Surname

Other Names

Candidate Signature

AQA

General Certificate of Secondary Education
Higher Tier
November 2012

Mathematics (Linear)   43651H

Paper 1

H

Thursday 8 November 2012   1.30 pm to 3.00 pm

For this paper you must have:
● mathematical instruments.

You must **not** use a calculator.

Time allowed
● 1 hour 30 minutes

Instructions
● Use black ink or black ball-point pen. Draw diagrams in pencil.
● Fill in the boxes at the top of this page.
● Answer **all** questions.
● You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
● Do all rough work in this book.

Information
● The marks for questions are shown in brackets.
● The maximum mark for this paper is 70.
● The quality of your written communication is specifically assessed in Questions 8 and 11. These questions are indicated with an asterisk (*).
● You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

Advice
● In all calculations, show clearly how you work out your answer.
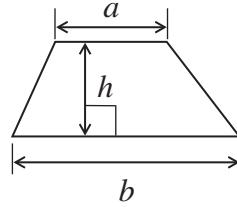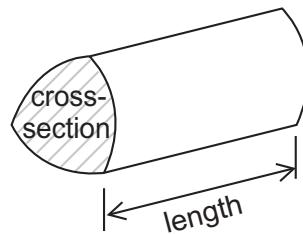
Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$
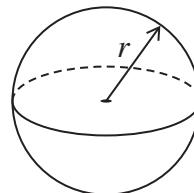
Volume of prism = area of cross-section × length
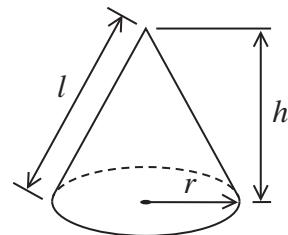
Volume of sphere $= \frac{4}{3}\pi r^3$

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

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

Curved surface area of cone $= \pi r l$
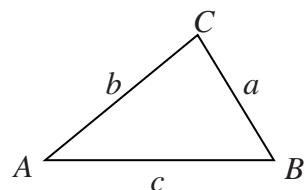
In any triangle ABC

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

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

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

The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by
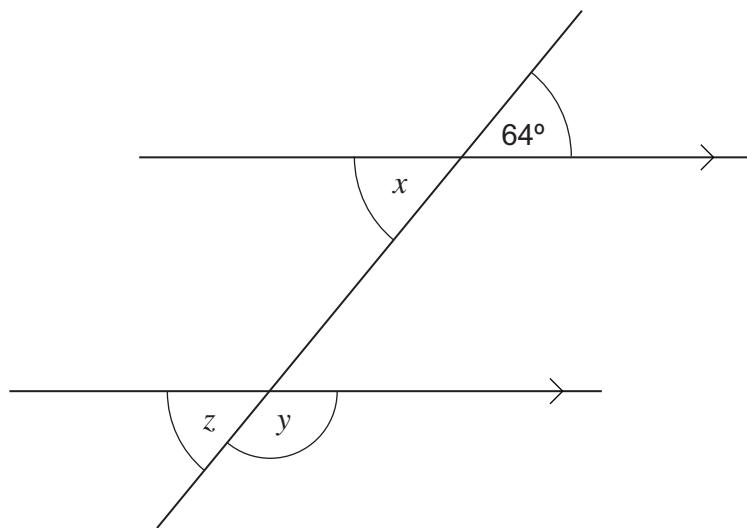
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Answer **all** questions in the spaces provided.

1

64°

x

Not drawn accurately

z *y*

1 (a) Write down the size of angle *x*.

Answer .... degrees   *(1 mark)*

1 (b) Work out the size of angle *y*.

....

Answer .... degrees   *(1 mark)*

1 (c) Choose the correct word from the list to complete the sentence.

opposite   **alternate**   **corresponding**   **interior**

Angle *x* and angle *z* are .... angles.

(1 mark)

3

Turn over ▶
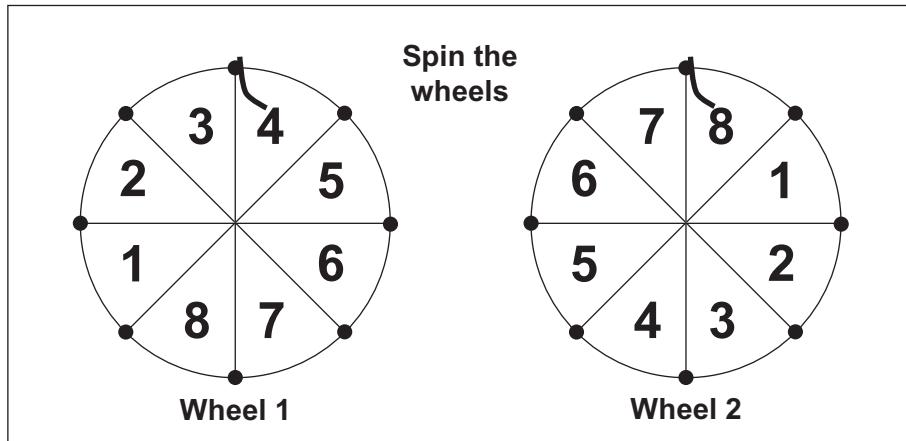
2 In a game, players spin two wheels.
The wheels are fair.

The numbers are added to get a score.
The wheels show a score of 4 + 8 = 12

Spin the wheels

Wheel 1

Wheel 2

You may use the grid below to help you answer the questions on the next page.

Wheel 2

+	1	2	3	4	5	6	7	8
1								
2								
3								
4								12
5								
6								
7								
8								

Wheel 1

2 (a)   What is the most likely score?

....

....

Answer ....   *(2 marks)*

2 (b)

Score
2, 3, 15 or 16
to win a prize

Work out the probability of winning a prize.

....

....
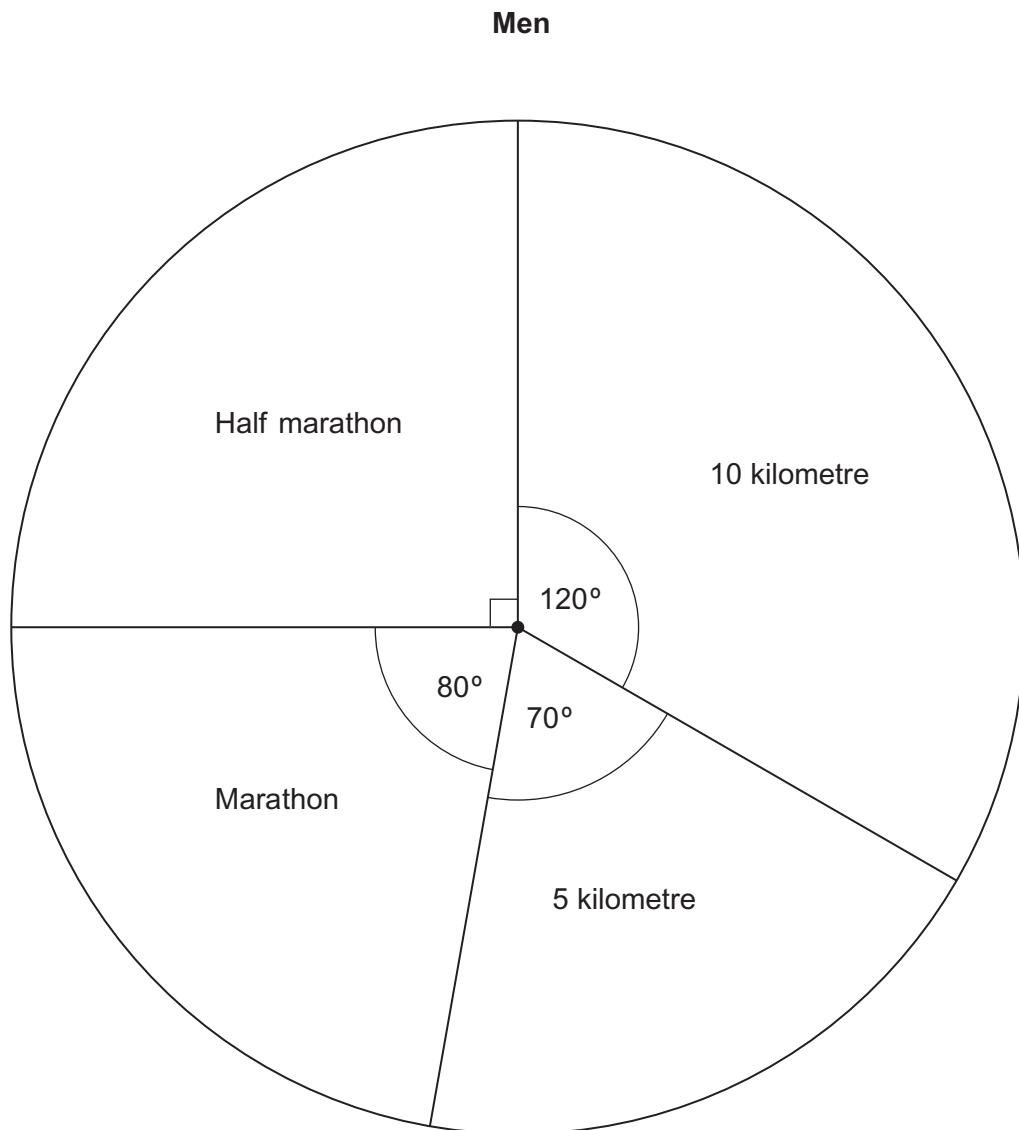
Answer ....   *(3 marks)*

Turn over for the next question

3   There are 36 men in a running club.

The pie chart shows information about their favourite races.

Men

Half marathon

10 kilometre

120°

80°

70°

Marathon

5 kilometre

There are 20 women in the running club.
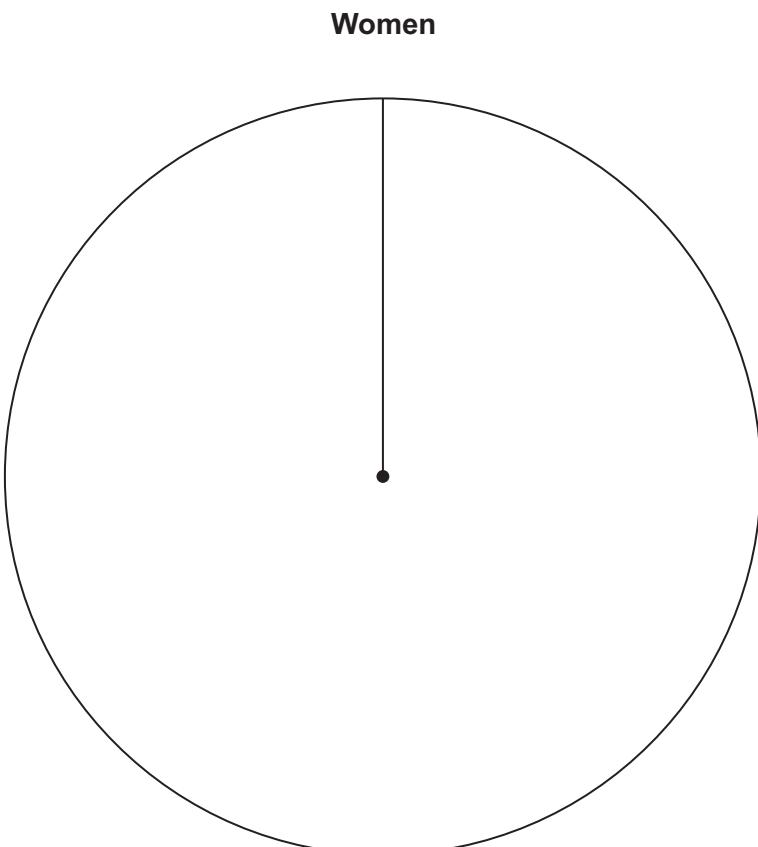
Here is information about their favourite races.

The same **proportion** of women prefer the half marathon as men.

The same **number** of women prefer 5 km races as men.

Equal numbers of women prefer 10 km races and the marathon.

Use this information to draw a fully labelled pie chart to show the favourite races of the women.

Women
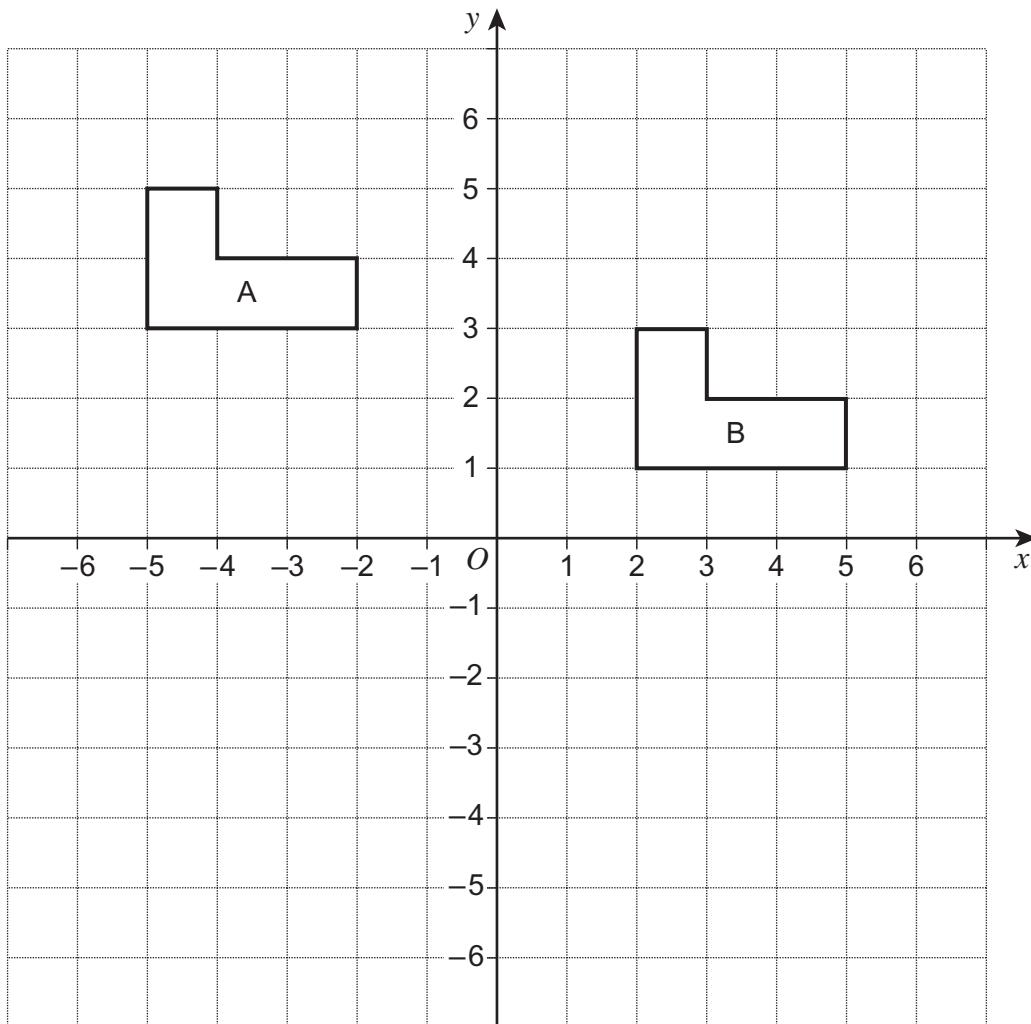
(4 marks)

Turn over ▶

4

4 (a) Describe fully the **single** transformation that maps shape A to shape B.

....

....

(2 marks)

4 (b) Draw the reflection of shape B in the line $y = -1$

(2 marks)

5   Solve $9x - 3 = 4x + 17$

....

....

....

....

$x =$ .... *(3 marks)*

6 (a)   Factorise $7x - 21$

Answer .... *(1 mark)*

6 (b)   Multiply out $4(y + 9)$

Answer .... *(1 mark)*

7   Expand and simplify $5(x - 3) - 2(x - 1)$

....

....

....

Answer .... *(3 marks)*

12

Turn over ▶
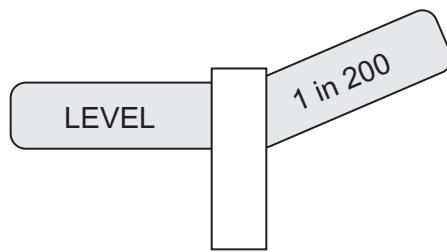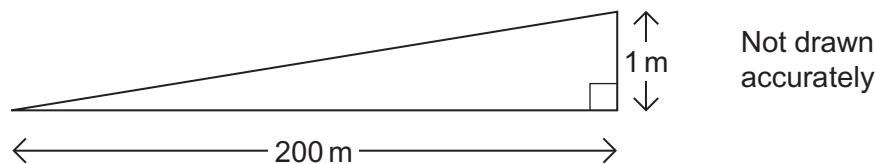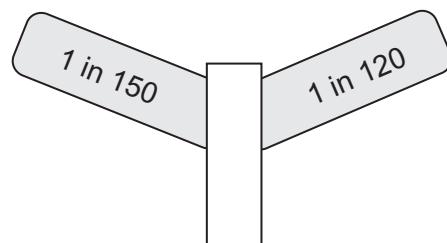
8 The steepness of a railway track is shown by signs like this.

On the left of the sign the track is level.
On the right of the sign the track rises 1 metre for every 200 metres travelled horizontally.

Not drawn accurately

1 m

200 m

*8 (a)

Which side of this sign shows the steeper track?
Show clearly how you decide.

You may use a diagram to explain your answer.

....

....

....

(2 marks)
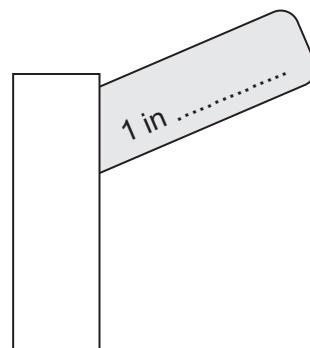
8 (b)   The steepness can also be measured as a percentage.

For example   1 in 200   would be $\frac{1}{200} \times 100 = 0.5\%$

The steepest railway line in Britain has a percentage of 2.5%.

Fill in this sign to show a steepness of 2.5%.

1 in ....
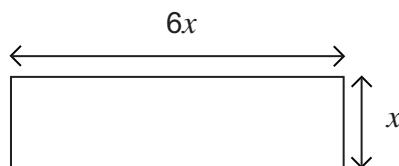
(2 marks)

Turn over for the next question

Turn over ▶
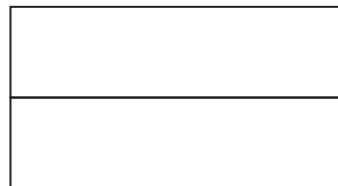
9   The length of this rectangular tile is 6 times the width.

$6x$

x

Not drawn
accurately

Two tiles are put together to make this shape.

Not drawn
accurately

The perimeter of the new shape is 24 cm.

Work out the width of **one** tile.

....

....

....

....

....

....

        Answer .... cm   *(3 marks)*
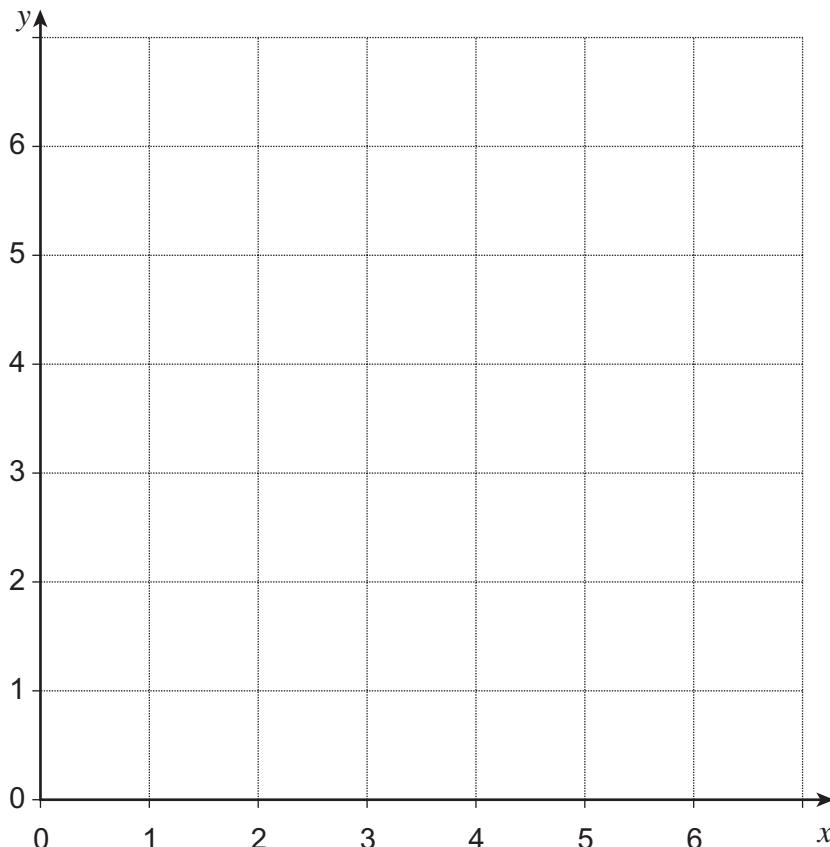
10 On the grid draw lines to show the region satisfied by the three inequalities.

$$x \leqslant 4$$

$$y \leqslant x$$

$$x + y \geqslant 4$$

Label the region clearly with the letter R.

(3 marks)
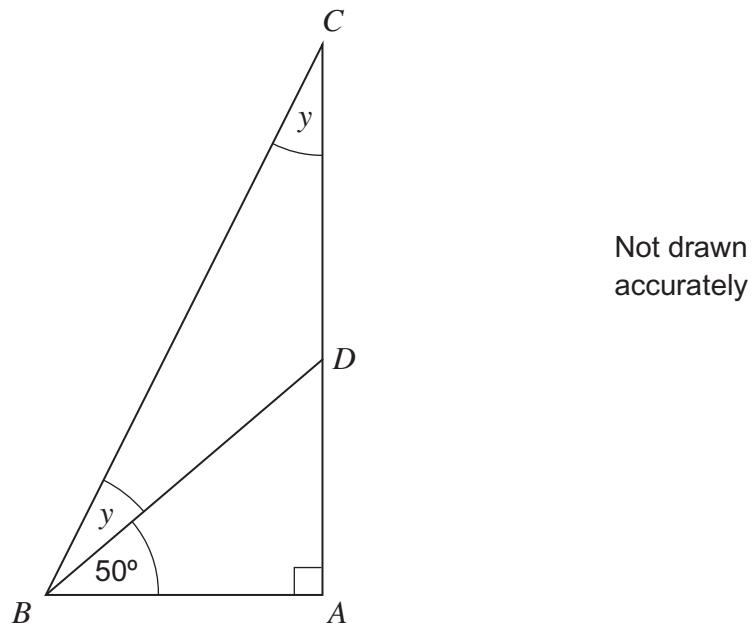
11 (a) *ABC* is a right-angled triangle.

Not drawn accurately
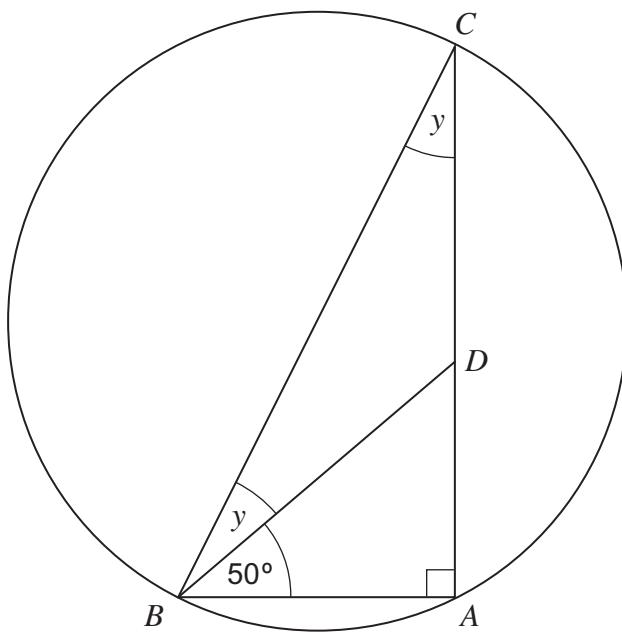
Work out the size of angle *y*.

....

....

....

....

....

....

Answer .... degrees   *(3 marks)*

*11 (b)   A circle is drawn around ABC.
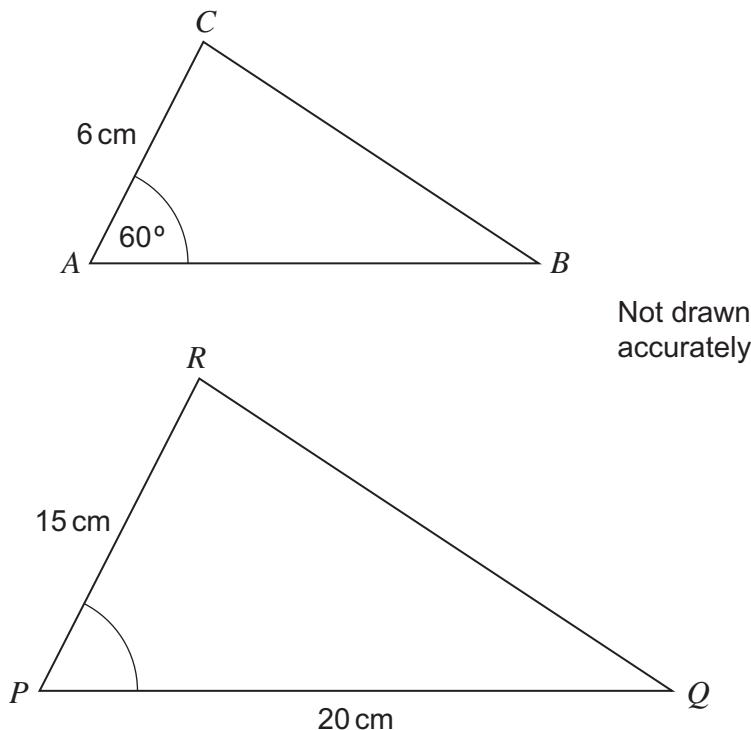
Not drawn accurately

Give a reason why BC is a diameter of the circle.

....

....

(1 mark)

Turn over for the next question

4

Turn over ▶

12   *PQR* is an enlargement of *ABC*.

C

6 cm

60°

A   B

Not drawn
accurately

R

15 cm

P

20 cm   Q

12 (a)   Work out the scale factor of the enlargement.

....

Answer ....   *(1 mark)*

12 (b)   Write down the size of angle *P*.

Answer .... degrees   *(1 mark)*
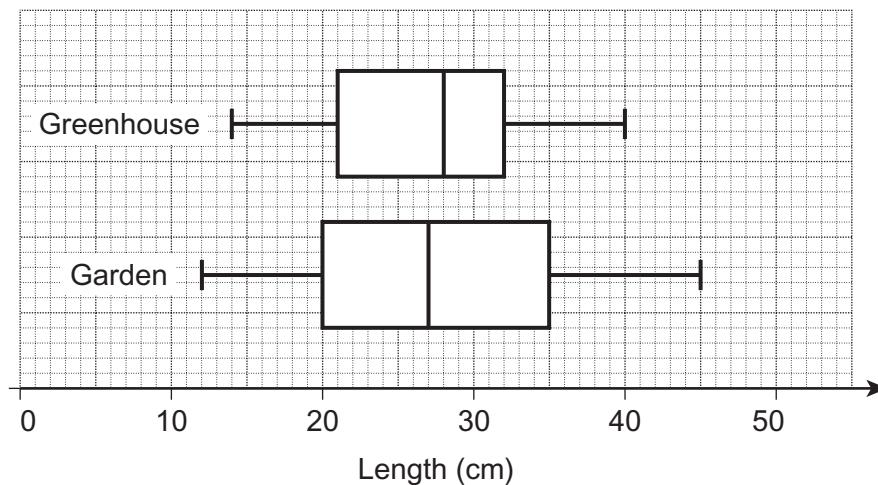
12 (c)   Work out the length *AB*.

....

....

Answer .... cm   *(2 marks)*

13 Cucumbers are grown in a greenhouse or in a garden.
The box plots show data about their lengths, in centimetres.

13 (a) Write down the median length of the cucumbers grown in the garden.

Answer .... cm   *(1 mark)*

13 (b) Give **two** comparisons between the lengths of cucumbers grown in the greenhouse and cucumbers grown in the garden.

Comparison 1 ....

....

....

Comparison 2 ....

....

....

(3 marks)

8

Turn over ▶

14 (a) Factorise $x^2 - 9$

....

Answer .... *(1 mark)*

14 (b) Hence, simplify fully $\dfrac{x^2 - 9}{2x^2 - 5x - 3}$

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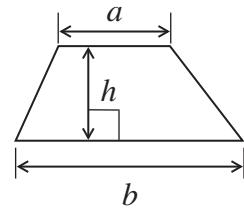
Answer .... *(3 marks)*

15   The area of a trapezium is given by the formula

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

15 (a)   For a trapezium, a = 5 cm, b = 8 cm and h = 6 cm

All measurements are given to the nearest centimetre.

Work out the minimum possible area.

....

....

....

....

Answer .... cm^2 *(3 marks)*

15 (b)   Rearrange $A = \frac{1}{2}(a + b)h$ to make h the subject.

....

....

....

Answer ....   *(2 marks)*

9

Turn over ▶

16 The manager of a company wants to survey his employees.

He decides to sample 20% of them, stratified by the type of job they do.

This table shows the number of employees.

Office staff	Drivers	Mechanics	**Total**
12	24	4	40

Fill in the table below to show how many of each group he should survey.

Office staff	Drivers	Mechanics

(3 marks)

17 Write $\sqrt{12} + \sqrt{75}$ in the form $a\sqrt{3}$ where a is an integer.

....

....

....

Answer .... *(2 marks)*

18 Write these numbers in order of size starting with the smallest.

You **must** show your working.

$$27^{\frac{2}{3}} \qquad\qquad 64^{\frac{1}{3}} \qquad\qquad 4^{\frac{3}{2}}$$

....

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....

....

Answer .... , ... , ... *(3 marks)*

Turn over ▶

8

19 *ABCD* is a triangular based pyramid.
The base *BCD* is a right-angled triangle.
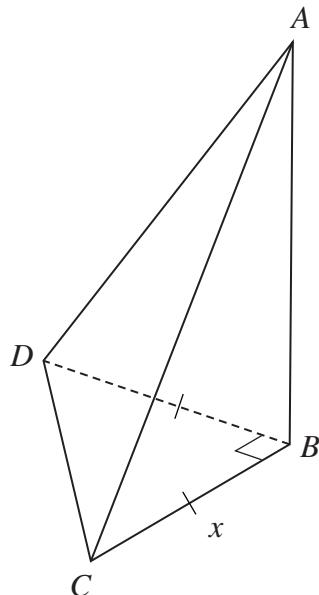
A is directly above *B*.
BC = *BD*
AB = 2 × *BC*
The volume of the pyramid is 72 cm^3.

The formula for the volume of a pyramid is $\frac{1}{3}$ × base area × height.

Calculate the length of *BC*, labelled *x* in the diagram.

....

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....

....

....

....

Answer .... cm   *(3 marks)*
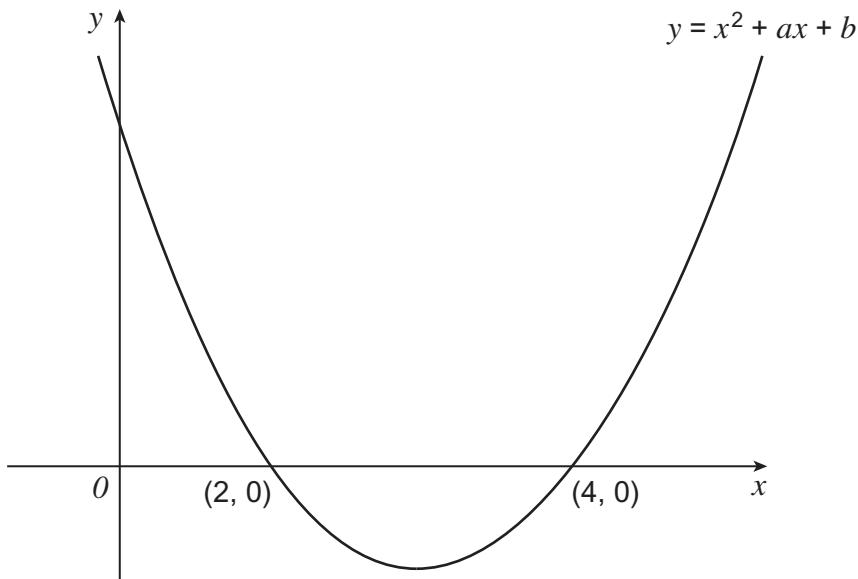
20 The diagram shows a sketch of the graph of $y = x^2 + ax + b$

The graph crosses the x-axis at (2, 0) and (4, 0).

Work out the value of b.
You **must** show your working.

....

....

....

....

....

....

$b =$ .... *(4 marks)*

END OF QUESTIONS

7

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED