

# St Ninian's S3 BT1 Revision N5



# Scientific Notation

## Exercise 1



1. Copy and complete the following :-

$$\begin{aligned}39\,000 &= 3900 \times 10 = 390 \times \dots \times \dots = 39 \times \dots \times \dots \times \dots \\ &= 3.9 \times \dots \dots \dots \quad (\text{Stop here, since } 3.9 \text{ lies between } 1 \text{ and } 10). \\ &= 3.9 \times 10^4\end{aligned}$$

2. Using the same method as Qu 1., write the following numbers in scientific notation :-

- |            |            |              |
|------------|------------|--------------|
| (a) 4800   | (b) 6780   | (c) 31000    |
| (d) 35200  | (e) 54350  | (f) 970000   |
| (g) 487000 | (h) 109100 | (i) 4400000. |

## Exercise 2



1. Using the "quick" method, write the following numbers in scientific notation :-

- |           |             |               |
|-----------|-------------|---------------|
| (a) 49000 | (b) 547000  | (c) 234000    |
| (d) 660   | (e) 1482    | (f) 9000      |
| (g) 70000 | (h) 1680000 | (i) 47300000. |

2. You have learned that :-  $3 \text{ million} = 3\,000\,000 = 3.0 \times 10^6$   
 $1.27 \text{ million} = 1\,270\,000 = 1.27 \times 10^6$



Write out each of the following in full, then write each in scientific notation :-

- |   |                             |                             |
|---|-----------------------------|-----------------------------|
| (a) 7 million = 7000000 = $7.0 \times 10^6$ |                             |                             |
| (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 |
| (k) 5.714 million                           | (l) $5\frac{1}{4}$ million  | (m) $6\frac{3}{4}$ million. |

# Scientific Notation

3. This table gives the areas of various stretches of water throughout the world. Write each of the areas in scientific notation.

Sea / Ocean	Area (km <sup>2</sup> )
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 ?

4. 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 3



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

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

2.

Player	Valuation
Figo	$£1.525 \times 10^7$
Woodgate	$£5.75 \times 10^6$
Novo	$£8.755 \times 10^5$
Coyle	$£3.285 \times 10^4$
McCracken	$£1.004 \times 10^2$

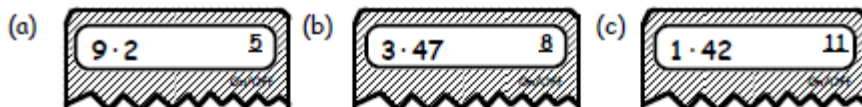
This table shows the valuation of certain football players as of June 2004.

Write out each of the valuations in full.



# Scientific Notation

3. What large numbers are shown on the calculators below ?



4. Write the amount, £1 billion :-

- (a) as a very large number in figures.  
(b) in scientific notation.



## Exercise 4



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

3. A box of toffees weighs  $5.81 \times 10^{-2}$  kilograms.

Is this more or less than 58 grams ?



4. What small numbers are shown on the calculators below ?



5. Write out in full :-

- (a)  $4.2 \times 10^{-2}$       (b)  $7.8 \times 10^6$       (c)  $8.01 \times 10^{-4}$       (d)  $9.021 \times 10^3$ .

6. Write in scientific notation :-

- (a) 0.003      (b) 5470      (c) 0.00039      (d) 21500000.

# Scientific Notation

## Revision Exercise



1. Write the following numbers in scientific notation :-

- (a) 400                      (b) 8 000                      (c) 16 500  
(d) 5 million                (e) 1.89 million              (f)  $3\frac{1}{4}$  million  
(g) 70 000                    (h) 1 680 000                (i) 47 300 000.

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

- (a)  $2.4 \times 10^4$             (b)  $6.2 \times 10^2$             (c)  $7.361 \times 10^5$             (d)  $9 \times 10^7$ .

3. Write the amount TWO BILLION POUNDS :-

- (a) as a very large number in figures.  
(b) in scientific notation.

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

- (a) 0.05                      (b) 0.000 092                (c) 0.0274                      (d) 0.000 002  
(e) 0.000 175                (f) 0.368                      (g) 0.001 81                    (h) 0.000 09.

5. Write the following numbers in full :-

- (a)  $3.9 \times 10^{-2}$             (b)  $2.1 \times 10^{-4}$             (c)  $4.97 \times 10^{-3}$             (d)  $7.02 \times 10^{-5}$   
(e)  $3.2748 \times 10^{-1}$         (f)  $5 \times 10^{-3}$                 (g)  $9 \times 10^{-5}$                 (h)  $3.007 \times 10^{-6}$ .

# Answers

## Exercise 1

1.  $3.9 \times 10^4$   
2. a  $4.8 \times 10^3$       b  $6.78 \times 10^3$   
c  $3.1 \times 10^4$       d  $3.52 \times 10^4$   
e  $5.435 \times 10^4$       f  $9.7 \times 10^5$   
g  $4.87 \times 10^5$       h  $1.091 \times 10^5$   
i  $4.4 \times 10^6$

## Exercise 2

1. a  $4.9 \times 10^4$       b  $5.47 \times 10^5$   
c  $2.34 \times 10^5$       d  $6.6 \times 10^2$   
e  $1.482 \times 10^3$       f  $9 \times 10^3$   
g  $7 \times 10^4$       h  $1.68 \times 10^6$   
i  $4.73 \times 10^7$

2. a 7000000       $7 \times 10^6$   
b 2500000       $2.5 \times 10^6$   
c 9190000       $9.19 \times 10^6$   
d 4500000       $4.5 \times 10^6$   
e 17000000       $1.7 \times 10^7$   
f 27000000       $2.7 \times 10^7$   
g 2800000       $2.8 \times 10^6$   
h 1970000       $1.97 \times 10^6$   
i 12500000       $1.2 \times 10^7$   
j 15500000       $1.55 \times 10^7$   
k 5714000       $5.714 \times 10^6$   
l 5250000       $5.25 \times 10^6$   
m 6750000       $6.75 \times 10^6$

3. Pacific  $1.6538 \times 10^8$   
Atlantic  $8.221 \times 10^7$   
Indian  $7.36 \times 10^7$       Med  $2.51 \times 10^6$   
Clyde  $2.13 \times 10^3$       Ness  $5.6 \times 10^6$   
Eng Channel  $1.036 \times 10^5$

4.  $£2.5 \times 10^5$

5.  $3.1629 \times 10^7$

## Exercise 3

1. a 38000      b 750  
c 324000      d 6470  
e 14780      f 30  
g 9000000      h 2900000  
i 60140      j 70000000  
k 53700000      l 888800000

2. F  $£15250000$       W  $£5750000$   
N  $£875500$       C  $£32850$   
McC  $£100.40$

3. a 920000      b 347000000  
c 142000000000

4. a  $£1000000000000$   
b  $£1 \times 10^{12}$

## Exercise 4

1. a  $3 \times 10^{-3}$       a  $7.4 \times 10^{-5}$   
c  $2.86 \times 10^{-2}$       d  $6 \times 10^{-6}$   
e  $4.82 \times 10^{-4}$       f  $2.87 \times 10^{-1}$   
g  $3.93 \times 10^{-3}$       h  $7 \times 10^{-5}$

2. a 0.051      b 0.00036  
c 0.00274      d 0.0000506  
e 0.32741      f 0.004  
g 0.00007      h 0.000008009

3. More

4. a 0.037      b 0.000709  
c 0.01001

5. a 0.042      b 7800000  
c 0.000801      d 9021

6. a  $3 \times 10^{-3}$       b  $5.47 \times 10^3$   
c  $3.9 \times 10^{-4}$       d  $2.15 \times 10^7$

1. a  $4 \times 10^2$       a  $8 \times 10^3$   
c  $1.65 \times 10^4$       d  $5 \times 10^6$   
e  $1.89 \times 10^6$       f  $3.25 \times 10^6$   
g  $7 \times 10^5$       h  $1.68 \times 10^6$   
i  $4.73 \times 10^7$

2. a 24000      b 620  
c 736100      d 90000000

3. a 2000000000000  
b  $2 \times 10^{12}$

4. a  $5 \times 10^{-2}$       b  $9.2 \times 10^{-5}$   
c  $2.74 \times 10^{-2}$       d  $2 \times 10^{-6}$   
e  $1.75 \times 10^{-4}$       f  $3.68 \times 10^{-1}$   
g  $1.81 \times 10^{-3}$       g  $9 \times 10^{-5}$

5. a 0.039      b 0.00021  
c 0.00497      d 0.0000702  
e 0.32748      f 0.005  
g 0.00009      h 0.000003007

# Significant Figures

Q1. Round to 1 significant figure :

a.	23	b.	5.5	c.	78	d.	31
e.	125	f.	309	g.	291	h.	843.6
i.	7646	j.	1928	k.	8003	l.	5192.7
m.	10.9	n.	556.2	o.	3.98	p.	12345
q.	1.01	r.	93	s.	0.86	t.	606

Q2. Round to 2 significant figures :

a.	8.72	b.	92.8	c.	0.186	d.	679
e.	2.112	f.	6.463	g.	31.4	h.	25.8
i.	24.27	j.	18.76	k.	6397	l.	4.99
m.	0.0526	n.	0.00613	o.	0.08702	p.	13814
q.	2.456	r.	45192	s.	29.302	t.	0.756

Q3. Round to 3 significant figures :

a.	49.32	b.	2.345	c.	0.5928	d.	4765
e.	6.081	f.	24180	g.	0.06281	h.	29.514
i.	0.0094682	j.	56248	k.	0.09803	l.	24.47
m.	28.32	n.	2463	o.	3174	p.	30.03
q.	2.6759	r.	3085	s.	2.007	t.	0.0003175

Q4. Round 248382 correct to

a.	4 sig. figs	b.	3 sig. figs	c.	2 sig. figs	d.	1 sig. fig
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Q5. Round 0.0286016 correct to

a.	4 sig. figs	b.	3 sig. figs	c.	2 sig. figs	d.	1 sig. fig
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Q6. Calculate and give your answer correct to 2 significant figures

a.	$5.16 \times 22.7$	b.	$27.3 \div 6.84$	c.	$3.14 \times 9^2$
d.	$25.8 \times 1.76 \div 1.1$	e.	$13.2 \times 3.72$	f.	$25.8 \div 52.9$
g.	$1.14^2 \times 2.92$	h.	$5.2 \times 0.49 \div 30.3$	i.	$234 \div (0.028 \times 33)$
j.	$(0.08 \times 25^2) \div 3$	k.	$(1.05)^2 \times 455$	l.	$3.14 \times 12^2 \div 7$

Q7. Calculate and give your answer correct to 3 significant figures

a.	$2.29 \times 58.1$	b.	$325.9 \div 68.2$	c.	$3.14 \times 18$
d.	$0.08 \times 12349$	e.	$3.7^2 \div 1.56$	f.	$1001 \div 3$
g.	$12.7 \times (1.24 + 0.321)$	h.	$0.13 \times 99 \div 0.49$	i.	$0.77 \div (4.2 \times 1.9)$
j.	$(26.9 - 1.85) \times 13$	k.	$60 \div 29$	l.	$11 \times 2.6 \div 30$

# Answers

## Significant Figures

- Q1. a. 20      b. 6      c. 80      d. 30      e. 100      f. 300      g. 300  
h. 800      i. 8000      j. 2000      k. 8000      l. 5000      m. 10      n. 600  
o. 4      p. 10000      q. 1      r. 100      s. 0.9      t. 600
- Q2. a. 8.7      b. 93      c. 0.19      d. 680      e. 2.1      f. 6.5      g. 31  
h. 26      i. 24      j. 19      k. 6400      l. 5.0      m. 0.053      n. 0.0061  
o. 0.087      p. 14000      q. 2.5      r. 45000      s. 29      t. 0.76
- Q3. a. 49.3      b. 2.35      c. 0.593      d. 4770      e. 6.08      f. 24200      g. 0.0628  
h. 29.5      i. 0.00947      j. 56200      k. 0.0980      l. 24.5      m. 28.3      n. 2460  
o. 3170      p. 30.0      q. 2.68      r. 3090      s. 2.10      t. 0.000318
- Q4. a. 248400      b. 248000      c. 250000      d. 200000
- Q5. a. 0.02860      b. 0.0286      c. 0.029      d. 0.03
- Q6. a. 120      b. 4.0      c. 250      d. 41      e. 49      f. 0.49  
g. 3.8      h. 0.084      i. 250      j. 17      k. 500      l. 65
- Q7. a. 133      b. 4.78      c. 56.5      d. 988      e. 8.78      f. 334  
g. 19.8      h. 26.3      i. 0.0965      j. 326      k. 2.07      l. 0.953



# Percentages

- Q1. For each of the investments below, calculate
- the amount due at the end of the term
  - the total interest



	Bank/ Building Society	Amount Invested (£)	Rate of interest (per year)	Number of Years
a	Hamilton Bank	2000	8 %	2
b	Allied Friendly	5000	6 %	3
c	Northern Hill	4800	7 %	2
d	Highland Bank	3500	7.5 %	3
e	Church National	1600	5.5 %	4
f	Southern Rock	1750	11 %	3
g	London Savings Bank	20 000	6%	3
h	Bath & Eastern	18 000	8.5%	2
i	Royal Bank of Britain	50 000	9%	3
j	Bingford & Bradley	400	4.8%	2

- Q2. At the beginning of the year, Mr. Bradford borrows £5000 from the bank. The rate of compound interest is 8%. He agrees to pay back £108 per month. Calculate how much he still owes at the end of the second year.
- Q3. The Smiths buy a house for £60,000. If it appreciates in value at the rate of 9% per year, how much will it be worth in 5 years time ?
- Q4. Amanda wins some money and decides to spend £200 on some jewelry. If it appreciates at the rate of 2% per year, how much will the jewelry be worth 3 years from now ?
- Q5. In 1990 the world population was estimated to be 5300 million, and was increasing at the rate of 1.7% per annum. What will the population be in the year 2000 ? (answer to 2 significant figures)
- Q6. Peter buys a car for £3000. If it depreciates at the rate of 20% per annum, how much will he be able to sell it for in 3 years time ?
- Q7. Brian buys a new car costing £12600. It depreciates in value by 30% in the first year and by 20% each year after that. How much will he be able to trade it in for in 3 years time ?
- Q8. Each year a factory's machinery depreciates by 25% of its value at the beginning of the year. The initial value of the machinery was £360 000.
- What was the value of the machinery after 1 year ?
  - The machinery was to be scrapped at the end of the year when its value fell below half its original value. After how many years should the machinery be scrapped ?

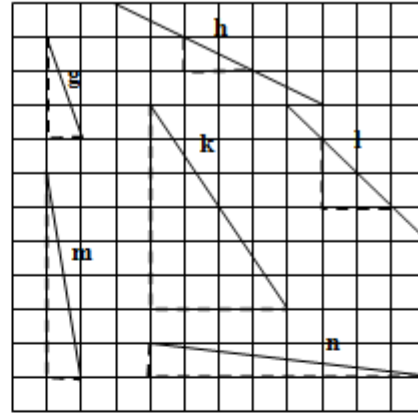
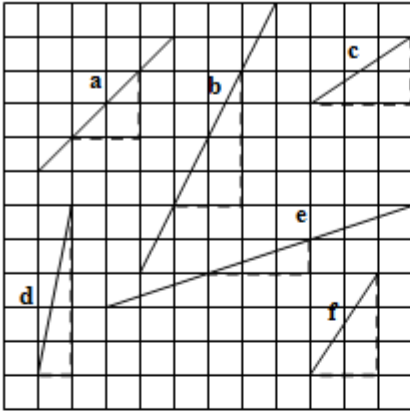
# Answers

## Percentages - appreciation & depreciation

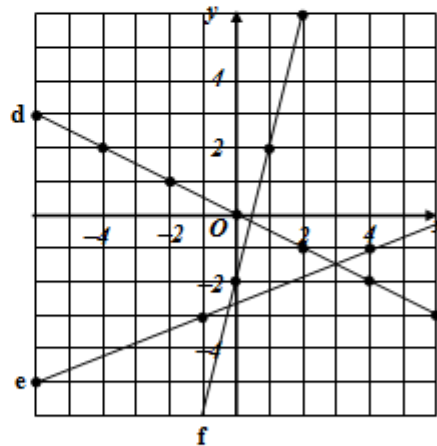
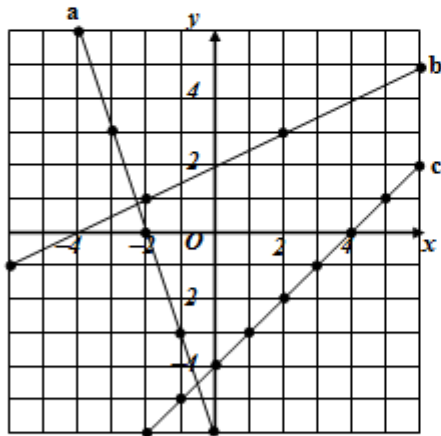
Q1.	a.	£2332.80, £332.80	b.	£5955.08, £955.08	c.	£5495.42, £495.42	
	d.	£4348.04, £848.04	e.	£1982.12, £382.12	f.	2393.35, 643.35	
	g.	£23820.32, 3820.32	h.	£21190.05, 3190.05	i.	£64751.45, £14751.45	
	j.	£439.32, £39.32					
Q2.	£3136.32	Q3.	£92317	Q4.	£212.24	Q5.	6300 million
Q6.	£1536	Q7.	£5644.80	Q8.	a. 270 000	b.	after 3 years

# Straight Line

**Q1.** Find the **gradients** of the lines shown in each of the diagrams below



**Q2.** Find the **gradients** of the lines below



**Q3.** Plot the following pairs of points and calculate the gradient of the line joining them.

- |                         |                        |                        |
|-------------------------|------------------------|------------------------|
| a. (2, 1) and (6, 3)    | b. (1, 5) and (3, 1)   | c. (2, 0) and (4, 6)   |
| d. (-2, -3) and (2, 3)  | e. (-1, 2) and (5, -1) | f. (-4, 2) and (4, -4) |
| g. (-6, -2) and (-5, 3) | h. (4, -3) and (6, 5)  | i. (-2, 3) and (0, -2) |

# Straight Line

**Q1.** For each line, write down the gradient and the coordinates of the point where it crosses the  $y$ -axis.

a.  $y = 3x + 1$

b.  $y = \frac{1}{2}x - 5$

c.  $y = -2x + 3$

d.  $y = -\frac{1}{4}x - 2$

e.  $y = 8x - \frac{1}{2}$

f.  $y = -x + 4$

**Q2.** Match these equations with the graphs shown below.

1.  $y = x + 1$

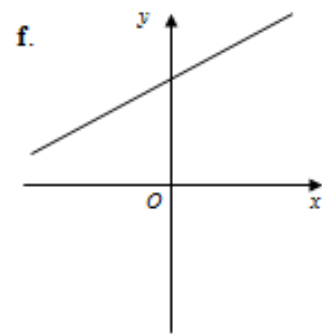
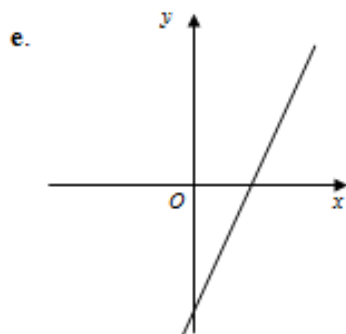
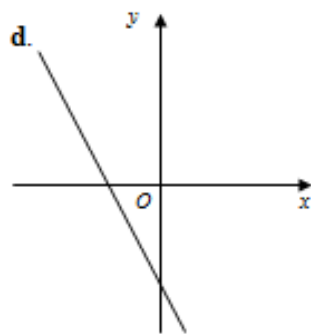
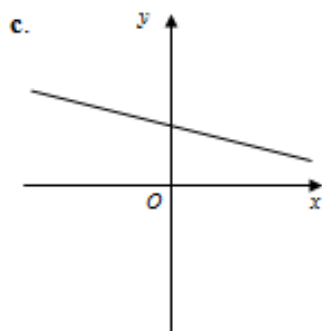
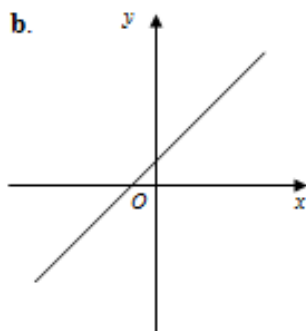
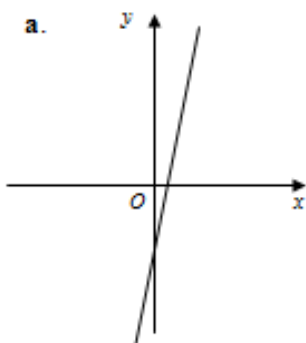
2.  $y = -2x - 3$

3.  $y = \frac{1}{2}x + 4$

4.  $y = -\frac{1}{4}x + 2$

5.  $y = 6x - 2$

6.  $y = 3x - 5$



**Q3.** Sketch the graphs of lines with equations

a.  $y = -x + 3$

b.  $y = 2x + 3$

c.  $y = 4x + 1$

d.  $y = \frac{1}{2}x - 2$

e.  $y = -2x - 1$

f.  $y = -3x + 2$

# Answers

## Linear Relationships ~ Gradients

- Q1. a. 1      b. 2      c.  $\frac{2}{3}$       d. 5      e.  $\frac{1}{3}$       f.  $\frac{3}{2}$   
g. -3      h.  $-\frac{1}{2}$       k.  $-\frac{3}{2}$       l. -1      m. -6      n.  $-\frac{1}{3}$
- Q2. a. -3      b.  $\frac{1}{2}$       c. 1      d.  $-\frac{1}{2}$       e.  $\frac{2}{5}$       f. 4
- Q3. a.  $\frac{1}{2}$       b. -2      c. 3      d.  $\frac{3}{2}$       e.  $-\frac{1}{2}$       f. -3  
g. 5      h. 4      i.  $-\frac{5}{2}$

## Linear Relationships ~ Straight Lines

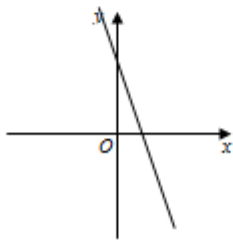
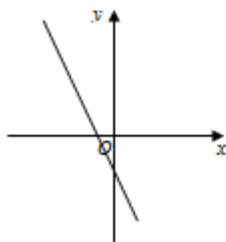
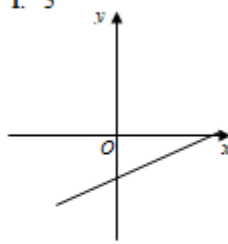
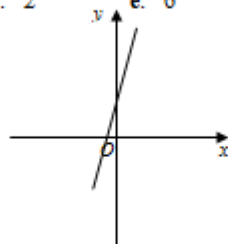
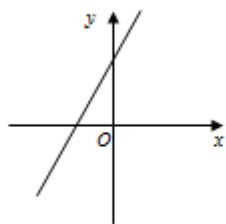
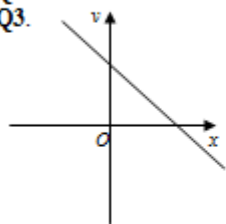
- Q1. a. 3, (0,1)      b.  $\frac{1}{2}$ , (0,-5)      c. -2, (0,3)

- d.  $-\frac{1}{4}$ , (0,-2)      e. 8, (0,- $\frac{1}{2}$ )      f. -1, (0,4)

- Q2. a. 5      b. 1      c. 4      d. 2      e. 6

- f. 3

Q3.



# Straight Line- Find Equation

7. Write down the equation of the lines described below:

- (a) with gradient 4, passing through the point (0, 5)
- (b) with gradient  $-2$ , passing through the point (0, 1)
- (c) with gradient  $\frac{2}{3}$ , passing through the point (0,  $-3$ )
- (d) with gradient 4, passing through the point (3, 1)
- (e) with gradient  $-5$ , passing through the point ( $-3$ , 1)
- (f) with gradient  $\frac{1}{2}$ , passing through the point ( $-5$ ,  $-2$ )
- (g) with gradient  $\frac{1}{3}$ , passing through the point (2, 7)
- (h) with gradient  $-\frac{2}{3}$ , passing through the point ( $-2$ ,  $-2$ )
- (i) with gradient  $-\frac{2}{3}$ , passing through the point ( $-5$ , 3)

8. Find the equation of the line joining each pair of points below.

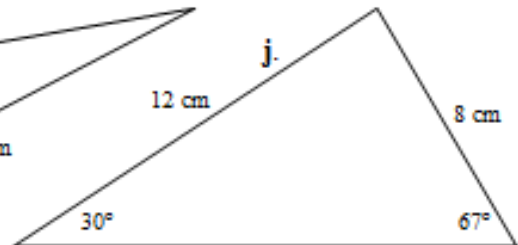
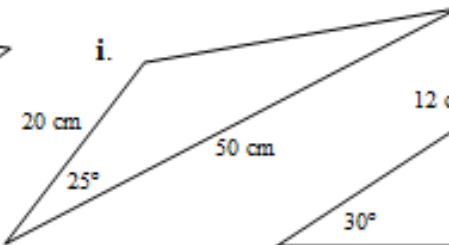
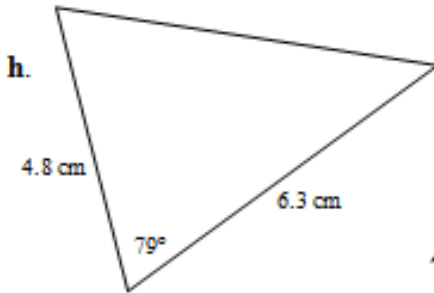
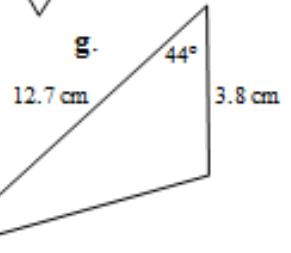
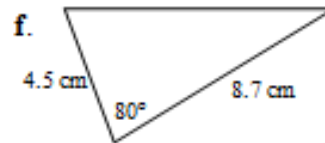
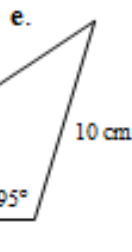
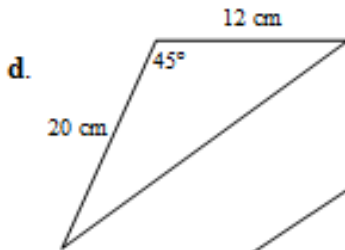
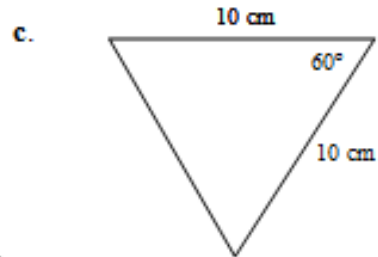
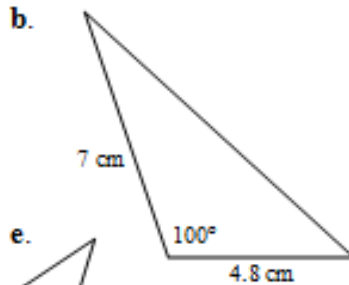
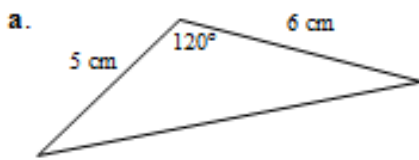
- (a) A(4, 3) and B(8, 11)
- (b) C(1, 9) and D(3, 1)
- (c) E( $-2$ , 6) and F(8, 8)
- (d) G(5,  $-9$ ) and H(8,  $-15$ )
- (e) I(0, 6) and J(5, 11)
- (f) K( $-1$ ,  $-3$ ) and L(7,  $-9$ )
- (g) M( $-4$ , 0) and N( $-1$ , 5)
- (h) P(2, 2) and Q( $-3$ , 4)
- (i) R(5,  $-1$ ) and S( $-2$ , 10)

# Answers

7. (a)  $y = 4x + 5$  (b)  $y = -2x + 1$  (c)  $y = \frac{3}{4}x - 3$   
(d)  $y = 4x - 11$  (e)  $y = -5x - 14$  (f)  $2y - x = 1$   
(g)  $3y - 4x = 13$  (h)  $3x + 4y = -14$  (i)  $2x + 3y = -9$
8. (a)  $y = 2x - 5$  (b)  $y + 4x = 13$  (c)  $5y = x + 32$   
(d)  $y = 2x - 1$  (e)  $y = x + 6$  (f)  $4x + 3y = -15$   
(g)  $3y - 5x = 20$  (h)  $2x + 5y = 14$  (i)  $7y + 11x = 48$

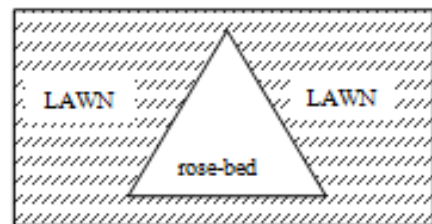
# Trigonometry

**Q1.** Find the area of the following triangles :

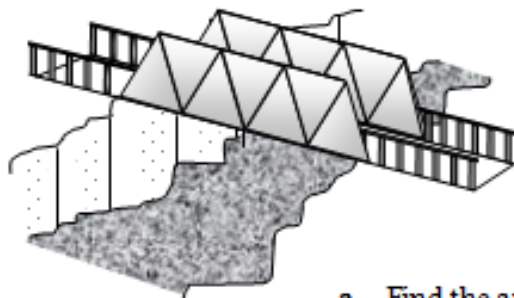


**Q2.** Mr. Fields is planting a rose-bed in his garden. It is to be in the shape of an equilateral triangle of side 2m.

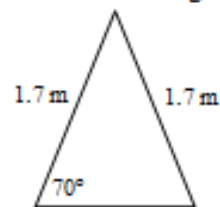
What area of lawn will he need to remove to plant his rose-bed?



**Q3.**



For safety reasons the sides of a footbridge are to be covered with triangular panels. Each panel is an isosceles triangle as shown.

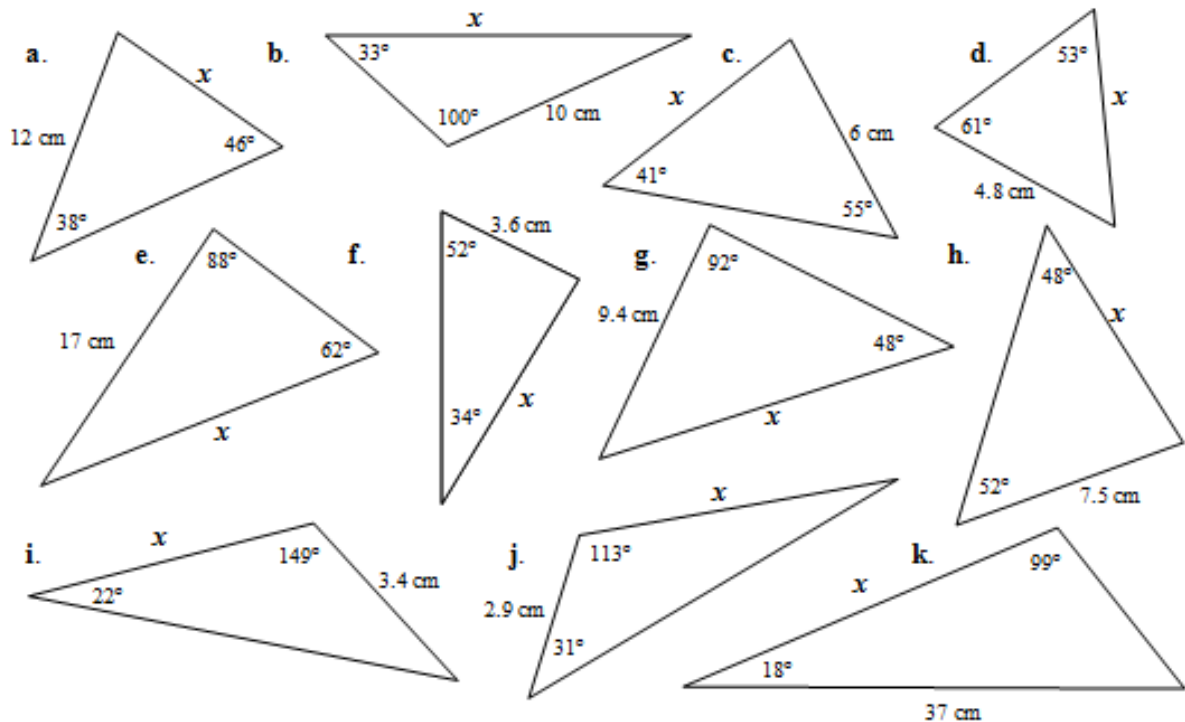


- Find the area of each panel.
- If there are 7 panels on each side of the bridge, find the total area of material required to cover the bridge.

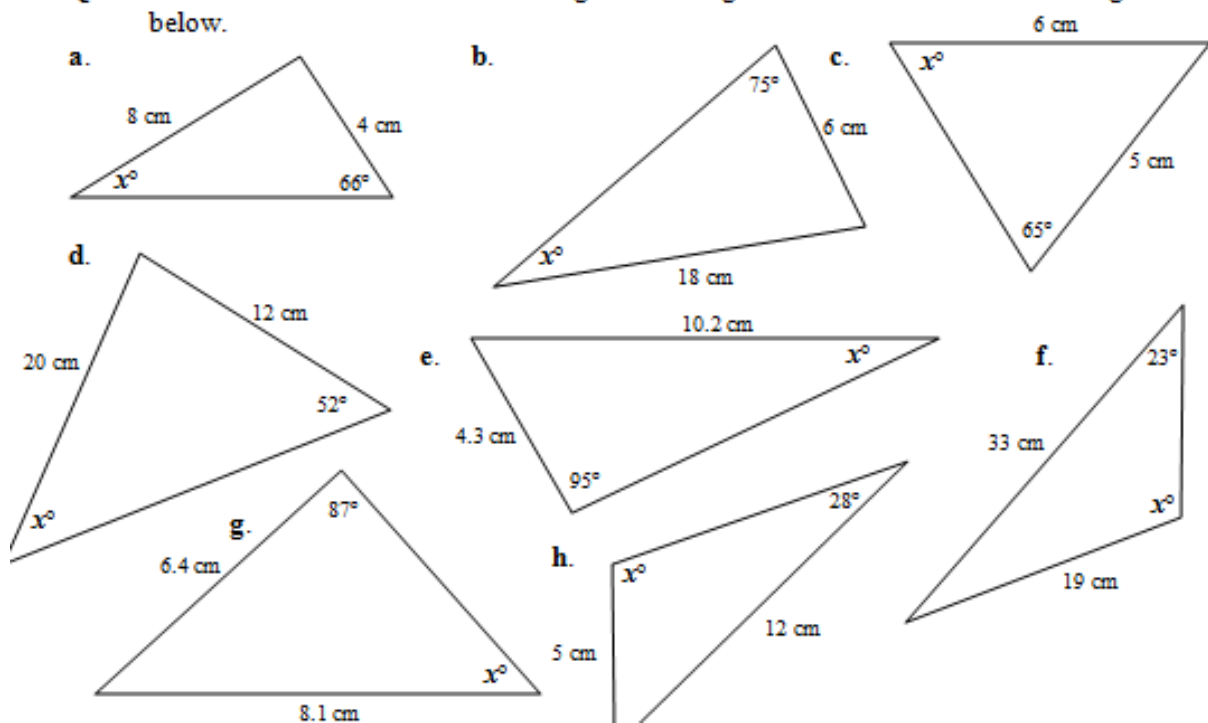


# Trigonometry

**Q1.** Use the sine rule to calculate the length of the side marked  $x$  in each of the triangles below.



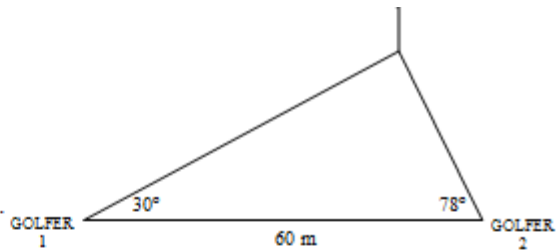
**Q2.** Use the sine rule to calculate the length of the angle marked  $x^\circ$  in each of the triangles below.



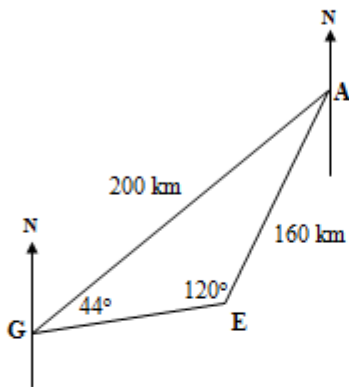
# Trigonometry

- Q3.** Two golfers are aiming for the green. The golfers are 60 m apart and the angles are as shown in the diagram.

What distance will each golfer have to hit the ball in order to reach the pin.



- Q4.**

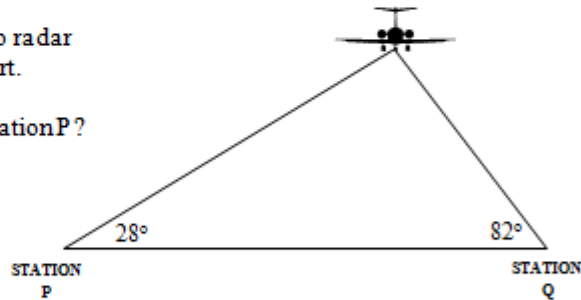


The diagram shows the path of an aircraft from Glasgow to Aberdeen to Edinburgh.

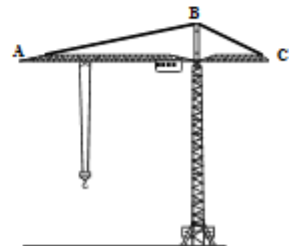
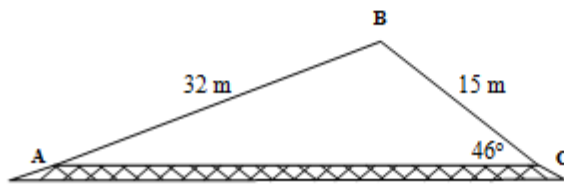
- Write down the size of  $\angle GAE$
- Calculate the distance GE.

- Q5.** An aircraft is picked up by two radar stations, P and Q, 120 km apart.

How far is the aircraft from station P?



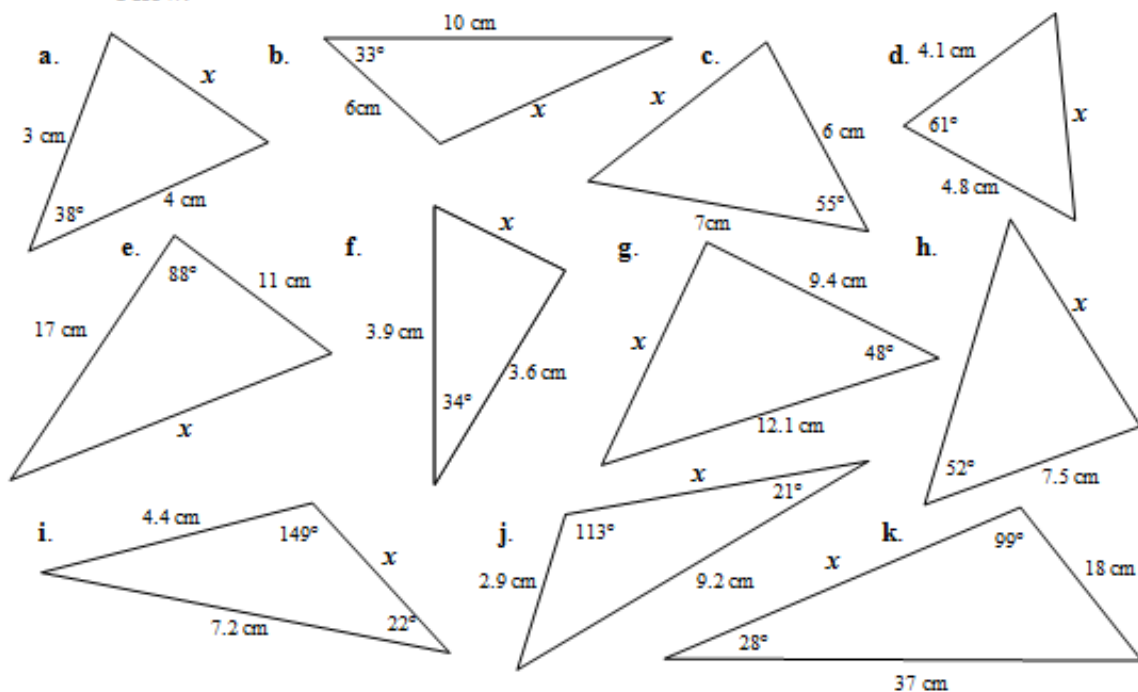
- Q6.** A large crane is being used in the construction of a block of flats. The crossbeam is supported by two metal stays.



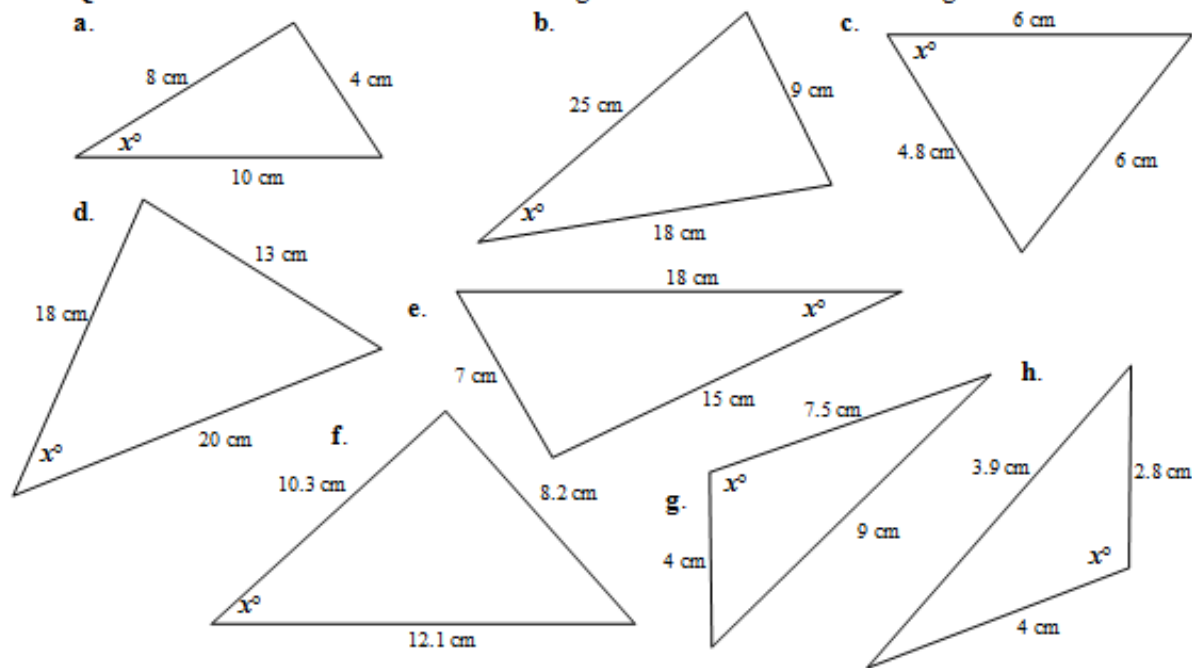
The length of AB is 32 m and the length of BC is 15 m.  $\angle BCA$  is  $46^\circ$ . Calculate the size of  $\angle BAC$  and the length of the crossbeam AC.

# Trigonometry

**Q1.** Use the cosine rule to calculate the length of the side marked  $x$  in each of the triangles below.



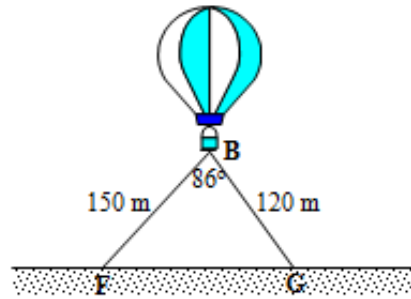
**Q2.** Use the cosine rule to calculate the angle marked  $x^\circ$  in each of the triangles below.



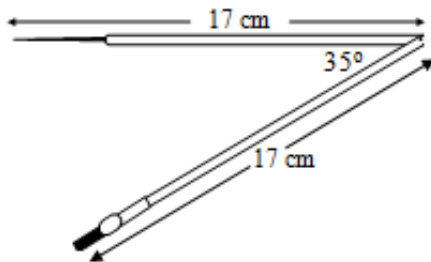
# Trigonometry

- Q3. A hot air balloon B is fixed to the ground at F and G by 2 ropes 120m and 150 m long.

If  $\angle FBG$  is  $86^\circ$ , how far apart are F and G.



- Q4.



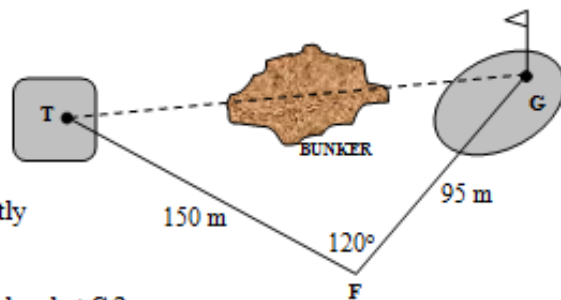
A set of compasses is shown where the angle between the arms is set at  $35^\circ$

Calculate the diameter of the circle which could be drawn with the arms in this position.

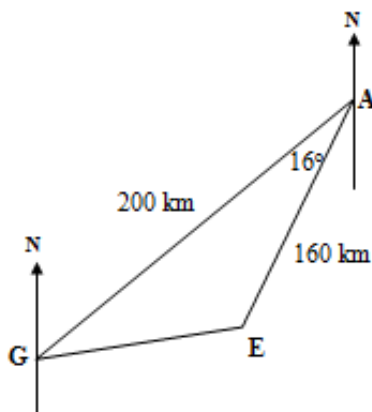
- Q5. During a golf match, Ian discovers that he has forgotten his sand wedge, so to avoid the bunker he plays a shot from T to F and then from F to G.

His opponent Fred decides to play directly from T to G.

How far will Fred need to hit his shot to land at G?



- Q6.



The diagram shows the path of an aircraft from Glasgow to Aberdeen, a distance of 200 km and then from Aberdeen to Edinburgh, a distance of 160 km.

Calculate the distance from Glasgow to Edinburgh.

# Answers

## Trigonometry ~ Area of a triangle

- Q1. a.  $13 \text{ cm}^2$     b.  $16.5 \text{ cm}^2$     c.  $43.3 \text{ cm}^2$     d.  $84.9 \text{ cm}^2$   
e.  $54.8 \text{ cm}^2$     f.  $19.3 \text{ cm}^2$     g.  $16.8 \text{ cm}^2$     h.  $14.8 \text{ cm}^2$   
i.  $211.3 \text{ cm}^2$     j.  $47.6 \text{ cm}^2$
- Q2.  $3.9 \text{ m}^2$
- Q3. a.  $0.93 \text{ m}^2$     b.  $13 \text{ m}^2$

## Trigonometry ~ Sine Rule

- Q1. a.  $10.3 \text{ cm}$     b.  $18.1 \text{ cm}$     c.  $7.5 \text{ cm}$     d.  $5.3 \text{ cm}$   
e.  $19.2 \text{ cm}$     f.  $5.1 \text{ cm}$     g.  $12.6 \text{ cm}$     h.  $8.0 \text{ cm}$   
i.  $4.7 \text{ cm}$     j.  $2.5 \text{ cm}$     k.  $33.4 \text{ cm}$
- Q2. a.  $27.2^\circ$     b.  $18.8^\circ$     c.  $49.0^\circ$     d.  $28.2^\circ$   
e.  $24.8^\circ$     f.  $42.7^\circ$     g.  $52.1^\circ$     h.  $57.7^\circ$
- Q3. golfer 1 ~  $61.7 \text{ m}$ , golfer 2 ~  $31.5 \text{ m}$     Q4. a.  $16^\circ$     b.  $63.7 \text{ km}$
- Q5.  $126 \text{ km}$     Q6.  $20^\circ$ ,  $40.6 \text{ m}$

## Trigonometry ~ Cosine Rule

- Q1. a.  $2.5 \text{ cm}$     b.  $5.9 \text{ cm}$     c.  $6.1 \text{ cm}$     d.  $4.6 \text{ cm}$   
e.  $19.9 \text{ cm}$     f.  $3.8 \text{ cm}$     g.  $9.1 \text{ cm}$     h.  $8.1 \text{ cm}$   
i.  $2.9 \text{ cm}$     j.  $7.5 \text{ cm}$     k.  $29.9 \text{ cm}$
- Q2. a.  $22.3^\circ$     b.  $15.3^\circ$     c.  $66.4^\circ$     d.  $39.6^\circ$   
e.  $22.2^\circ$     b.  $42.0^\circ$     c.  $98.4^\circ$     d.  $67.3^\circ$
- Q3.  $185 \text{ m}$     Q4.  $20.4 \text{ cm}$     Q5.  $214 \text{ m}$     Q6.  $64 \text{ km}$

# Standard Deviation

**Q1.** Calculate the mean and standard deviation for the following sets of data.

- a. 20 21 19 22 21 20 19 20 21 20
- b. 303 299 306 298 304 307 299 302 305 299 300
- c. 15.3 14.9 15.1 15.2 14.8 14.7 15.1 14.8 15.0 15.0
- d. 87 89 84 88 89 87 86 87 86 87
- e. 48 73 29 82 54 43 95 41 92 71
- f. 4.4 4.6 4.8 4.0 4.2 4.3 4.5 4.7 4.9 4.1
- g. 0.2 0.3 0.4 0.2 0.2 0.0 0.4 0.1 0.2 0.3
- h. 40 40 39 38 38 40 40 42 40 39

**Q7.** John James plays golf with his brother Joe each month. They keep a note of their score cards.

<b>John</b>	74	73	74	73	71	73	72	75	73	73	72	73
<b>Joe</b>	68	74	70	67	80	81	69	68	79	67	70	71

Calculate the mean and standard deviation and comment on John's and Joe's performance over the year.

**Q8.** The weekly takings in small store, to the nearest £, for a week in December and March are shown below

<b>December</b>	2131	2893	2429	3519	4096	4810
<b>March</b>	1727	2148	1825	2397	2901	3114

Calculate the mean and standard deviation and comment on any differences.

**Q9.** Two sixth year classes take part in a Sponsored Fast for Famine Relief. The number of hours each pupil lasted are shown below.

<b>6C1</b>	20	22	21	20	22	20	22	20	20	24	21	22	23	22	22	23
<b>6C2</b>	15	20	24	23	22	24	18	24	22	23	24	17	20	24	24	20

Calculate the mean and standard deviation for each class and comment on how well each class did.

# Answers

Q1.

	a.	b.	c.	d.	e.	f.	g.	h.
mean	20.3	302	14.99	87	62.8	4.45	0.23	39.6
SD	0.95	3.19	0.19	1.49	22.9	0.30	0.13	1.17

Q7. John 73, 1.64 ; Joe 72, 5.20

Joe has lower mean score but John has better overall performance (lower standard deviation)

Q8. Dec 3313, 1025; Mar 2352, 564

December has higher mean takings but March has less variation in takings

Q9. 6C1 21.5, 1.26 ; 6C2 21.5, 2.88

Same average but 6C1 has lower SD so less spread out.

# Quartiles

**Q1.** For each of the data sets below find the median, lower quartile, upper quartile and semi-interquartile range.

a.	2	4	4	6	7	8	10	14	15			
b.	29	30	32	33	34	37	40					
c.	17	19	20	22	23	25	26					
d.	0	0	0	1	1	2	2	2	3	3	4	
e.	1.8	1.8	2.8	2.9	4.0	4.0	4.0	4.7	5.1	5.2	5.3	
f.	0.13	0.18	0.18	0.19	0.25	0.26	0.29	0.29	0.30	0.31	0.33	0.39
g.	133	136	136	138	140	141	143	145				
h.	371	375	376	379	380	384	385	387	389	390		
i.	57	58	58	60	63	67	67	69	82	85	86	90
j.	11	11	11	12	13	14	15	15	16	18	20	

**Q2.** For each of the data sets below find the median, lower quartile, upper quartile and semi-interquartile range

a.	47	56	58	48	60	65	50	52	61	53	63	
b.	12	20	27	15	35	16	26	34	38	24	26	
c.	149	165	154	167	170	179	151	168	158			
d.	1	8	3	1	2	5	3	1	4	3	2	
e.	108	114	132	95	144	120	116	125	172	188	155	160
f.	65	74	59	43	63	52	48	63	67	85	92	48
g.	190	165	174	187	166	172	184	190	166	183	180	
h.	325	363	347	359	314	329	364	372	301	317	346	
i.	0.5	1.3	0.4	1.0	0.9	1.4	0.8	0.9	1.1	0.6		
j.	10	13	11	11	20	10	10	14	50	10	11	10



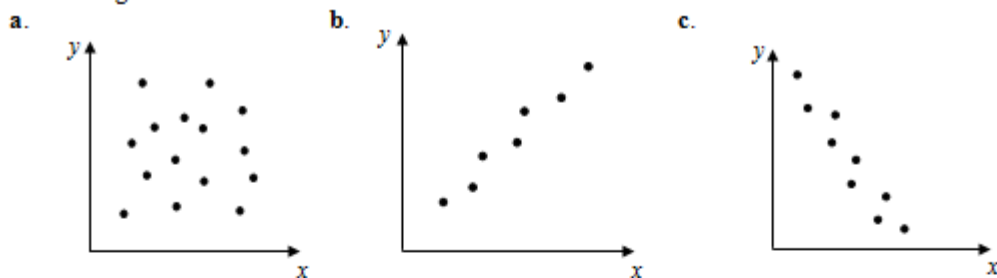
# Answers

Q1.	median	Q1	Q3	SIR
a.	7	4	12	4
b.	33	30	37	3.5
c.	22	19	25	3
d.	2	0	3	1.5
e.	4.0	2.8	5.1	1.15
f.	0.275	0.185	0.305	0.06
g.	139	136	142	3
h.	382	376	387	5.5
i.	67	59	83.5	12.25
j.	14	11	16	2.5

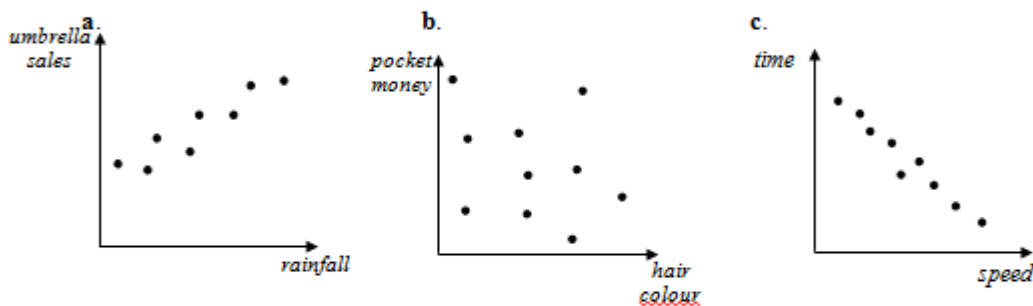
Q2.	median	Q1	Q3	SIR
a.	56	50	61	5.5
b.	26	16	34	9
c.	165	152.5	169	8.25
d.	3	1	4	1.5
e.	128.5	115	157.5	21.25
f.	63	50	70.5	10.25
g.	180	166	187	10.5
h.	346	317	363	23
i.	0.9	0.6	1.1	0.25
j.	11	10	13.5	1.75

# Scattergraphs

Q1. Using the words positive, negative or no relation, describe the correlation in each of the diagrams below.



Q2. What do the diagrams tell you about the correlation between the two variables involved?



Q3. A random survey of 20 pupils gave the following results

Pupil	1	2	3	4	5	6	7	8	9	10
Age	16	17	14	17	14	12	12	16	18	15
Height(cm)	182	199	171	200	183	159	170	179	198	180
Weight (kg)	71	78	69	66	54	60	46	72	76	63
Cash carried (£)	4.23	10.90	25.50	1.43	2.98	6.24	3.18	0.72	1.98	0.25

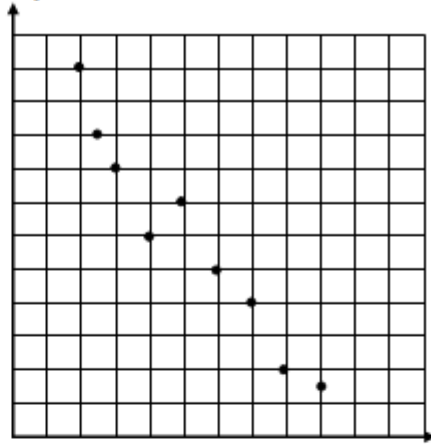
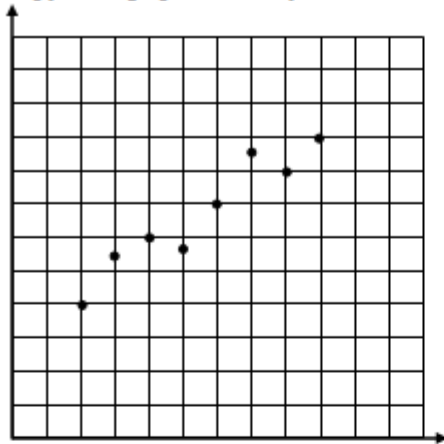
Pupil	11	12	13	14	15	16	17	18	19	20
Age	18	18	17	16	11	11	13	12	14	14
Height (cm)	190	179	187	169	160	151	150	171	170	182
Weight (kg)	68	75	77	76	49	41	55	53	60	67
Cash carried (£)	12.06	4.31	2.38	12.30	2.15	4.12	2.71	0.40	1.80	3.10

Draw a scatter diagram to find out if there is a correlation between

- age and height
- height and weight
- age and weight
- age and amount of cash carried.

# Scattergraphs Equation

Q1. Copy these graphs and use your ruler to draw what you think is the line of best fit.



Q2. For the following sets of data, draw a scatter diagram and find the equation of the line of best fit.

a. 

$x$	1	2	3	4	5
$y$	5	7	8	10	12

b. 

$x$	1	2	3	4	5
$y$	2	2.5	2.5	3.5	3

c. 

$x$	6	7	8	9	10
$y$	1	2	4	4.5	6

d. 

$x$	1	2	3	4	5
$y$	8	6	5	4	2

e. 

$x$	1	2	3	4	5
$y$	8	10	8	5	3

f. 

$x$	5	6	7	8	9
$y$	6	5.5	5.4	5.5	5

Q3. The height of a plant measured over five days is shown below.

<b>Days (D)</b>	1	2	3	4	5
<b>Height (H)</b>	1.6	1.9	2.5	3.4	3.5

- Plot the points and draw the best fitting straight line through them
- Work out the equation of the line.
- Use your line to estimate the height after  $1\frac{1}{2}$  days.

Q4. The table shows the results of an experiment.

$x$	1	2	3	4	5	6
$y$	9.2	12.0	18.3	19.0	25.1	30.2

Plot the points, draw a best fitting straight line and find its equation.

# Scattergraphs Equation

Q5. The results below show the length of a spring when a force is applied.

<i>Force (F)</i>	1	2	3	4	5	6
<i>Length (l)</i>	3.0	3.9	4.8	5.9	6.9	8.1

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate the length when a force of 4.5 is applied.

Q6. The following table gives the temperature of a bottle of water as it cools.

<i>Time, min (T)</i>	1	3	5	7	9
<i>Temperature (°C)</i>	66	61	57	53	50

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate the temperature after 2½ minutes.

Q7. The following table shows the speed of a car accelerating from rest.

<i>Time (secs)</i>	0	2	6	8	12	16
<i>Speed (mph)</i>	0	14	44	56	82	110

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate the speed after 10 seconds.

Q8. A restaurant manager finds that the cost of running his restaurant depends on the number of meals served.

<i>Number of meals</i>	10	20	30	40	50	60
<i>Cost in £</i>	188	192	220	216	232	248

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your equation to estimate the cost when 35 meals are served.

Q9. The results of an experiment are shown in the table below.

<i>V</i>	0	0.35	0.6	0.95	1.2	1.3
<i>R</i>	0.60	0.48	0.33	0.18	0.11	0.05

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate *R* when *V* is 0.8.

# Answers

## Statistics 4 ~ Scattergraphs & Correlation

- Q1. a. no relation      b. positive      c. negative  
Q2. a. positive correlation (more rain – more people buy umbrellas)  
b. no relation  
c. negative correlation (the faster you go, the less time it takes)  
Q3. a. yes    b. yes, but not strong    c. yes    d. no

## Statistics 5 ~ Regression (best fit line)

- Q1. student's best fit lines  
Q2. Answers will vary depending on where line is drawn  
a.  $y = 1.67x + 3.3$     b.  $y = 0.4x + 1.5$     c.  $y = 1.2x - 6$   
d.  $y = -1.5x + 9$     e.  $y = -1.5x + 12$     f.  $y = -0.25x + 7$   
Q3.  $H = 0.6D + 0.7$ , 1.6  
Q4.  $y = 3.8x + 6$   
Q5.  $l = 0.9F + 2.2$ , 6.25  
Q6.  $C = -2T + 67$ , 62°C  
Q7.  $S = 7T$ , 70 mph  
Q8.  $C = 1.1m + 177$ , £215.50  
Q9.  $R = -0.35V + 0.61$ , 0.3

# Change the Subject

Q1. Change the subject of each formula to  $x$ .

a.  $y = x + 3$

b.  $y = x - 5$

c.  $y = x + a$

d.  $y = x - b$

e.  $y = 3x$

f.  $y = 10x$

g.  $y = kx$

h.  $y = ax$

i.  $y = 3p + x$

j.  $y = x - 5t$

k.  $y = 2x + 1$

l.  $y = 3x - 7$

m.  $y = 7x + 4a$

n.  $y = 3b + 4x$

o.  $y = 8 + 10x$

Q2. Make  $a$  the subject of each formula.

a.  $b = 4 - a$

b.  $d = 12 - a$

c.  $y = 5x - a$

d.  $m = 2 - 2a$

e.  $q = 7 - 5a$

f.  $c = 20 - 3a$

g.  $r = s - 2a$

h.  $t = d - 4a$

i.  $z = 4b - 5a$

j.  $k = 2h - 7a$

k.  $p = 6q - 11a$

l.  $g = 2x - 9a$

Q3. Change the subject of the formula to  $x$ .

a.  $y = ax + b$

b.  $y = mx + c$

c.  $t = sx - r$

d.  $p = qx + 2r$

e.  $m = fx - 3n$

f.  $a = b + cx$

g.  $k = h - mx$

h.  $d = 3b + cx$

i.  $g = kc - hx$

Q4. Change the subject of each formula to the letter shown in brackets.

a.  $P = 4l$  ( $l$ )

b.  $V = IR$  ( $I$ )

c.  $S = DT$  ( $T$ )

d.  $A = lb$  ( $b$ )

e.  $C = \pi d$  ( $d$ )

f.  $G = UT$  ( $U$ )

g.  $v = u + at$  ( $t$ )

h.  $P = 2l + 2b$  ( $l$ )

i.  $H = xy + 5m$  ( $y$ )

Q5. Change the subject of each formula to  $c$ .

a.  $b = \frac{1}{2}c$

b.  $x = \frac{1}{5}c$

c.  $y = \frac{1}{4}c$

d.  $m = \frac{1}{6}c$

e.  $k = \frac{1}{9}c$

f.  $d = \frac{1}{10}c$

g.  $a = \frac{1}{2}c + 2$

h.  $h = \frac{1}{3}c - 5$

i.  $p = \frac{1}{4}c + q$

j.  $y = \frac{1}{10}c - x$

k.  $t = \frac{1}{8}c + 2s$

l.  $r = \frac{1}{5}c - 3q$

Q6. Make  $x$  the subject of each formula.

a.  $y = \frac{3}{x}$

b.  $d = \frac{c}{x}$

c.  $m = \frac{y}{x}$

d.  $s = \frac{a+2}{x}$

e.  $w = \frac{z-1}{x}$

f.  $a = \frac{b+c}{x}$

g.  $a = \frac{x+8}{9}$

h.  $k = \frac{x-5}{2}$

i.  $p = \frac{3-x}{4}$

j.  $y = \frac{2}{x} + 1$

k.  $z = \frac{6}{x} - 7$

l.  $h = \frac{m}{x} + k$

# Change the Subject

Q7. Change the subject of each formula to  $k$ .

a.  $y = \sqrt{k}$

b.  $x = \sqrt{k}$

c.  $m = \sqrt{k}$

d.  $a = \sqrt{\frac{k}{b}}$

e.  $c = \sqrt{\frac{k}{d}}$

f.  $h = \sqrt{\frac{k}{g}}$

g.  $s = \sqrt{\frac{t}{k}}$

h.  $q = \sqrt{\frac{p}{k}}$

i.  $w = \sqrt{\frac{z}{k}}$

j.  $r = k^2$

k.  $\underline{ab} = k^2$

l.  $\frac{p}{q} = k^2$

m.  $y = x + k^2$

n.  $c = k^2 - d$

o.  $x = 3k^2 - 1$

Q8. Change the subject of each formula to the letter shown in brackets.

a.  $v^2 = u^2 + 2as$

( $s$ )

b.  $v^2 = u^2 + 2as$

( $u$ )

c.  $V = \pi r^2 h$

( $h$ )

d.  $V = \pi r^2 h$

( $r$ )

e.  $R = \sqrt{\frac{A}{\pi}}$

( $A$ )

f.  $L = 3 + \sqrt{6a}$

( $a$ )

g.  $2k = \sqrt{(p+4)}$

( $p$ )

h.  $x^2 = \frac{4yz}{t}$

( $y$ )

i.  $ar = \frac{1}{2} \sqrt{\frac{x}{b}}$

( $b$ )

j.  $\underline{st} = A^2(x-3y)$

( $A$ )

k.  $R = A^2(x-3y)$

( $x$ )

l.  $na = \sqrt{(1-n^2)}$

( $n$ )

m.  $d = \frac{t(n-1)}{n}$

( $n$ )

n.  $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$

( $R$ )

o.  $d = \frac{a^2(x+b)}{4}$

( $a$ )

# Answers

- Q1.** a.  $x = y - 3$     b.  $x = y + 5$     c.  $x = y - a$     d.  $x = y + b$   
 e.  $x = \frac{y}{3}$     f.  $x = \frac{y}{10}$     g.  $x = \frac{y}{k}$     h.  $x = \frac{y}{a}$   
 i.  $x = y - 3p$     j.  $x = y + 5t$     k.  $x = \frac{y-1}{2}$     l.  $x = \frac{y+7}{3}$   
 m.  $x = \frac{y-4a}{7}$     n.  $x = \frac{y-3b}{4}$     o.  $x = \frac{y-8}{10}$
- Q2.** a.  $a = 4 - b$     b.  $a = 12 - d$     c.  $a = 5x - y$     d.  $a = \frac{2-m}{2}$   
 e.  $a = \frac{7-q}{5}$     f.  $a = \frac{20-c}{3}$     g.  $a = \frac{s-r}{2}$     h.  $a = \frac{d-t}{4}$   
 i.  $a = \frac{4b-z}{5}$     j.  $a = \frac{2h-k}{7}$     k.  $a = \frac{6q-p}{11}$     l.  $a = \frac{2x-g}{9}$
- Q3.** a.  $x = \frac{y-b}{a}$     b.  $x = \frac{y-c}{m}$     c.  $x = \frac{t+r}{s}$     d.  $x = \frac{p-2r}{q}$   
 e.  $x = \frac{m+3n}{f}$     f.  $x = \frac{a-b}{c}$     g.  $x = \frac{h-k}{m}$     h.  $x = \frac{d-3b}{c}$   
 i.  $x = \frac{kc-g}{h}$
- Q4.** a.  $l = \frac{P}{4}$     b.  $I = \frac{V}{R}$     c.  $T = \frac{S}{D}$     d.  $b = \frac{A}{l}$     e.  $d = \frac{C}{\pi}$     f.  $U = \frac{G}{T}$   
 g.  $t = \frac{v-u}{a}$     h.  $l = \frac{P-2b}{2}$     i.  $y = \frac{H-5m}{x}$
- Q5.** a.  $c = 2b$     b.  $c = 5x$     c.  $c = 4y$     d.  $c = 6m$   
 e.  $c = 9k$     f.  $c = 10d$     g.  $c = 2(a-2)$     h.  $c = 3(h+5)$   
 i.  $c = 4(p-q)$     j.  $c = 10(y+x)$     k.  $c = 8(t-2s)$     l.  $c = 5(r+3q)$
- Q6.** a.  $x = \frac{3}{y}$     b.  $x = \frac{c}{d}$     c.  $x = \frac{y}{m}$     d.  $x = \frac{a+2}{s}$   
 e.  $x = \frac{z-1}{w}$     f.  $x = \frac{b+c}{a}$     g.  $x = 9a - 8$     h.  $x = 2k + 5$   
 i.  $x = 3 - 4p$     j.  $x = \frac{2}{y-1}$     k.  $x = \frac{6}{z+7}$     l.  $x = \frac{m}{h-k}$
- Q7.** a.  $k = y^2$     b.  $k = x^2$     c.  $k = m^2$     d.  $k = a^2b$   
 e.  $k = c^2d$     f.  $k = h^2g$     g.  $k = \frac{t}{s^2}$     h.  $k = \frac{p}{q^2}$   
 i.  $k = \frac{z}{w^2}$     j.  $k = \sqrt{r}$     k.  $k = \sqrt{ab}$     l.  $k = \sqrt{\frac{p}{q}}$   
 m.  $k = \sqrt{y-x}$     n.  $k = \sqrt{c+d}$     o.  $k = \sqrt{\frac{x+1}{3}}$
- Q8.** a.  $s = \frac{v^2 - u^2}{2a}$     b.  $u = \sqrt{v^2 - 2as}$     c.  $h = \frac{V}{\pi r^2}$   
 d.  $r = \sqrt{\frac{V}{\pi h}}$     e.  $A = \pi r^2$     f.  $a = \frac{(L-3)^2}{6}$   
 g.  $p = 4k^2 - 4$     h.  $y = \frac{x^2 t}{4z}$     i.  $b = \frac{x}{(2ar)^2}$   
 j.  $A = \sqrt{\frac{st}{(x-3y)}}$     k.  $x = \frac{R+3A^2y}{A^2}$     l.  $n = \sqrt{1 - (na)^2}$   
 m.  $n = \frac{t}{t-d}$     n.  $R = \frac{r_1 r_2}{r_1 + r_2}$     o.  $a = \sqrt{\frac{4d}{x+b}}$



# Functions

- A function is given as  $f(x) = 6x - 5$ .  
Find: (a)  $f(3)$       (b)  $f(-1)$       (c)  $f(\frac{1}{2})$       (d)  $f(a)$
- A function is given as  $f(x) = x^2 + 4$ .  
Find: (a)  $f(2)$       (b)  $f(4)$       (c)  $f(-3)$       (d)  $f(p)$
- A function is given as  $h(a) = 12 - 2a$ .  
Find: (a)  $h(4)$       (b)  $h(6)$       (c)  $h(-2)$       (d)  $h(m)$
- A function is defined as  $g(x) = x^2 + 3x$ .  
Find: (a)  $g(a)$       (b)  $g(2p)$       (c)  $g(m+1)$       (d)  $g(2-e)$
- A function is defined as  $f(x) = x^2 - 4x$ .  
Find: (a)  $f(4)$       (b)  $f(3a)$       (c)  $f(a-2)$       (d)  $f(2p+1)$
- A function is given as  $f(x) = 5x + 3$ . For what value of  $x$  is :  
(a)  $f(x) = 23$       (b)  $f(x) = -2$       (c)  $f(x) = 5$  ?
- A function is given as  $h(t) = 20 - 6t$ . For what value of  $t$  is :  
(a)  $h(t) = 2$       (b)  $h(t) = -16$       (c)  $h(t) = 32$  ?
- A function is given as  $g(a) = a^2 - 16$ . For what value(s) of  $a$  is :  
(a)  $g(a) = 9$       (b)  $g(a) = -15$       (c)  $g(a) = 0$  ?
- A function is defined as  $f(x) = x^2 + 2x$ .  
(a) Evaluate: (i)  $f(3)$       (ii)  $f(-2)$  .  
(b) Find  $f(a+3)$  in its simplest form.
- A function is defined as  $h(a) = 33 - 6a$ .  
(a) Evaluate: (i)  $h(4)$       (ii)  $h(-1)$  .  
(b) Given that  $h(t) = 0$ , find the value of  $t$ .  
(c) Express  $h(p-2)$  in its simplest form.

# Answers

## 1.1 FUNCTIONAL NOTATION

1. (a) 13 (b) -11 (c) -2 (d)  $6a-5$
2. (a) 8 (b) 20 (c) 13 (d)  $p^2+4$
3. (a) 4 (b) 0 (c) 16 (d)  $12-2m$
4. (a)  $a^2+3a$  (b)  $4p^2+6p$  (c)  $m^2+5m+4$  (d)  $e^2-7e+10$
5. (a) 0 (b)  $9a^2-12a$  (c)  $a^2-8a+12$  (d)  $4p^2-4p-3$
6. (a) 4 (b) -1 (c)  $\frac{2}{5}$
7. (a) 3 (b) 6 (c) -2
8. (a)  $\pm 5$  (b)  $\pm 1$  (c)  $\pm 4$
9. (a) (i) 15 (ii) 0 (b)  $a^2+8a+15$
10. (a) (i) 9 (ii) 39 (b) 5.5 (c)  $45-6p$