Cambridge Assessment International Education

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6483893081

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **May/June 2022**

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. Any blank pages are indicated.

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[Turn over

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. $\quad A = \pi rl$

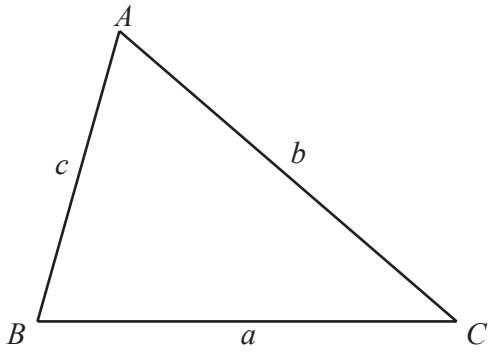
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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. $\quad V = \frac{4}{3}\pi r^3$



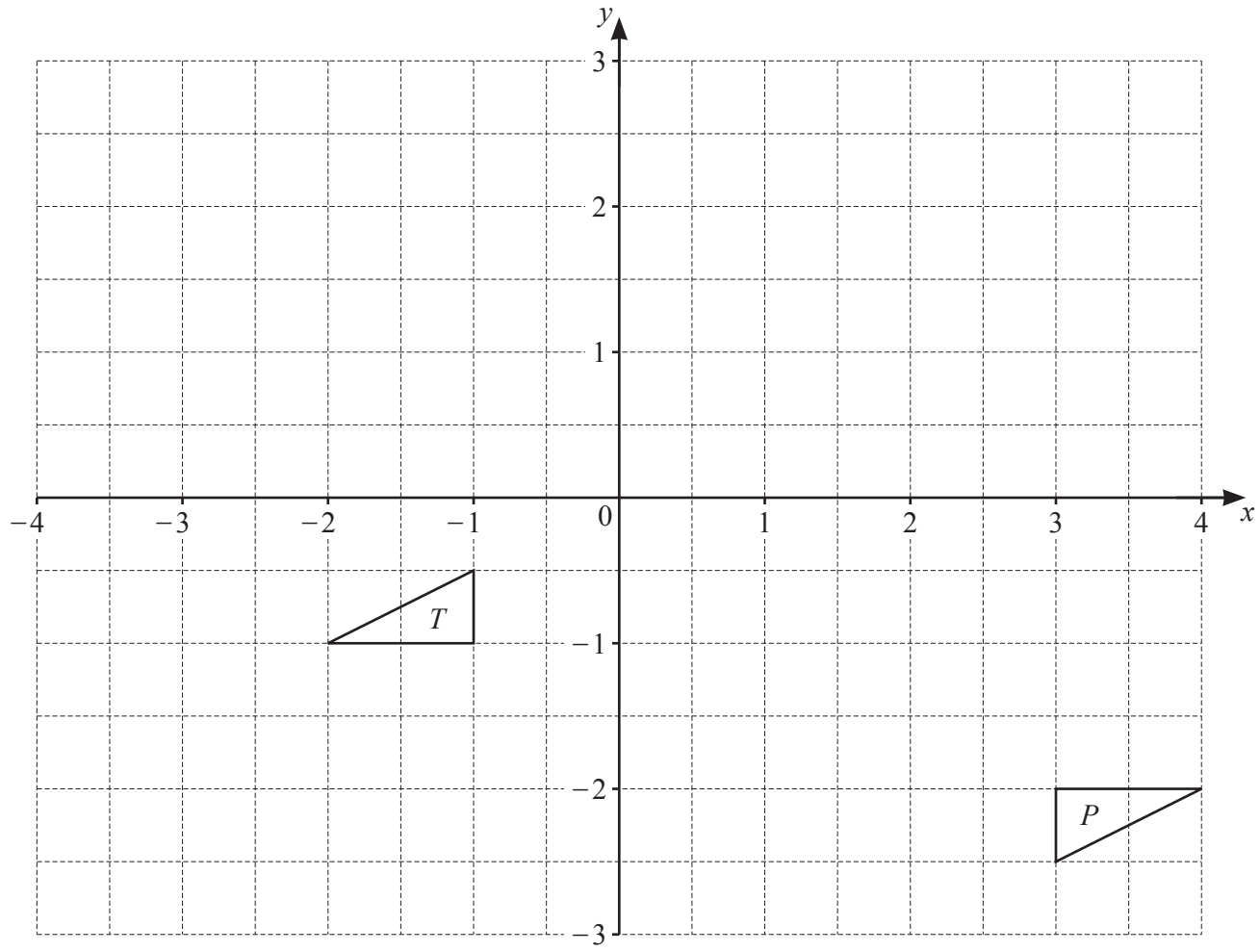
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



(a) Translate triangle T by the vector $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$. [2]

(b) Reflect triangle T in the line $y = 0.5$. [2]

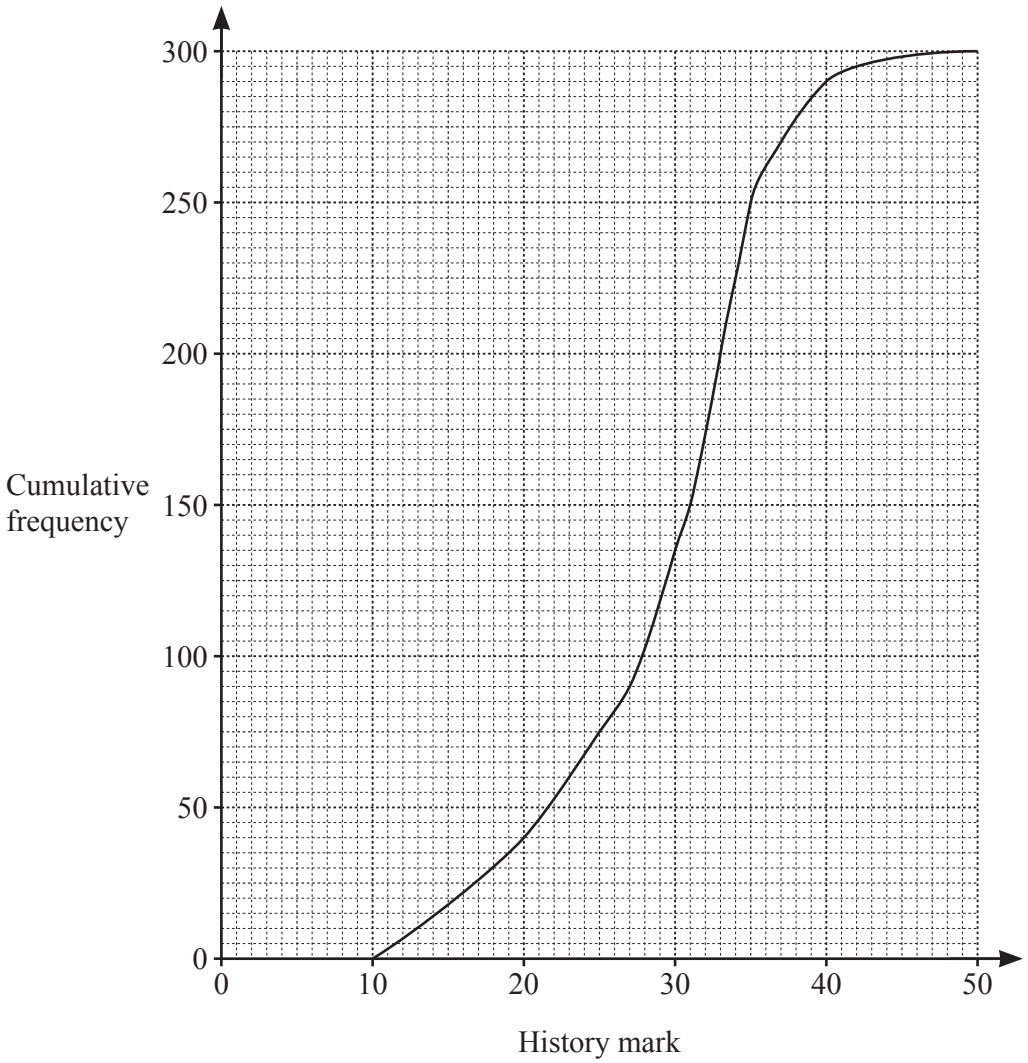
(c) Describe fully the **single** transformation that maps triangle P onto triangle T.

.....

..... [3]

(d) Enlarge triangle P with scale factor -2, centre $(3, -1)$. [2]

2 **(a)** The cumulative frequency curve shows the marks for 300 students in a history test.



(i) Find an estimate for the median.

..... [1]

(ii) Estimate the number of students with a mark of more than 20.

..... [2]

(iii) 70% of the students pass the test.

Find the pass mark.

..... [2]

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(b) The table shows the marks for 100 students in a geography test.

Mark m	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 40$	$40 < m \leqslant 50$
Frequency	2	28	57	13

Calculate an estimate of the mean.

..... [2]

(c) The table shows the marks for 9 students in chemistry and in physics.

Chemistry mark (x)	33	28	39	40	22	25	38	43	36
Physics mark (y)	45	32	26	49	18	36	29	40	35

(i) Find the equation of the regression line for y in terms of x.

$y =$ ..... [2]

(ii) What type of correlation is seen in this data?

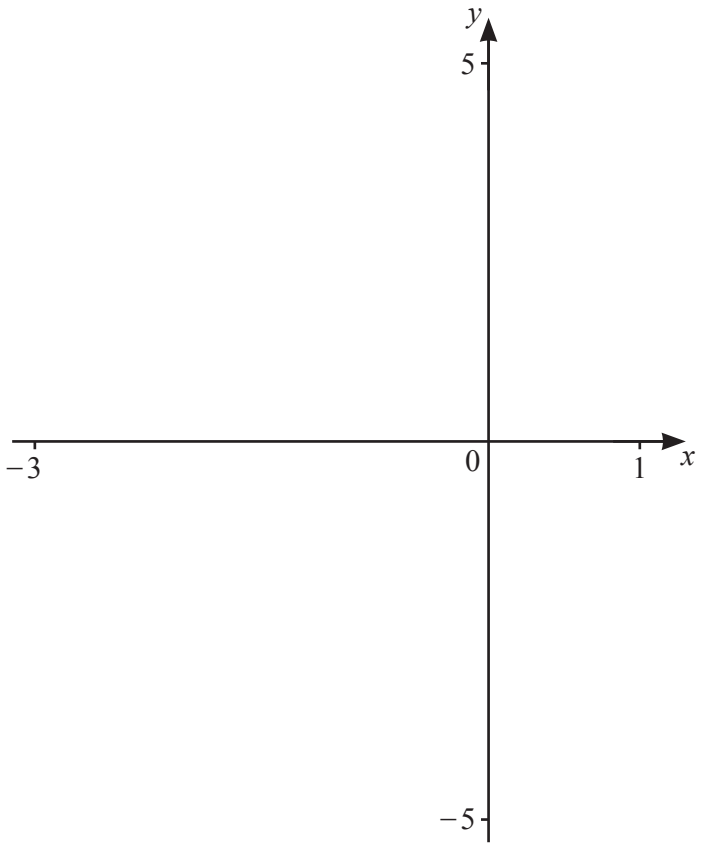
..... [1]

(iii) Use your answer to **part (c)(i)** to estimate the physics mark for a student with a mark of 30 in chemistry.

..... [1]

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3



$$f(x) = 2x + 4 - \frac{1}{x^2}$$

(a) On the diagram, sketch the graph of $y = f(x)$ for values of x between -3 and 1. [3]

(b) Write down the equation of the asymptote of the graph.

..... [1]

(c) Find the coordinates of the local maximum.

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

(d) $g(x) = x^3 - 5x$ for $-3 \leqslant x \leqslant 1$.

Solve $f(x) \leqslant g(x)$.

..... [4]

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4 **(a)** $216 is shared in the ratio 5 : 1.

Work out the larger share.

$ ..... [2]

(b) Luis shares some money between Ali, Betty and Clare in the ratio 3 : 4 : 6.
Ali receives $171.

Find the total amount of money Luis shared.

$ ..... [2]

(c) Farima invests $1400 in a savings account paying simple interest at a rate of 2.5% per year.

Calculate the total amount in the account at the end of 3 years.

$ ..... [3]

(d) Emir invests $3000 at a rate of 2% per year compound interest.

(i) Calculate the value of Emir's investment at the end of 4 years.

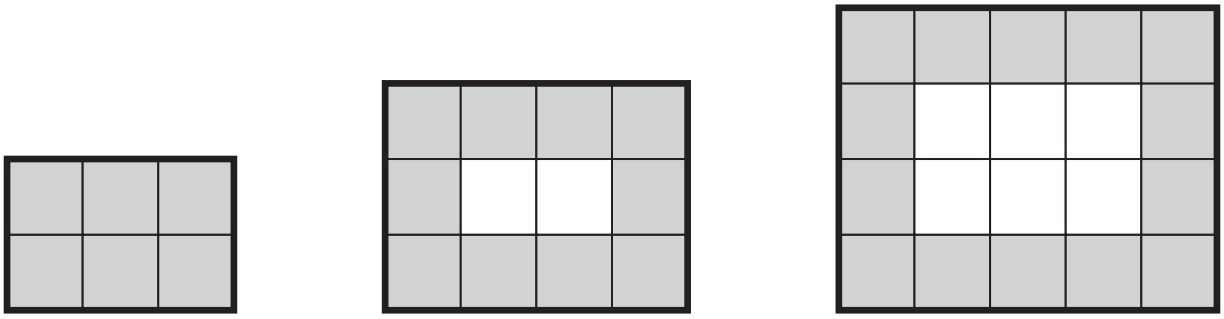
$ ..... [2]

(ii) Find the number of complete years until Emir's investment is first worth more than $4000.

..... [4]

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5 A sequence of patterns is made using grey tiles and white tiles.



Pattern 1 Pattern 2 Pattern 3

(a) Complete the table.

Pattern number	1	2	3	4		n
Number of grey tiles	6	10				
Number of white tiles	0	2				

[6]

(b) Find and simplify an expression for the total number of tiles in Pattern n.

..... [1]

(c) Pattern k has a total of 600 tiles.

Find the number of grey tiles in Pattern k.

..... [4]

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(d) The tiles in a pattern are put in a bag.

The probability of taking a grey tile from the bag at random is $\frac{5}{12}$.

A tile is taken from the bag at random and replaced.
This is repeated 3 times.

Find the probability that all 3 tiles are white.

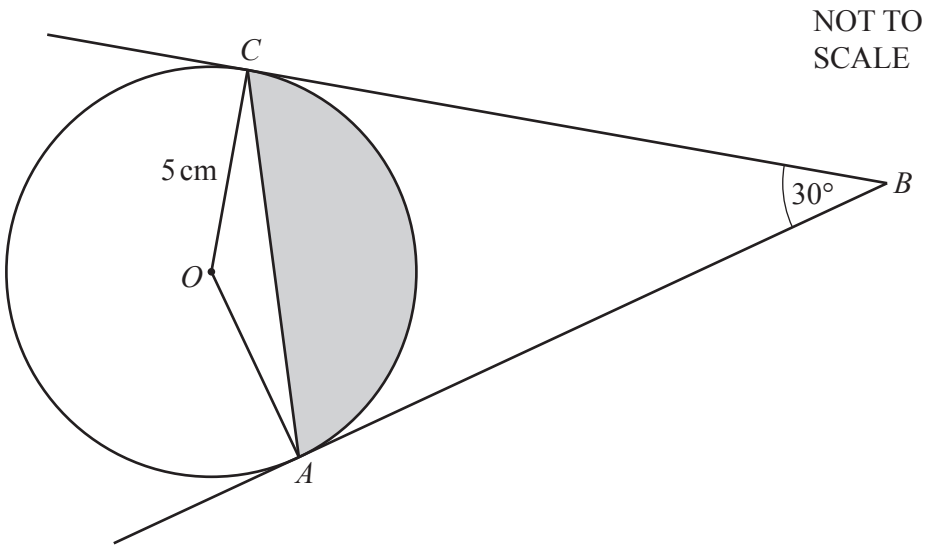
..... [2]

(e) All the grey tiles from Pattern 4 are put in a bag.
Two tiles are taken from the bag at random without replacement.

Find the probability that one tile came from a corner of the pattern and the other did not.

..... [3]

6 (a)

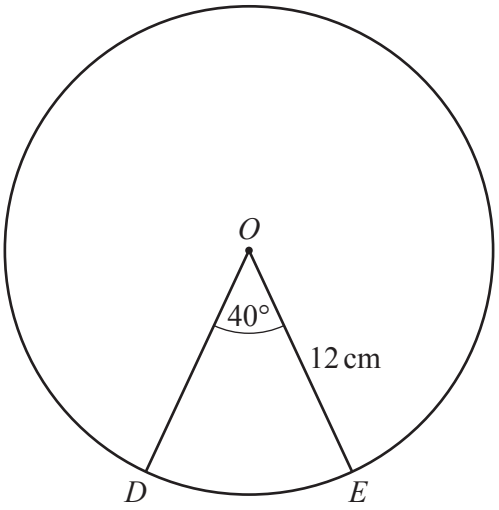


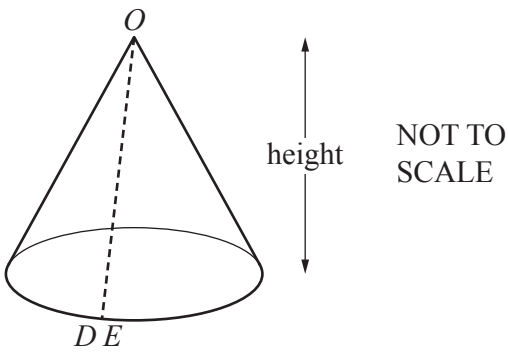
The diagram shows a circle, centre O, with radius 5 cm.
BA and BC are tangents to the circle at A and C.
Angle $ABC = 30°$.

Calculate the area of the shaded minor segment.

..... cm^2 [4]

(b)





The circle, centre O, has radius 12 cm.
Angle $DOE = 40°$.
The minor sector DOE is removed.
The major sector is formed into a cone by joining OD to OE.

Calculate the height of the cone.

..... cm [5]

7 Abbi makes wooden boards in three sizes, small, medium and large.
They are all cuboids.
The medium board has height 2 cm, width 23 cm and length 50 cm.

(a) Calculate the volume of the medium board.

..... cm^3 [2]

(b) The small board is mathematically similar to the large board.
The small board has a volume of 287.5 cm^3 and a height of 1.15 cm.
The large board has a volume of 18400 cm^3.

(i) Find the height of the large board.

..... cm [3]

(ii) Is the medium board mathematically similar to the large board?
Explain how you decide.

..... because .....

..... [3]

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8 **(a)** A is the point $(-11, 7)$ and B is the point $(8, -13)$.

Find the length of AB.

..... [3]

(b) P is the point $(2, -5)$ and Q is the point $(6, 11)$.
Line L is perpendicular to PQ and crosses PQ at point R.
The ratio $PR : RQ = 3 : 1$.

Find the equation of line L.

..... [6]

9 **(a)** $f(x) = 2x + 3$ $g(x) = 2 - 4x$ $h(x) = 3^x$

(i) Find f(5).

..... [1]

(ii) Find and simplify g(f(x)).

..... [2]

(iii) Find $g^{-1}(x)$.

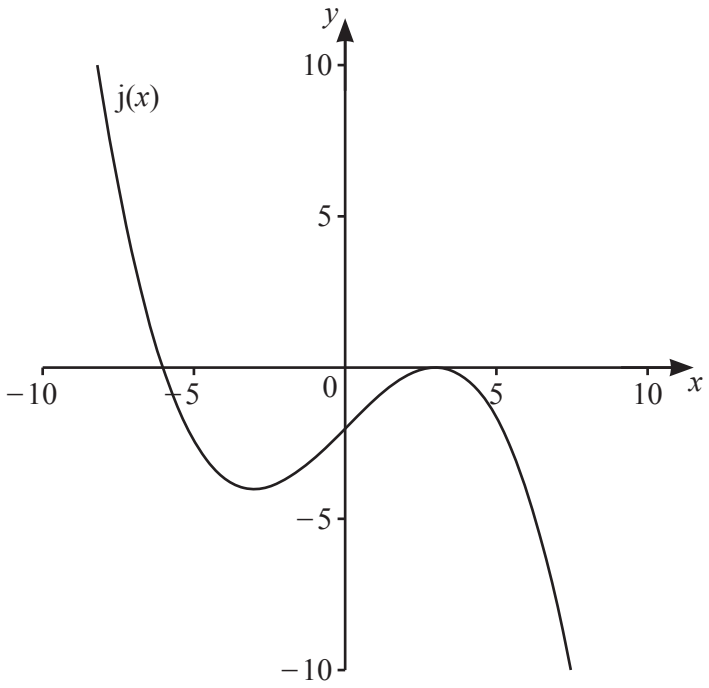
$g^{-1}(x) =$ ..... [2]

(iv) Solve $h(x) = 48$.

..... [2]

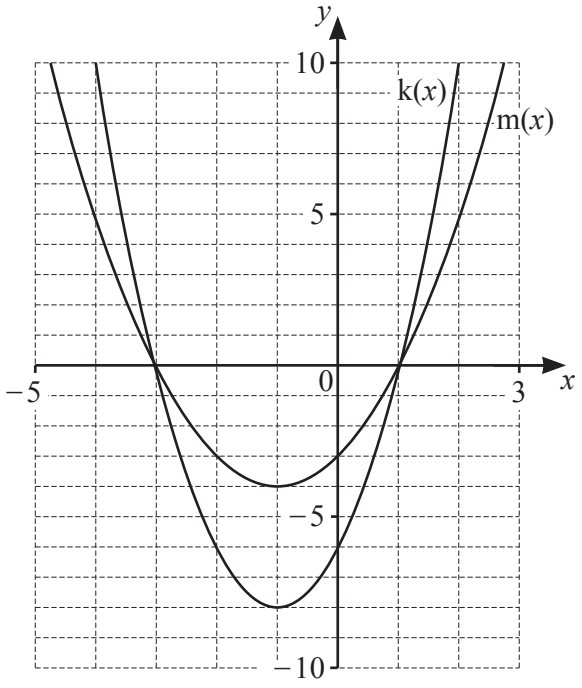
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(b) (i) The diagram shows a sketch of the graph of $y = \mathrm{j}(x)$.



On the same diagram, sketch the graph of $y = \mathrm{j}(x+2)$. [1]

(ii) The diagram shows the graphs of $y = \mathrm{k}(x)$ and $y = \mathrm{m}(x)$.



Write $\mathrm{k}(x)$ in terms of $\mathrm{m}(x)$.

$\mathrm{k}(x) =$ ..... [1]

10 **(a)** Simplify fully.

$$\frac{4x^2y}{3} \div \frac{x}{12y}$$

..... [2]

(b) Write as a single fraction in its simplest form.

$$\frac{1}{x-3} - \frac{x-3}{2}$$

..... [3]

(c) The nth term of a sequence is $an^2 + bn - 5$.
The second term of this sequence is -3 and the third term is 4.

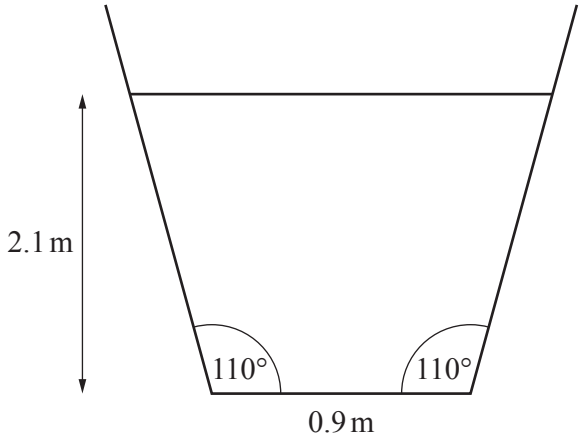
Find the value of a and the value of b.
You must show all your working.

$a =$ .....

$b =$ ..... [6]

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11



NOT TO SCALE

The diagram shows the symmetrical cross-section of a ditch containing water.
The angle between the base and each side of the ditch is 110°.
The width of the base is 0.9 m and the depth of the water is 2.1 m.
The ditch is 100 m long.

(a) Calculate the volume of water in the ditch.

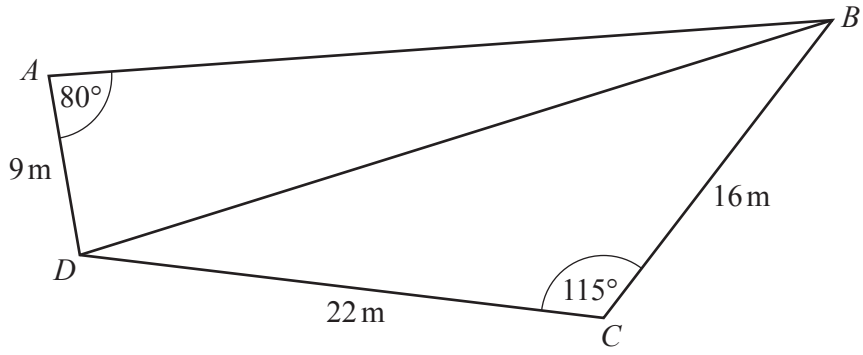
.....m^3 [4]

(b) On a different day, the ditch contains 300 m^3 of water.
Water is pumped out of the ditch at a rate of 4.2 litres per second.

Calculate the time taken to empty the ditch completely.
Give your answer in hours and minutes, correct to the nearest minute.

..... h ..... min [4]

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NOT TO SCALE

(a) Calculate the area of triangle *BCD*.

..... m^2 [2]

(b) Calculate angle *ADB*.

Angle *ADB* = ... [6]

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