



# Cambridge IGCSE™

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**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  $\pi$ , 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.

## Formula List

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

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

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

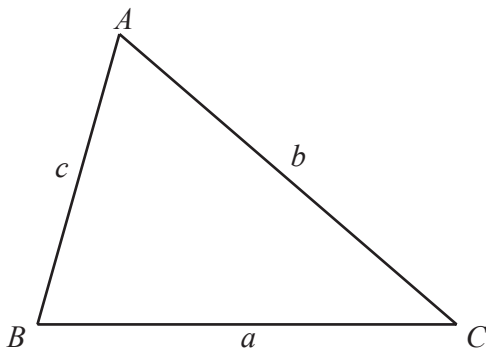
Curved surface area,  $A$ , of sphere of radius  $r$ .  $A = 4\pi r^2$

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

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

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

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



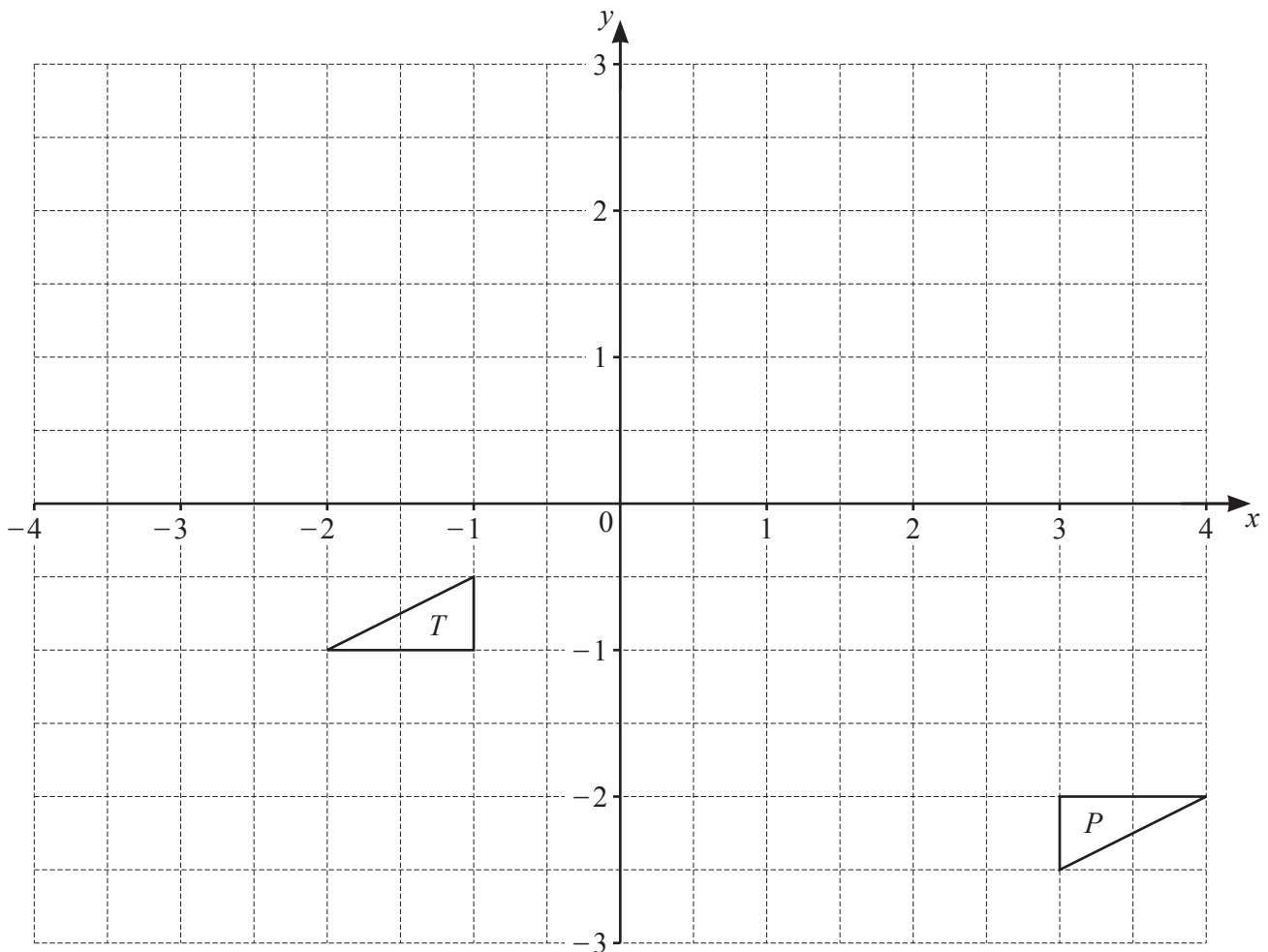
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



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

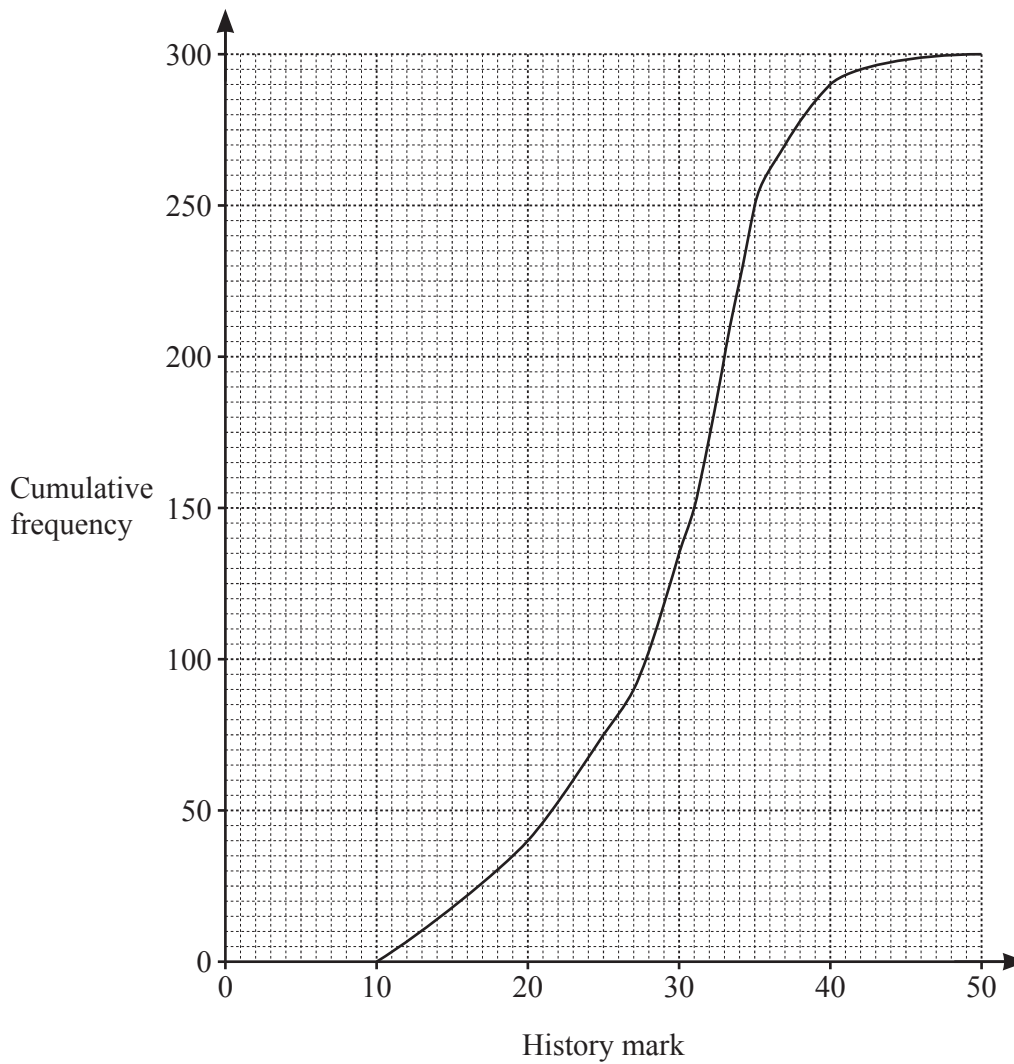
(b) Reflect triangle  $T$  in the line  $y = 0.5$ . [2]

(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]

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

Mark $m$	$10 < m \leq 20$	$20 < m \leq 30$	$30 < m \leq 40$	$40 < m \leq 50$
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  $x$ .

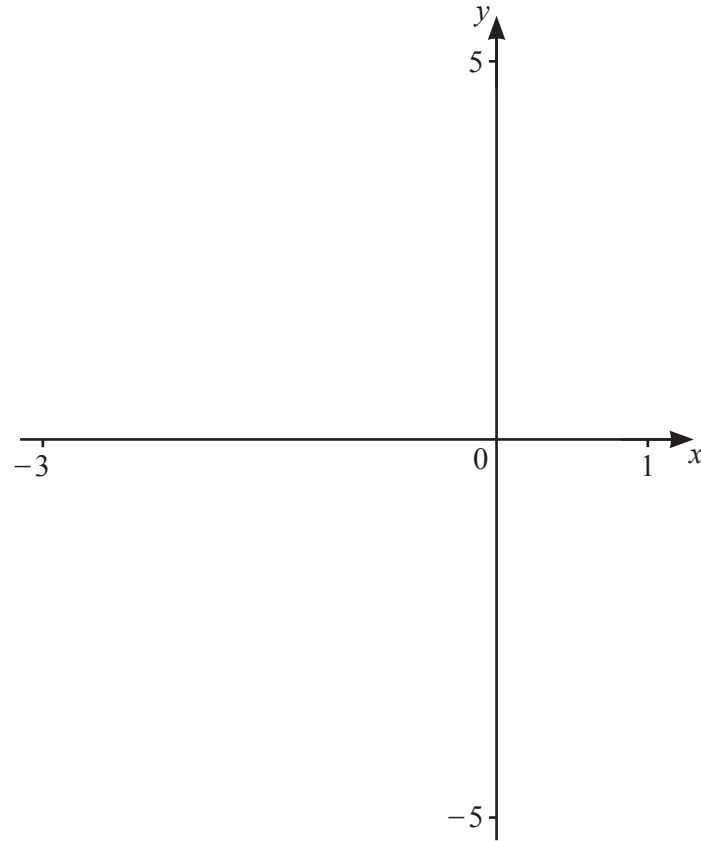
$y =$  ..... [2]

(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]



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

(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  $-3 \leq x \leq 1$ .

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

..... [4]

- 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.

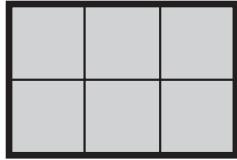
(i) Calculate the value of Emir's investment at the end of 4 years.

\$ ..... [2]

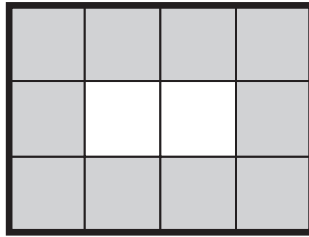
(ii) Find the number of complete years until Emir's investment is first worth more than \$4000.

..... [4]

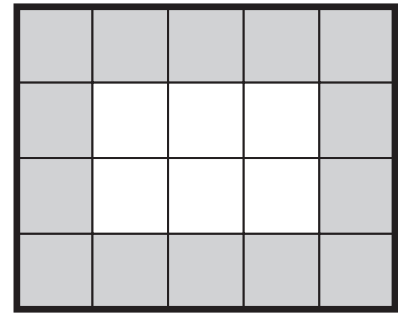
5 A sequence of patterns is made using grey tiles and white tiles.



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]



(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]

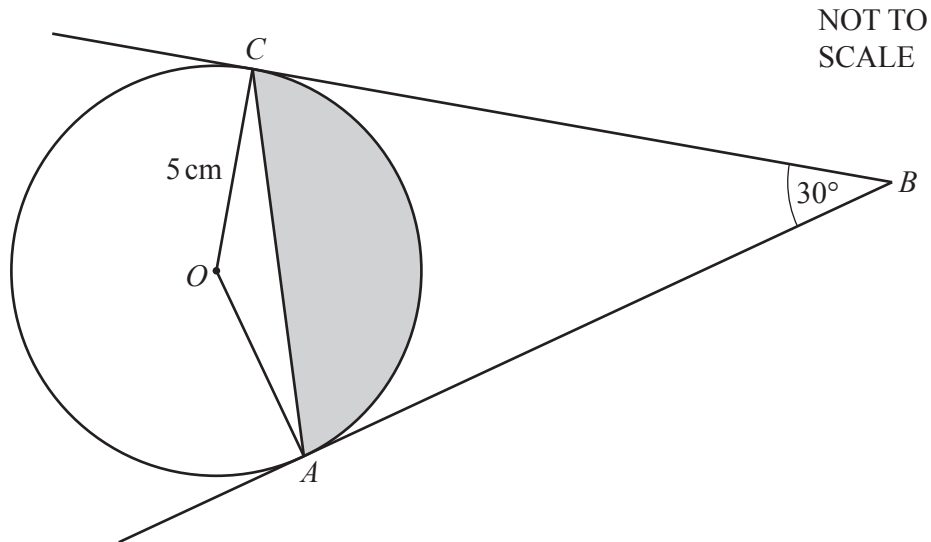
(e) All the grey tiles from Pattern 4 are put in a bag.

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)

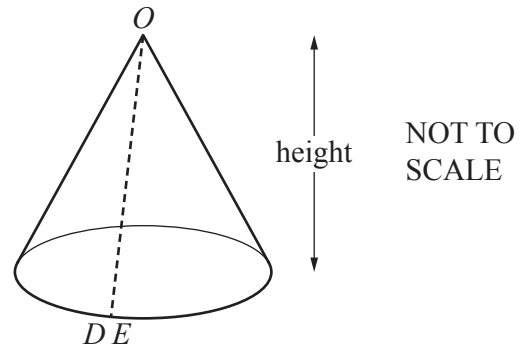
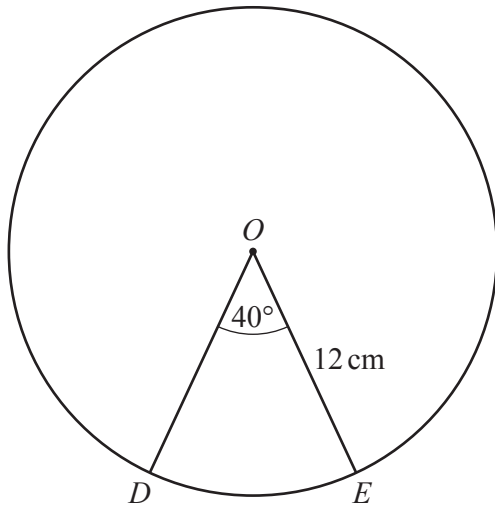


The diagram shows a circle, centre  $O$ , with radius  $5\text{ cm}$ .  
 $BA$  and  $BC$  are tangents to the circle at  $A$  and  $C$ .  
 Angle  $ABC = 30^\circ$ .

Calculate the area of the shaded minor segment.

.....  $\text{cm}^2$  [4]

(b)



The circle, centre  $O$ , has radius 12 cm.

Angle  $DOE = 40^\circ$ .

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.

.....  $\text{cm}^3$  [2]

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

(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]

- 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]

14

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]

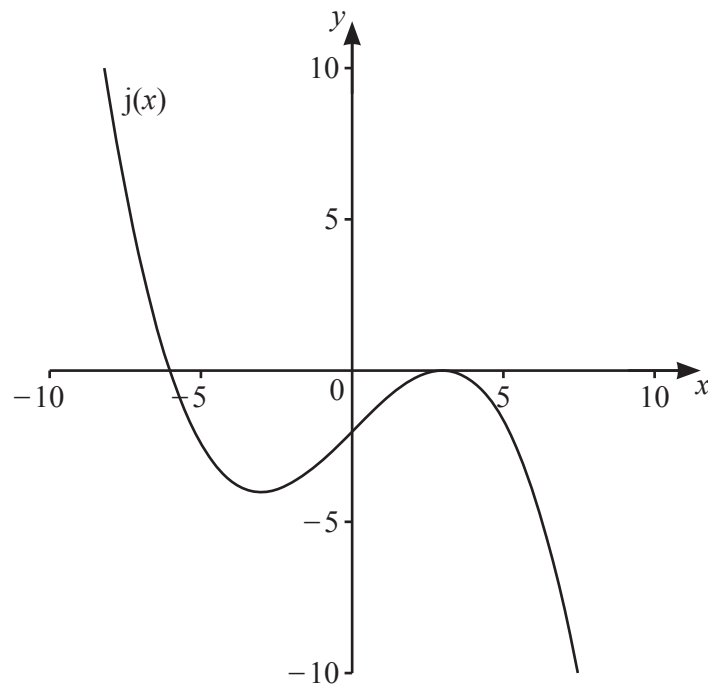
(iii) Find  $g^{-1}(x)$ .

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

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

..... [2]

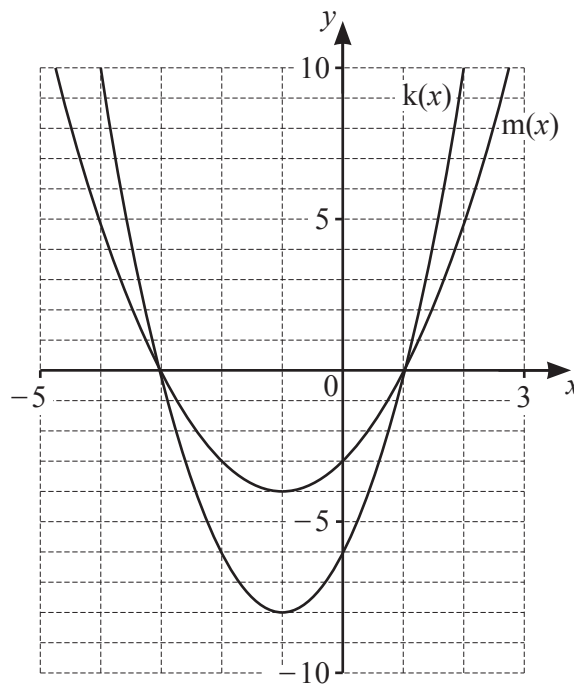
(b) (i) The diagram shows a sketch of the graph of  $y = j(x)$ .



On the same diagram, sketch the graph of  $y = j(x+2)$ .

[1]

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



Write  $k(x)$  in terms of  $m(x)$ .

$k(x) = \dots\dots\dots$  [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  $n$ th term of a sequence is  $an^2 + bn - 5$ .  
The second term of this sequence is  $-3$  and the third term is  $4$ .

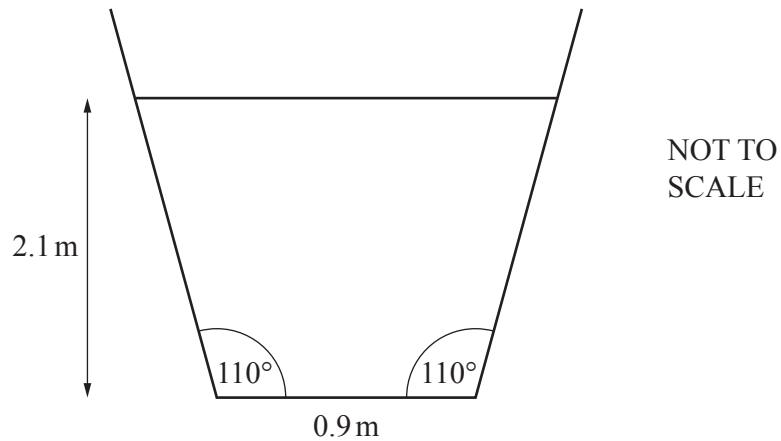
Find the value of  $a$  and the value of  $b$ .  
You must show all your working.

$a =$  .....

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



11



The diagram shows the symmetrical cross-section of a ditch containing water. The angle between the base and each side of the ditch is  $110^\circ$ . 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.

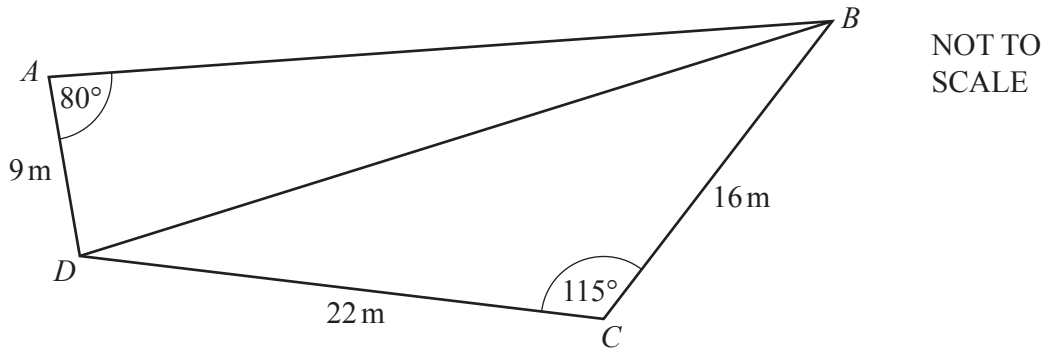
..... $\text{m}^3$  [4]

(b) On a different day, the ditch contains  $300 \text{ m}^3$  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]

12



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

.....  $\text{m}^2$  [2]

(b) Calculate angle  $ADB$ .

Angle  $ADB =$  ..... [6]



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