

1.

(a) Expand  $3(2t+1)$

$$\underline{6t + 3} \quad (1)$$

(b) Expand and simplify  $(x+5)(x-3)$

$$\begin{aligned} (x+5)(x-3) &= x^2 - 3x + 5x - 15 \\ &= x^2 + 2x - 15 \end{aligned}$$

$$\underline{x^2 + 2x - 15} \quad (2)$$

(c) Factorise  $10p - 15q = 5(2p - 3q)$

$$\underline{5(2p - 3q)} \quad (1)$$

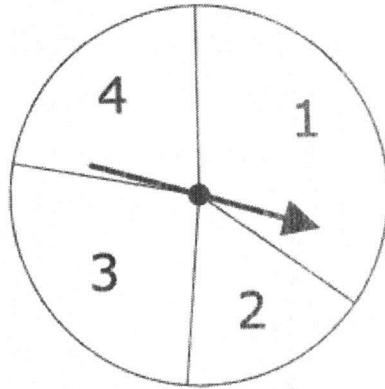
(d) Factorise  $n^2 + 4n = n(n+4)$

$$\underline{n(n+4)} \quad (1)$$

Question 2 is on the next page.

2.

The diagram shows a pointer which spins about the centre of a fixed disc.



When the pointer is spun, it stops on one of the numbers 1, 2, 3 or 4.  
The probability that it will stop on one of the numbers 1 to 3 is given in the table.

Number	1	2	3	4
Probability	0.35	0.16	0.27	

Magda is going to spin the pointer once.

(a) Work out the probability that the pointer will stop on 4.

$$1 - (0.35 + 0.16 + 0.27) = 0.22$$

$$\begin{array}{r} 0.22 \\ \hline (2) \end{array}$$

(b) Work out the probability that the pointer will stop on 1 or 3.

$$\begin{aligned} P(1 \text{ or } 3) &= P(1) + P(3) \\ &= 0.35 + 0.27 \\ &= 0.62 \end{aligned}$$

$$\begin{array}{r} 0.62 \\ \hline (2) \end{array}$$

Omar is going to spin the pointer 75 times.

(c) Work out an estimate for the number of times the pointer will stop on 2.

$$75 \times 0.16 = 12$$

$$\begin{array}{r} 12 \\ \hline (2) \end{array}$$

3.

(i) Solve the inequality  $3x + 7 > 1$

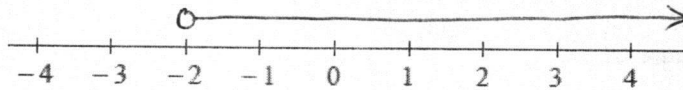
$$3x > 1 - 7$$

$$3x > -6$$

$$x > -2$$

$$x > -2$$

(ii) On the number line, represent the solution to part (i).



4.

The grouped frequency table gives information about the distance each of 150 people travel to work.

Distance travelled (d km)	Frequency (f)	Midpoint (x)	fx
$0 < d \leq 5$	34	2.5	85
$5 < d \leq 10$	48	7.5	360
$10 < d \leq 15$	26	12.5	325
$15 < d \leq 20$	18	17.5	315
$20 < d \leq 25$	16	22.5	360
$25 < d \leq 30$	8	27.5	220
	150		1665

(a) Work out what percentage of the 150 people travel more than 20 km to work.

$$\frac{16 + 8}{150} \times 100 = 16\%$$

16 %  
(2)

(b) Work out an estimate for the mean distance travelled to work by the people.

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$= \frac{1665}{150}$$

$$= 11.1 \text{ km}$$

11.1 km  
(4)

5.

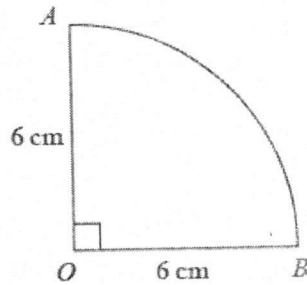


Diagram NOT accurately drawn

The diagram shows a shape.  
 $AB$  is an arc of a circle, centre  $O$ .  
 Angle  $AOB = 90^\circ$ .  
 $OA = OB = 6$  cm.

Calculate the perimeter of the shape.  
 Give your answer correct to 3 significant figures.

$$\begin{aligned}
 P &= 6 + 6 + \frac{2\pi r}{4} \\
 &= 12 + \frac{2\pi \times 6}{4} \\
 &= 21.4 \text{ cm (3 s.f.)} \quad \dots\dots\dots 21.4 \text{ cm}
 \end{aligned}$$

6.

(a) Find the gradient of the line with equation  $3x - 4y = 15$

$$\begin{aligned}
 3x - 4y &= 15 \\
 3x - 15 &= 4y \\
 4y &= 3x - 15 \\
 y &= \frac{3}{4}x - \frac{15}{4} \quad \dots\dots\dots \frac{3}{4} \quad (3)
 \end{aligned}$$

(b) Work out the coordinates of the point of intersection of the line with equation  $3x - 4y = 15$  and the line with equation  $5x + 6y = 6$

Solve the equations as simultaneous equations. sub  $y = -1.5$  into (1).

$$\begin{aligned}
 3x - 4y &= 15 \quad \text{--- (1) } \times 5 \\
 5x + 6y &= 6 \quad \text{--- (2) } \times 3 \\
 3x - 4y &= 15 \\
 3x + 6 &= 15 \\
 3x &= 9 \\
 x &= 3
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{1} \times 5 &\Rightarrow 15x - 20y = 75 \quad \text{--- (3)} \\
 \textcircled{2} \times 3 &\Rightarrow 15x + 18y = 18 \quad \text{--- (4)} \\
 \textcircled{4} - \textcircled{3} &\Rightarrow \underline{38y = -57} \\
 &\quad y = \underline{\underline{-1.5}}
 \end{aligned}$$

(3, -1.5)  
(4)

7.

Express the algebraic fraction  $\frac{2x^2-3x-20}{x^2-16}$  as simply as possible.

$$2x^2 - 3x - 20$$

$$= 2x^2 - 8x + 5x - 20$$

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

$$= \underline{(x-4)(2x+5)}$$

$$x^2 - 16 = \underline{(x-4)(x+4)}$$

P	S
-40	-3
-8x + 5	

$$\frac{2x^2 - 3x - 20}{x^2 - 16} = \frac{\cancel{(x-4)}(2x+5)}{\cancel{(x-4)}(x+4)}$$

$$= \underline{\underline{\frac{2x+5}{x+4}}}$$

$$\frac{2x+5}{x+4}$$

8.

Plumbers' solder is made from tin and lead.

The ratio of the weight of tin to the weight of lead is 1 : 2

(a) Work out the weight of tin and the weight of lead in 120 grams of plumbers' solder.

$$T : L = 1 : 2$$

$$\text{Weight of tin} = \frac{120}{1+2} \times 1 = 40\text{g}$$

$$\text{Weight of lead} = \frac{120}{1+2} \times 2$$

$$= 80\text{g.}$$

tin	.....	40	g
lead	.....	80	g
		(2)	

(b) What weight of plumbers' solder contains 25 grams of tin?

$$T : L = 1 : 2$$

$$= 25 : x$$

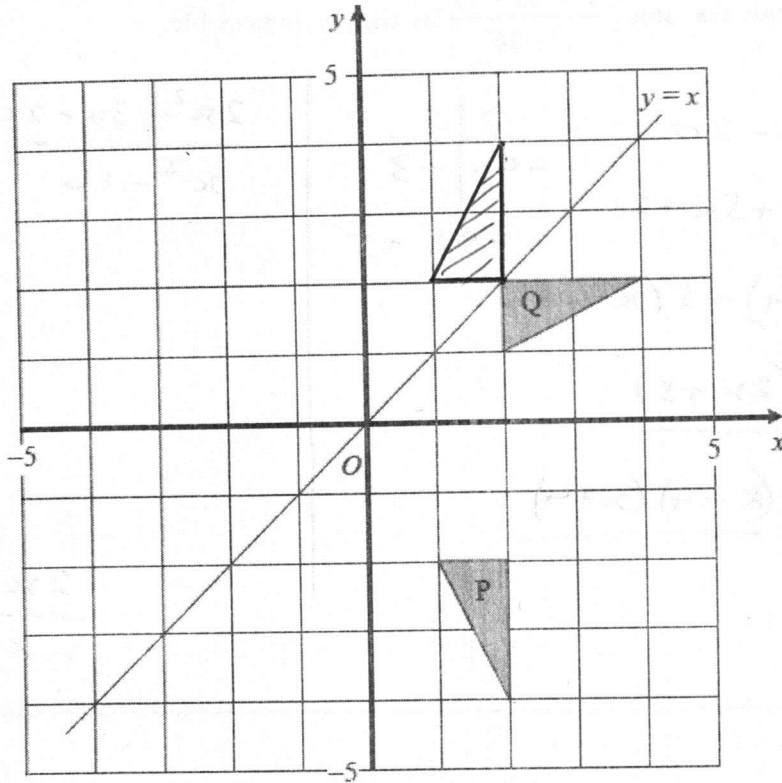
$$x = 2 \times 25$$

$$= 50\text{g}$$

$$\text{Total weight} = 25 + 50 = \underline{\underline{75\text{g.}}}$$

	.....	75	g
		(1)	

9.



(a) Describe fully the single transformation which maps triangle P onto triangle Q.

Rotate P anticlockwise  $90^\circ$  about the centre  $(0, 0)$ .

(3)

(b) Reflect triangle Q in the line with equation  $y=x$ .

(2)

10.

In a sale, normal prices are reduced by 12%.  
The sale price of a computer is £726

$$100\% - 12\% = 88\%$$

Work out the normal price of the computer.

$$88\% \rightarrow \pounds 726$$

$$1\% \rightarrow \pounds \frac{726}{88}$$

$$100\% \rightarrow \pounds \frac{726}{88} \times 100 = \underline{\underline{\pounds 825}}$$

$$\pounds \underline{\underline{825}}$$

11.

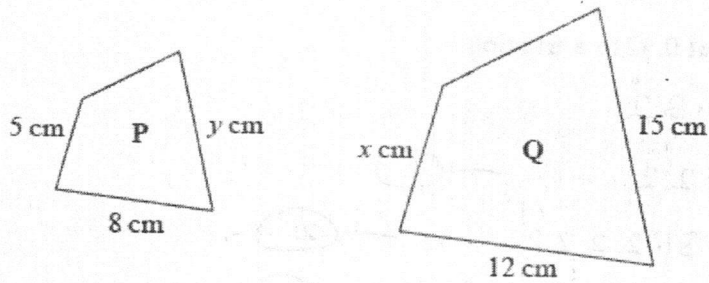


Diagram NOT  
accurately drawn

Quadrilateral P is mathematically similar to quadrilateral Q.

(a) Calculate the value of  $x$ .

$$\text{Length scale factor} = \frac{12}{8} = 1.5$$

$$\begin{aligned} \therefore x &= 5 \times 1.5 \\ &= \underline{\underline{7.5 \text{ cm}}} \end{aligned}$$

$$x = \underline{\underline{7.5 \text{ cm}}} \quad (2)$$

(b) Calculate the value of  $y$ .

$$\begin{aligned} y &= \frac{15}{1.5} \\ &= 10 \end{aligned}$$

$$y = \underline{\underline{10}} \quad (2)$$

The area of quadrilateral P is  $60 \text{ cm}^2$ .

(c) Calculate the area of quadrilateral Q.

$$\begin{aligned} \text{Area scale factor} &= (\text{Length Scale Factor})^2 \\ &= 1.5^2 \\ &= 2.25 \end{aligned}$$

$$\begin{aligned} \text{Area of Q} &= 60 \times 2.25 \\ &= \underline{\underline{135 \text{ cm}^2}} \end{aligned} \quad \underline{\underline{135 \text{ cm}^2}} \quad (2)$$

12.

Convert the recurring decimal  $0.3\dot{2}$  to a fraction.

$$\text{Let } x = 0.3\dot{2}$$

$$x = 0.32222\dots \quad \text{--- (1)}$$

$$\textcircled{1} \times 10 \Rightarrow 10x = 3.2222\dots \quad \text{--- (2)}$$

$$\textcircled{1} \times 100 \Rightarrow 100x = 32.2222\dots \quad \text{--- (3)}$$

$$\textcircled{3} - \textcircled{2} \Rightarrow 90x = 29 \Rightarrow x = \frac{29}{90} // \quad \frac{29}{90}$$

13.

(a) Expand and simplify  $(3p-2q)(2p+5q)$ 

$$\begin{aligned} (3p-2q)(2p+5q) \\ = 6p^2 + 15pq - 4pq - 10q^2 \\ = 6p^2 + 11pq - 10q^2 \end{aligned}$$

$$\frac{6p^2 + 11pq - 10q^2}{(2)}$$

(b) Simplify  $(2x^2y^4)^3$ 

$$\begin{aligned} (2x^2y^4)^3 &= 2^3 (x^2)^3 (y^4)^3 \\ &= 8x^6y^{12} \end{aligned}$$

$$\frac{8x^6y^{12}}{(2)}$$

(c) Simplify  $(a^4b^{-3})^{-2}$ 

$$\begin{aligned} (a^4b^{-3})^{-2} &= (a^4)^{-2} (b^{-3})^{-2} \\ &= a^{-8}b^6 \end{aligned}$$

$$\frac{a^{-8}b^6}{(2)}$$

(d) Simplify  $(27p^6)^{\frac{1}{3}}$ 

$$\begin{aligned} (27p^6)^{\frac{1}{3}} &= 27^{\frac{1}{3}} (p^6)^{\frac{1}{3}} \\ &= \sqrt[3]{27} \times p^2 \\ &= \underline{\underline{3p^2}} \end{aligned}$$

$$\frac{3p^2}{(2)}$$



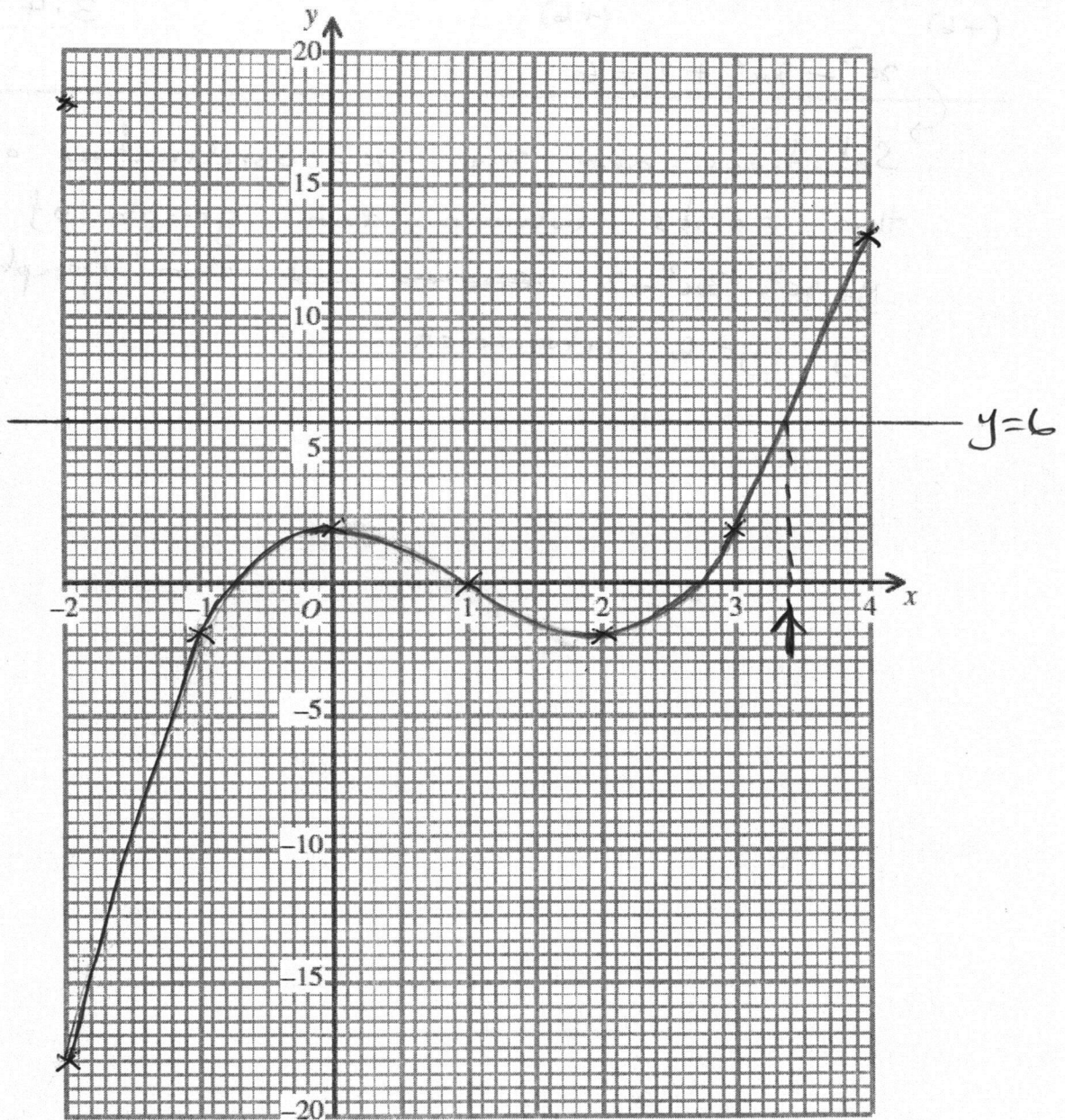
14.

(a) Complete the table of values for  $y = x^3 - 3x^2 + 2$

x	-2	-1	0	1	2	3	4
y	-18	-2	2	0	-2	2	18

(2)

(b) On the grid, draw the graph of  $y = x^3 - 3x^2 + 2$



(2)

(c) Use your graph to find estimates, correct to 1 decimal place where appropriate, for the solutions of

(i)  $x^3 - 3x^2 + 2 = 0$

Solutions are the  $x$ -coordinates of the points, where the graph crosses the  $x$ -axis.  $x = -0.7, x = 1, x = 2.8$

(ii)  $x^3 - 3x^2 - 4 = 0$

$x^3 - 3x^2 - 4 = 0$

(+6)

(+6)

3.4

$x^3 - 3x^2 + 2 = 6$

(4)

Solutions are the  $x$ -coordinates of the points where the graph of  $y = x^3 - 3x^2 + 2$  ~~crosses~~ and the graph of  $y = 6$  intersect.