Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9293741267

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/11**

Paper 1 (Core) **May/June 2019**

45 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical Instruments

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.
CALCULATORS MUST NOT BE USED IN THIS PAPER.
All answers should be given in their simplest form.
You must show all the relevant working to gain full marks and you will be given marks for correct methods 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 40.

This document consists of **11** printed pages and **1** blank page.

Cambridge Assessment International Education

Formula List

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle, radius r.	$A = \pi r^2$
Circumference, C, of circle, radius r.	$C = 2\pi r$
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 prism, cross-sectional area A, length l.	$V = Al$
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.	$V = \frac{4}{3}\pi r^3$

Answer **all** the questions.

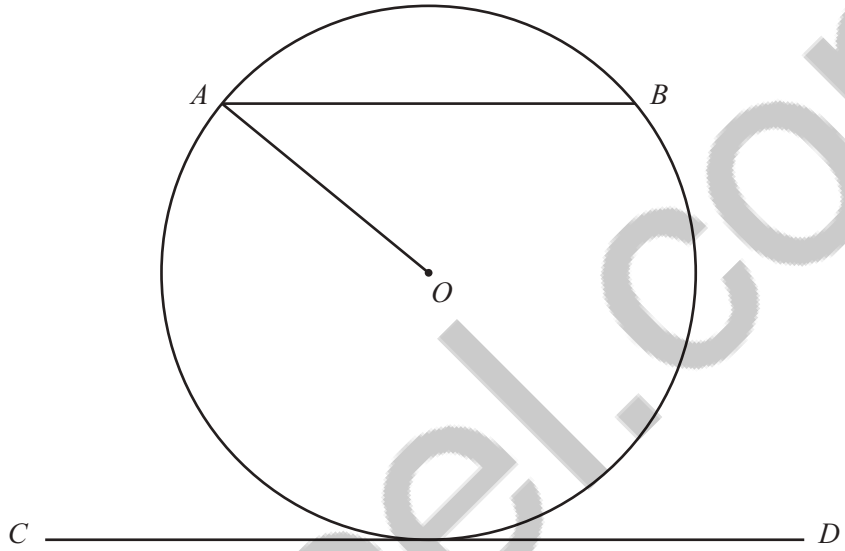
1 Write 36 247 correct to the nearest thousand.

..... [1]

2 Write down three multiples of 12.

....., ..., ... [1]

3



The diagram shows a circle centre O and three lines, OA, AB and CD.

Write down the line that is

(a) a chord,

..... [1]

(b) a tangent.

..... [1]

4 The cost, in dollars, of a taxi journey is

$$2 \times (\text{number of kilometres travelled}) + 10.$$

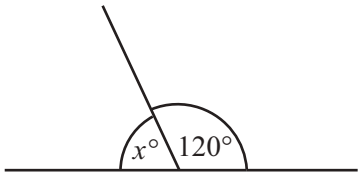
Find the cost of a taxi journey of 30 kilometres.

$ ..... [2]

5 Change 2.4 metres into millimetres.

..... mm [1]

6 **(a)**

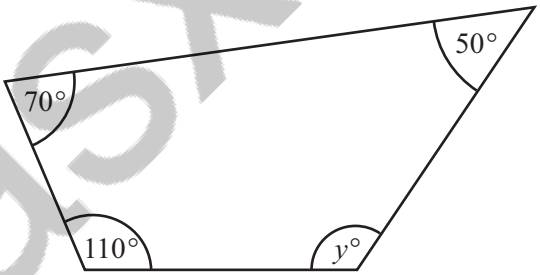


NOT TO SCALE

Find the value of x.

$x =$ ..... [1]

(b)

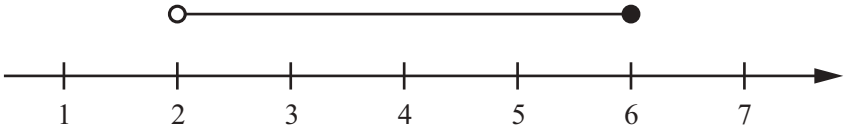


NOT TO SCALE

Find the value of y.

$y =$ ..... [1]

7



Write down all the integers that satisfy the inequality shown on this number line.

..... [1]

8 **(a)** Work out $\frac{3}{8}$ of 16.

..... [1]

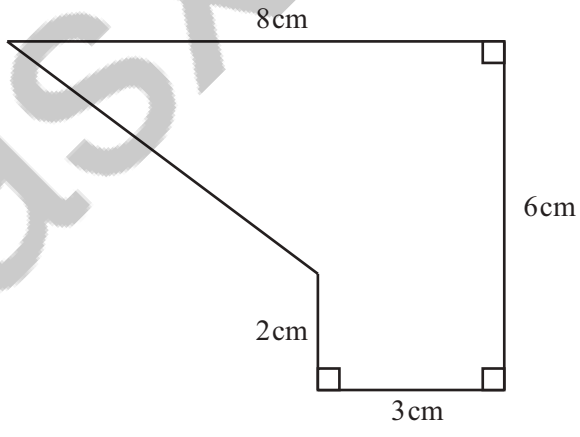
(b) Write $\frac{1}{20}$ as a percentage.

..... % [1]

(c) Write $\frac{1}{8}$ as a decimal.

..... [1]

9



NOT TO SCALE

Work out the area of this shape.

..... cm^2 [3]

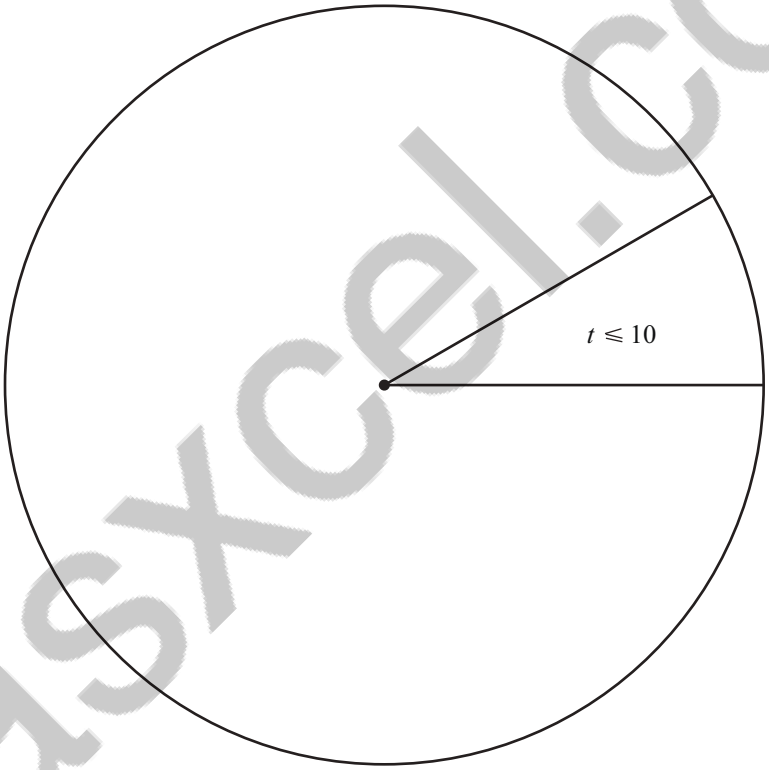
10 Huda is drawing a pie chart for the times, in minutes, that 60 students take to travel to school.

Time (t minutes)	Frequency	Angle (degrees)
$t \leqslant 10$	5	30
$10 < t \leqslant 15$	15	
$15 < t \leqslant 20$	10	
$t > 20$	30	

(a) Complete the table to show the sector angles in the pie chart.

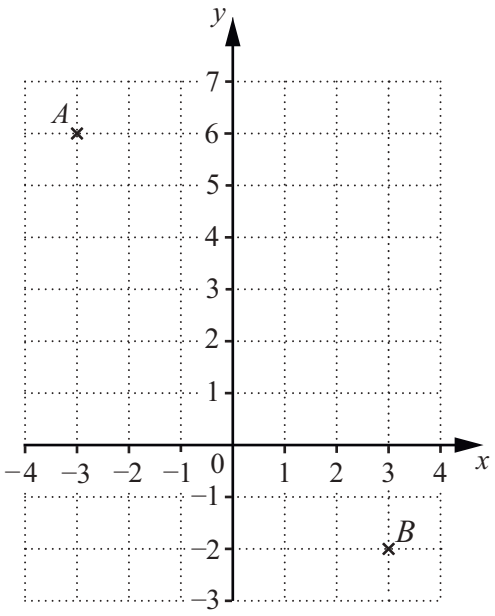
[2]

(b) Complete the pie chart to show this information.



[2]

11



A is the point (–3, 6) and B is the point (3, –2).

Find the co-ordinates of the midpoint of AB.

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

12 Solve $2x < 8$.

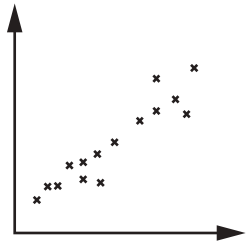
..... [1]

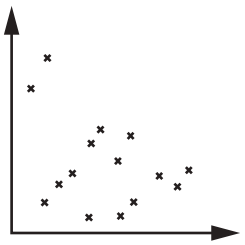
13 $2^7 = 128$

Find the value of 2^8.

..... [1]

14 Write down the type of correlation shown in each of these scatter diagrams.





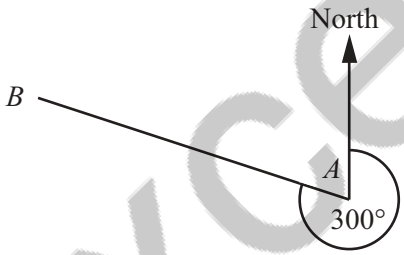
.... [2]

15 $f(x) = x^2 + 1$

Work out the values of x when $f(x) = 26$.

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

16



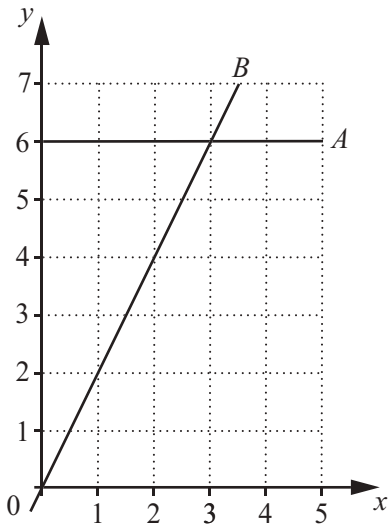
NOT TO SCALE

The bearing of B from A is 300°.

Find the bearing of A from B.

..... [2]

17



(a) Write down the equation of line A.

..... [1]

(b) Find the equation of line B.

..... [2]

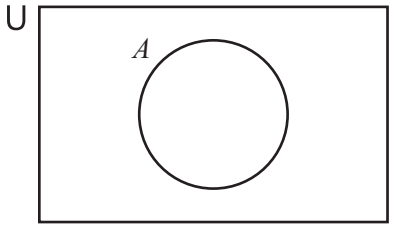
18 Solve the simultaneous equations.

$$x + y = 3$$
$$x - 4y = 13$$

$x =$ .....

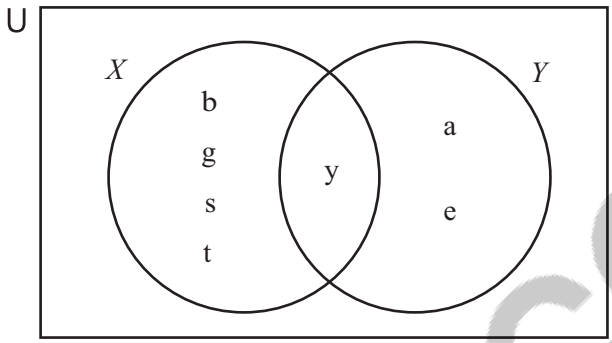
$y =$ ..... [2]

19 **(a)** On the Venn diagram shade the region represented by A'.



[1]

(b)



The Venn diagram shows two sets X and Y.
$\mathsf{U} = \{a, b, e, g, s, t, y\}$

A letter is chosen at random.

Write down the probability that it is in set Y but not in set X.

..... [1]

20 A is the point (–3, 4) and B is the point (2, 2).

Find the vector $\overrightarrow{AB}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

21 The graph of $y = f(x)$ is translated by the vector $\begin{pmatrix} -2 \\ 0 \end{pmatrix}$.

Write down the equation of the new graph.

$y =$ ..... [1]

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CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

8407547624

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/21**

Paper 2 (Extended) **May/June 2019**

45 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical Instruments

READ THESE INSTRUCTIONS FIRST

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The total number of marks for this paper is 40.

This document consists of **8** printed pages.

Cambridge Assessment International Education

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. $\quad A = \pi rl$

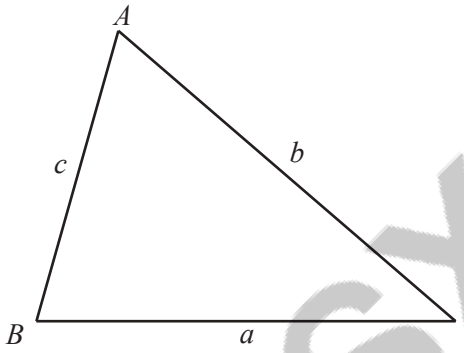
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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 Work out.

(a) $(0.3)^2$

..... [1]

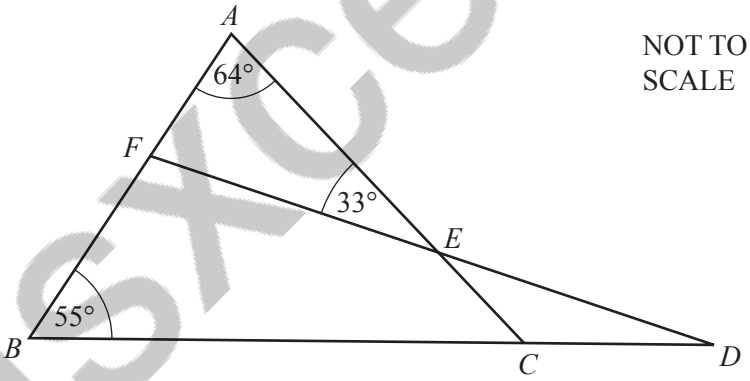
(b) $\frac{4}{9} - \frac{1}{6}$

..... [2]

2 Divide 360 in the ratio 7 : 2.

..... , ... [2]

3



NOT TO SCALE

ABC is a triangle.
FED and *BCD* are straight lines.

Work out angle *EDC*.

Angle *EDC* = ... [2]

4 Expand and simplify.

$$4(3x + y) - 3(x - 2y)$$

..... [2]

5 Sacha drove 425 km from home at an average speed of 100 km/h.

(a) Calculate the time for the journey giving your answer in hours and minutes.

..... h ..... min [2]

(b) The return journey took 3 hours and 55 minutes.
She started at 21 56.

At what time did she arrive home?

..... [2]

6 **(a)** Write down the integer solutions to this inequality.

$$-2 \leqslant 2x < 8$$

..... [2]

(b) Solve $2 + 2x > 5x + 14$.

..... [2]

7 Work out $(5.2 \times 10^{18}) - (2.4 \times 10^{17})$.
Give your answer in standard form.

..... [2]

8 A map is drawn to a scale of 1 cm to 5 km.

(a) On the map, the distance between two towns is 4.8 cm.

Find the actual distance between the towns.

.....km [1]

(b) An island has an area of 75 km^2.

Find the area of the island on the map.

.....cm^2 [2]

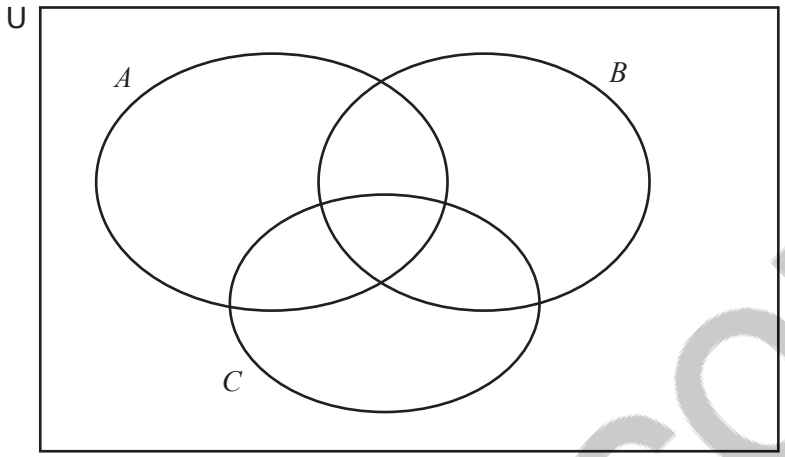
9 Factorise completely.

$2x^2 - 18$

..... [2]

10 U = {integers from 1 to 12}
A = {1, 2, 4, 5, 12}
B = {2, 3, 4, 6, 10}
C = {1, 2, 8, 9, 10}

(a) Complete the Venn Diagram.



[2]

(b) Find $\mathrm{n}(A \cap (B \cup C)')$.

..... [1]

11 The point A has co-ordinates (3, 8).
The point B has co-ordinates (7, 0).

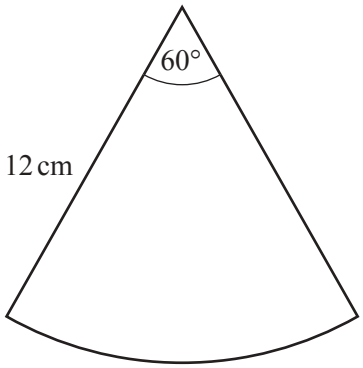
(a) Find the co-ordinates of the midpoint of AB.

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

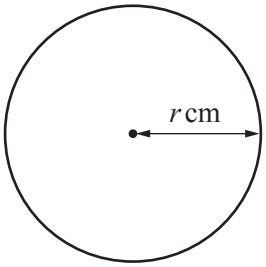
(b) Find the equation of the perpendicular bisector of AB.
Write your answer in the form $y = mx + c$.

$y =$ ..... [3]

12



NOT TO SCALE



The sector and the circle have the same area.
The angle of the sector is 60°.
The radius of the sector is 12 cm and the radius of the circle is r cm.

Work out the value of r.
Give your answer as a surd in its simplest form.

$r =$ ..... [3]

13 Rearrange this formula to make b the subject.

$$A = \frac{(a+b)}{2}h$$

$b =$ ..... [3]

Question 14 is printed on the next page.

14 **(a)** Find the value of $\log_{25} 5$.

..... [1]

(b) Simplify $\log 63 - 2\log 3$.

..... [2]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/31**

Paper 3 (Core) **May/June 2019**

1 hour 45 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical Instruments
Graphics Calculator

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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 96.

This document consists of **18** printed pages and **2** blank pages.

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[Turn over

Formula List

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle, radius r.	$A = \pi r^2$
Circumference, C, of circle, radius r.	$C = 2\pi r$
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 prism, cross-sectional area A, length l.	$V = Al$
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.	$V = \frac{4}{3}\pi r^3$

Answer **all** the questions.

1 **(a)** Write in words the number 6015.

..... [1]

(b) Find the value of

(i) 4^3,

..... [1]

(ii) $\frac{2(3+9)}{3\times 16}$,

..... [1]

(iii) 3×5^2,

..... [1]

(iv) $40-10\times 2$.

..... [1]

(c) Find

(i) $\sqrt{81}$,

..... [1]

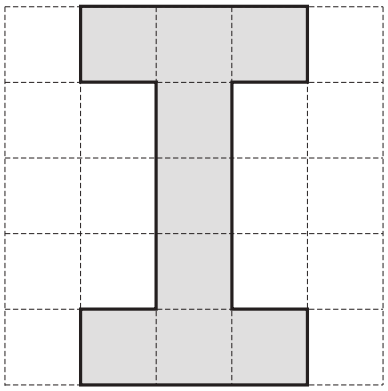
(ii) a prime number between 20 and 30,

..... [1]

(iii) 60 as a product of prime factors.

..... [2]

2



This shape is drawn on a 1 cm^2 grid.

(a) **(i)** Work out the area and the perimeter of the shape.
Give the units of each answer.

Area = ...

Perimeter = ... [4]

(ii) The shape is enlarged by a scale factor of 3.

Find the perimeter of the enlarged shape.
Give your answer in metres.

..... m [3]

(b) Write down the order of rotational symmetry of the shape.

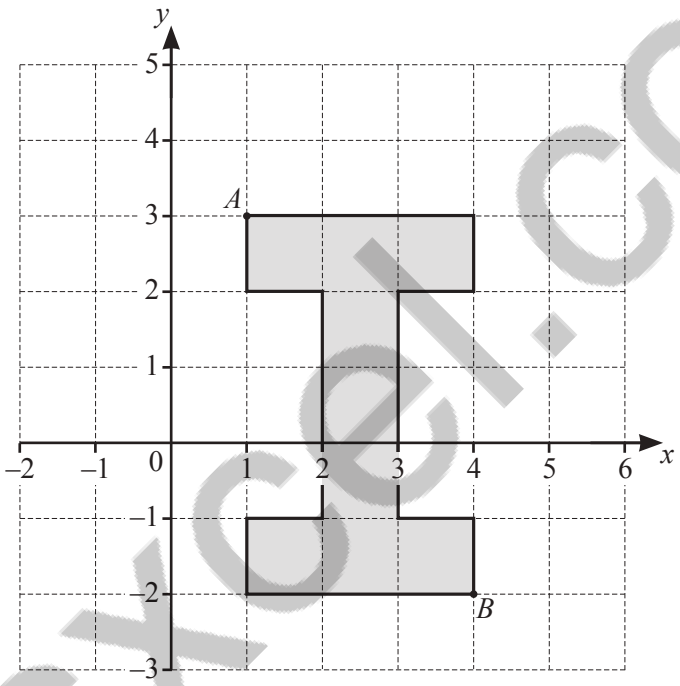
..... [1]

(c) On the diagram, draw all the lines of symmetry. [2]

(d) Work out the sum of all the interior angles of the shape.

..... [3]

(e)



Write down the co-ordinates of point *A* and point *B*.

A (..... , ...)

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

3 **(a)** A packet of cereal costs $2.80 .

Work out the largest number of these packets that can be bought with $20.
How much change would you get?

..... packets and $ ..... change [3]

(b) A packet originally contained 450 g of cereal.
The mass of cereal in the packet is increased by 15%.

Work out how much **extra** cereal is added to the packet.

..... g [2]

(c) 51 out of 300 people said they would buy the heavier packet of cereal.

Work out 51 as a percentage of 300.

..... % [1]

4 This formula can be used to change a temperature in degrees Celsius, C, to a temperature in degrees Fahrenheit, F.

$$F = 2C + 30$$

(a) Find the value of F when

(i) $C = 0$,

..... [1]

(ii) $C = 120$.

..... [1]

(b) Find the value of C when $F = 350$.

..... [2]

(c) Find the value of C when $F = C$.

..... [2]

(d) Rearrange the formula to make C the subject.

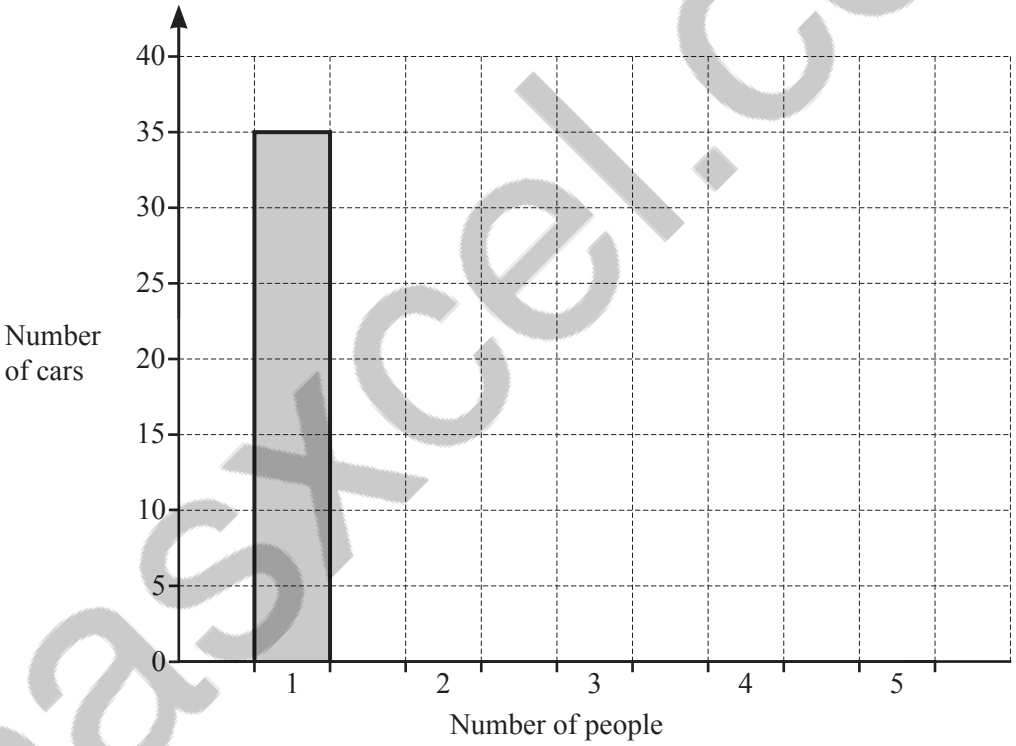
$$F = 2C + 30$$

$C =$ ..... [2]

5 Henri records the number of people in each car passing through his village.
The results are shown in the table.

Number of people	Number of cars
1	35
2	25
3	20
4	10
5	10

(a) Complete the bar chart to show this information.



[2]

(b) Find the total number of cars that Henri recorded.

..... [1]

(c) Using the results in the table, work out

(i) the mode,

..... [1]

(ii) the median,

..... [1]

(iii) the mean.

..... [2]

(d) One of the cars is chosen at random.
Work out the probability that it contains

(i) 4 people,

..... [1]

(ii) 1 or 2 people.
Give your answer as a fraction in its simplest form.

..... [2]

6 **(a)** These are the first four terms of a sequence.

11 18 25 32

(i) Write down the rule for continuing this sequence.

..... [1]

(ii) Find an expression for the nth term of this sequence.

..... [2]

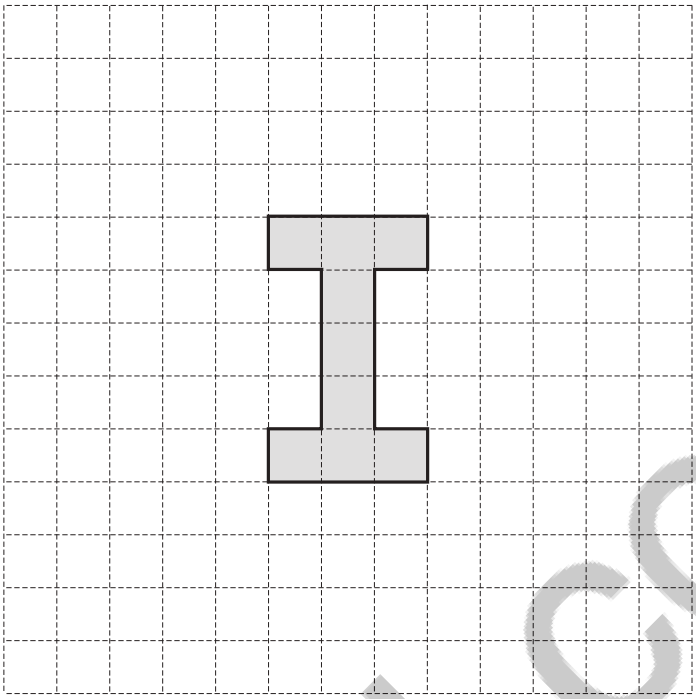
(b) Here are the first four terms of another sequence.

23 18 13 8

Find the next two terms of this sequence.

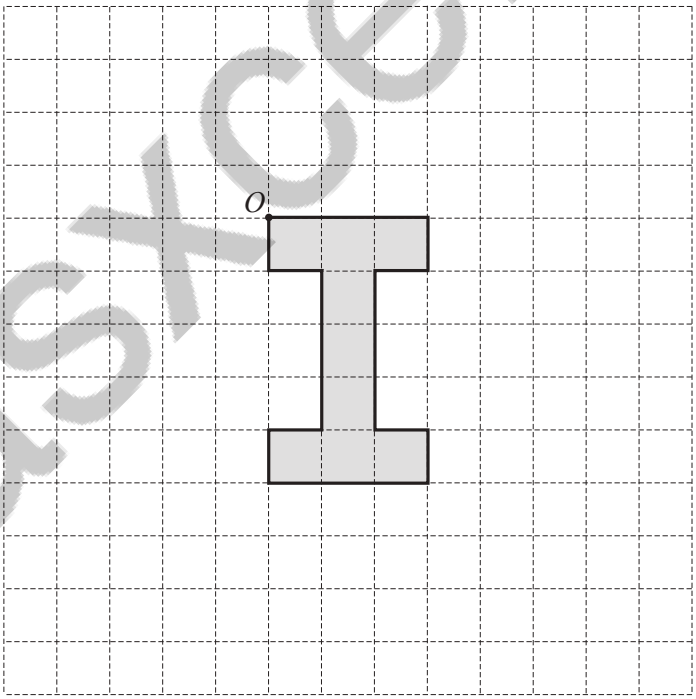
..... , ... [2]

7 **(a)** On the grid, draw the image of the shape after a translation by vector $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$.



[2]

(b) On the grid, draw the image of the shape after a rotation of 90° anticlockwise about the point O.



[2]

8 **(a)** Simplify.

$$4a + 2a - 3a$$

..... [1]

(b) Solve.

(i) $17 - x = 4$

$x =$ ..... [1]

(ii) $\frac{x}{5} = 4$

$x =$ ..... [1]

(iii) $2(3x + 1) = 44$

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

(c) Factorise fully.

$$12x - 30$$

..... [2]

(d) Simplify fully.

(i) $\dfrac{x^4 \times x^3}{x^7}$

..... [2]

(ii) $\dfrac{15y^6}{3y^2}$

..... [2]

9 Crystal carries out a survey of cars, vans and lorries that drive past her house.

(a) She sees a total of 500 of these types of vehicle.
The ratio cars : vans : lorries = 14 : 4 : 7.

Work out how many of each type of vehicle she sees.

Cars .....

Vans .....

Lorries ..... [3]

(b) One car travels 2.5 km in 5 minutes.

Work out the speed of this car in kilometres per hour.

..... km/h [2]

(c) Crystal measures the speed of each of the 500 vehicles.
Her results are shown in the table.

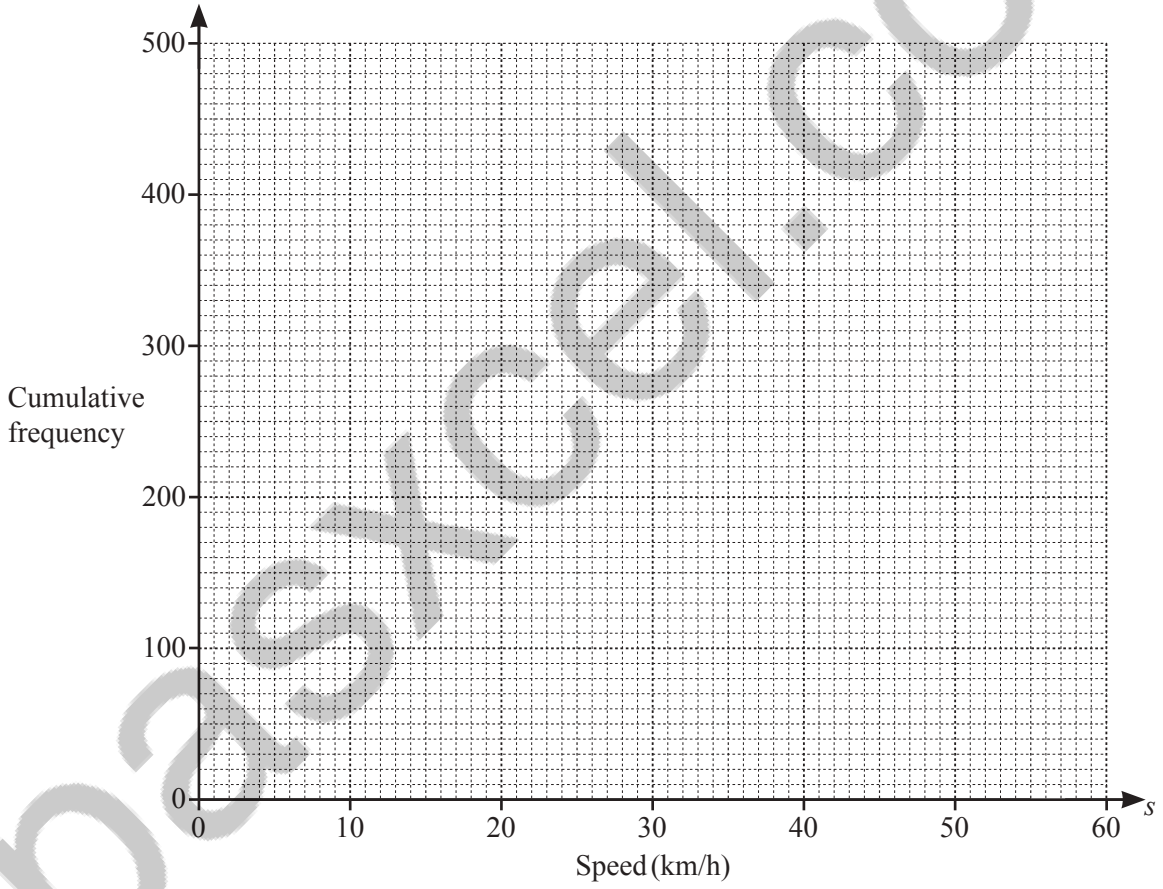
Speed (s km/h)	Frequency
$0 < s \leqslant 10$	0
$10 < s \leqslant 20$	20
$20 < s \leqslant 30$	230
$30 < s \leqslant 40$	170
$40 < s \leqslant 50$	60
$50 < s \leqslant 60$	20

(i) Complete the cumulative frequency table.

Speed (s km/h)	Cumulative Frequency
$s \leqslant 10$	0
$s \leqslant 20$	
$s \leqslant 30$	
$s \leqslant 40$	
$s \leqslant 50$	
$s \leqslant 60$	500

[1]

(ii) On the grid, draw a cumulative frequency curve for this information.



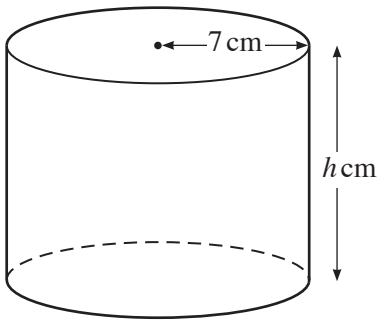
[3]

(iii) Use your cumulative frequency curve to estimate the number of cars travelling **faster than** 35 km/h.

..... [2]

10

NOT TO SCALE



A cylinder has radius 7 cm and height h cm.

(a) Show that the area of the circular end of the cylinder is 154 cm^2, correct to the nearest whole number.

[2]

(b) The volume of the cylinder is 2 litres.

Work out the value of h.

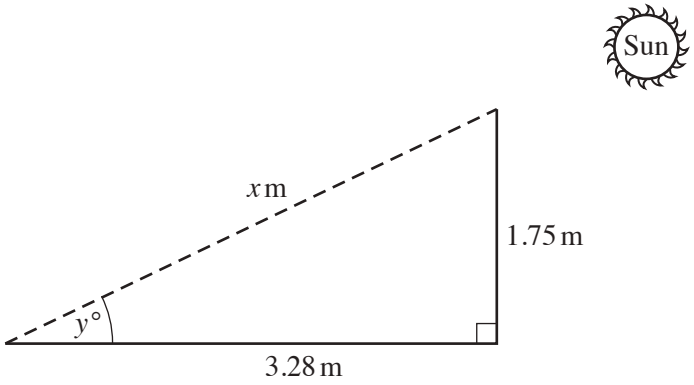
$h =$ ..... [2]

(c) A cube has side length x cm.
It has the same volume as the cylinder.

Find the value of x.

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

11 A vertical post, 1.75 m tall, stands on horizontal ground.
One day, the post casts a shadow of length 3.28 m.



NOT TO SCALE

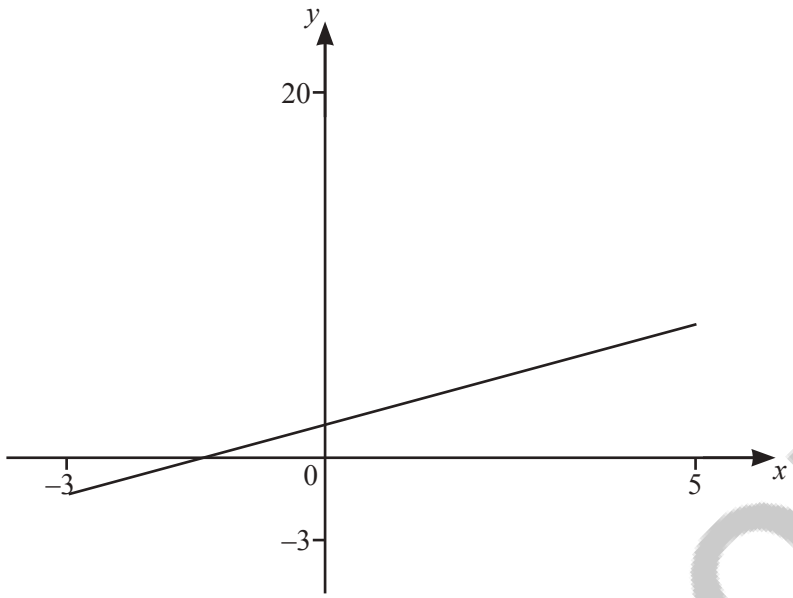
(a) Find the value of x.

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

(b) Find the value of y, the angle of elevation of the Sun.

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

12



The diagram shows the graph of $y = x + 2$ for $-3 \leqslant x \leqslant 5$.

(a) Find the co-ordinates of the y-intercept.

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

(b) On the diagram, sketch the graph of $y = x^2 - x - 1$ for $-3 \leqslant x \leqslant 5$. [2]

(c) Solve this equation.

$$x^2 - x - 1 = x + 2$$

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

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Cambridge IGCSE

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CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4886478967

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **May/June 2019**

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 **19** printed pages and **1** blank page.

Cambridge Assessment International Education

[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. $\quad A = \pi rl$

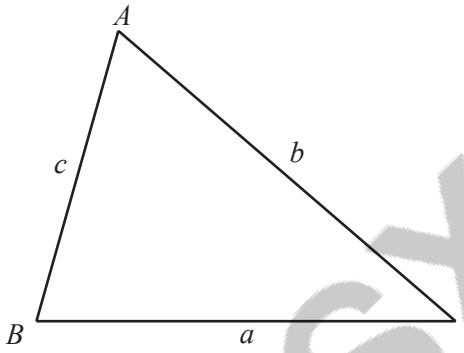
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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 In a sale, a shop reduces all its prices by 15%.

(a) Calculate the sale price of a television originally costing \$630.

\$ ..... [2]

(b) The price of a fridge in the sale is \$952.

Calculate the original price.

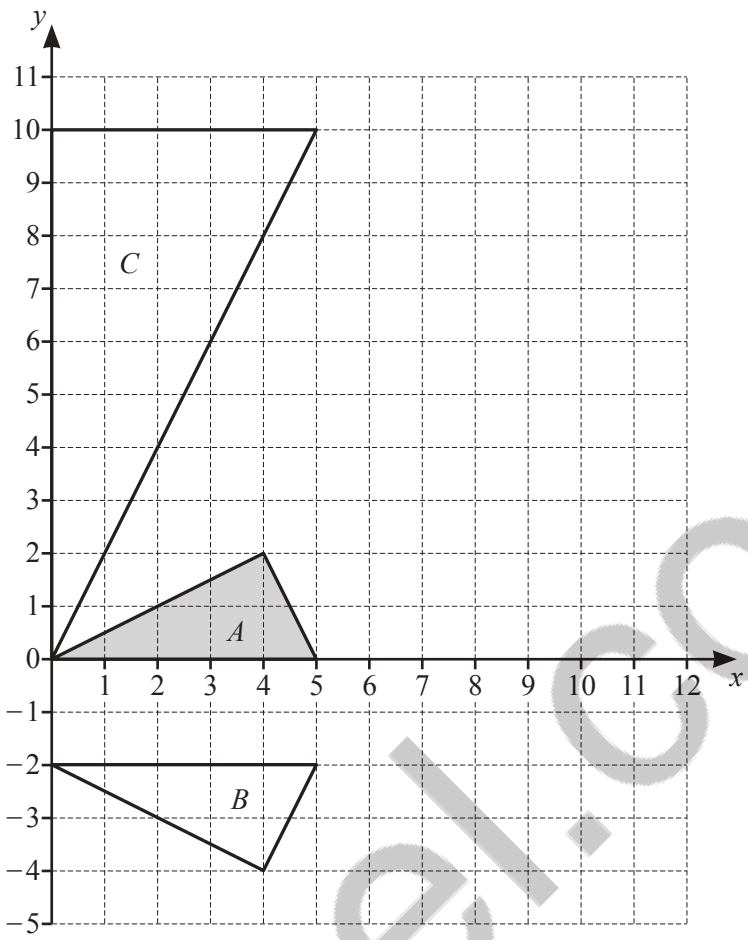
\$ ..... [3]

(c) After one week the shop reduces the price of the television in **part (a)** by a further 5% each week until it is sold.

Calculate the number of weeks from the start of the sale until the television reaches half the original price.

..... [4]

2



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

..... [2]

(b) Translate triangle A by the vector $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$. [2]

(c) Triangle A can be mapped onto triangle C by a rotation followed by an enlargement.

(i) Use trigonometry to calculate the angle of rotation.

..... [3]

(ii) The scale factor of the enlargement is $\sqrt{a}$ where a is an integer.

Find the value of a.

$a =$ ..... [3]

3 1 3 5 9 15 45

The list shows the six factors of 45.

This is a method for finding how many factors a number has.

- Write the number as the product of its prime factors in index form.
- Add one to each of the powers and multiply these numbers together.

For example,

$45 = 3^2 \times 5^1$

$(2+1) \times (1+1) = 3 \times 2 = 6$

So 45 has 6 factors.

(a) $24 = 2^3 \times 3^1$

By listing all the factors of 24, show that the method works for 24.

[3]

(b) Use the method to find how many factors 360 has.

..... [4]

4 Rani planted some seeds in her garden.
After two months she measured the heights, h cm, of each of 120 plants.

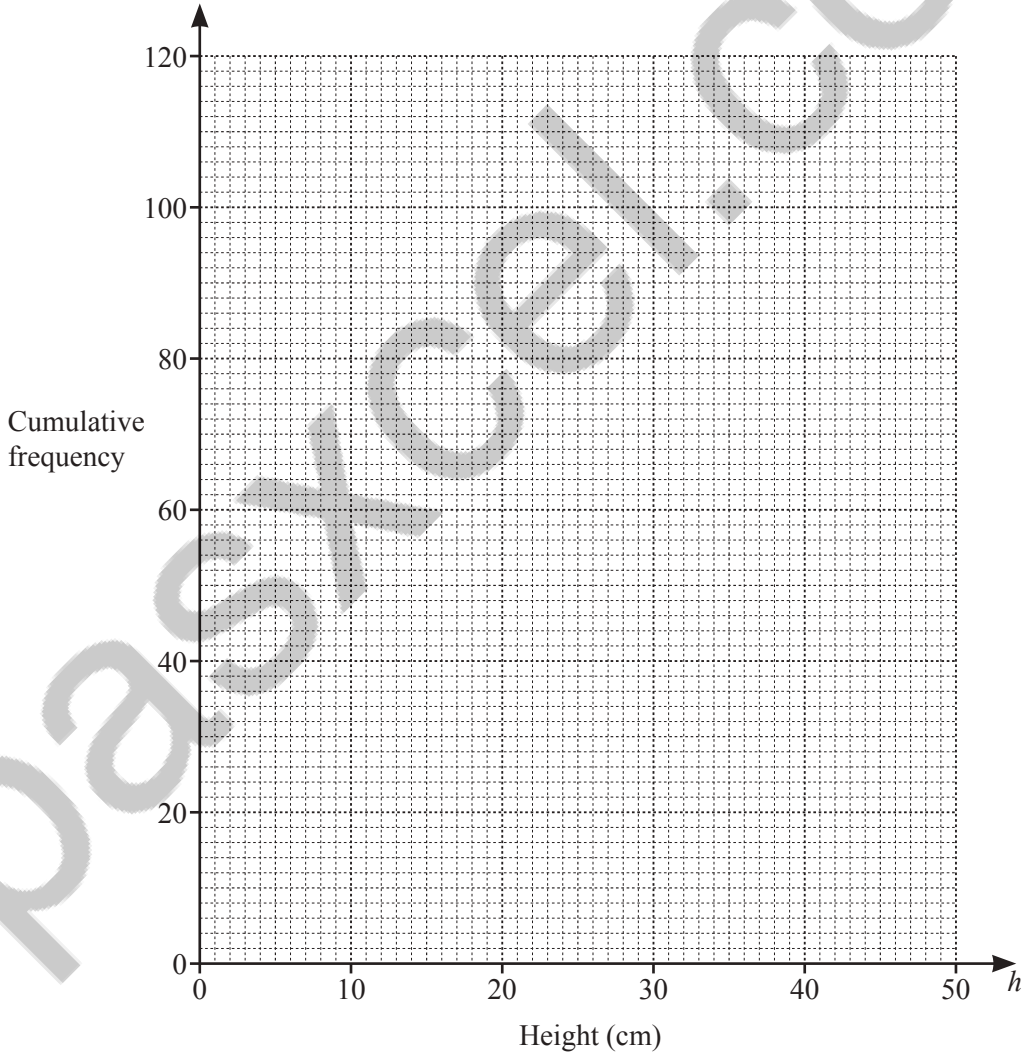
The results are shown in the table.

Height (h cm)	$0 < h \leqslant 10$	$10 < h \leqslant 20$	$20 < h \leqslant 25$	$25 < h \leqslant 30$	$30 < h \leqslant 35$	$35 < h \leqslant 40$	$40 < h \leqslant 50$
Frequency	0	16	28	32	24	14	6

(a) Calculate an estimate of the mean height.

..... cm [2]

(b) Draw a cumulative frequency curve for this information.



[5]

(c) Use your cumulative frequency curve to estimate

(i) the median height,

..... cm [1]

(ii) the interquartile range,

..... cm [2]

(iii) the number of plants with a height of more than 37 cm.

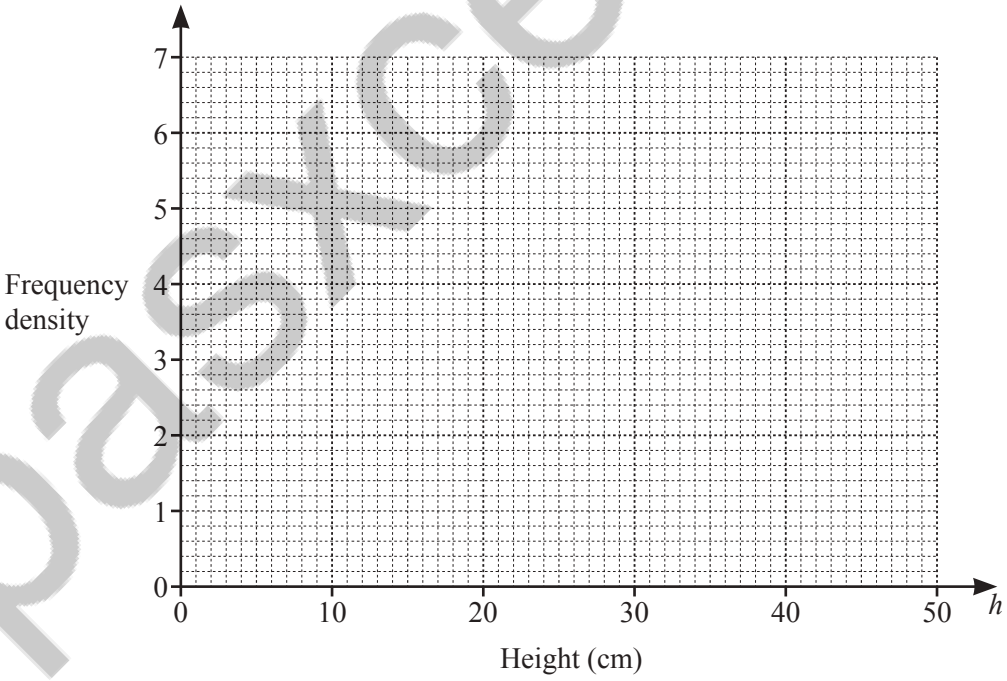
..... [2]

(d) (i) Complete this table of frequency densities for the 120 plants.

Height (h cm)	$0 < h \leqslant 10$	$10 < h \leqslant 20$	$20 < h \leqslant 25$	$25 < h \leqslant 30$	$30 < h \leqslant 35$	$35 < h \leqslant 40$	$40 < h \leqslant 50$
Frequency density	0	1.6					

[2]

(ii) Draw a histogram to show this information.



[3]

5 Jian asks 60 people what their favourite type of television programme is.

These are the results.

Type of programme	Number of people
Factual	15
Sport	18
Drama	12
Game Show	10
Other	5

(a) Jian draws a pie chart to show these results.

Calculate the sector angle for Drama.

..... [2]

(b) Jian chooses one of the 60 people at random.

Write down the probability that the person says Factual.

..... [1]

(c) Jian chooses two of the 60 people at random.

(i) Find the probability that one of them says Drama and the other says Game Show.

..... [3]

(ii) Find the probability that at least one person says Sport.

..... [3]

6 y is inversely proportional to $\sqrt{x}$.
When $x = 9$, $y = 6$.

(a) **(i)** Find an equation connecting x and y.

..... [2]

(ii) Calculate y when $x = 30$.

..... [1]

(iii) Calculate x when $y = 15$.

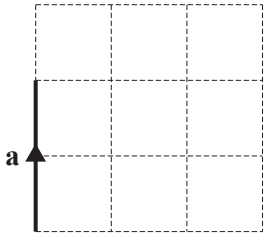
..... [2]

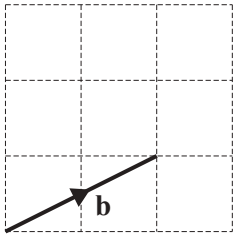
(b) For the three variables x, y and z, z is also proportional to $(y + 5)$.
When $x = 9$, $z = 33$.

Find an equation connecting x and z.

..... [2]

7 The vectors **a** and **b** are shown on the grids.



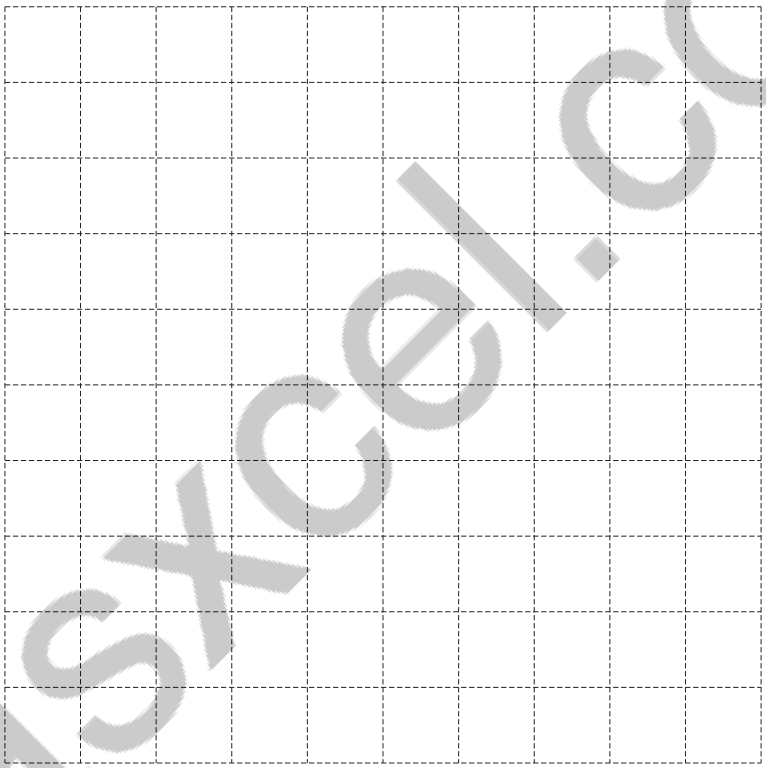


(a) On the grid below, draw and label the following three vectors.

$2\mathbf{b}$

$2\mathbf{a} + \mathbf{b}$

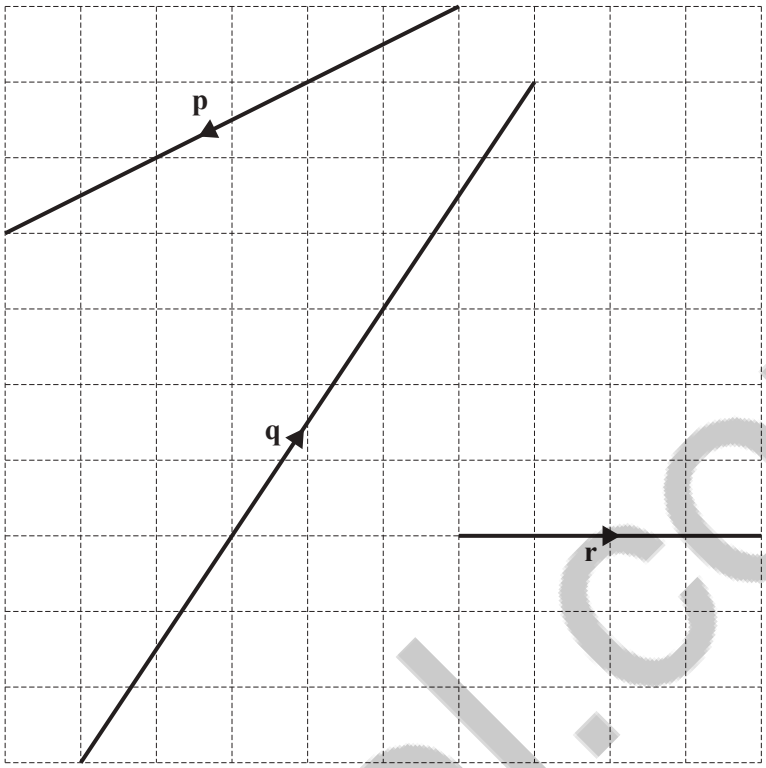
$\mathbf{a} - 2\mathbf{b}$



[3]

(b) Vectors **p**, **q**, and **r** are drawn on this grid.

Write each of the vectors in terms of **a** and/or **b**.

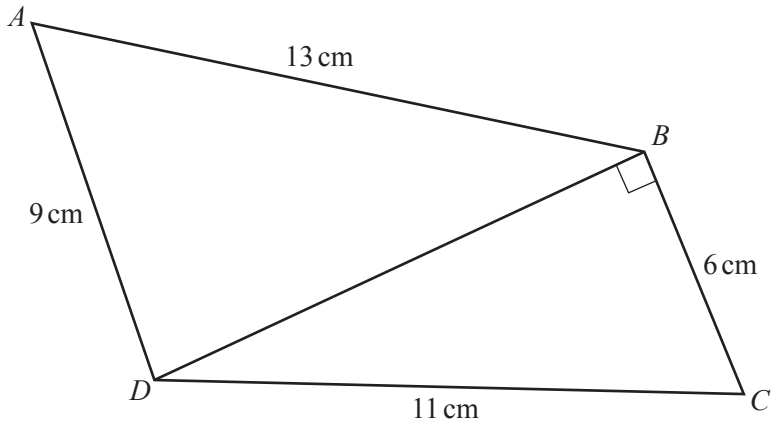


p = ...

q = ...

r = ... [3]

8



NOT TO SCALE

ABCD is a quadrilateral.

(a) Show that $BD = 9.22$ cm, correct to 3 significant figures.

[3]

(b) Calculate angle *ABD*.

Angle *ABD* = ... [3]

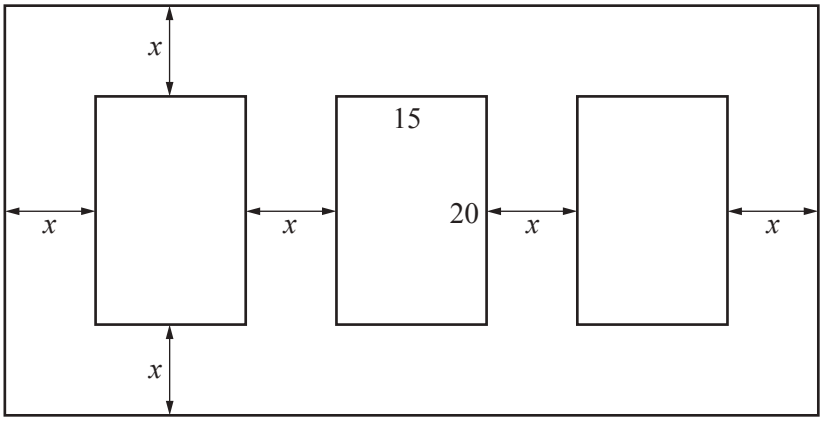
(c) Calculate the total area of the quadrilateral *ABCD*.

..... cm^2 [3]

(d) Calculate the length of the diagonal AC.

$AC =$ ..... cm [3]

9 In this question all lengths are in centimetres.



NOT TO SCALE

The diagram shows a picture frame with three pictures.
The frame and the pictures are rectangles.

Each picture measures 20 cm by 15 cm.
The width of the borders between each picture and between each picture and the frame are all x cm.
The total area of the frame is 2208 cm^2.

(a) Show that $4x^2 + 85x - 654 = 0$.

[3]

(b) Solve the equation $4x^2 + 85x - 654 = 0$.
You must show all your working.

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

(c) Find the dimensions of the picture frame.

Length ..... cm

Height ..... cm [2]

10 **(a)** $f(x) = 5 - 2x$ $\quad\quad$ $g(x) = 3x + 2$

(i) Find $f(-3)$.

..... [1]

(ii) Find $f(g(4))$.

..... [2]

(iii) Solve $\dfrac{f(x)}{g(x)} = 2$.

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

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

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

(v) Find and simplify $g(f(x))$.

..... [2]

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

$$\frac{3}{\mathrm{f}(x)} + \frac{2}{\mathrm{g}(x)}$$

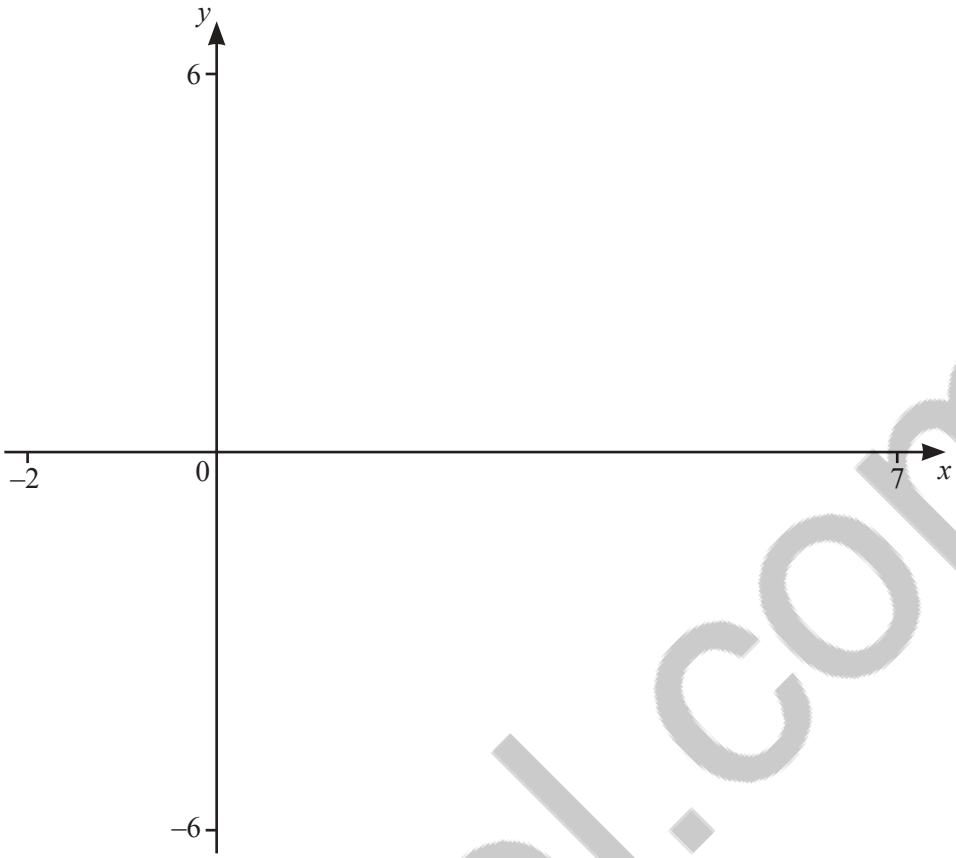
..... [3]

(b) The function $\mathrm{h}(x)$ has an inverse function $\mathrm{j}(x)$.

Write down, in its simplest form, $\mathrm{j}(\mathrm{h}(x))$.

..... [1]

11



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

(a) On the diagram, sketch the graph of $y = f(x)$ for values of x between -2 and 7. [3]

(b) Write down the co-ordinates of the local maximum.

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

(c) Write down the equation of each of the three asymptotes.

..... , ... , ... [3]

(d) $g(x) = x - 5$

(i) Solve the equation $f(x) = g(x)$.

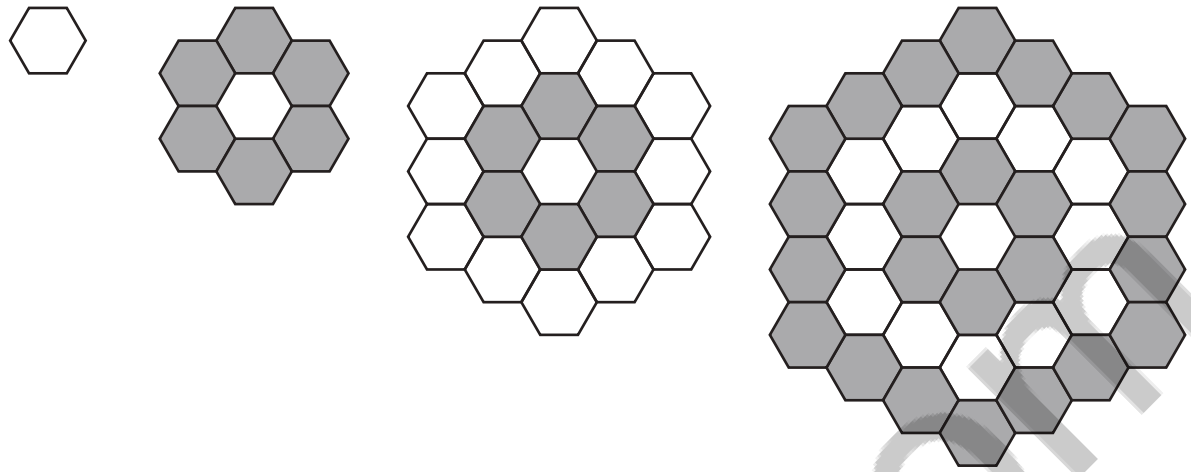
$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(ii) Solve the inequality $f(x) > g(x)$.

..... [3]

12 Here is a sequence of patterns made using identical regular hexagons.

Pattern 1 Pattern 2 Pattern 3 Pattern 4



Pattern number	1	2	3	4	5	6
Number of white hexagons	1	1	13	13		
Number of grey hexagons	0	6	6	24		
Total number of hexagons	1	7	19	37	61	

(a) Complete the table for Pattern 5 and Pattern 6. [5]

(b) The nth term of the sequence for the total number of hexagons is $3n^2 + pn + q$.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/11**

Paper 1 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

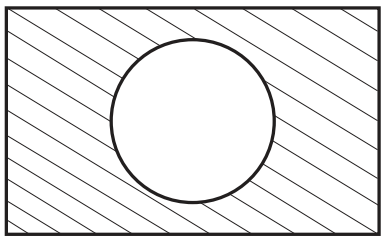
B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	36 000	**1**	
2	Any 3 multiples of 12	**1**	
3(a)	*AB*	**1**	
3(b)	*CD*	**1**	
4	70	**2**	**M1** for $2 \times 30 + 10$ or 60 seen
5	2400	**1**	
6(a)	60	**1**	
6(b)	130	**1**	
7	3, 4, 5, 6	**1**	
8(a)	6	**1**	
8(b)	5	**1**	
8(c)	[0].125 cao	**1**	
9	28	**3**	**M1** for area of rectangle e.g. 18 seen or for area of triangle e.g. $0.5 \times 5 \times 4$ and **M1** for complete method for total area
10(a)	Angles 90, 60, 180 in oder	**2**	**B1** for 2 correct angles or **M1** for 6° [per student] seen
10(b)	Correct pie chart with category labels	**2**	**B1** for 1 correct sector (angle and label) If 0 scored, **SC1** for correct pie chart with *their* angles with sum equal to 330
11	(0, 2)	**2**	**B1** for each
12	$x < 4$	**1**	
13	256	**1**	
14	Positive None oe	**2**	**B1** for each
15	–5 and +5	**2**	**B1** for each If 0 scored, **M1** for $x^2 = 25$ or $x = \sqrt{25}$
16	120	**2**	**M1** for 300 –180 or **M1** 360 – 300 or better

Question	Answer	Marks	Partial Marks
17(a)	$y = 6$ Final answer	**1**	
17(b)	$y = 2x$ Final answer	**2**	**M1** for [gradient =] $\frac{6}{3}$ oe
18	[x =] 5 [y =] –2	**2**	**B1** for each If 0 scored, **SC1** for correct substitution and evaluation to find other variable
19(a)		**1**	
19(b)	$\frac{2}{7}$	**1**	
20	$\begin{pmatrix} 5 \\ -2 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or $\begin{pmatrix} 5 \\ k \end{pmatrix}$
21	f(x + 2)	**1**	

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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/21**

Paper 2 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

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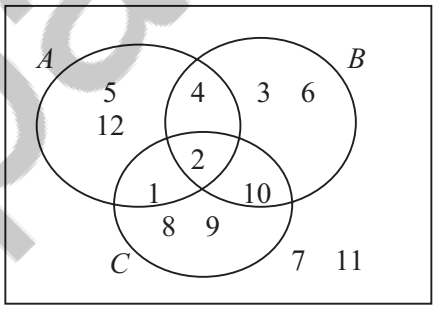
B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	0.09	**1**	
1(b)	$\frac{5}{18}$ or equiv fraction	**2**	**M1** for $\frac{8}{18}$ or $\frac{3}{18}$ oe
2	280, 80	**2**	**B1** for each or **M1** for 360 ÷ (7 + 2) soi by 40
3	28	**2**	**B1** for *CED* = 33 or *ECD* = 119 or *ECB* = 61 or *BFD* = 97
4	$9x + 10y$ final answer	**2**	**B1** for $12x + 4y - 3x + 6y$ or $ax + 10y$, $a \neq 0$ or $9x + by$, $b \neq 0$
5(a)	4 [h] 15 [min]	**2**	**M1** for 425 ÷ 100 soi by 4.25 oe
5(b)	[0]1 51 oe	**2**	**B1** for 25 51
6(a)	–1, 0, 1, 2, 3	**2**	**B1** for 5 correct and 1 extra or 3 or 4 correct with no errors or **M1** for $-1 \leqslant x < 4$
6(b)	$x < -4$ final answer	**2**	**M1** for $2 - 14 > 5x - 2x$ oe If 0 scored, **SC1** for $x = -4$ or $x > -4$ or $x \leqslant -4$ or $x \geqslant -4$
7	4.96×10^{18}	**2**	**B1** for 52×10^{17} or 0.24×10^{18} or figs 496
8(a)	24	**1**	
8(b)	3	**2**	**B1** for 5^2 soi
9	$2(x + 3)(x - 3)$ final answer	**2**	**B1** for $2(x^2 - 9)$ or $(2x + 6)(x - 3)$ or $(x + 3)(2x - 6)$ in working or answer space
10(a)		**2**	**B1** for 1, 2 or 3 numbers misplaced
10(b)	2	**1**	**FT** *their* diagram
11(a)	(5, 4)	**1**	

Question	Answer	Marks	Partial Marks
11(b)	$[y =] \frac{1}{2}x + 1\frac{1}{2}$ oe	**3**	**M1** for $\frac{8-0}{3-7}$ oe or gradient = –2 **M1** for gradient of perpendicular $= \frac{-1}{\textit{their}\text{ gradient}}$
12	$2\sqrt{6}$	**3**	**M1** for $\frac{60}{360} \times \pi \times 12^2 = \pi r^2$ oe **A1** for $r^2 = 24$ or better
13	$[b =] \frac{2A}{h} - a$ or $[b =] \frac{2A - ah}{h}$ oe Final answer	**3**	**M2** for $2A - ah = bh$ or $\frac{2A}{h} = a + b$ or **M1** for $2A = (a + b)h$ or $\frac{A}{h} = \frac{a+b}{2}$
14(a)	$\frac{1}{2}$ or 0.5	**1**	
14(b)	log 7	**2**	**M1** for correct use of $\log a^n = n\log a$ or $\log(a \div b) = \log a - \log b$

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/31**

Paper 3 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 96

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	Six thousand [and] fifteen	**1**	
1(b)(i)	64	**1**	
1(b)(ii)	[0].5 oe	**1**	
1(b)(iii)	75	**1**	
1(b)(iv)	20	**1**	
1(c)(i)	9	**1**	
1(c)(ii)	23 or 29	**1**	
1(c)(iii)	$2 \times 2 \times 3 \times 5$ oe	**2**	**B1** for any correct product equal to 60 or for 2, 3, 5 as final answer
2(a)(i)	[A =] 9 cm^2 [P =] 20 cm	**4**	**B1** for each value and each unit
2(a)(ii)	[0].6	**3**	**FT** $\frac{\textit{their}\ \text{P} \times 3}{100}$ **B1** for *their* P × 3 **M1** for ÷ 100
2(b)	2	**1**	
2(c)	Two correct ruled lines	**2**	**B2** for 2 correct lines and no extra lines **B1** for 2 correct lines and no more than 2 extra lines
2(d)	1800	**3**	**M2** for $8 \times 90 + 4 \times 270$ soi by 720 + 1080 or **M1** for 8×90 or 4×270 soi by 720 or 1080
2(e)	[*A* =] (1, 3) [*B* =] (4, –2)	**2**	**B1** for each
3(a)	7 with [0].4[0] change	**3**	**B2** for 7 or **M1** for 20 ÷ 2.80 soi by 7.1…
3(b)	67.5	**2**	**M1** for 450×0.15 oe soi
3(c)	17	**1**	
4(a)(i)	30	**1**	
4(a)(ii)	270	**1**	
4(b)	160	**2**	**B1** for $350 = 2C + 30$ oe
4(c)	–30	**2**	**B1** for $C = 2C + 30$
4(d)	$\frac{F-30}{2}$ or $\frac{F}{2} - 15$	**2**	**B1** for $F - 30 = 2C$ or for $\frac{F}{2} = C + 15$

Question	Answer	Marks	Partial Marks
5(a)	Correct bar chart	**2**	**B1** for 4 correct heights, unequal widths or for 3 correct heights, all equal widths
5(b)	100	**1**	
5(c)(i)	1	**1**	
5(c)(ii)	2	**1**	
5(c)(iii)	2.35	**2**	**M1** for $1 \times 35 + 2 \times 25 + 3 \times 20 + 4 \times 10 + 5 \times 10$ or for $\div$ *their*100
5(d)(i)	$\frac{10}{100}$ oe	**1**	**FT** $\frac{10}{\textit{their}100}$
5(d)(ii)	$\frac{3}{5}$	**2**	**M1** for $\frac{60}{\textit{their}100}$
6(a)(i)	Add 7 oe	**1**	
6(a)(ii)	$7n + 4$	**2**	**B1** for $7n + x$ or for $pn + 4 \quad p \neq 0$
6(b)	3 –2	**2**	**B1** for 3 or for *their first value* – 5
7(a)	Correct image	**2**	**B1** for $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or $\begin{pmatrix} 4 \\ k \end{pmatrix}$
7(b)	Correct image	**2**	**B1** for rotation 90° clockwise about O
8(a)	$3a$	**1**	
8(b)(i)	13	**1**	
8(b)(ii)	20	**1**	
8(b)(iii)	7	**3**	**M1** for $3x + 1 = 22$ or $6x + 2 = 44$ **M1** for a correct FT next step
8(c)	$6(2x – 5)$	**2**	**B1** for $3(4x – 10)$ or $2(6x – 15)$ If 0 scored, **SC1** for $12(x – 2.5)$
8(d)(i)	x^0 or 1	**2**	**B1** for $\frac{x^7}{x^7}$
8(d)(ii)	$5y^4$	**2**	**B1** for $\frac{5y^6}{y^2}$ or $\frac{15y^4}{3}$ soi or $5y^k$ or ky^4
9(a)	[C] 280 [V] 80 [L] 140	**3**	**B2** for one value correct or **M1** for $\frac{500}{14+4+7}$ soi by 20

Question	Answer	Marks	Partial Marks
9(b)	30	**2**	**M1** for $\frac{2.5}{5}$ or 2.5×12 soi
9(c)(i)	[0] 20 250 420 480 [500]	**1**	
9(c)(ii)	Correct curve	**3**	**B2** for *their* 6 points correctly plotted and increasing or **B1** for 4 or 5 of *their* points correctly plotted and increasing **M1** for increasing curve through *their* points
9(c)(iii)	150 to 170	**2**	**M1** for attempt to read y from using $x = 35$ **FT** *their* curve only if it is increasing
10(a)	$\pi \times 7^2$	**M1**	
	153.9…	**A1**	
10(b)	13[.0]	**2**	**B1** for 2000
10(c)	12.6 or 12.59…	**3**	**M2** for $[their 2000]^{\frac{1}{3}}$ or **M1** for x^3 soi
11(a)	3.72 or 3.717 to 3.718	**2**	**M1** for $3.28^2 + 1.75^2$
11(b)	28.1 or 28.06 to 28.15	**2**	**M1** for tan[ ] $\frac{1.75}{3.28}$ or for sin[ ] $\frac{1.75}{their(a)}$ or for cos[ ] $\frac{3.28}{their(a)}$
12(a)	(0, 2)	**1**	
12(b)	Correct sketch	**2**	**B1** for correct shape or for vertex in correct quadrant
12(c)	–1 or 3	**2**	**B1** for each

Cambridge Assessment International Education
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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 120

Published

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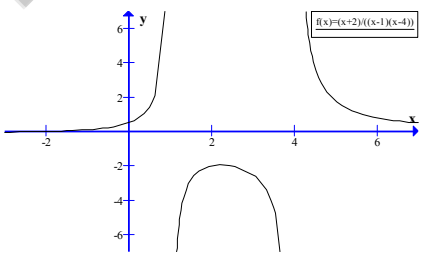
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	535.5[0] final answer	**2**	**M1** for $630 \times \left(1-\frac{15}{100}\right)$ oe
1(b)	\$1120	**3**	**M2** for $952 \div \left(1-\frac{15}{100}\right)$ oe or **M1** for 85% associated with 952
1(c)	12 nfww	**4**	**M3** for $n\log\left(1-\frac{5}{100}\right) = \log\left(\frac{\frac{1}{2}(630)}{their 535.50}\right)$ oe soi by 10.3 or 10.4 or 10.34 to 10.36… or correct trials as far as 10 and 11 or suitable sketch(es) e.g. $y = 535.5 \times 0.95^x$ and $y = 315$ or **M2** for $\left(1-\frac{5}{100}\right)^n = \left(\frac{\frac{1}{2}(630)}{their 535.50}\right)$ oe or at least 3 correct trials or final answer 11 nfww or **M1** for *their* $535.5 \times \left(1-\frac{5}{100}\right)^n = \frac{1}{2}(630)$ soi oe
2(a)	Reflection $y = -1$	**2**	**B1** for each
2(b)	Triangle at (6, –3), (11, –3), (10, –1)	**2**	**B1** for translation $\begin{pmatrix} k \\ -3 \end{pmatrix}$ or $\begin{pmatrix} 6 \\ k \end{pmatrix}$
2(c)(i)	63.4 or 63.43 to 63.44	**3**	**B2** for $\tan[\theta] = \frac{4}{2}$ oe or **B1** for correct angle clearly identified and no other angle seen.
2(c)(ii)	5	**3**	**M2** for $\frac{\sqrt{125}}{5}$ or $\frac{10}{\sqrt{20}}$ or $\frac{5}{\sqrt{5}}$ or **M1** for $\sqrt{10^2+5^2}$ or $\sqrt{4^2+2^2}$ or $\sqrt{1^2+2^2}$ or $\sqrt{125}$ or $\sqrt{20}$ or $\sqrt{5}$
3(a)	1, 2, 3, 4, 6, 8, 12, 24	**B2**	**B1** for 7 correct and 1 incorrect or 6 or 7 correct and none incorrect or 8 correct and 1 extra
	$(3 + 1) \times (1 + 1) = 8$	**B1**	soi by $4 \times 2 = 8$

Question	Answer	Marks	Partial Marks
3(b)	$360 = 2^3 \times 3^2 \times 5$	**B2**	**M1** for two steps in a factor ladder or tree oe or listing all factors of 360 with no extras or omissions.
	$(3 + 1) \times (2 + 1) \times (1 + 1)$	**M1**	soi by $4 \times 3 \times 2$ **FT** dep on factors being prime
	24	**B1**	
4(a)	27.7 or 27.70 to 27.71	**2**	**M1** for at least 3 midpoints soi
4(b)	Correct cf curve	**5**	Curve/polygon through (10, 0), (20, 16), (25, 44), (30, 76), (35, 100), (40, 114), (50, 120) or **B4** for curve through 5 or 6 points or 7 points with no curve or **B3** for 'correct curve' through all other consistent points in interval or **B2** for all correct cfs or **B1** for 4 or 5 correct cfs. If 0 scored **SC1** for any cumulative frequency diagram.
4(c)(i)	26 to 28	**1**	Dep on increasing curve **FT**
4(c)(ii)	9 to 11.5	**2**	Dep on increasing curve **FT** **B1** for lq = 22 to 23.5 or uq = 32.5 to 33.5
4(c)(iii)	10 to 15	**2**	Dep on increasing curve **FT** **B1** for 105 to 110 seen
4(d)(i)	5.6, 6.4, 4.8, 2.8, 0.6	**2**	**B1** for 3 or 4 correct
4(d)(ii)	Correct histogram	**3**	**B2 FT** for bars with *their* heights or **B1FT** for 3 or 4 bars with *their* heights or bars with all correct widths
5(a)	72	**2**	**M1** for $\frac{12}{60} \times 360$
5(b)	$\frac{1}{4}$ oe	**1**	
5(c)(i)	$\frac{4}{59}$ oe	**3**	**M2** for $\frac{12}{60} \times \frac{10}{59} + \frac{10}{60} \times \frac{12}{59}$ oe or **M1** for $\frac{12}{60} \times \frac{10}{59}$ or $\frac{10}{60} \times \frac{12}{59}$ soi $\frac{2}{59}$

Question	Answer	Marks	Partial Marks
5(c)(ii)	$\frac{303}{590}$ oe	**3**	**M2** for $1-\left(\frac{42}{60}\times\frac{41}{59}\right)$ oe or $\frac{18}{60}\times\frac{42}{59}+\frac{42}{60}\times\frac{18}{59}+\frac{18}{60}\times\frac{17}{59}$ or **M1** for $\frac{18}{60}\times\frac{42}{59}$ or $\frac{42}{60}\times\frac{18}{59}$ or $\frac{18}{60}\times\frac{17}{59}$ or $\frac{42}{60}\times\frac{41}{59}$
6(a)(i)	$y=\frac{18}{\sqrt{x}}$ oe	**2**	**M1** for $y=\frac{k}{\sqrt{x}}$ oe
6(a)(ii)	3.29 or 3.286...	**1**	**FT** wrong k only
6(a)(iii)	1.44 oe	**2**	**M1** for $\sqrt{x}=\frac{their18}{15}$ or $225=\frac{(their18)^2}{x}$
6(b)	$z=3\left(\frac{18}{\sqrt{x}}+5\right)$ oe	**2**	**M1** for $z=K\left(their\left(a(i)\right)+5\right)$ $K\neq1$ or for $z=3(y+5)$
7(a)	Vector $\begin{pmatrix}4\\2\end{pmatrix}$ drawn Vector $\begin{pmatrix}2\\5\end{pmatrix}$ drawn Vector $\begin{pmatrix}-4\\0\end{pmatrix}$ drawn	**3**	**B1** for each with arrows If 0 scored **SC1** for all three without arrows or all incorrect arrows
7(b)	[**p** =] –3**b** oe [**q** =] 3**a** + 3**b** oe [**r** =] 2**b** – **a** oe	**3**	**B1** for each
8(a)	Correct Pythagoras statement leading to 11^2-6^2 or 121 – 36 or 85	**M2**	or **M1** for $[BD]^2+6^2=11^2$ oe
	9.219…	**A1**	9.219… implies M1 A1
8(b)	43.8 or 43.80... nfww	**3**	**M2** for $\cos[ABD]=\frac{9.22^2+13^2-9^2}{2\times9.22\times13}$ or better or **M1** for $9^2=9.22^2+13^2-2\times9.22\times13\cos[ABD]$ oe

Question	Answer	Marks	Partial Marks
8(c)	69.1 or 69.13 to 69.14... nfww	**3**	**M1** for $0.5 \times 9.22 \times 6$ oe **M1** for $0.5 \times 9.22 \times 13 \times \sin$ (*their* 43.8) oe
8(d)	17.7 or 17.69...	**3**	**M1** for $6^2 + 13^2 -$ $2 \times 6 \times 13 \cos (90 +$ *their* 43.8) **A1** for 313 or 312.9 to 313.0
9(a)	$(45 + 4x)(20 + 2x) = 2208$	**M1**	
	$900 + 90x + 80x + 8x^2$	**B1**	For expansion
	Completion to $4x^2 + 85x - 654 = 0$ with no errors or omissions	**A1**	
9(b)	$\frac{-85 \pm \sqrt{85^2 - 4(4)(-654)}}{2 \times 4}$	**M1**	or $(x - 6)(4x + 109)$ or sketch of parabola $(+x^2)$ with one positive zero and one negative
	6, –27.25 oe	**B2**	**B1** for each
9(c)	Length = 69 Height = 32	**B2**	**B1FT** for each
10(a)(i)	11	**1**	
10(a)(ii)	–23	**2**	**M1** for $5 - 2(3 \times 4 + 2)$ soi or $5 - 2(3x + 2)$
10(a)(iii)	$\frac{1}{8}$ oe	**3**	**M1** for $5 - 2x = 2(3x + 2)$ oe **M1FT** for $5 - 4 = 6x + 2x$ or better
10(a)(iv)	$\frac{5-x}{2}$ oe final answer	**2**	**M1** for $2x + y = 5$ or better or $x = 5 - 2y$ or $\frac{y}{2} = \frac{5}{2} - x$
10(a)(v)	$17 - 6x$ oe final answer	**2**	**M1** for $3(5 - 2x) + 2$
10(a)(vi)	$\frac{5x+16}{(5-2x)(3x+2)}$ or $\frac{5x+16}{10+11x-6x^2}$ final answer	**3**	**M1** for common denominator $(5 - 2x)(3x + 2)$ oe **M1** for $3(3x + 2) + 2(5 - 2x)$ oe
10(b)	x	**1**	
11(a)	Correct sketch 	**3**	**B1** for each branch

Question	Answer	Marks	Partial Marks
11(b)	(2.24, –1.94)	**2**	or (2.242 to 2.243, –1.943 to –1.942) **B1** for each co-ordinate
11(c)	$x = 1$, $x = 4$, $y = 0$	**3**	**B1** for each
11(d)(i)	1.34 or 1.344 to 1.345 2.79 or 2.789... 5.87 or 5.866...	**3**	**B1** for each If 0 scored, **SC1** for 1.3, 2.8 and 5.9
11(d)(ii)	$x < 1$ $1.34 < x < 2.79$ $4 < x < 5.87$	**3**	**B1** for each **FT** dep on two solutions to **(i)** between 1 and 4. **FT** dep on solution to **(i)** > 4
12(a)	(5) (6) 37 37 24 54 (61) 91	**5**	**B1** for each
12(b)	[p =] –3 [q =] 1	**2**	**B1** for each