Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	CANDIDATE NUMBER

5562327434

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 2014**

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, glue or correction fluid.
You may use an HB 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.

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

CAMBRIDGE International Examinations

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. $\quad A = \pi rl$

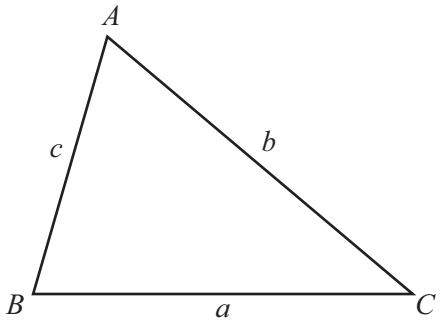
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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



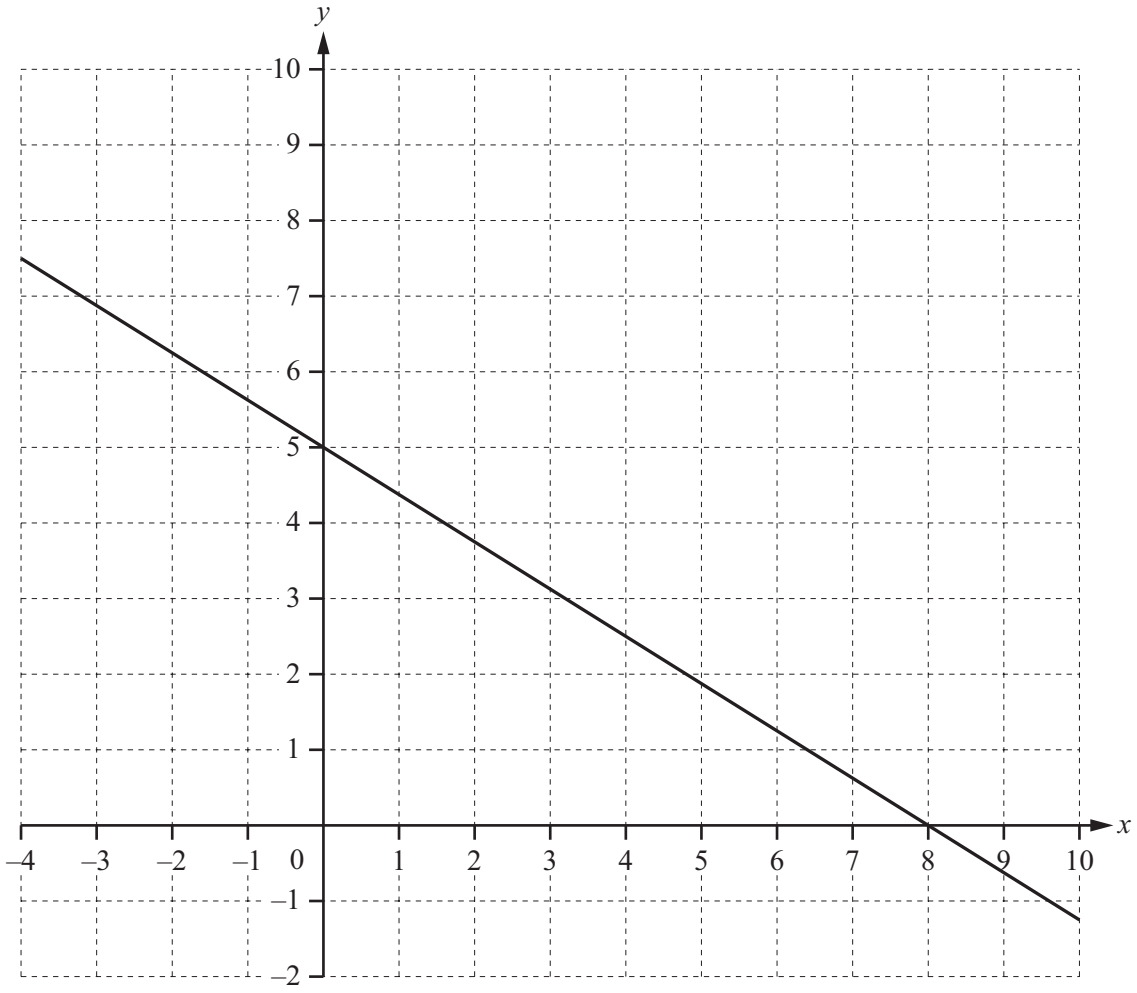
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



The diagram shows the graph of $5x + 8y = 40$.

(a) On the grid, show accurately the region defined by these inequalities.

$5x + 8y \geqslant 40$ $y \geqslant 2x + 3$ $x \geqslant -2$

[4]

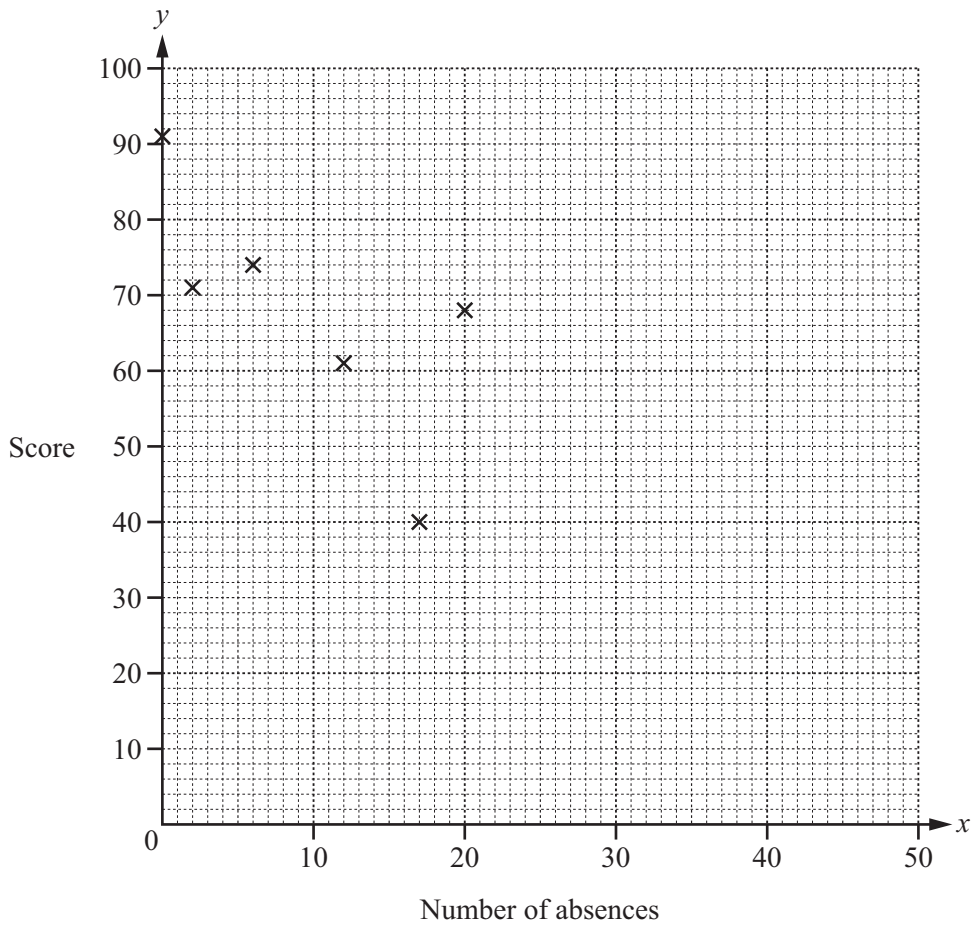
(b) Find the minimum value of y in the region.
Give your answer correct to 2 decimal places.

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

2 The table shows the scores (y) of 10 students in a mathematics test and their number of absences (x) from school.

Number of absences (x)	6	12	0	2	20	17	35	46	35	50
Score (y)	74	61	91	71	68	40	30	63	68	60

(a) Complete this scatter diagram.
The first six points have been plotted for you.



[2]

(b) What type of correlation is shown by the scatter diagram?

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

(c) Find the equation of the regression line.
Write your answer in the form $y = mx + c$.

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

(d) A student who had 26 absences missed the test.

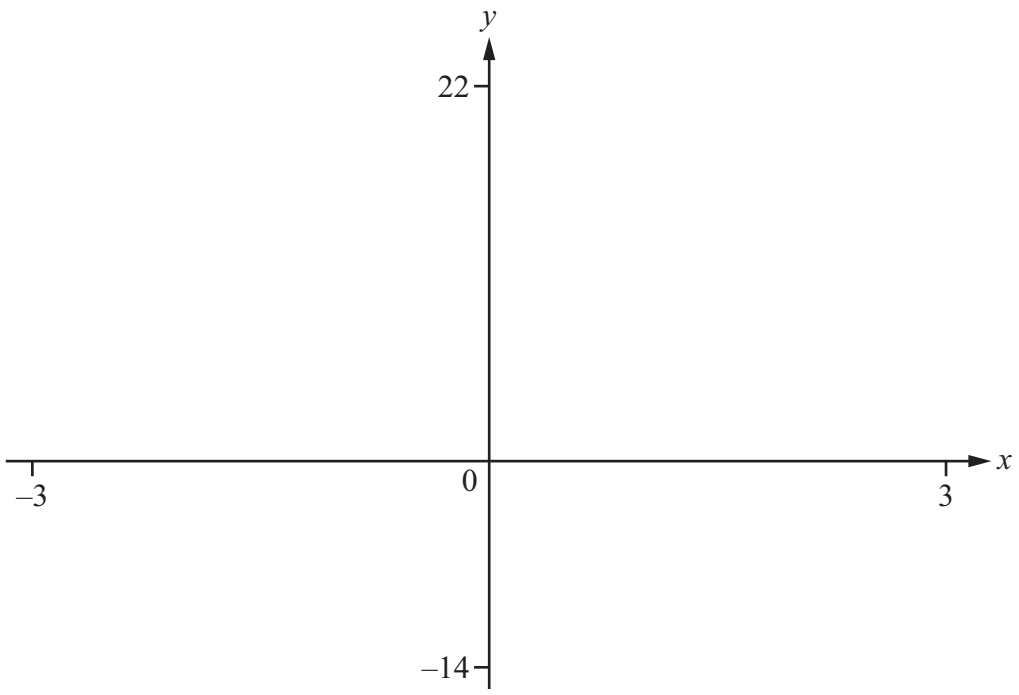
(i) Use your equation to estimate a score for that student.

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

(ii) The teacher does not have confidence in this estimate.
Use your diagram to explain why.

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

3



(a) On the diagram, sketch the graph of $y = x^3 - 3x + 4$ for $-3 \leqslant x \leqslant 3$. [2]

(b) Describe fully the symmetry of the graph.

Answer(b) .....

..... [3]

(c) Find the co-ordinates of the local maximum and local minimum.

Answer(c) Maximum (..... , ...)

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

(d) Find the range of values of x for which $y < 5$.

Answer(d) ..... [3]

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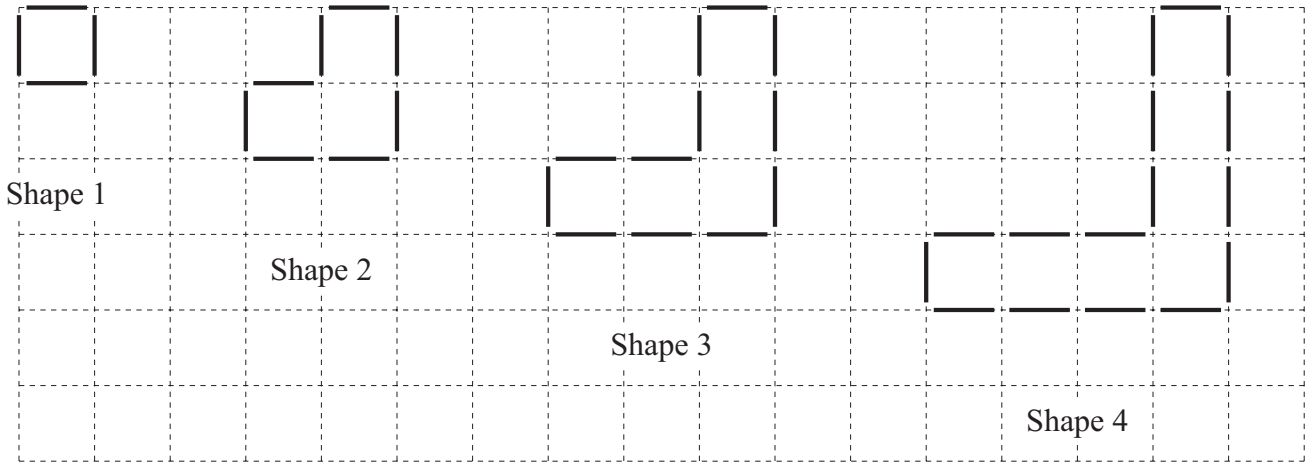
4 **(a)** The shapes below form a sequence.
The shapes are made with 1 cm rods.



(i) Complete the table below.

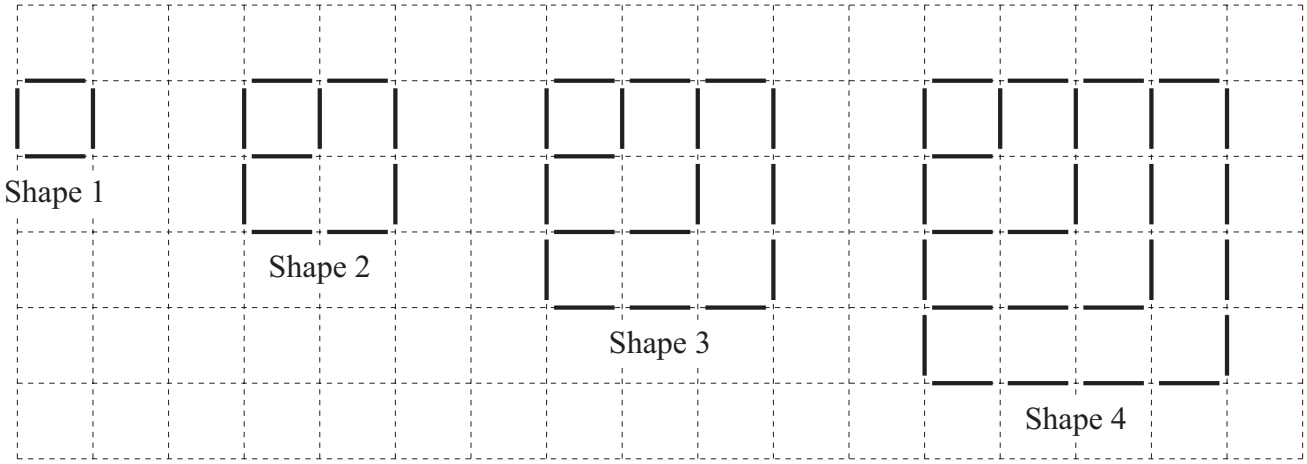
Shape number	1	2	3	4		7		*n*
Number of rods	4	8	12	16				
Number of squares enclosed	1	3	5	7				

[5]

(ii) Find the number of squares enclosed by Shape 100.

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

(b) Here is another sequence of shapes made with 1 cm rods.



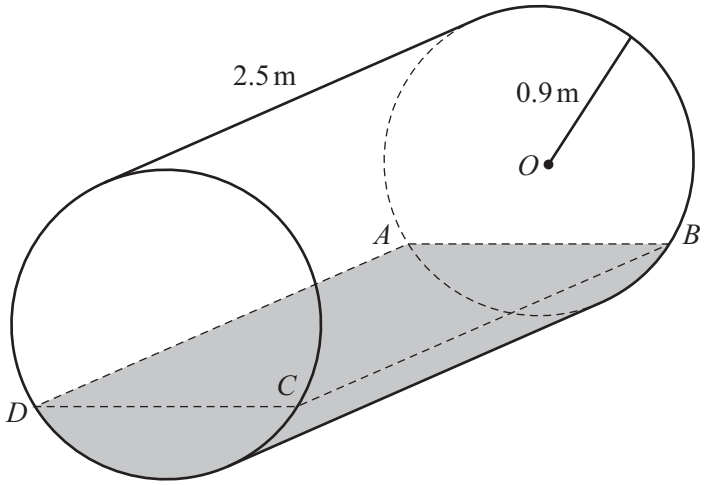
(i) Find the number of rods in Shape 5.

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

(ii) Find an expression, in terms of n, for the number of rods in Shape n.

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

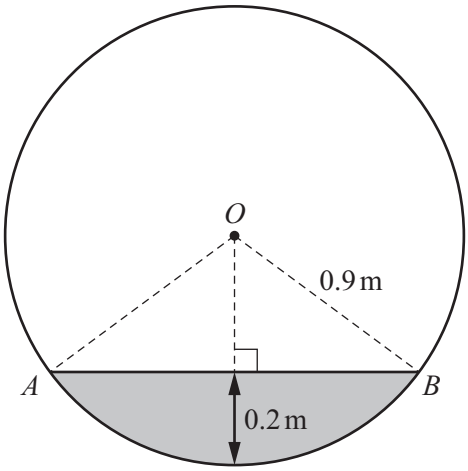
5 The diagram below shows the cylindrical tank in which Dipak stores his heating oil.



NOT TO SCALE

The length of the tank is 2.5 m and its radius is 0.9 m.
Dipak measures the depth of the oil to be 0.2 m.

The diagram below shows the cross-section of the tank and the oil.



NOT TO SCALE

(a) Calculate the rectangular surface area of the oil, *ABCD*.

Answer(a) ..... m^2 [4]

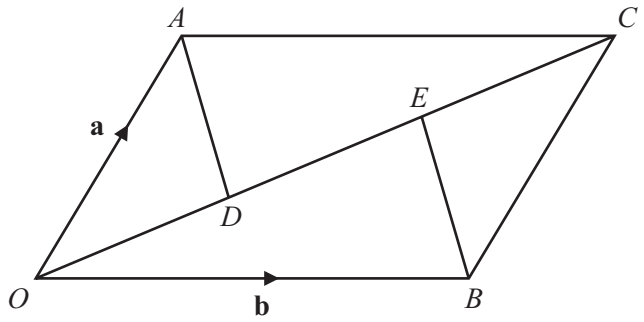
(b) Calculate angle *AOB* and show that it rounds to 77.9° correct to 1 decimal place.

[3]

(c) Find the number of **extra** litres of oil that Dipak needs to fill the tank.

Answer(c) ..... litres [5]

6



NOT TO SCALE

The diagram shows a parallelogram, $OACB$.
OC is a diagonal and $OD = DE = EC$.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Find these vectors in terms of **a** and **b**.
Write each answer in its simplest form.

(i) $\overrightarrow{OC}$

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

(ii) $\overrightarrow{AD}$

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

(b) Show that $\overrightarrow{EB} = \overrightarrow{AD}$.

[2]

(c) **(i)** What two conclusions can you make about AD and EB?

Answer(c)(i) .....

..... [1]

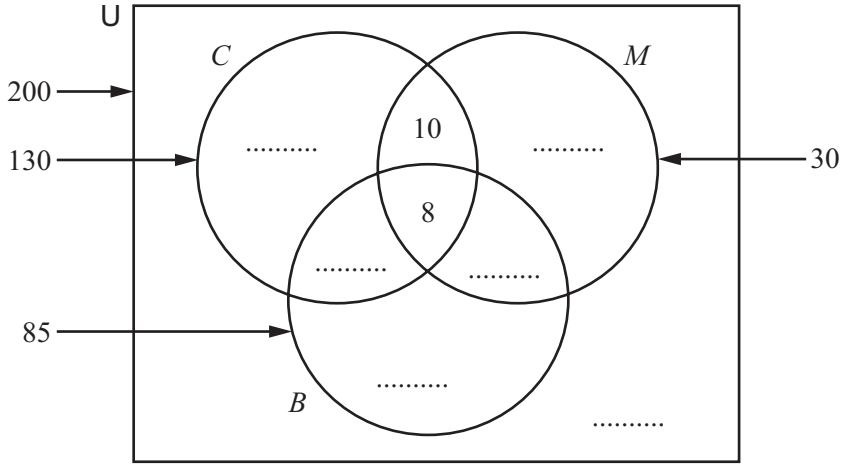
(ii) What conclusion can you make about the quadrilateral $AEBD$?

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

7 In a survey, 200 people were asked whether they owned a vehicle.

130 owned a car (C), 30 owned a motorcycle (M) and 85 owned a bicycle (B).
18 owned a car and a motorcycle.
17 owned a motorcycle and a bicycle.
60 owned a car and a bicycle.
8 owned a car and a motorcycle and a bicycle.

(a) Complete this Venn Diagram.



[3]

(b) Find the probability that a person, chosen at random from these 200 people,

(i) does not own any of the three vehicles,

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

(ii) is an element of the set $B \cap M \cap C'$.

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

(c) Two of the 200 people are chosen at random, without replacement.

Calculate the probability that

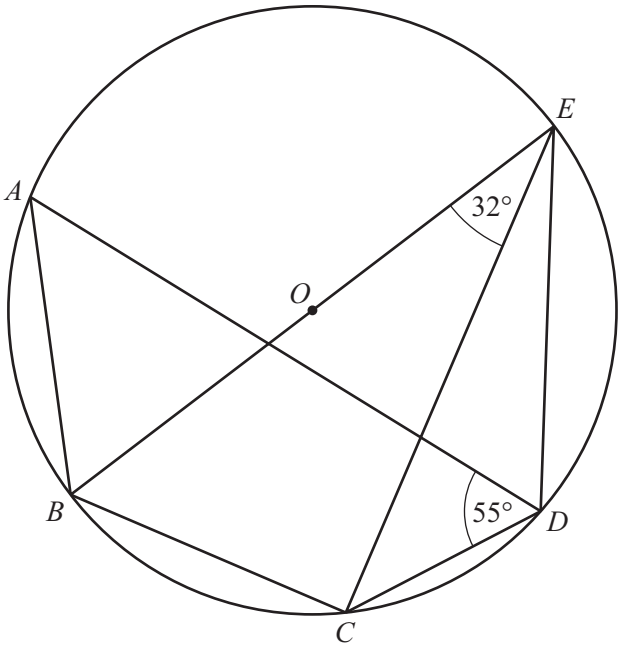
(i) both own a motorcycle,

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

(ii) one owns only a car and the other owns only a bicycle.

Answer(c)(ii) ..... [3]

8 (a)



NOT TO SCALE

A, *B*, *C*, *D* and *E* are points on the circle centre *O*.
BE is a diameter, angle *BEC* = 32° and angle *ADC* = 55°.

Find

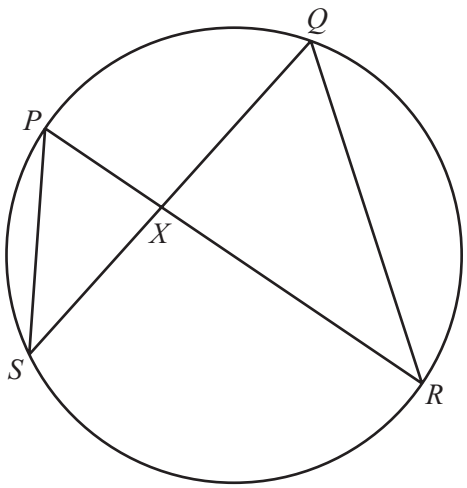
(i) angle *EBC*,

Answer(a)(i) Angle *EBC* = ... [1]

(ii) angle *ABE*.

Answer(a)(ii) Angle *ABE* = ... [2]

(b)



NOT TO SCALE

P, Q, R and S are points on a circle.
PR and QS intersect at X.
$PS = 8$ cm, $QR = 12$ cm and $PX = 5$ cm.

(i) Explain why triangle PXS is similar to triangle QXR.

Answer(b)(i) .....

.....

..... [2]

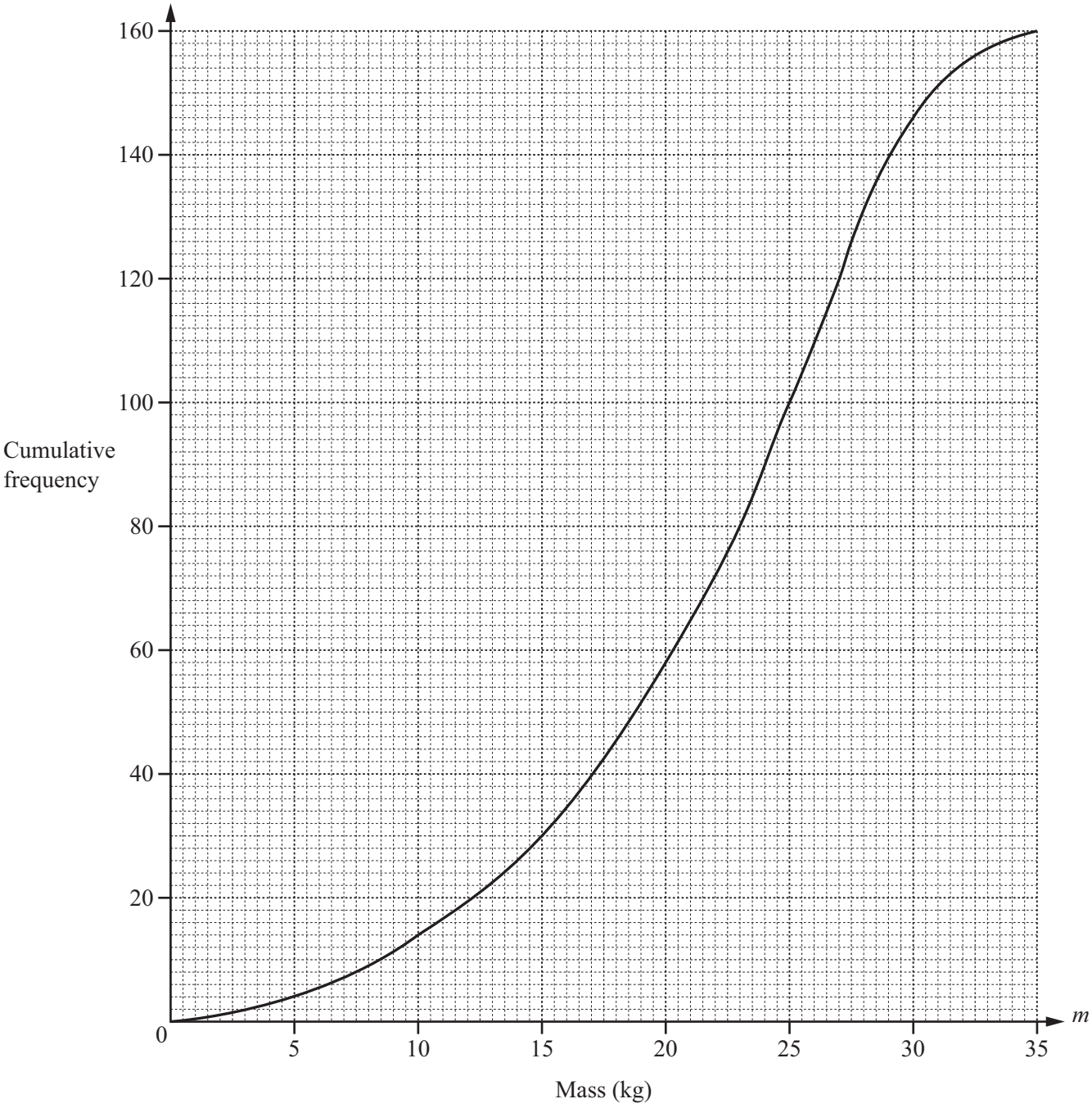
(ii) Calculate the length of QX.

Answer(b)(ii) ..... cm [2]

(iii) Find the value of $\frac{\text{Area of triangle } PXS}{\text{Area of triangle } QXR}$.

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

9 A transport company records the masses, m kg, of 160 parcels it delivers.
The cumulative frequency curve shows this information.



(a) (i) Find the median.

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

(ii) Find the lower quartile.

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

(iii) Find the interquartile range.

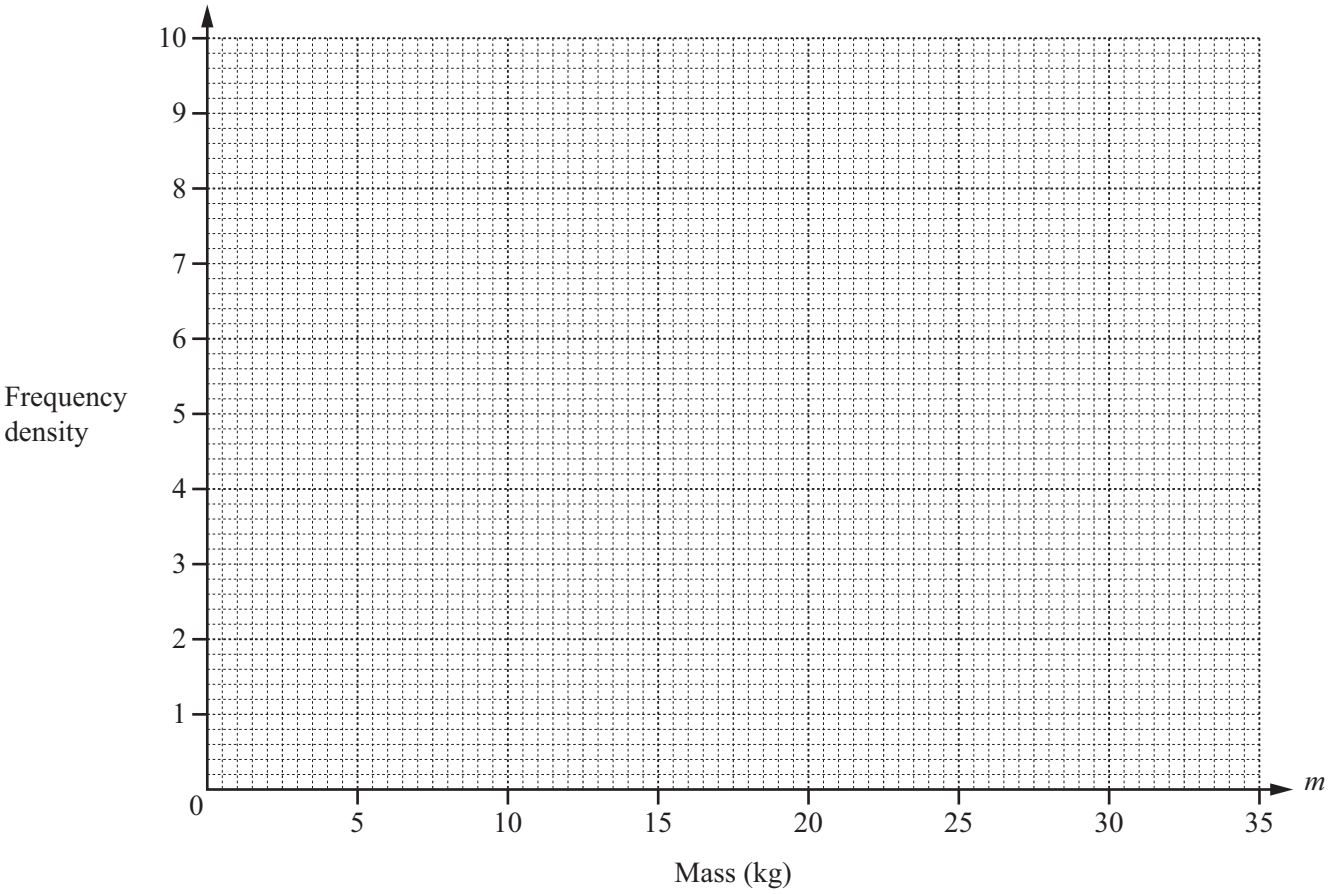
Answer(a)(iii) ..... kg [1]

(b) Use the cumulative frequency curve to complete the frequency table.

Mass (m kg)	$0 < m \leqslant 10$	$10 < m \leqslant 15$	$15 < m \leqslant 20$	$20 < m \leqslant 25$	$25 < m \leqslant 35$
Frequency	14		28		

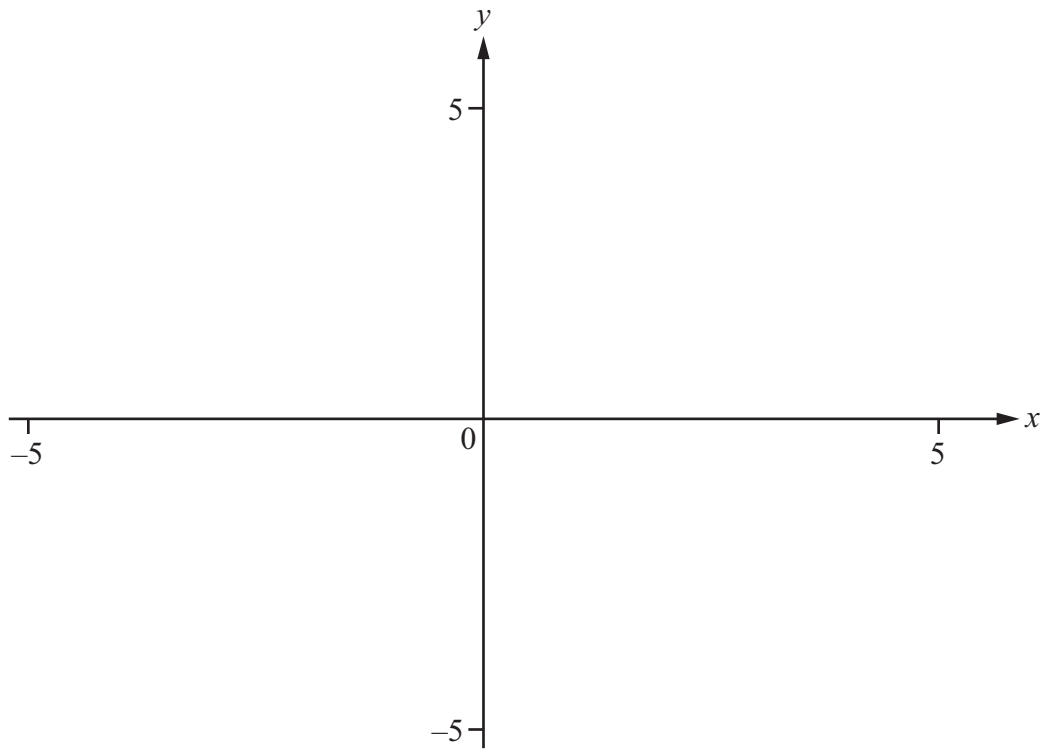
[3]

(c) On the grid below, use the results from **part (b)** to draw a histogram.



[3]

10



(a) $f(x) = 10^x - 3$.

(i) On the diagram, sketch the graph of $y = f(x)$. [2]

(ii) Write down the equation of the asymptote of $f(x)$.

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

(b) $g(x) = \tan 30x°$.

(i) On the same diagram, sketch the graph of $y = g(x)$. [3]

(ii) Write down the equations of the vertical asymptotes of $g(x)$ for values of x between –5 and 5.

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

(c) Solve the equation $f(x) = g(x)$ for values of x between –5 and 5.

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

11 Janine and Gitte work for the same company.

(a) In 2010, the ratio Janine's salary : Gitte's salary was $5 : 4$.
The total of their salaries was $95 400.

Find each of their salaries in 2010.

Answer(a) Janine $ .....

Gitte $ ..... [2]

(b) Each of their salaries was a 6% increase on their 2009 salaries.

(i) Write down the ratio of their salaries in 2009.

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

(ii) Find the total of their salaries in 2009.

Answer(b)(ii) $ ..... [3]

(c) In 2011, Janine and Gitte each received an increase of the same amount of money.
In 2011, the ratio Janine's salary : Gitte's salary was $11 : 9$.

Find the increase they each received.

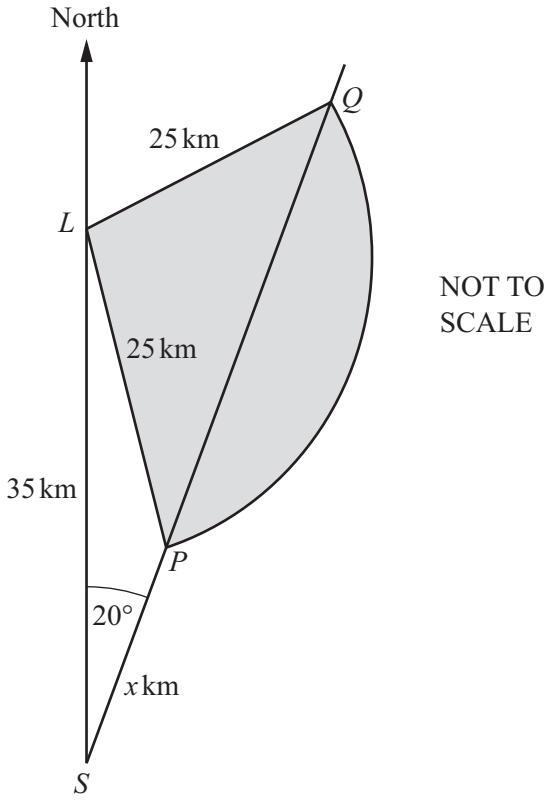
Answer(c) $ ..... [3]

(d) In 2012 Janine's friend, Alain, received a salary increase of 8%.
In 2013, his salary was reduced by 8%.

Find the percentage change in Alain's salary over the two years.
Say whether it is an increase or decrease.

Answer(d) ..... by ..... % [3]

12



A ship sails from S on a bearing of 020°.
There is a lighthouse at L, 35 km due north of S.
The light from the lighthouse has a range of 25 km.
$SP = x$ km.

(a) Use the cosine rule to show that $x^2 - kx + 600 = 0$, where $k = 65.78$ correct to 2 decimal places.

[3]

(b) (i) Solve the equation $x^2 - 65.78x + 600 = 0$, giving your answers correct to 2 decimal places.

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

(ii) Write down the distance SQ.

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

(c) The ship is sailing at 30 km/h.
Use your answers to **part (b)** to find the length of time the light is visible from the ship.
Give your answer in hours and minutes correct to the nearest minute.

Answer(c) ..... h ..... min [3]

Question 13 is printed on the next page.

13 $f(x) = 3x - 2$ $g(x) = x + 3$ $h(x) = 2x^2 + 7x + 3$

(a) Find $h(g(0))$.

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

(b) Find $f(g(x))$, writing your answer in its simplest form.

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

(c) Find $f^{-1}(x)$.

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

(d) Simplify $\dfrac{g(x)}{h(x)}$.

Answer(d) ..... [3]