UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **May/June 2011**

2 hours 15 minutes

Candidates answer on the Question Paper

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.

Unless instructed otherwise, give your answers exactly or correct to three significant figures as appropriate.
Answers in degrees should be given to one decimal place.
For π, use your calculator value.

You must show all the relevant working to gain full marks and you will be given marks for correct methods, including sketches, even if your answer is incorrect.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 120.

For Examiner's Use

This document consists of **20** printed pages.

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. $\quad A = \pi rl$

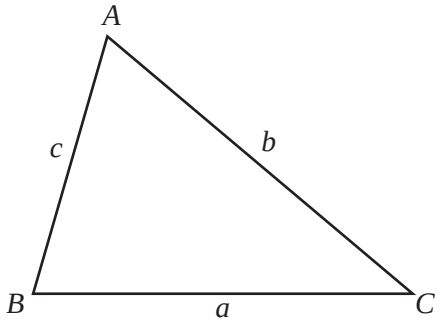
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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

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

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

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



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

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

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

For Examiner's Use

Answer **all** the questions.

1 **(a)** In 2009 the height of a tree was 25.2 m.
A year later, the height was 28 m.
Calculate the percentage increase in height.

Answer(a) ..... % [3]

(b) The height of 25.2 m was a 20% increase of the height in 2008.
Calculate the height in 2008.

Answer(b) ..... m [3]

(c) The height of the tree is expected to increase by 5% of its value **each** year.
The height is now 30 m.

(i) Calculate the expected height in 3 years time.

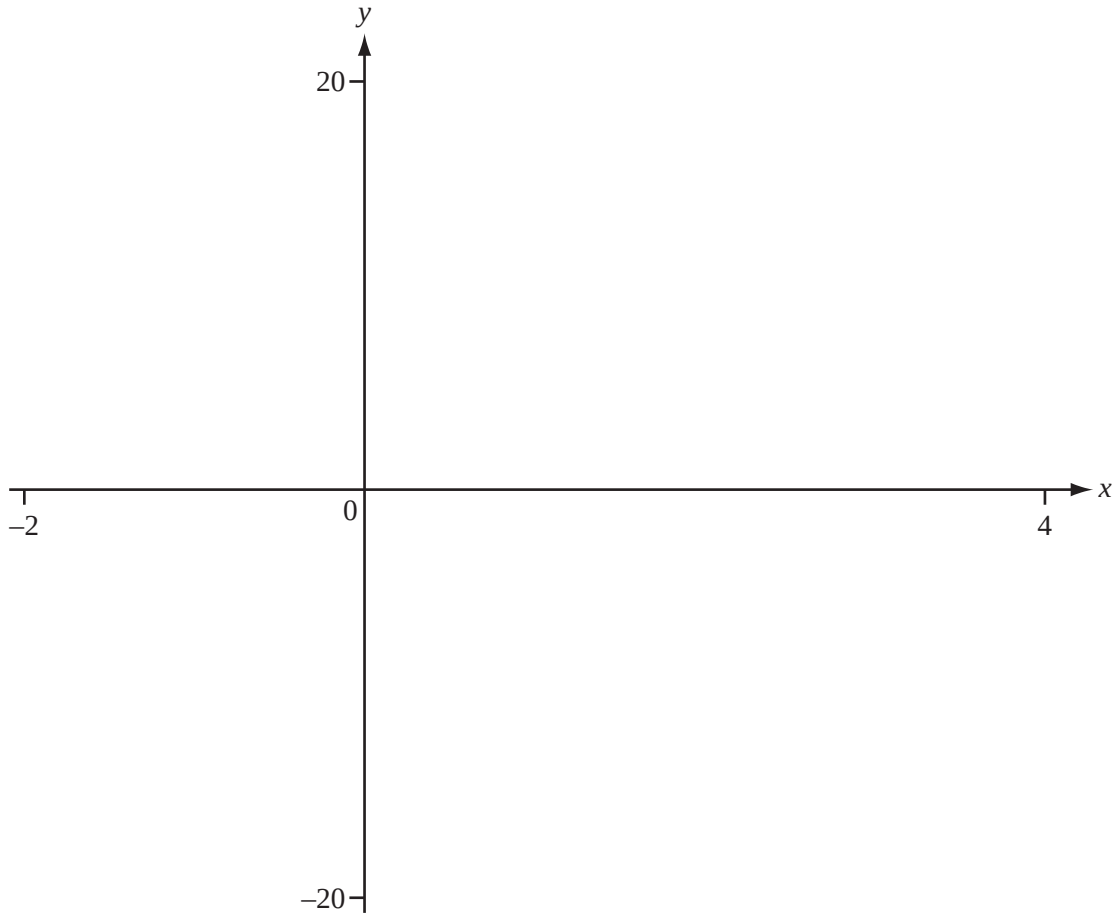
Answer(c)(i) ..... m [3]

(ii) Calculate the number of years it will take for the tree to reach a height of 40 m.

Answer(c)(ii) ..... [2]

For Examiner's Use

2



(a) On the axes, sketch the graph of $y = x^3 - 3x^2$. [3]

(b) Write down the zeros of $y = x^3 - 3x^2$.

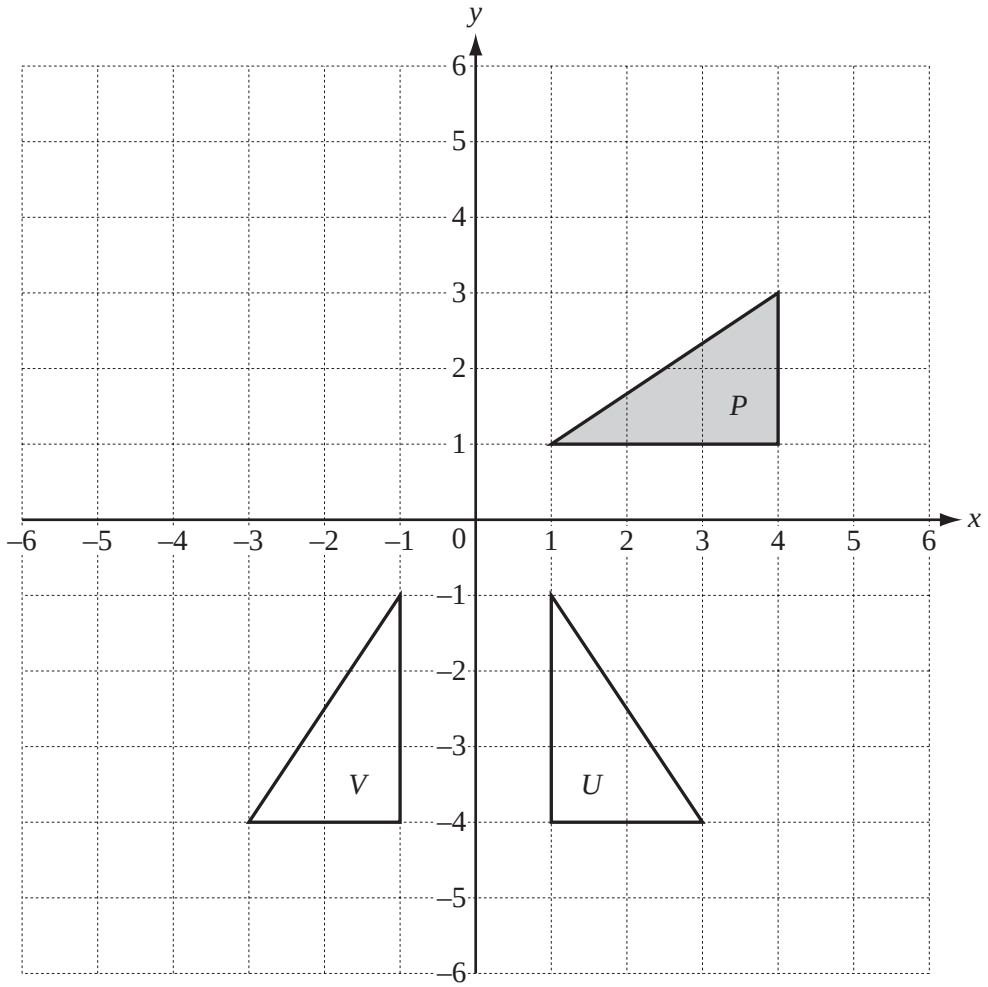
Answer(b) $x =$ ..... $x =$ ..... [1]

(c) Write down the co-ordinates of any local maximum or local minimum points.

Answer(c) ..... [2]

For Examiner's Use

3



(a) Describe fully the **single** transformation that maps triangle *P* onto

(i) triangle *U*,

Answer(a)(i) .....

..... [3]

(ii) triangle *V*.

Answer(a)(ii) .....

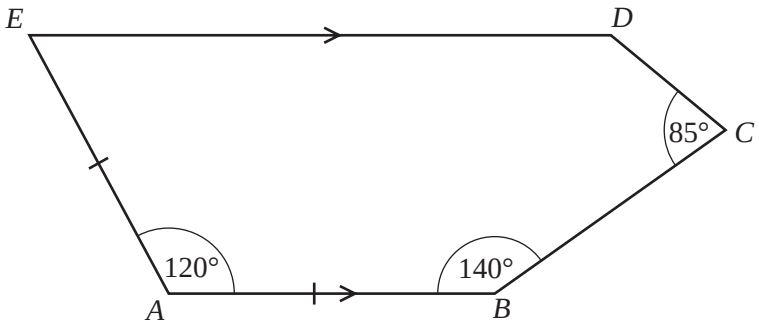
..... [2]

(b) On the grid above, draw the following transformations of triangle *P*.

(i) Translation by $\begin{pmatrix} -6 \\ 2 \end{pmatrix}$. [2]

(ii) Stretch by a scale factor 1.5 with the *y*-axis invariant. [2]

4 **(a)**



NOT TO SCALE

ABCDE is a pentagon with angle *EAB* = 120°, angle *ABC* = 140° and angle *BCD* = 85°.
AB is parallel to *ED* and *EA* = *AB*.

(i) Calculate the size of angle *AED*.

Answer(a)(i) ..... [1]

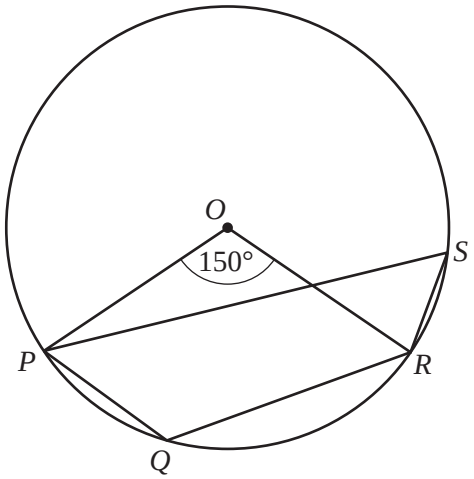
(ii) Calculate the size of angle *EDC*.

Answer(a)(ii) ..... [2]

(iii) On the diagram above, draw the line *EB* and calculate the size of angle *EBC*.

Answer(a)(iii) ..... [1]

(b)



NOT TO SCALE

P, *Q*, *R* and *S* lie on a circle, centre *O*.
Angle *POR* = 150°.

Calculate the size of

(i) angle *PSR*,

Answer(b)(i) ..... [1]

(ii) angle *PQR*.

Answer(b)(ii) ..... [1]

For Examiner's Use

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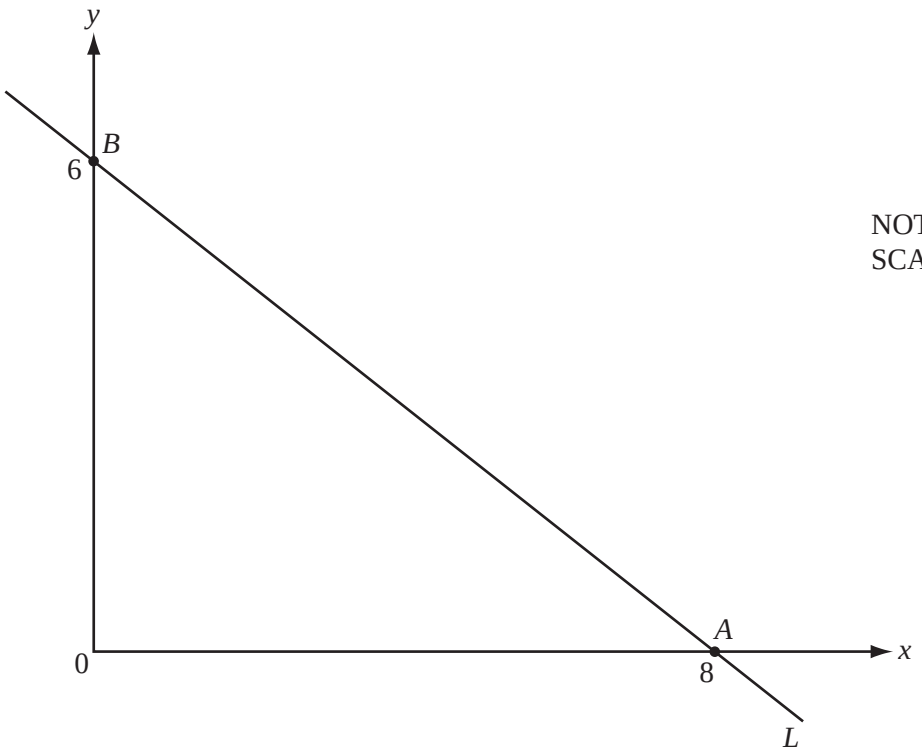


The diagram shows the line, L, which passes through the points A (8, 0) and B (0, 6).

(a) The line L also passes through the point (h, 9).
Find the value of h.

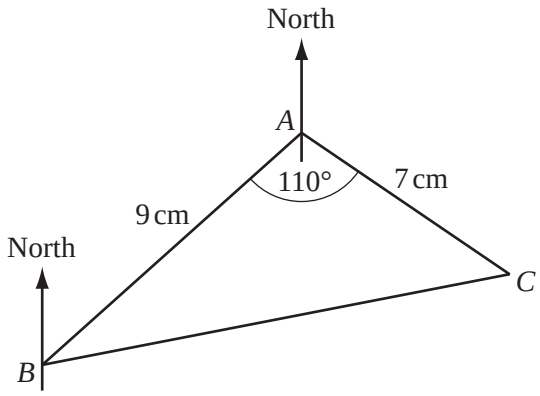
Answer(a) $h =$ ..... [2]

(b) Find the equation of the line which is perpendicular to L and which passes through the mid-point of the line AB.

Answer(b) ..... [4]

For Examiner's Use

6 (a)



NOT TO SCALE

In triangle ABC, $AB = 9$ cm, $AC = 7$ cm and angle $BAC = 110°$.

(i) Calculate the area of triangle ABC.

Answer(a)(i) ..... cm^2 [2]

(ii) Calculate the length of BC.

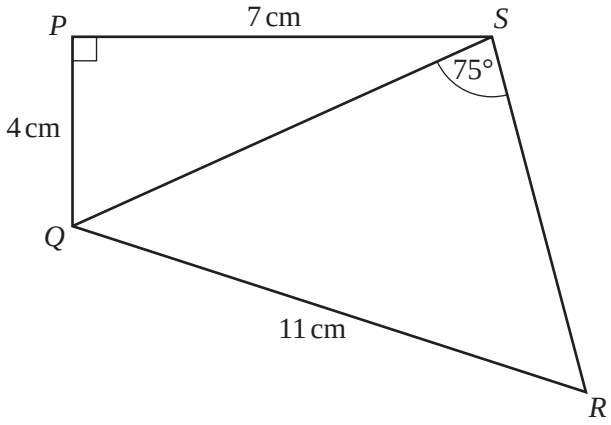
Answer(a)(ii) ..... cm [3]

(iii) The bearing of A from B is 050°.

Find the bearing of C from A.

Answer(a)(iii) ..... [2]

(b)



NOT TO SCALE

In the quadrilateral $PQRS$, $PQ = 4$ cm, $PS = 7$ cm and $QR = 11$ cm.

Angle $QPS = 90°$ and angle $QSR = 75°$.

Calculate the size of angle QRS.

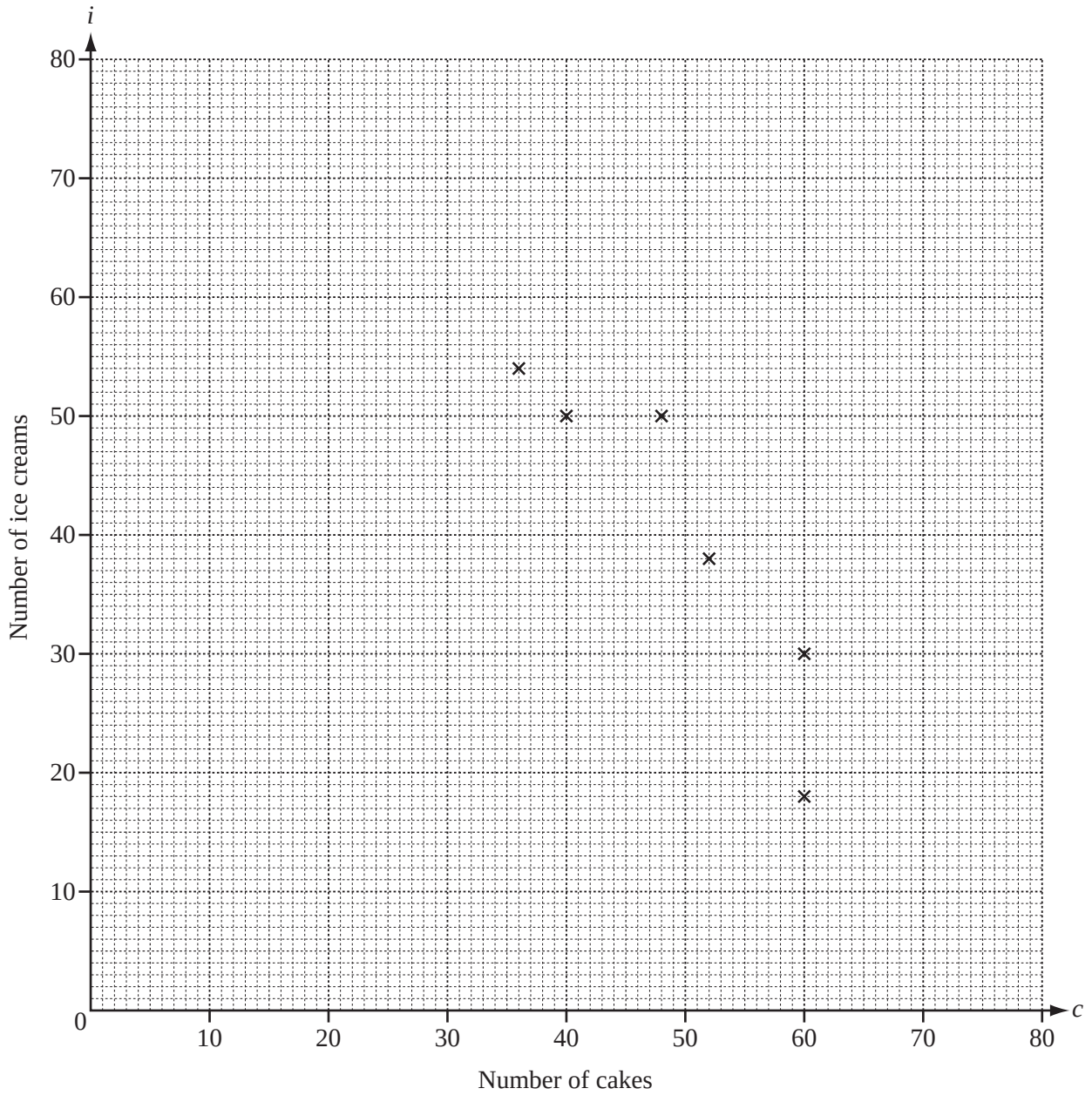
Answer(b) ..... [5]

For Examiner's Use

7 Nyali sells cakes and ice creams.
She records the number of cakes (c) and the number of ice creams (i) she sells each day for 10 days.
The results are shown in the table.

Number of cakes (c)	48	60	52	40	60	36	70	20	44	50
Number of ice creams (i)	50	18	38	50	30	54	14	70	46	50

(a) Complete the scatter diagram.
The first 6 points have been plotted for you.



[2]

For Examiner's Use

(b) Write down one word to describe the correlation between c and i.

Answer(b) ..... [1]

(c) Find the equation of the line of regression, writing i in terms of c.

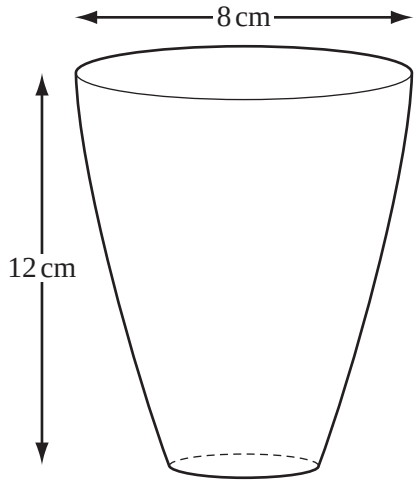
Answer(c) $i =$ ..... [2]

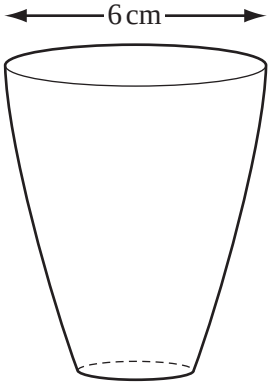
(d) Use your equation to estimate the number of ice creams Nyali sells on a day when she sells 67 cakes.

Answer(d) ..... [1]

For Examiner's Use

8





NOT TO SCALE

The diagram shows two similar containers.
The top of the large container has diameter 8 cm.
The top of the small container has diameter 6 cm.

(a) The height of the large container is 12 cm.
Calculate the height of the small container.

Answer(a) ..... cm [2]

(b) The volume of the large container is 550 cm^3.
Calculate the volume of the small container.

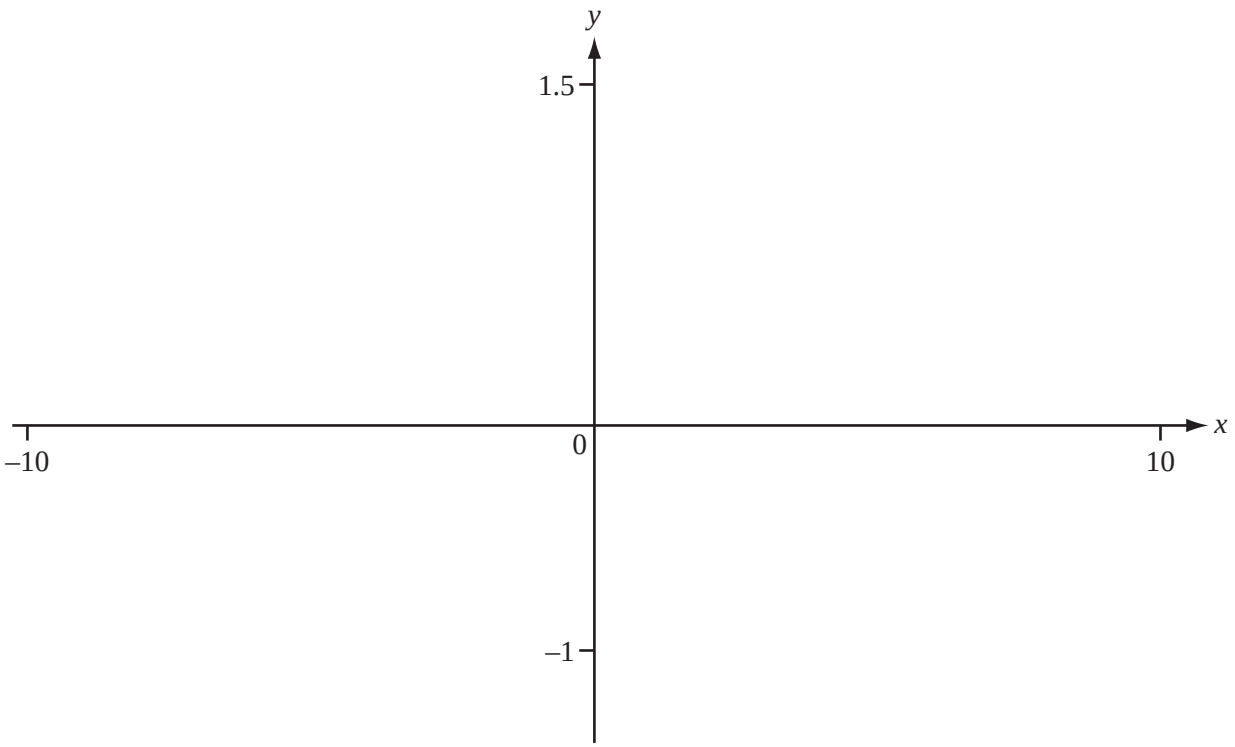
Answer(b) ..... cm^3 [3]

(c) Write 550 cm^3 in litres.

Answer(c) ..... litres [1]

For Examiner's Use

9



(a) **(i)** On the axes, sketch the graph of $y = f(x)$, where $f(x) = \log x$ for $0 < x \leqslant 10$. [2]

(ii) Write down the co-ordinates of the point where the graph of $y = f(x)$ crosses the x-axis.

Answer(a)(ii) (..... , ...) [1]

(iii) Write down the equation of the asymptote of the graph of $y = f(x)$.

Answer(a)(iii) ..... [1]

(iv) Find the range of $f(x)$ for the domain $0 < x \leqslant 10$.

Answer(a)(iv) ..... [2]

(b) Solve the equation $\log x = \dfrac{10 - x}{20}$.

Answer(b) $x =$ ..... [2]

(c) $g(x) = \dfrac{10 - x}{20}$

Find the range of $g(x)$ for the domain $-10 \leqslant x \leqslant 10$.

Answer(c) ..... [2]

(d) On the axes, sketch the graph of $y = f(x + 1)$. [2]

For Examiner's Use

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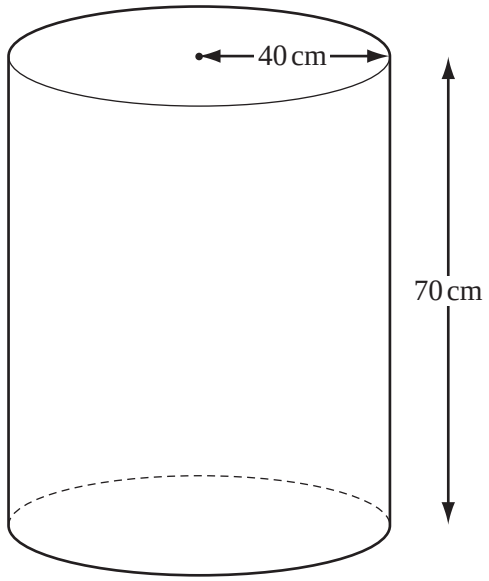


NOT TO SCALE

The diagram shows a water tank which is open at the top.
The tank is in the shape of a cylinder with radius 40 cm and height 70 cm.

(a) (i) Calculate the total surface area of the cylinder.

Answer(a)(i) ..... cm^2 [2]

(ii) The cylinder is made of metal which costs \$2.40 per **square metre**.

Calculate the cost of the metal.

Answer(a)(ii) \$ ..... [3]

For Examiner's Use

(b) (i) Calculate the volume of the cylinder.

Answer(b)(i) ..... cm^3 [2]

(ii) Water is poured into the empty cylinder at a rate of $8\,cm^3$ per second.

Calculate the time taken to fill the cylinder.

Give your answer in hours and minutes, correct to the nearest minute.

Answer(b)(ii) ..... h ..... min [4]

For Examiner's Use

11

1	7	8	12	15	19	19

The diagram shows seven numbered cards.

(a) A card is chosen at random.

(i) Write down the probability that it is numbered 12 or 15.

Answer(a)(i) ..... [1]

(ii) The probability that the number on the card is greater than x is $\frac{5}{7}$.

Write down the value of x.

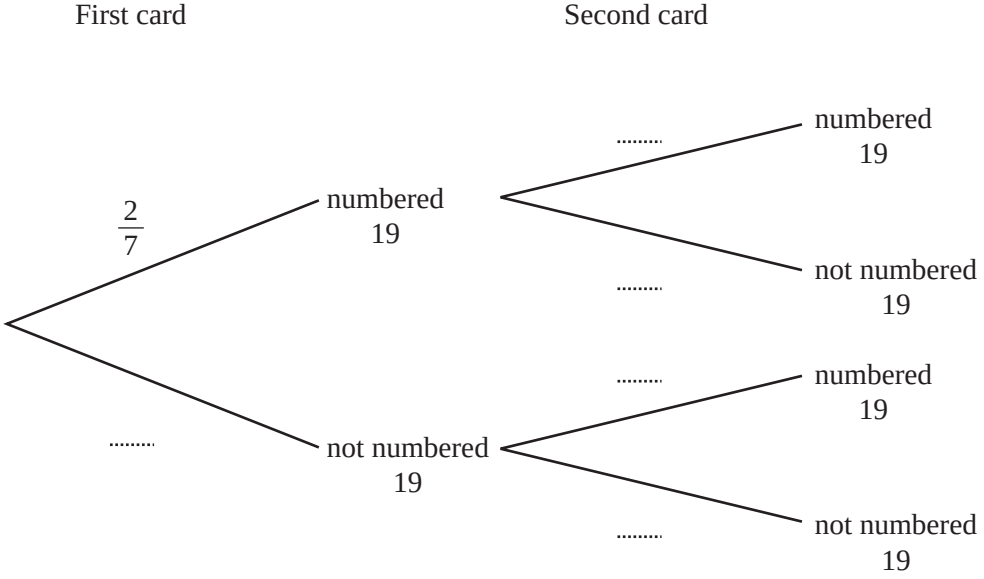
Answer(a)(ii) ..... [1]

(b) Two cards are chosen at random, without replacement, from the seven numbered cards.

(i) When the first card chosen is numbered 19, write down the probability that the second card is also numbered 19.

Answer(b)(i) ..... [1]

(ii)



Complete the tree diagram, by writing the probabilities in the spaces. [2]

For Examiner's Use

(iii) Find the probability that both cards are numbered 19.

Answer(b)(iii) ..... [2]

(iv) Find the probability that exactly one card is numbered 19.

Answer(b)(iv) ..... [3]

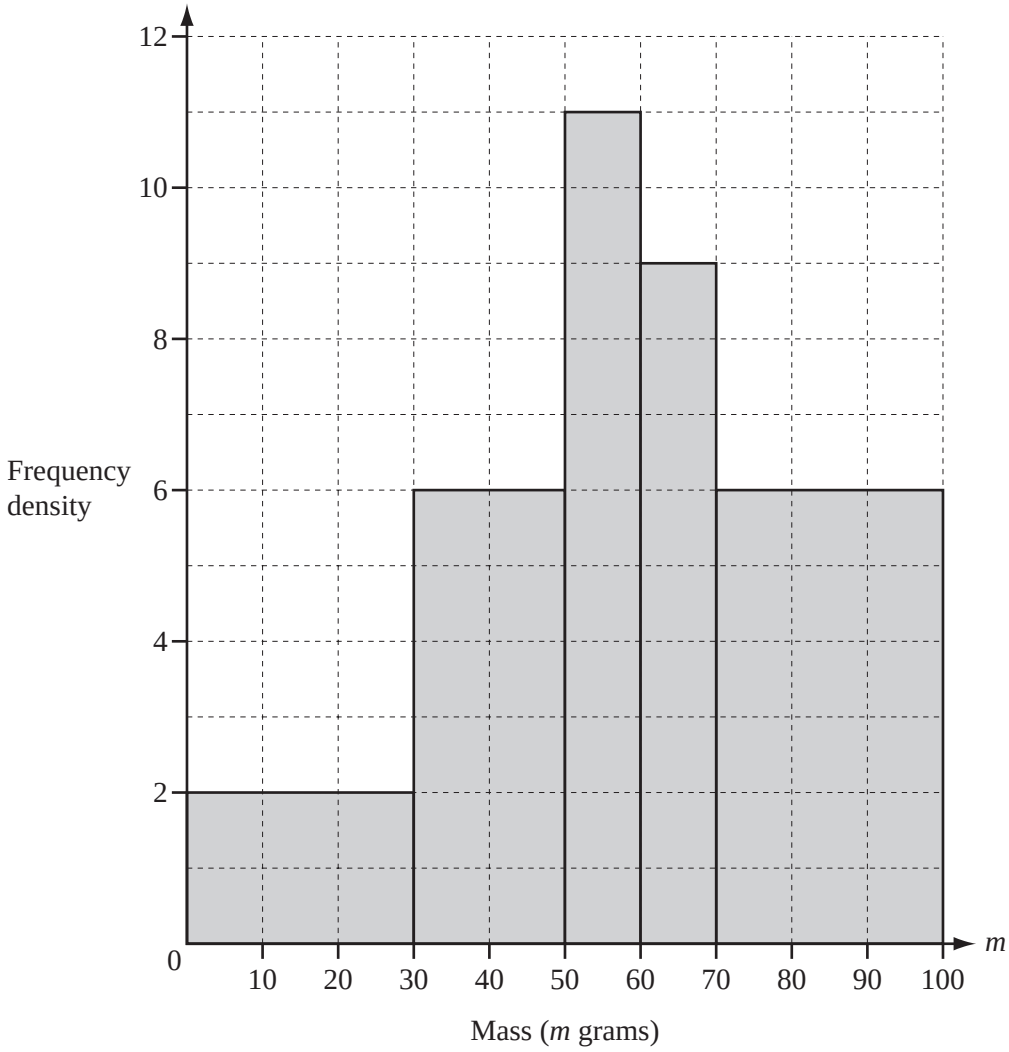
(c) Cards are chosen at random, without replacement, from the seven numbered cards, until a card that is numbered 19 is chosen.

Find the probability that this happens with the third card.

Answer(c) ..... [2]

For Examiner's Use

12



The histogram shows numbers of apples and their masses (m grams).

(a) Complete the frequency table using the information in the histogram.

Mass (m grams)	$0 \leqslant m < 30$	$30 \leqslant m < 50$	$50 \leqslant m < 60$	$60 \leqslant m < 70$	$70 \leqslant m < 100$
Frequency	60		110		

[3]

(b) Calculate an estimate of the mean mass of the apples.

Answer(b) ..... g [2]

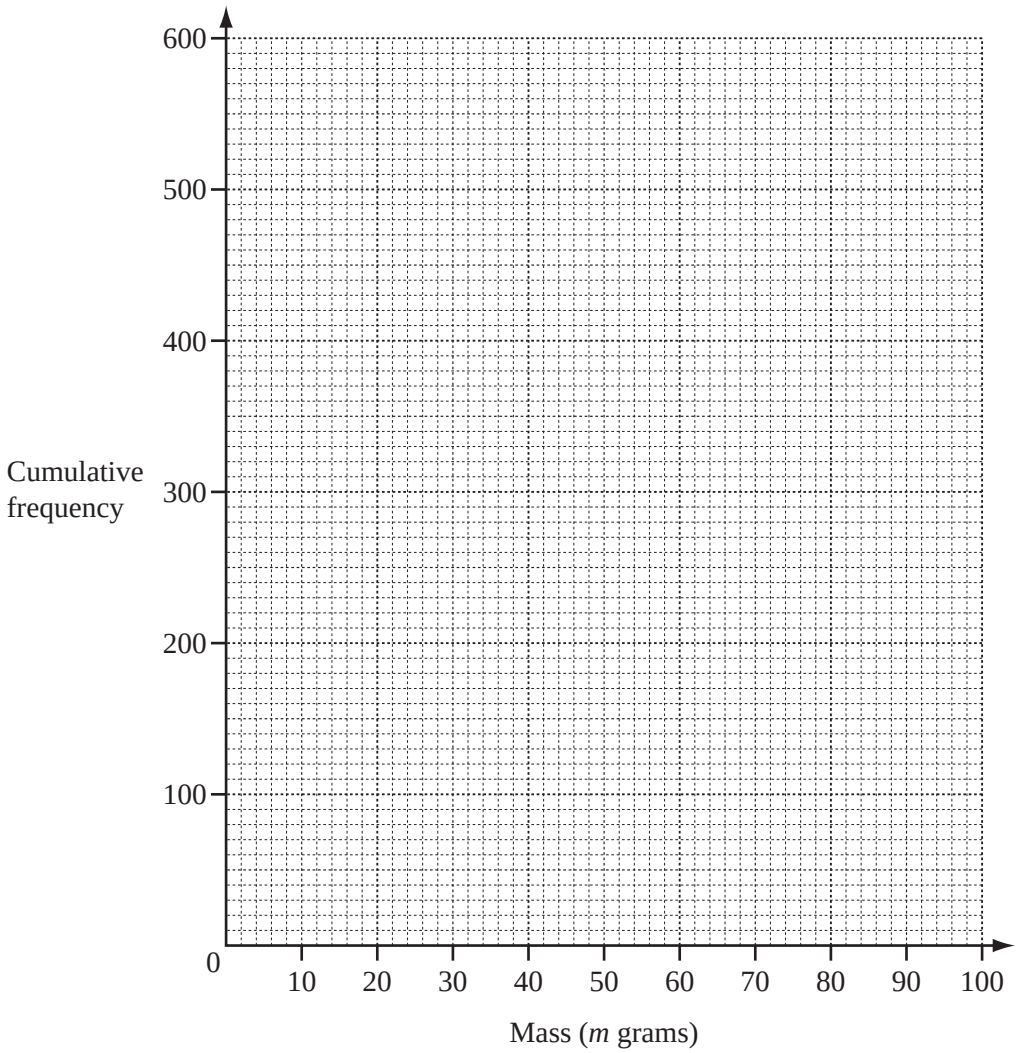
(c) Complete the cumulative frequency table using the information in your frequency table.

Mass (m grams)	$m < 30$	$m < 50$	$m < 60$	$m < 70$	$m < 100$
Cumulative frequency	60				560

[2]

For Examiner's Use

(d) On the grid below, complete the cumulative frequency curve.



[3]

(e) Use your cumulative frequency curve to find

(i) the median,

Answer(e)(i) ..... g [1]

(ii) the lower quartile,

Answer(e)(ii) ..... g [1]

(iii) the inter-quartile range,

Answer(e)(iii) ..... g [1]

(iv) the number of apples with a mass of at least 40 g.

Answer(e)(iv) ..... [2]

For Examiner's Use

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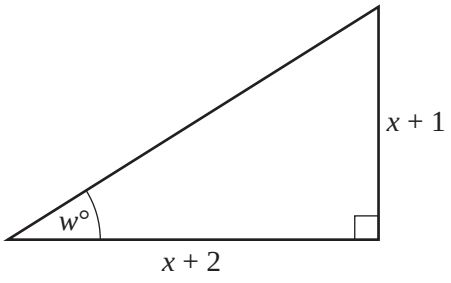

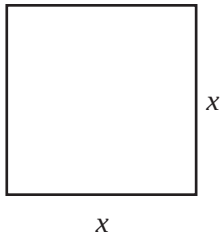

NOT TO SCALE

The area of the right-angled triangle is equal to the area of the square.

(a) Show that $x^2 - 3x - 2 = 0$.

[3]

(b) Solve the equation $x^2 - 3x - 2 = 0$.
Give your answers correct to 2 decimal places.

Answer(b) $x =$ ..... or $x =$ ..... [3]

(c) Calculate the value of w.

Answer(c) $w =$ ..... [2]