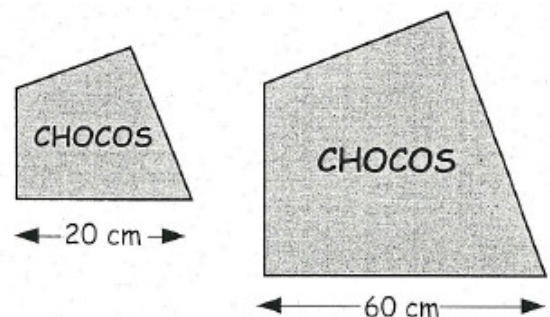


Exercise 2

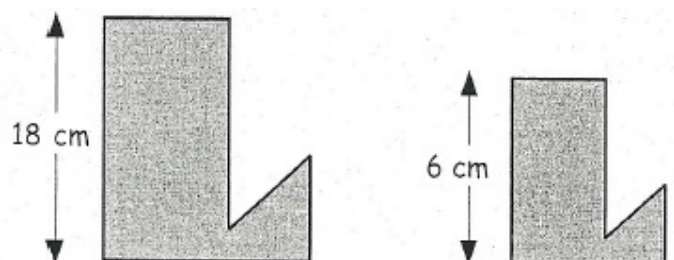
1. These two rectangles are similar.
- Write down the "length" scale factor. ($= 15 \div \dots = \dots$)
 - Now write down the "area" scale factor (it is **not** 3 !)
 - Calculate the area of the larger rectangle.



2. The two chocolate box tops are similar. The area of the small one is 250 cm^2 .
- Write down the length scale factor.
 - What is the area scale factor?
 - Calculate the area of the larger box lid?



3. The two "L" shapes are similar. If the larger one has an area of 270 cm^2 , calculate the area of the smaller one.



MNU 4-18a: I can plot and describe the position of a point on a 4-quadrant coordinate grid.

Exercise 1

- The coordinates of A are $(-3, 2)$.
Write the coordinates of the other points.

- Copy the set of axes from question 1.
 - Plot the following six points :-
 $P(2, 3)$, $Q(-1, 5)$, $R(-4, 3)$,
 $S(-4, -1)$, $T(-1, -3)$ and $U(2, -1)$.

- Name the shape formed when the six points are joined up in order.

- Draw a set of axes from -5 to 5 on both axes.

- Plot the points $A(3, 2)$, $B(3, -3)$ and $C(-2, -3)$.

- Find and plot a fourth point (call it D), such that ABCD is a square.

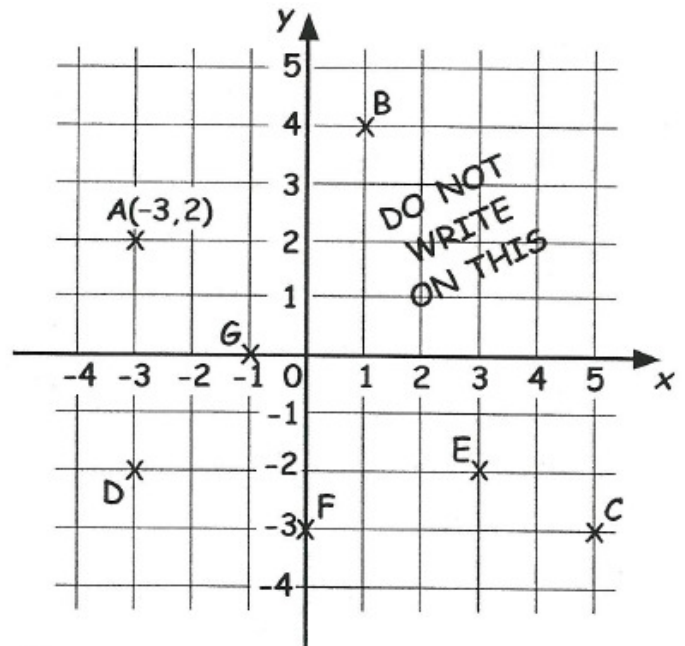
- Draw a set of axes from -5 to 5 on both axes.

- Plot the points $J(2, 1)$, $K(4, 1)$ and $L(3, 4)$.

- Join the three points and write the name of the shape formed.

- Reflect this shape over the x -axis.

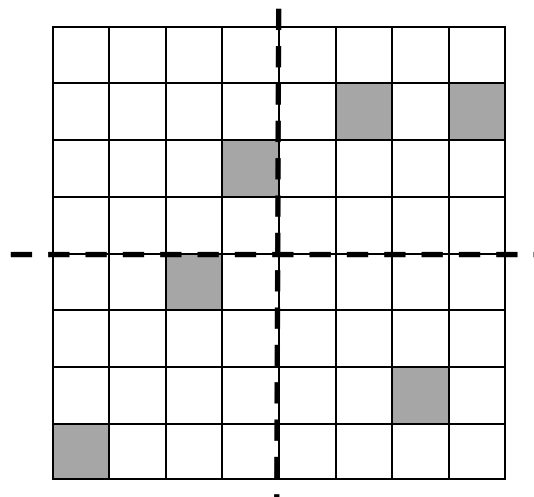
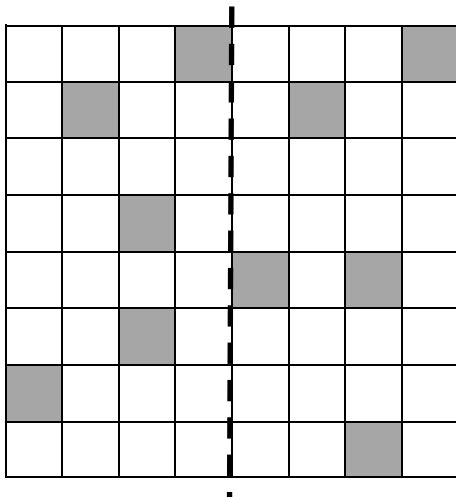
- Write the coordinates of the vertices of the new shape found.



MNU 4-17b: I can apply my understanding of the 4-quadrant coordinate system to move, and describe the transformation of, a point or shape on a grid.

Exercise 1

- Copy each diagram and shade just enough sections so that the dotted lines are lines of symmetry:-

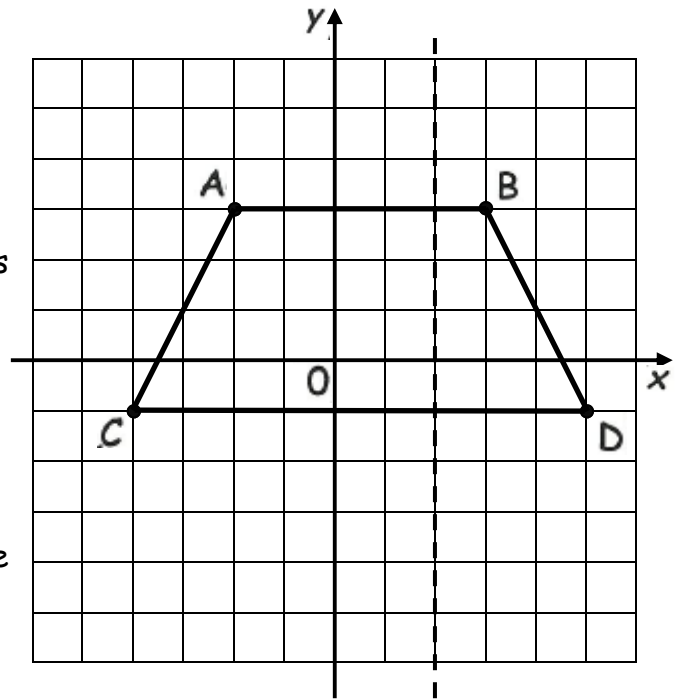


2. A trapezium is drawn with vertices at the points A (-2, 3), B (3, 3), C (5, -1) and D (-4, -1).

(a) (i) Write down the coordinates of A', B', C' and D', the images of A, B, C and D under reflection in the x-axis.

(ii) Copy the axes and draw trapezium A'B'C'D'.

(b) On a separate diagram, draw trapezium A''B''C''D'', which is made by reflecting ABCD in the dotted line.



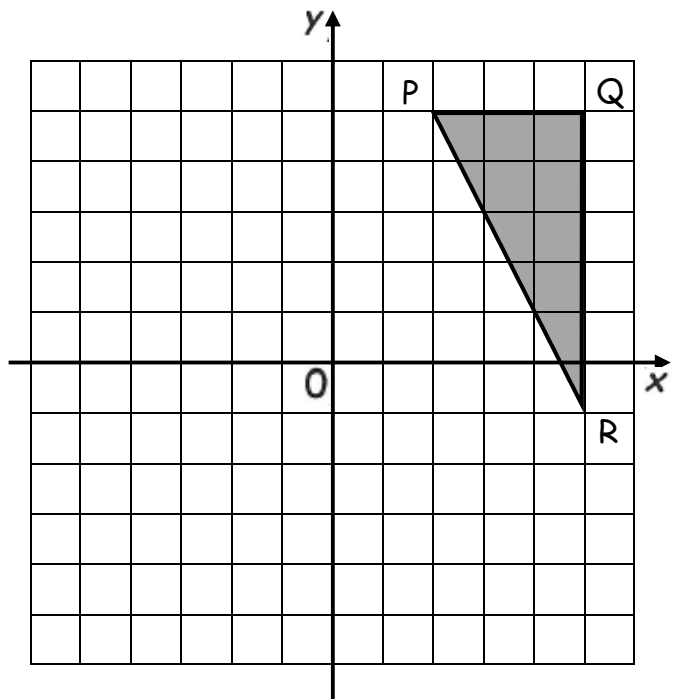
Exercise 2

1. Triangle PQR has been placed on a grid as shown.

(a) Copy the diagram and add the image of PQR under a 90° anti-clockwise rotation about O.

(b) Copy and complete the table:-

Point	Image
P (2, 5)	P' (-5, -2)
Q	Q'
R	R'



2. Write down the image of each point below after rotation by a quarter turn anti-clockwise about O:-

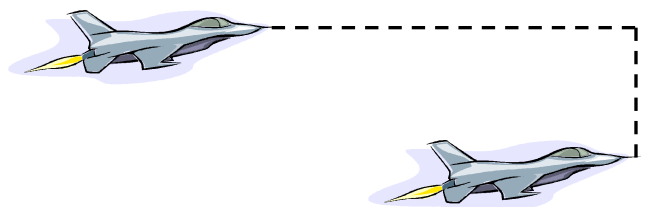
(a) Point K (3, 4) (b) Point L (-3, 4) (c) Point M (-3, -4)

(d) Point N (3, -4) (e) Point P (x, y)

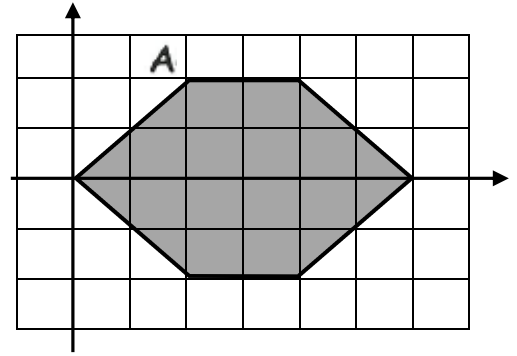
3. Write down the images of points K, L, M, N and P in question 2 after rotation by a quarter turn **clockwise**.

Exercise 3

1. Describe the translation made by the fighter plane accurate to the nearest millimetre:-



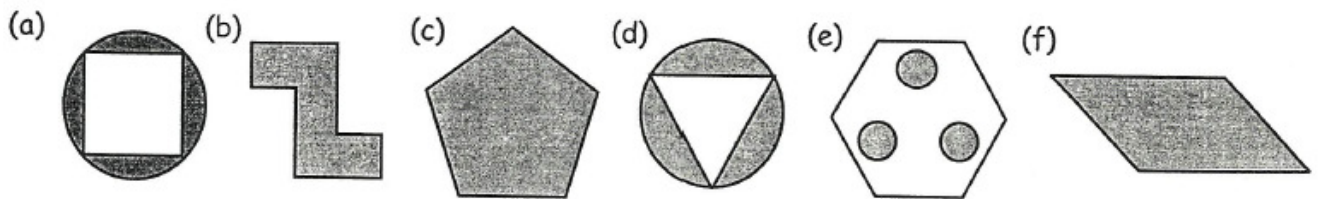
2. (a) Copy the axes and hexagon on to square paper.
 (b) On the same diagram, draw the image of the hexagon after a translation of:-
 (i) 4 right and 2 down
 (ii) 4 right and 2 up
 (iii) 4 down
 (iv) 4 up
 (c) State the coordinates of the image of vertex A after each translation in (b).
 (d) Describe **two** more translations which, when the images are drawn, would complete a **ring** of hexagons around the original.



MNU 4-19a: Having investigated patterns in the environment, I can use appropriate mathematical vocabulary to discuss the rotational properties of shapes, pictures and patterns and can apply my understanding when completing or creating designs.

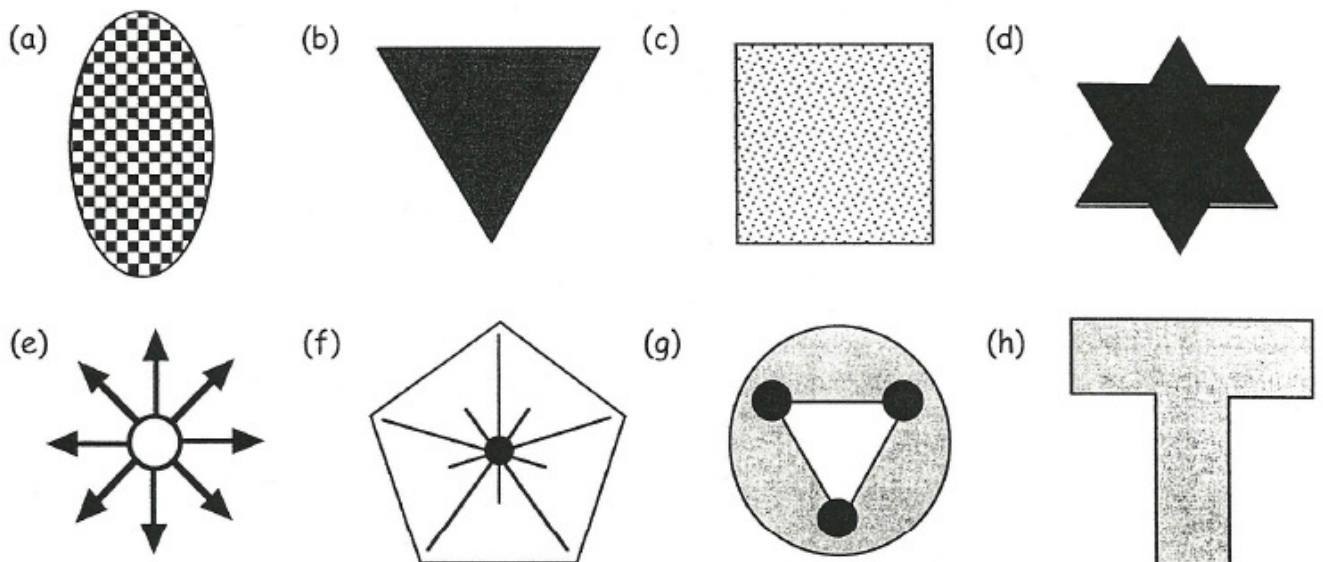
Exercise 1

1. Which of the following shapes have half-turn symmetry?



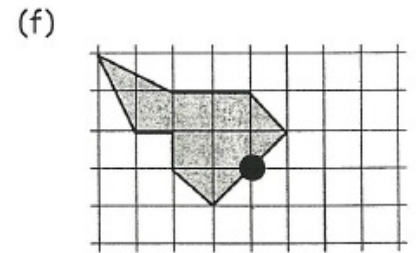
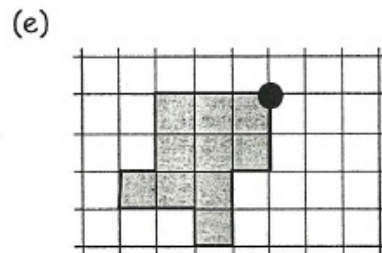
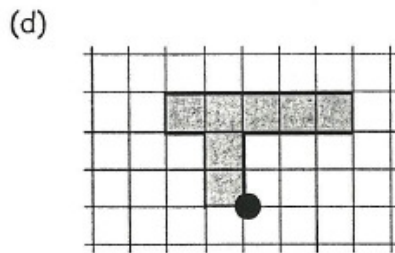
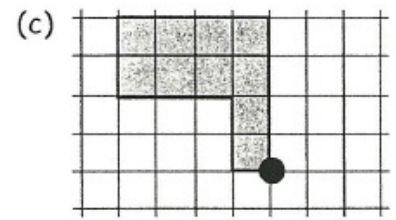
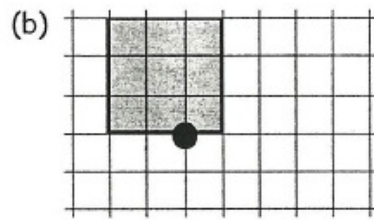
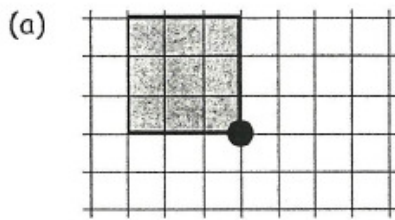
2. Seven capital letters of the alphabet have $\frac{1}{2}$ -turn symmetry. Which letters?

3. State what kind of turn symmetry each of the following shapes have. ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$), and state the "order" of rotational symmetry in each case.



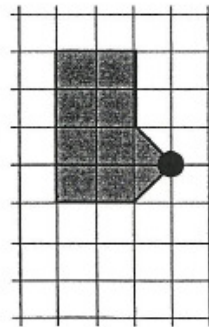
Exercise 2

1. Copy each of these shapes and rotate each one by 180° , ($\frac{1}{2}$ a turn), around the dot.



2. (Tricky!) Copy this shape.

Try to rotate the shape by 90° (a $\frac{1}{4}$ turn) clockwise about the dot.



MNU 4-20a: I can evaluate and interpret raw and graphical data using a variety of methods, comment on relationships I observe within the data and communicate my findings to others.

Exercise 1

1. The stem and leaf diagram shows the ages of spectators watching a football match.

- Write a key for the diagram.
- Write out all the ages shown in the diagram.
- How old was the youngest spectator?
- What was the modal age?
- Find the median.



Spectators ages

1	2	2	6	9		
2	0	4	5	6		
3	0	1	1	1	2	4
4	2					
5	0	3				

2. For each set of data shown :-

- Construct an ordered stem and leaf diagram.
- Find the mode and median.

(a) Ages of mature students at a University.

23	42	27	37	25	60	29	35	26	45	35	26
50	39	27	26	42	47	26	59	42	23	29	29
20	51	43	44	28	46	42	27	52	30	30	42

(b) Distances (in metres) jumped from a standing position.

1.62	1.23	1.41	1.15	0.97	1.31	1.23	1.26	1.5
1.33	1.29	1.12	1.23	1.19	1.36	1.53	1.08	1.23
0.9	1.2	1.51	1.03	1.66	1.53	1.44	1.23	1.39

Exercise 2

1. A class was asked to complete a survey. For each set of data below:-

- (i) Draw a dotplot
- (ii) Comment on the distribution

(a) Weight (in kg):-

34, 67, 38, 61, 66, 40, 40, 56, 51, 60, 67, 48, 62, 41, 59, 68, 37, 67, 39

(b) Height (in cm):-

166, 159, 179, 171, 177, 164, 156, 170, 175, 162, 166, 161, 179, 163

(c) Shoe size:-

9, 4, 10, 5, 7, 7, 5, 11, 5, 4, 8, 6, 5, 8

Exercise 3

1. The table shows the results of a questionnaire asking a group of 90 pupils their favourite bedtime drink.

(a) COPY and complete the table.

(b) Construct an accurate pie chart using a pair of compasses, a protractor and the table information.

Drink	Number	Fraction	Angle
Water	10	$\frac{10}{90}$	$\frac{10}{90} \times 360 = 40^\circ$
Chocolate	15	$\frac{15}{90}$	$\frac{15}{90} \times 360 = \dots^\circ$
Milk	30	$\frac{\dots}{90}$	$\frac{\dots}{90} \times 360 = \dots^\circ$
None	35	$\frac{\dots}{90}$	$\frac{\dots}{90} \times 360 = \dots^\circ$
TOTAL	90	1	360°



2. For each table below, construct an accurate pie chart, showing all your working.

(a)

Favourite pet	Number
Cat	20
Dog	10
Mouse	12
Rabbit	18
TOTAL

(b)

People's weight (kg)	Number
30 - 50	80
51 - 70	120
71 - 90	480
91 - 110	40
TOTAL

MNU 4-20b: In order to compare numerical information in real-life contexts, I can find the mean, median, mode and range of sets of numbers, decide which type of average is most appropriate to use and discuss how using an alternative type of average could be misleading.

Exercise 1

1. Calculate the mean for each set of data :-

(a) 3, 8, 4, 2, 10, 7, 8

(b) 50, 60, 52, 58, 54, 56

(c) 1.3, 2.6, 3.2, 4.1, 5, 4.8, 4, 1.9, 0.1, 2

(d) the first ten prime numbers.

2. Find the median for each set of data :-

(a) 1, 3, 5, 6, 8, 11, 14

(b) 16, 22, 23, 25, 31, 40, 61, 63

(c) 4, 1, 14, 12, 6, 7, 11, 13, 9

(d) 5, 8, 21, 12, 5, 16, 33, 12, 15, 9.

3. Find the mode for each set of data :-

(a) 1, 1, 2, 3, 5, 8, 13, 21, 34, 55

(b) 3, 2, 1, 8, 4, 5, 9, 2, 7, 6, 0,

(c) 1.7, 2.3, 1.6, 3, 2.3, 3.7, 2.9,

(d) A, C, F, G, H, Y, T, E, D, D, G, H, G.

4. Find the mean, median, mode and range of each set of data :-

(a) 10, 14, 15, 15, 16, 19, 22, 23, 27, 29, 30

(b) 46, 31, 66, 73, 83, 43, 16, 66

(c) All the prime numbers between 30 and 50.

5. The mean cost for 12 people to hire a bus was to be £15.

Unfortunately, some people did not turn up for the bus trip.

Each of those who went on the trip ended up paying £22.50.

How many must have turned up?



Exercise 2

1. For each data set below: (i) find the mean, median and mode
(ii) state which average best describes the data

(a) 12, 10, 69, 10, 100, 44, 45, 10, 32

(b) 273, 222, 296, 124, 131, 118, 240, 141, 120, 135

(c) 12, 8, 15, 8, 11, 10, 5, 13, 17

2. A factory owner claims that his business pays wages which are higher than the national average of £22000 per year.

A spokesperson for the factory's workers says that the owner pays **less** than the national average.

The factory employs nine people who earn the following per year:-

£16000, £16000, £18500, £19000, £21000, £21000, £22500, £26000, £29000

The factory owner pays himself £75000 per year.

- (a) Show that, depending on the type of average used, the factory owner and the workers' spokesperson are **both** correct.

- (b) Which person is being more honest?

MNU 4-21a: I can select appropriately from a wide range of tables, charts, diagrams and graphs when displaying discrete, continuous or grouped data, clearly communicating the significant features of the data.

Exercise 1

1. The data below shows the number of cars parked on a main street each day at lunchtime.

16 11 32 40 65 32 33 18 12 6 23

57 16 54 42 67 32 78 47 49 52 70

16 38 7 13 35 79 71 52 24 15 10

Class Intervals	Tally	Frequency
0 - 9		
10 - 19		
20 - 29		
30 - 39		
40 -		



- (a) **COPY** and complete the frequency table.
(b) On how many days was data collected?
(c) On how many days were there more than 30 cars parked at lunchtime?

2. For each set of data below, choose a suitable class interval and construct a frequency table.

(a)

13	4	41	69	51	58	57	33
11	40	46	61	22	22	52	63
14	53	46	54	42	56	60	54
50	29	43	13	46	17	25	21
25	36	39	20	7	11	14	6

(b)

20	18	5	18	13	9	11	21
7	17	8	22	13	23	4	19
6	15	13	26	10	19	17	22
14	26	10	8	18	19	24	3
11	11	15	23	8	26	17	5

Exercise 2

1. A footballer practised taking 4 penalties every day. The table shows the results over several weeks.

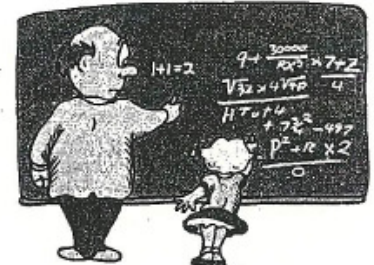
- COPY and complete the table.
- How many days did he record taking penalties?
- How many penalties were scored in total?
- Calculate the mean number of penalties scored.

No. scored (x)	Freq (f)	f × x
0	2	0 × 2 = 0
1	2	1 × 2 = ...
2	11	2 × .. = ...
3	16	.. × .. = ...
4	9	.. × .. = ...
...

2. Shown are the test scores for classes 2X1 and 2Y1.

2X1 scores (x)	Freq (f)
12	1
14	6
16	8
18	9
20	6

2Y1 scores (x)	Freq (f)
12	5
14	5
16	11
18	8
20	1



Find the mean score for each class.

Exercise 3

1. A gardener recorded the number of new dandelions that appeared in his lawn each week over a 7 week period.

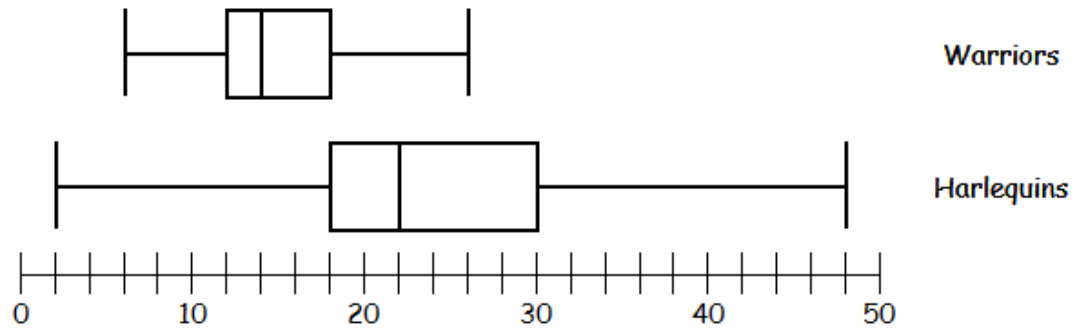
He began to use a weed killer and studied the results.

- Copy and complete the table.
- Which week did the gardener start using the weedkiller?
- Find the median.



Week	Frequency (new weeds)	Cumulative freq. (total so far)
1	3	3
2	12	15
3	36	...
4	68	...
5	40	...
6	12	...
7	1	...

5. The box plots show the number of points scored by two rugby teams during a season.

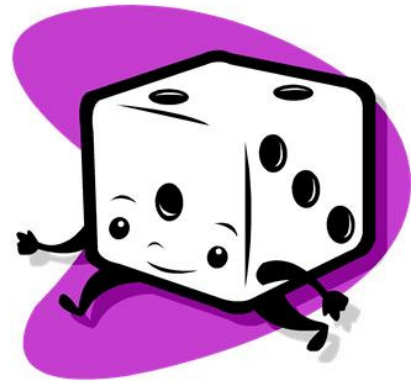


- (a) Make a five figure summary for each team
- (b) Which team finished higher in the league table at the end of the season? Give **two** reasons for your answer.

MNU 4-22a: By applying my understanding of probability, I can determine how many times I expect an event to occur, and use this information to make predictions, risk assessment, informed choices and decisions.

Exercise 1

1. A normal six-sided die is rolled 3000 times.
How many times would you **expect** the result to be:-
- (a) a six
- (b) an odd number
- (c) greater than 4?
2. A survey asked 100 out of the 45000 voters in an election which party they would vote for.
The results are shown in the table.



Party	Votes
Labour	24
SNP	30
Lib Dem	4
Conservative	7
Green	10
Don't Know	25

- (a) **How many** voters are likely to be undecided?
- (b) How many more votes is the SNP candidate likely to get compared to her nearest rival?
- (c) Candidates have to pay a deposit of £500 to stand in an election, and lose this money if they get less than 5% of the vote.
How many of the "Don't Know"s will have to vote Lib Dem if they want to avoid losing their deposit?
- (d) The Labour party candidate thinks that if he gets 10000 of the "Don't Know"s to vote for him, he will win. Is he correct? Explain your answer.