Cambridge Assessment International Education

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1983691202

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/43**

Paper 4 (Extended) **October/November 2023**

2 hours 15 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use your calculator value.

INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

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Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

Curved surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

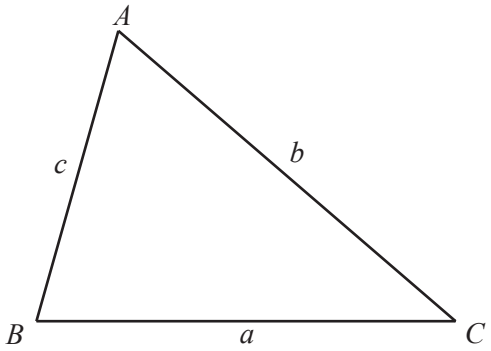
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cylinder of radius r, height h. $\quad V = \pi r^2 h$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



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

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

$$\text{Area} = \frac{1}{2}bc\sin A$$

Answer **all** the questions.

1 **(a)** In 1911 the men's world record for the triple jump was 15.52 m.
In 2021 the record was 18.29 m.

Find 15.52 m as a percentage of 18.29 m.

..... % [1]

(b) In 2021 the women's world record for running 800 m was 1 minute 53 seconds.

Find the average speed for this run in m/s.

.....m/s [2]

(c) In 2021 the men's world record speed for running 100 m was 37.58 km/h.

Find the time taken, in seconds, for this run.

.....s [3]

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2 These are Sunni's last 12 scores in a game.

7 17 4 20 15 12 11 16 6 18 9 20

(a) Find

(i) the mode

..... [1]

(ii) the median

..... [1]

(iii) the mean

..... [1]

(iv) the range

..... [1]

(v) the upper quartile.

..... [1]

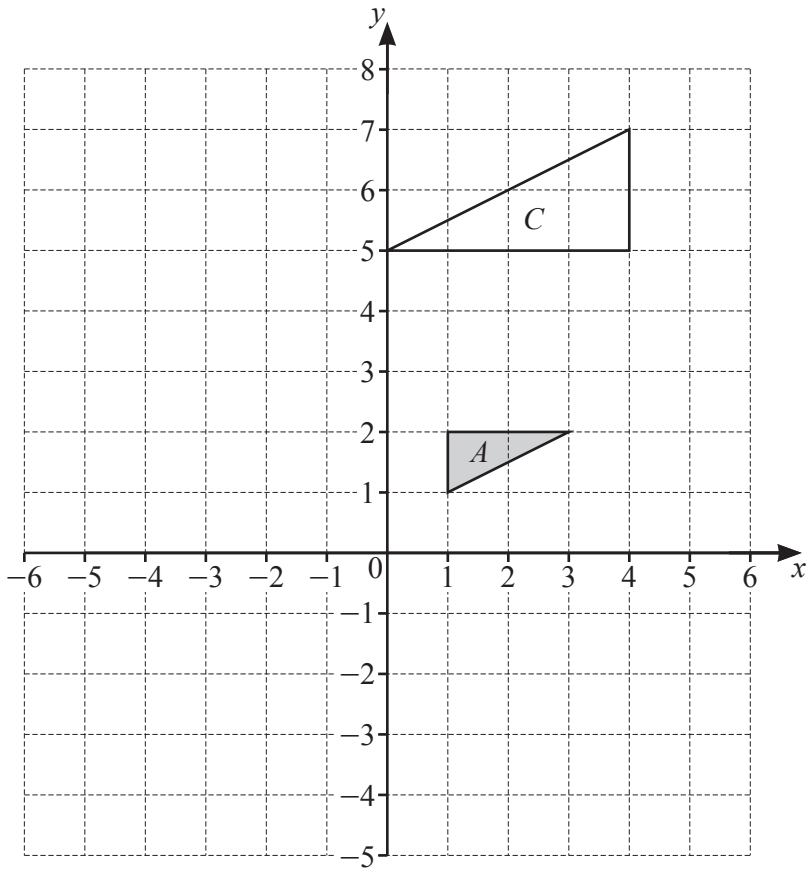
(b) Explain why the mode is not the best measure of average to represent Sunni's scores.

.....

..... [1]

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3



(a) Translate triangle A by the vector $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$. Label the image B. [2]

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

.....

..... [3]

(c) **(i)** Triangle D is the image of triangle A after a reflection in the line $y = -1$ followed by a rotation, 90° clockwise, about the point $(1, -1)$.

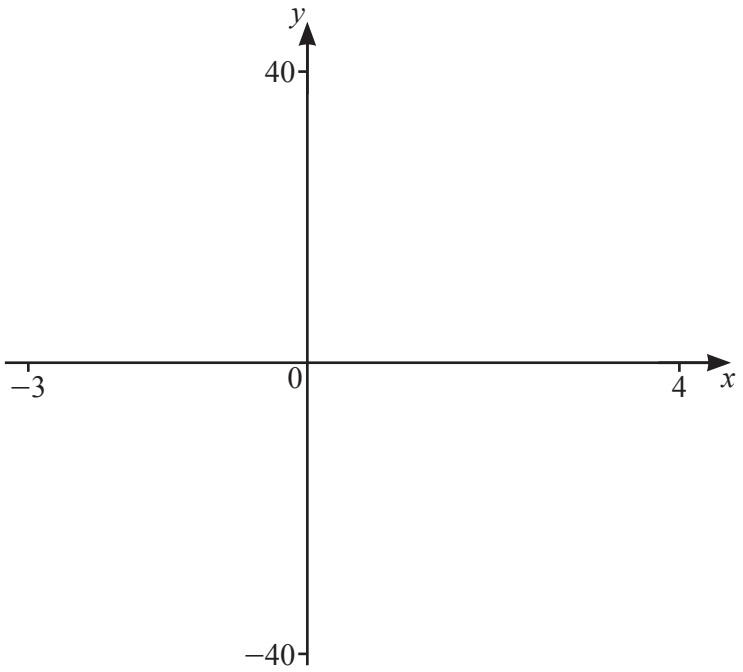
Draw and label triangle D. [4]

(ii) Describe fully the **single** transformation that maps triangle A onto triangle D.

.....

..... [2]

4



$f(x) = 2x^3 - 3x^2 - 12x + 7 \quad \text{for} \quad -3 \leqslant x \leqslant 4$

(a) Sketch the graph of $y = f(x)$. [2]

(b) Solve $f(x) = 0$.

..... [3]

(c) Find the values of k for which $f(x) = k$ has exactly two solutions.

$k =$ ..... or $k =$ ..... [2]

(d) Find the range of values of x for which the gradient of $f(x)$ is negative.

..... [2]

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5 A museum records the value of a picture every 5 years.
The picture increases in value by 60% **every 5 years**.
The value the museum recorded in 2020 was $20 000.

(a) Calculate the value recorded in 2015.

$ ..... [2]

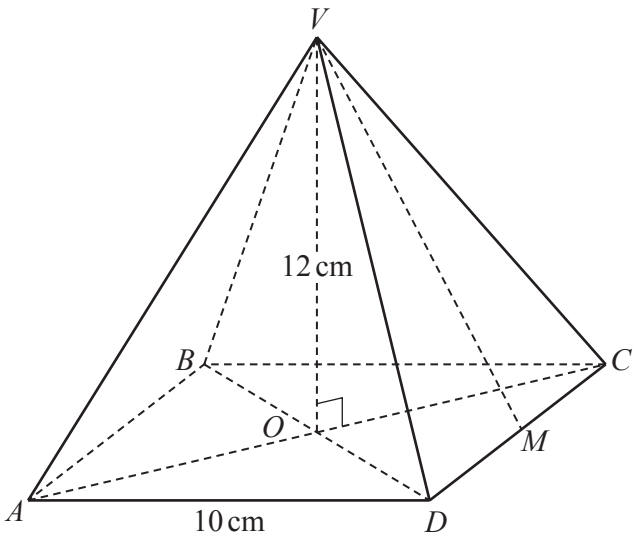
(b) Show that the value recorded in 2040 will be $131 072 .

[1]

(c) Calculate the year in which the value recorded will first be over $1 000 000.

..... [4]

6



NOT TO SCALE

VABCD is a square-based pyramid.
V is vertically above the centre of the base *O*.
$AD = 10\,\text{cm}$ and $VO = 12\,\text{cm}$.

(a) (i) Calculate the volume of the pyramid.

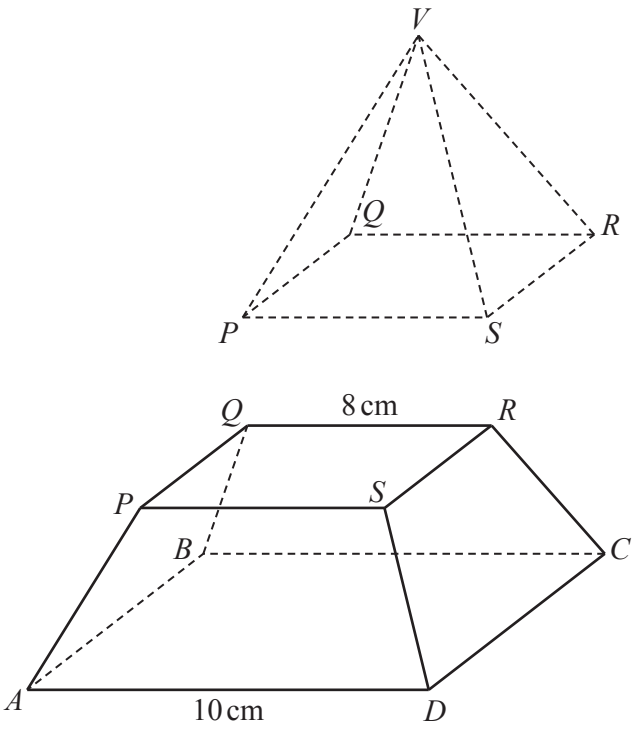
..... cm^3 [2]

(ii) *M* is the mid-point of *CD*.

Show that $VM = 13\,\text{cm}$.

[2]

(b)



NOT TO SCALE

A pyramid *VPQRS* is cut from the larger pyramid so that the face *PQRS* is parallel to the face *ABCD*.
$QR = 8\,\text{cm}$.

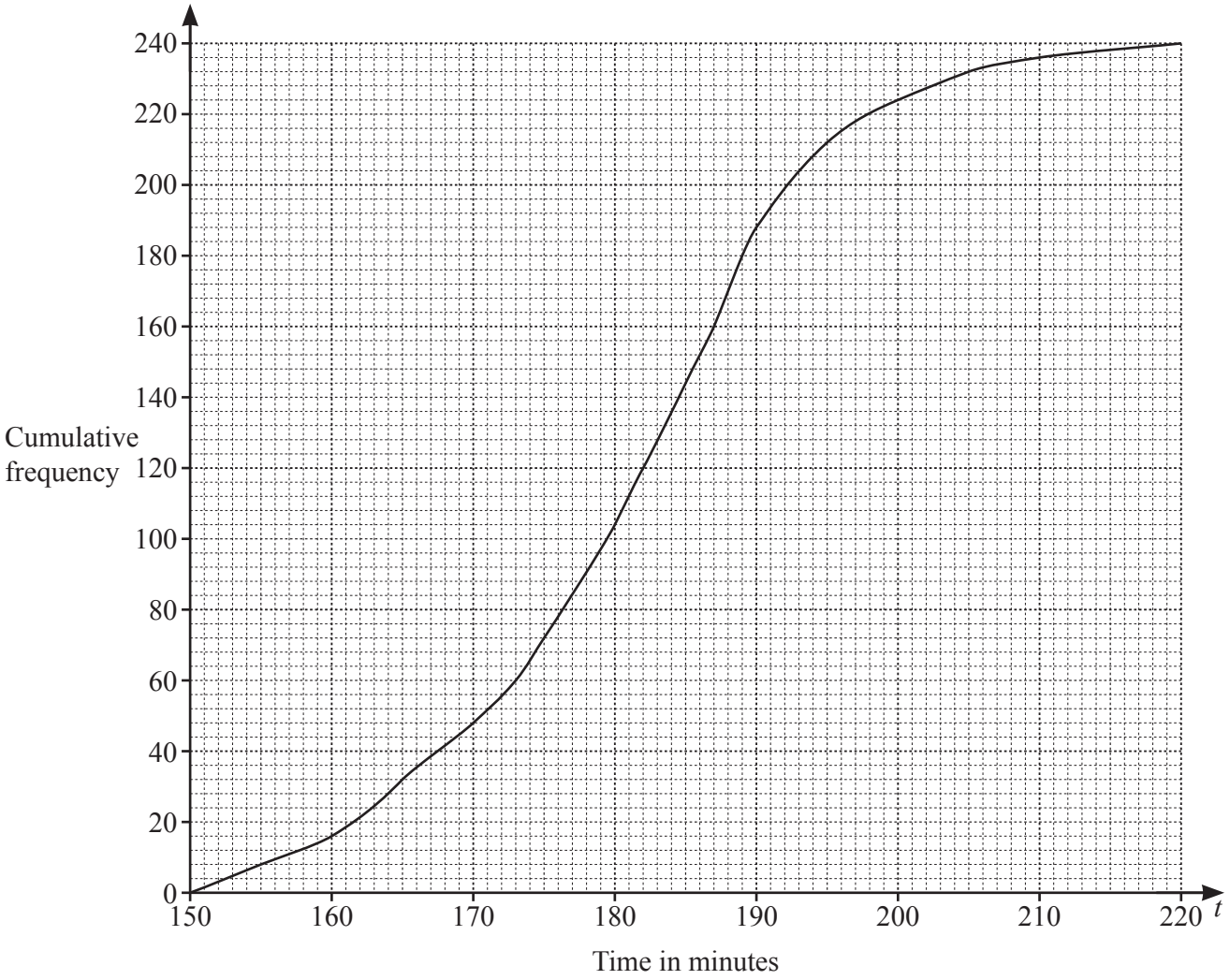
(i) Calculate the volume of the remaining solid, *ABCDPQRS*.

..... cm^3 [4]

(ii) Calculate the total surface area of the remaining solid.

..... cm^2 [4]

7 240 people take part in a marathon race.
The times, t minutes, they took for the race are shown in the cumulative frequency curve.



(a) Use the curve to estimate

(i) the median time

..... min [1]

(ii) the interquartile range.

..... min [2]

(b) The fastest 20% of the runners are awarded a medal.

Use the curve to estimate the longest time taken by a runner who received a medal.

..... min [2]

(c) Use the curve to complete the frequency table.

Time, t minutes	$150 < t \leqslant 160$	$160 < t \leqslant 170$	$170 < t \leqslant 180$	$180 < t \leqslant 190$	$190 < t \leqslant 200$	$200 < t \leqslant 210$	$210 < t \leqslant 220$
Frequency	16	32					

[2]

(d) Use the table in **part (c)** to calculate an estimate of the mean time.

..... min [2]

8 **(a)** $v = u + at$

Find v when $u = 60$, $a = -32$ and $t = 3$.

$v =$ ..... [2]

(b) Solve.

(i) $6x + 2 = 9 - 4x$

$x =$ ..... [2]

(ii) $|2x - 3| = 7$

..... [3]

(c) Solve by factorisation.

$3x^2 - 11x + 6 = 0$

$x =$ ..... or $x =$ ..... [2]

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(d) Rearrange $y = \frac{ax+3b}{5x}$ to make x the subject.

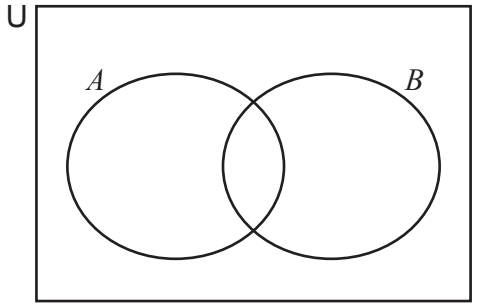
$x =$ ..... [3]

(e) Simplify.

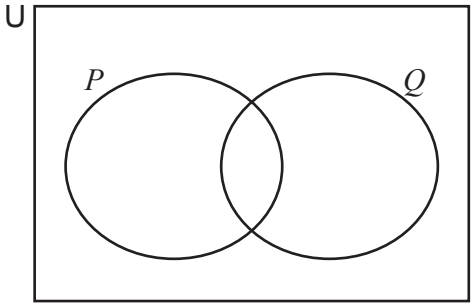
$$\frac{ax-2bx+3ay-6by}{x^2-9y^2}$$

..... [4]

9 **(a)** For each Venn diagram, shade the given set.



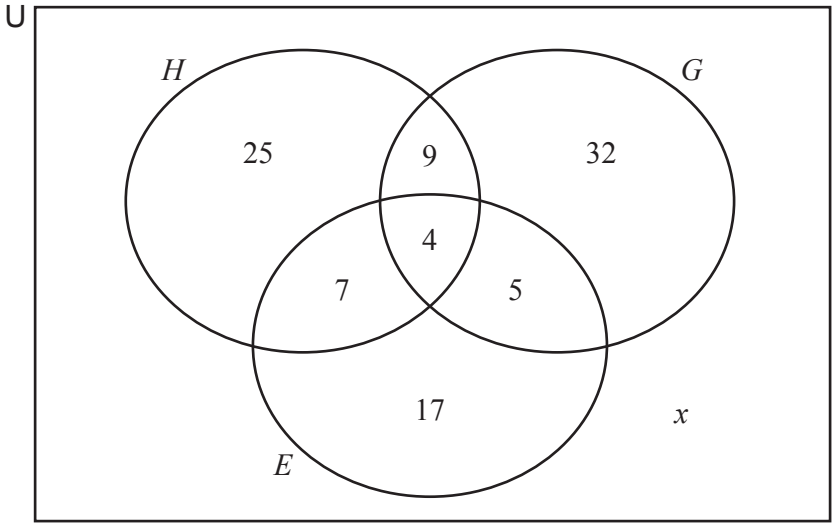
$A \cap B$



$P' \cup Q'$

[2]

(b) There are 120 students in a year group.
The Venn diagram below shows the number of students who study History (H), Geography (G) and Economics (E).



(i) Find the value of x.

..... [1]

(ii) One of the 120 students is chosen at random.

Find the probability that this student studies both History and Geography.

..... [1]

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(iii) Two of the students who study Economics are chosen at random.

Find the probability that one of these students also studies Geography but not History and the other student also studies History but not Geography.

..... [3]

(iv) Three of the 120 students are chosen at random.

Find the probability that two students study exactly two of the subjects and the other student studies all three subjects.

..... [3]

10 $f(x) = 4x - 1$ $g(x) = 3 - 2x$ $h(x) = 4(2 - x)$

(a) (i) Find $g(-3)$.

..... [1]

(ii) Find f(h(4)).

..... [2]

(iii) Find $g(f(x))$.
Give your answer in its simplest form.

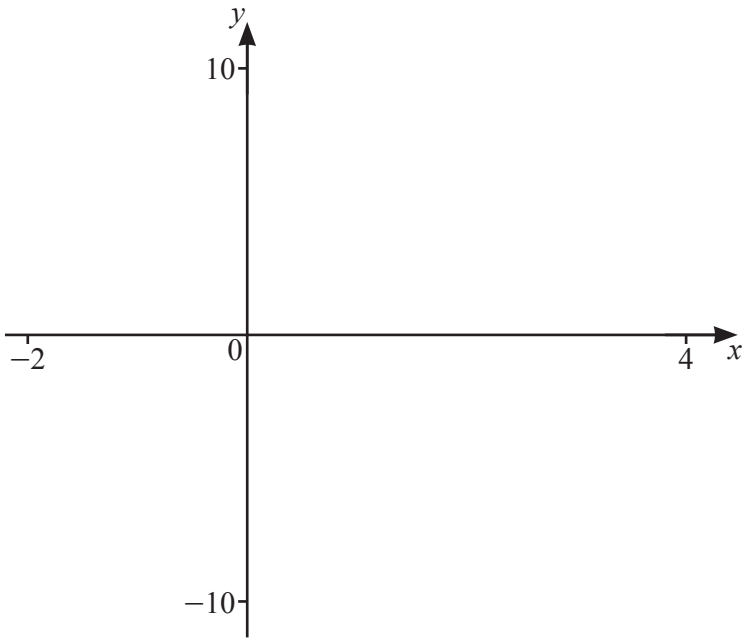
..... [2]

(iv) Find $h^{-1}(x)$.

$h^{-1}(x) =$ ..... [2]

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(b) (i) Sketch the graph of $y = \dfrac{f(x)}{g(x)}$ for values of x between -2 and 4.



[3]

(ii) Write down the equation of the asymptote which is parallel to the y-axis.

..... [1]

(iii) Use the graph to solve $h(x) = \dfrac{f(x)}{g(x)}$.

$x =$ ..... or $x =$ ..... [3]

(iv) $h(x) = \dfrac{f(x)}{g(x)}$ can be rearranged to the form $ax^2 + bx + c = 0$.

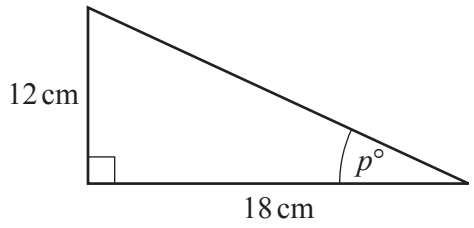
Find the value of a, the value of b and the value of c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

11 (a)

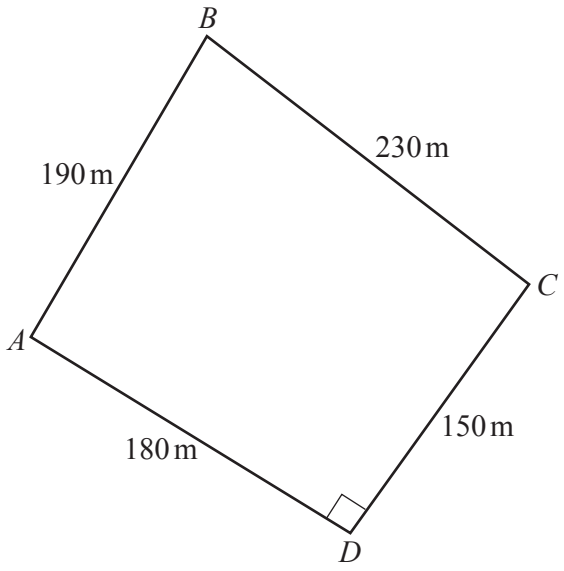


NOT TO SCALE

Calculate the value of p.

$p =$ ..... [2]

(b)



NOT TO SCALE

(i) Show that angle $ABC = 67.0°$ correct to 1 decimal place.

[4]

(ii) Calculate the shortest distance from A to the side BC.

..... m [3]

Question 12 is printed on the next page.

12 **(a)** Find the coordinates of the point where the line $y = 3x + 7$ crosses

(i) the y-axis

(..... , ...) [1]

(ii) the line $y = 2$.

(..... , ...) [2]

(b) A is the point $(-5, 8)$ and B is the point $(1, -2)$.

Find the equation of the perpendicular bisector of AB.

..... [5]

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