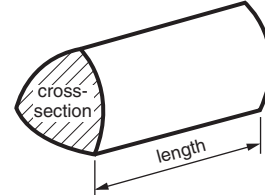


Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) \times length



In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$



Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

1 (a) Write as a decimal.

(i) $\frac{3}{50}$

(a)(i) _____ [1]

(ii) $\frac{2}{9}$

(ii) _____ [1]

(b) Work out.

(i) $\frac{5^2 \times 5^5}{5^4}$

(b)(i) _____ [2]

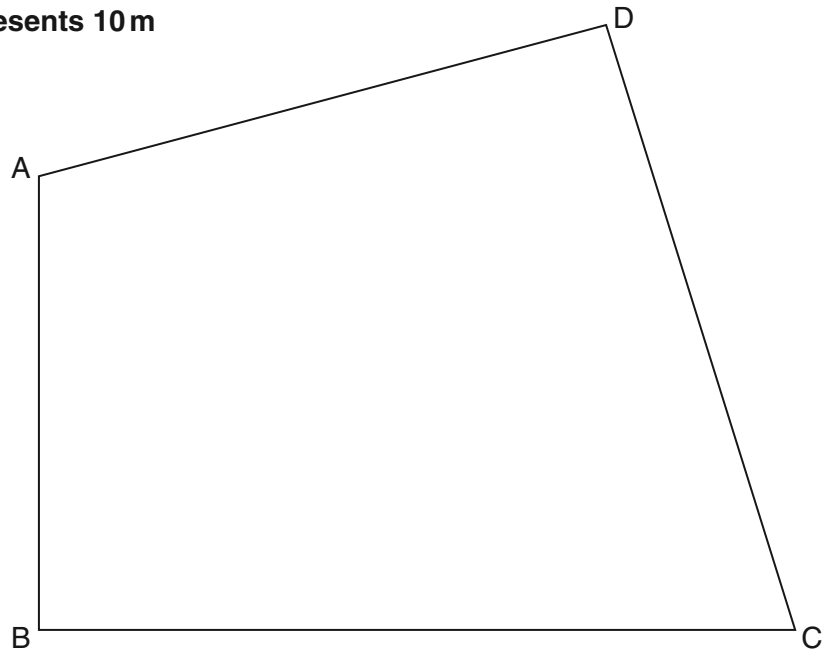
(ii) $3\frac{1}{3} - 1\frac{5}{6}$

Give your answer in its simplest form.

(ii) _____ [3]

2 The scale drawing shows a field ABCD.

Scale: 1 cm represents 10 m



Tom pitches his tent in the field.

The tent is pitched

- closer to AB than to AD
- more than 50 m from C.

Construct and shade the region where Tom's tent could be pitched.
Leave in all your construction lines.

[4]

- 3 Nita is making a fruit drink.
She mixes apple juice and mango juice in the ratio 3 : 1.

(a) How much of each type of juice will she need to make 1 litre of the fruit drink?
Give your answers in millilitres.

(a) Apple juice _____ ml

Mango juice _____ ml [2]

- (b)* Apple juice costs 56p for a 1-litre carton.
Mango juice costs £1.20 for a 1-litre carton.
A pack of 80 plastic cups costs £1.

Nita sells her fruit drink at a school concert in 250 ml cups for 60p each.
She gives all the **profit** she makes to the school fund.
Nita makes 80 cups of the fruit drink and sells them all.

How much money does she give to the school fund?

(b) _____ [5]

- 4 (a) This two-way table summarises some information about the membership of Sheldon Running Club.

	Age under 18	Age 18–59	Age 60+
Male	30	68	22
Female	14	46	20

- (i) How many of the members are female?

(a)(i) _____ [1]

- (ii) One of the males is selected at random.
Find the probability that he is under 18.

(ii) _____ [2]

- (iii) What percentage of the whole membership is aged 18–59?

(iii) _____ % [2]

- (b) Twenty members of Sheldon Running Club run a 10 km race. Their times, in minutes, are listed below.

63 40 42 54 52 37 58 72 60 45
39 46 65 55 48 51 45 62 51 57

- (i) Complete this stem and leaf diagram to represent the data.

3	
4	
5	
6	
7	

Key: 6 | 3 represents 63 minutes

[3]

- (ii) Find the range of the times.

(b)(ii) _____ minutes [1]

- (iii) Joe says

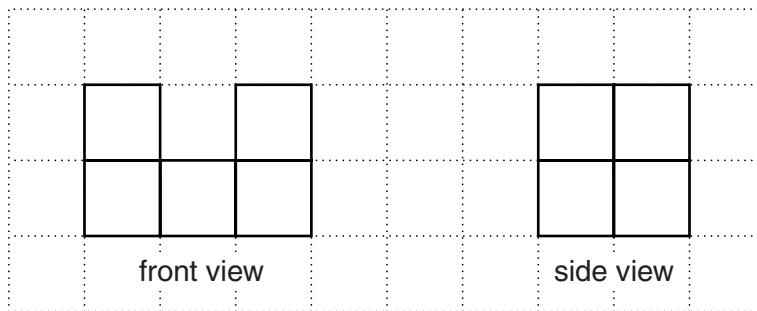
Half of these runners ran at an average speed of **more than** 12 km/h.

Is he correct? Show how you decide.

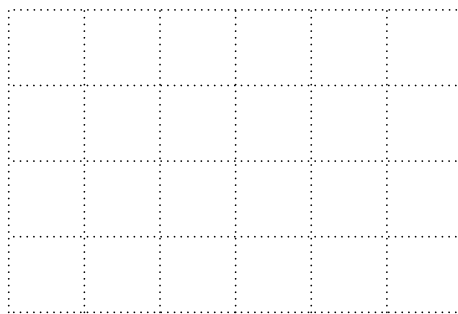
_____ because _____
_____ [4]

5 Alec has 6 one-centimetre cubes.

- (a) Alec makes a solid with the six cubes.
Its front view and side view are shown below.



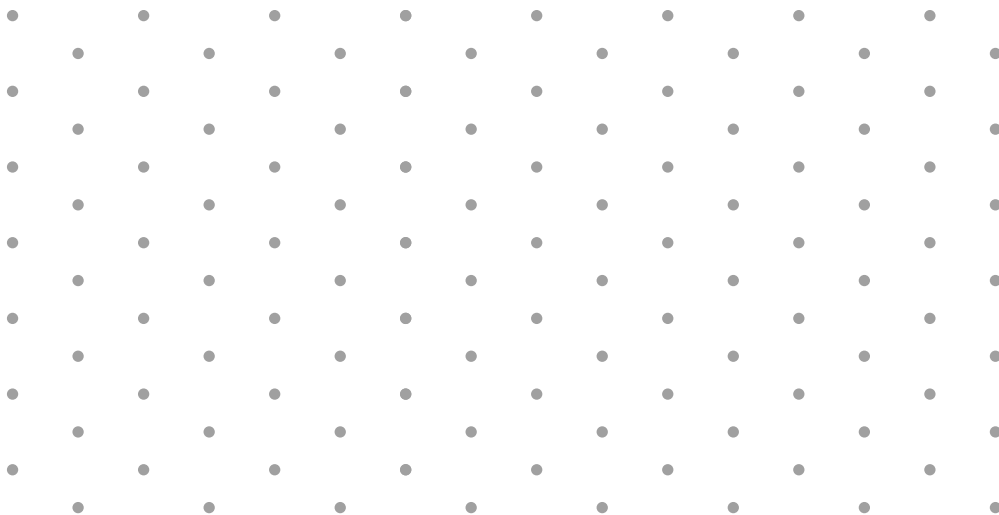
On the grid below, draw the plan view of the solid.



[2]

- (b) Alec rearranges the 6 cubes to make a cuboid with the **smallest** possible surface area.

(i) On the isometric grid below, sketch this cuboid.

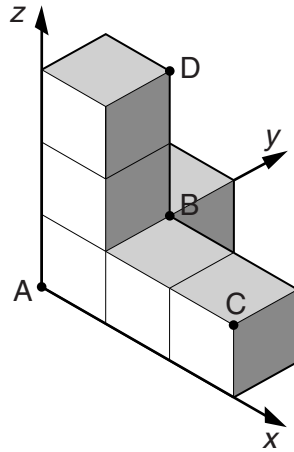


[2]

(ii) Find the total surface area of this cuboid.

(b)(ii) _____ cm² [2]

- (c) Alec makes a different solid with the 6 cubes. He places the solid on the axes below.



The coordinates of point A are (0, 0, 0) and the coordinates of point B are (1, 1, 1).

Write down the coordinates of

- (i) point C,

(c)(i) (_____ , _____ , _____) [1]

- (ii) point D.

(ii) (_____ , _____ , _____) [1]

- 6 (a) Here are the first four terms of a sequence.

8 11 14 17

Write an expression for the n th term of this sequence.

(a) _____ [2]

- (b) The n th term of another sequence is given by $12 - 5n$.

Write down the first three terms of this sequence.

(b) _____ , _____ , _____ [2]

7 (a) Expand.

$$3(a + 4)$$

(a) _____ [1]

(b) Factorise fully.

$$2b^2 + 6b$$

(b) _____ [2]

(c) Solve.

$$5x - 2 = 3x + 7$$

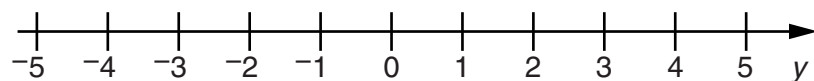
(c) $x =$ _____ [3]

(d) (i) Solve this inequality.

$$4y - 3 \geq 5$$

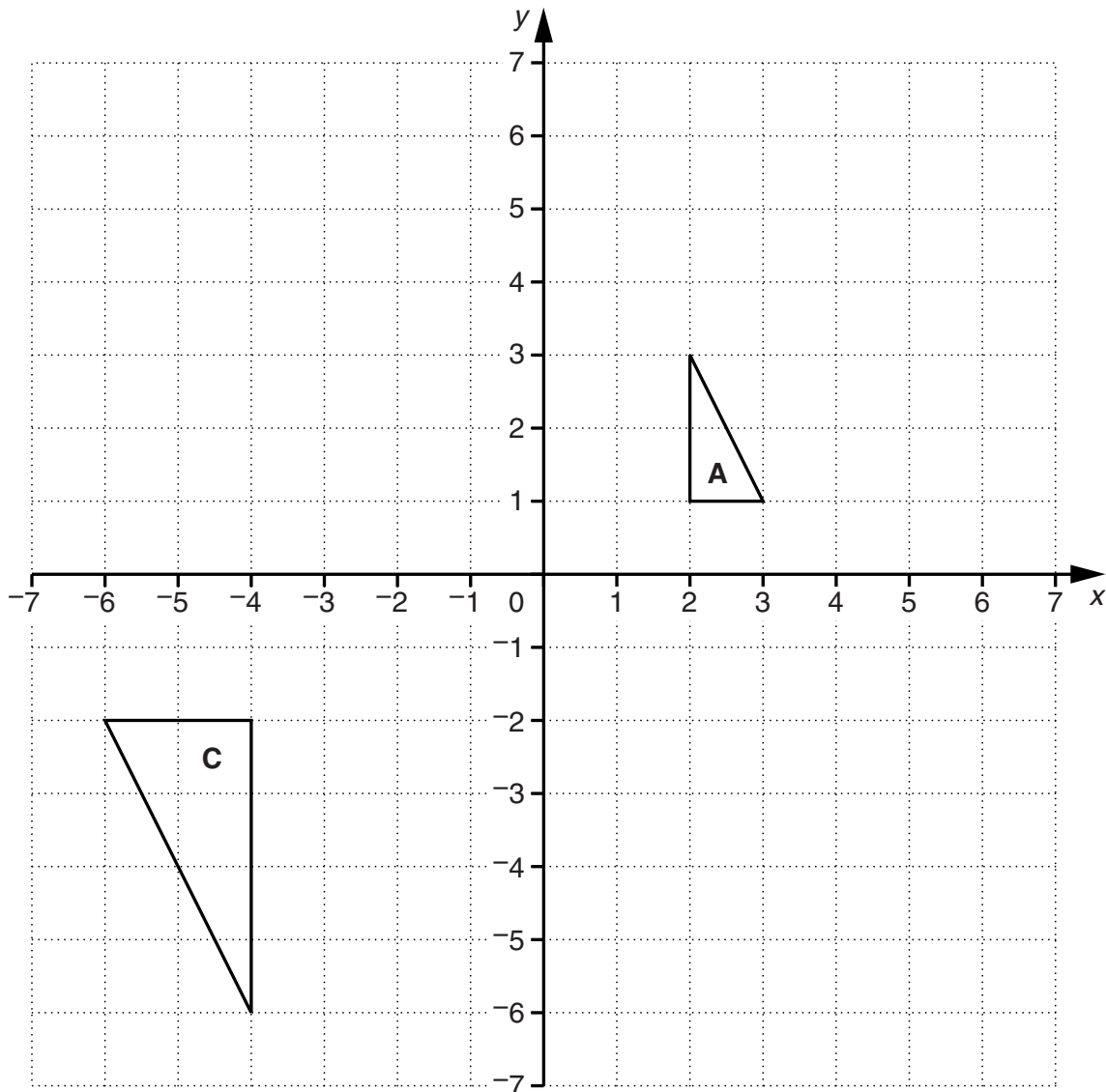
(d)(i) _____ [2]

(ii) Represent your solution to part (d)(i) on the number line.



[1]

8 Triangles **A** and **C** are drawn on the grid below.



(a) Triangle **B** is the image of triangle **A** after

- a reflection in the x -axis, followed by
- a translation of $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$.

Draw and label triangle **B** on the grid.

[3]

(b) Describe fully the **single** transformation that maps triangle **A** onto triangle **C**.

[3]

9 (a) The population of the UK in 2008 was 61.4 million.

(i) Write 61.4 million in standard form.

(a)(i) _____ [1]

(ii) The budget for building the facilities for the London 2012 Olympics was £9325 million. Chloe estimates that this was about £1500 per person in the UK.

Show that Chloe's estimate is **not** correct. [2]

(b) The mass of concrete used in building the Olympic Park was 698 792 tonnes. The mass of concrete used in building the Olympic Village was 648 500 tonnes.

Find the total mass of concrete used to build the Park and the Village. Give your answer in standard form, correct to three significant figures.

(b) _____ tonnes [2]

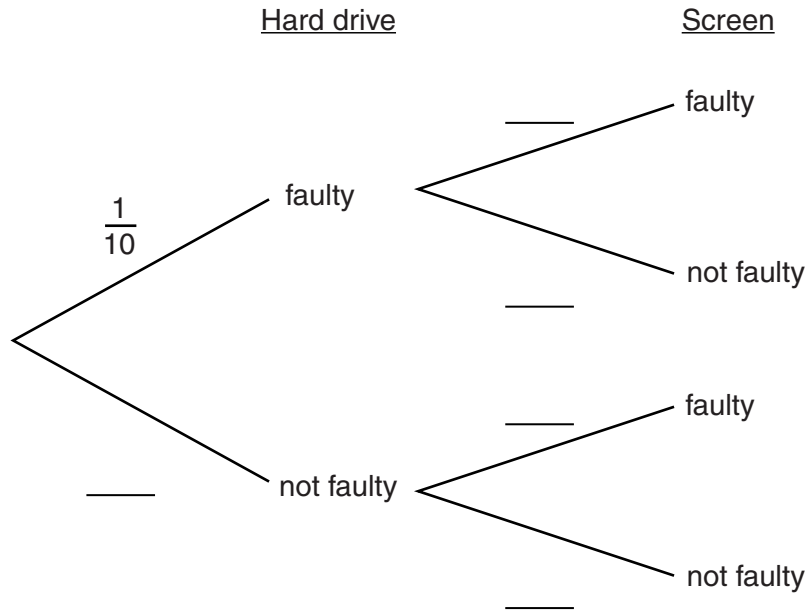
10 Amir sells laptops.
Before selling each laptop, he checks the hard drive and the screen.

The probability that the hard drive is faulty is $\frac{1}{10}$.

The probability that the screen is faulty is $\frac{1}{5}$.

These probabilities are independent.

(a) Complete the tree diagram to represent this information.



[2]

(b) Amir tests a laptop at random.

Find the probability that both the hard drive and the screen are **not** faulty.

(b) _____ [2]

- 11 A ball is dropped from the top of a cliff into the sea.
The height, h metres, of the ball above sea level, t seconds after it is dropped, is given by

$$h = 90 - 5t^2.$$

- (a) Write down the height of the top of the cliff above sea level.

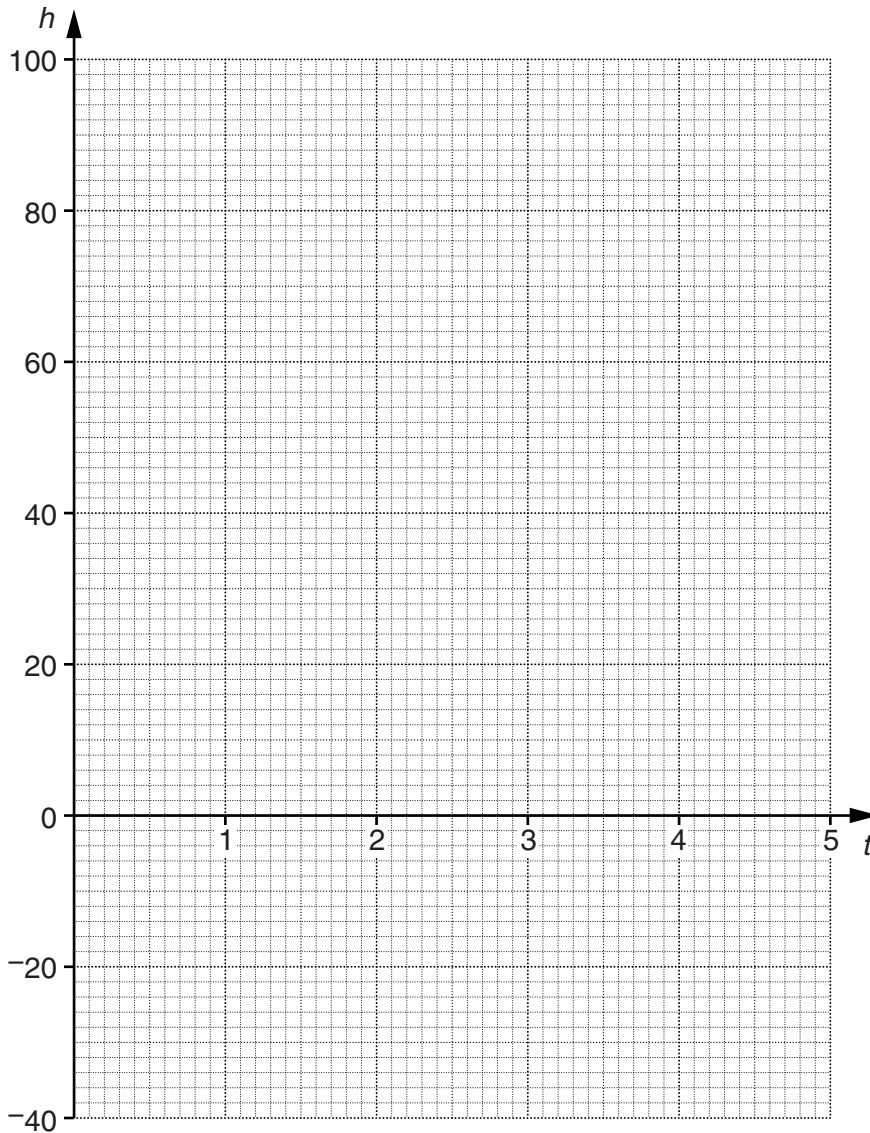
(a) _____ m [1]

- (b) Complete this table of values for the equation $h = 90 - 5t^2$.

t	0	1	2	3	4	5
h				45	10	-35

[2]

- (c) On the axes below draw the graph of $h = 90 - 5t^2$, for values of t from 0 to 5.



[2]

(d) Use your graph to find

(i) the height of the ball above sea level after 2.5 seconds,

(d)(i) _____ m [1]

(ii) the time taken for the ball to reach sea level.

(ii) _____ s [1]

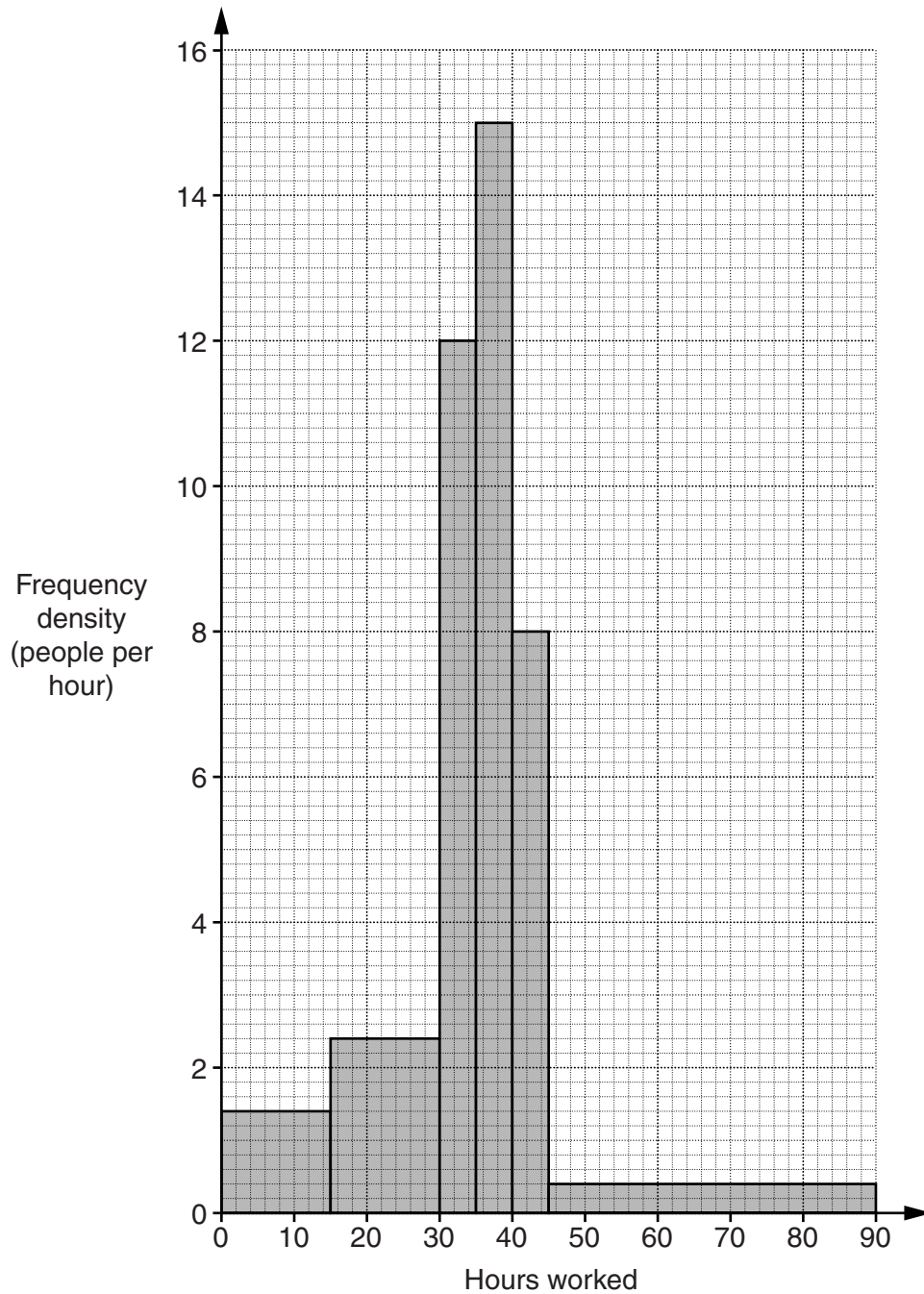
12 In a football league, teams gain 3 points for a win and 1 point for a draw.

East Hill have either won or drawn each of their last 12 matches.
They gained a total of 28 points from these matches.

Find the number of these matches that East Hill have won.

_____ [3]

- 13 Karen surveys a group of people to find out how many hours, in total, they had worked in the previous week. Her results are summarised in the histogram.



- (a) How many people worked between 15 and 30 hours in the previous week?

(a) _____ [1]

- (b) A national survey found that 54% of people had an average working week of between 30 and 45 hours.

How do the results of Karen's survey compare with the national survey?

[4]

- 14 The frequency, F hertz, of the note produced by a vibrating string is inversely proportional to its length, d centimetres.

When the length of the string is 60 cm, the frequency of the note is 300 hertz.

- (a) Find an equation connecting F and d .

(a) _____ [2]

- (b) Find the frequency of the note produced when the string is 40 cm long.

(b) _____ hertz [1]

- 15 (a) Write $x^2 + 8x + 10$ in the form $(x + a)^2 + b$.

(a) _____ [3]

- (b) Hence state the minimum value of $x^2 + 8x + 10$.

(b) _____ [1]

16 Vector $\mathbf{p} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and vector $\mathbf{q} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$.

(a) Calculate.

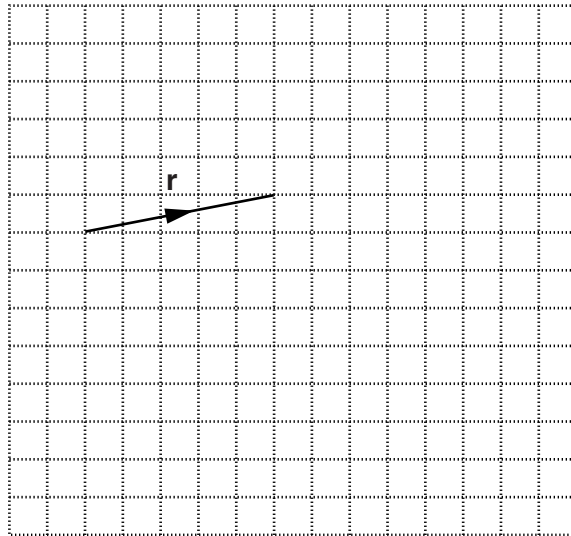
(i) $3\mathbf{p}$

(a)(i) $\begin{pmatrix} \\ \end{pmatrix}$ [1]

(ii) $\mathbf{p} + \mathbf{q}$

(ii) $\begin{pmatrix} \\ \end{pmatrix}$ [1]

(b) The vector \mathbf{r} is shown on the grid below.



Given that $\mathbf{r} = j\mathbf{p} + k\mathbf{q}$, find the values of j and k .

(b) $j = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$ [2]

TURN OVER FOR QUESTIONS 17 AND 18

17 (a) Evaluate.

$$\left(\frac{1}{9}\right)^{\frac{3}{2}}$$

(a) _____ [2]

(b) Expand and simplify.

$$(3 + \sqrt{2})(5 + \sqrt{2})$$

(b) _____ [2]

18 Express as a single fraction in its simplest form.

$$\frac{3}{x+2} + \frac{4}{x-3}$$

_____ [3]

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