Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

3506774698

MATHEMATICS **0580/43**

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

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator, Geometrical instruments, Tracing paper (optional)

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.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

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[Turn over

1 Here is part of a train timetable for a journey from London to Marseille.
All times given are in local time.
The local time in Marseille is 1 hour ahead of the local time in London.

London	07 19
Ashford	07 55
Lyon	13 00
Avignon	14 08
Marseille	14 46

(a) **(i)** Work out the total journey time from London to Marseille.
Give your answer in hours and minutes.

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

(ii) The distance from London to Ashford is 90 km.
The local time in London is the same as the local time in Ashford.

Work out the average speed, in km/h, of the train between London and Ashford.

.... km/h [3]

(iii) During the journey, the train takes 35 seconds to completely cross a bridge.
The average speed of the train during this crossing is 90 km/h.
The length of the train is 95 metres.

Calculate the length, in metres, of this bridge.

.... m [4]

(b) The fares for the train journey are shown in the table below.

From London to Marseille	Standard fare	Premier fare
Adult	\$84	\$140
Child	\$60	\$96

(i) For the **standard fare**, write the ratio adult fare : child fare in its simplest form.

.... : .... [1]

(ii) For an **adult**, find the percentage increase in the cost of the standard fare to the premier fare.

.... % [3]

(iii) For one journey from London to Marseille, the ratio

number of adults : number of children = 11 : 2.

There were 220 adults in total on this journey.
All of the children and 70% of the adults paid the standard fare.
The remaining adults paid the premier fare.

Calculate the total of the fares paid by the adults and the children.

\$ .... [5]

(c) There were 3.08×10^5 passengers that made this journey in 2018.
This was a 12% decrease in the number of passengers that made this journey in 2017.

Find the number of passengers that made this journey in 2017.
Give your answer in standard form.

.... [3]

2 **(a)** Solve.

$$5x - 17 = 7x + 3$$

$x =$ .... [2]

(b) Find the integer values of n that satisfy this inequality.

$$-7 < 4n \leqslant 8$$

.... [3]

(c) Simplify.

(i) $a^3 \times a^6$

.... [1]

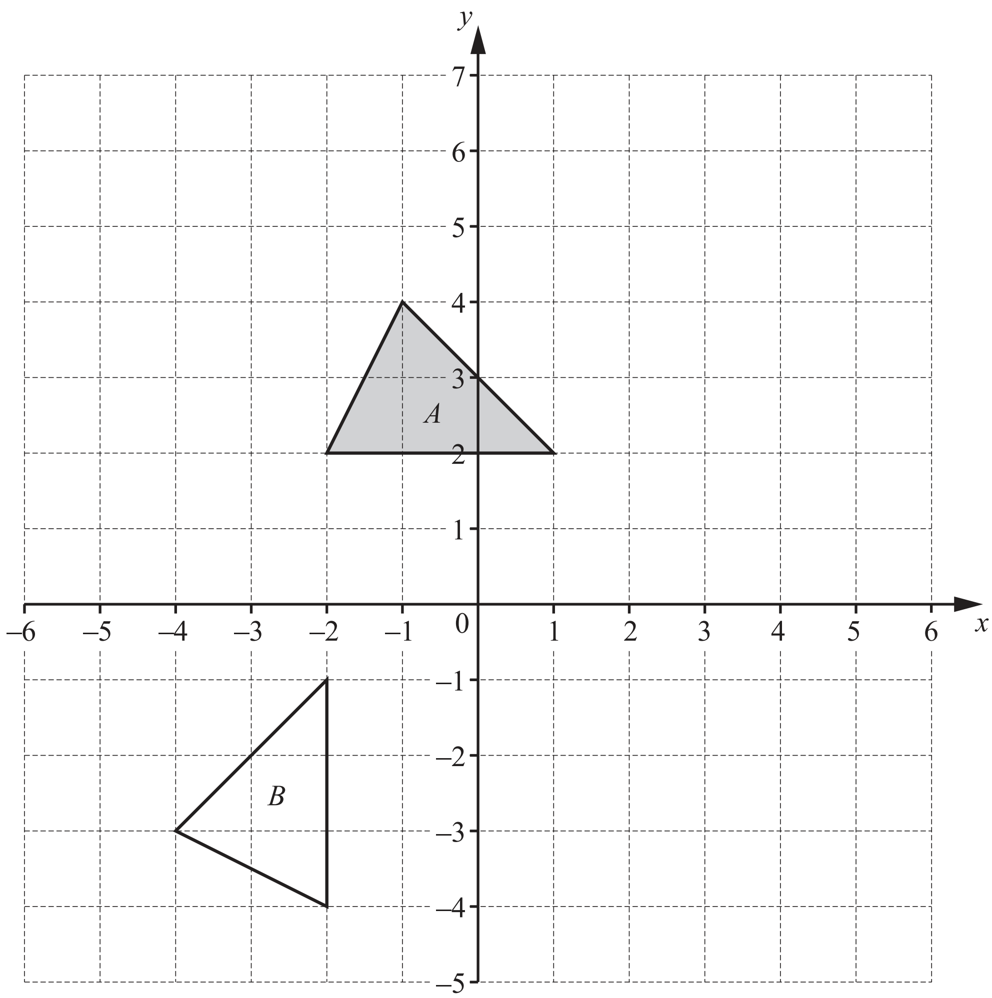
(ii) $(5xy^2)^3$

.... [2]

(iii) $\left(\dfrac{27x^{12}}{64y^3}\right)^{-\frac{1}{3}}$

.... [3]

3



(a) On the grid, draw the image of

(i) triangle A after a translation by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$, [2]

(ii) triangle A after a reflection in the line $y = x$. [2]

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

....

.... [3]

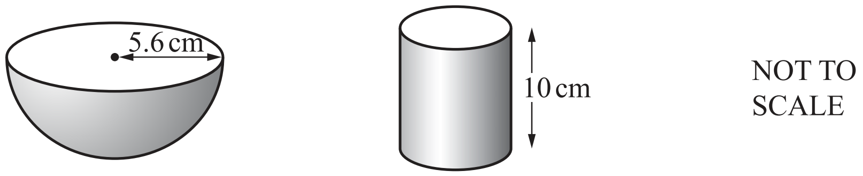
(c) **(i)** Find the matrix that represents an enlargement, scale factor -2, centre $(0, 0)$.

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

(ii) Calculate the determinant of the matrix in **part (c)(i)**.

.... [1]

4 (a)



The diagram shows a hemispherical bowl of radius 5.6 cm and a cylindrical tin of height 10 cm.

(i) Show that the volume of the bowl is 368 cm^3, correct to the nearest cm^3.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

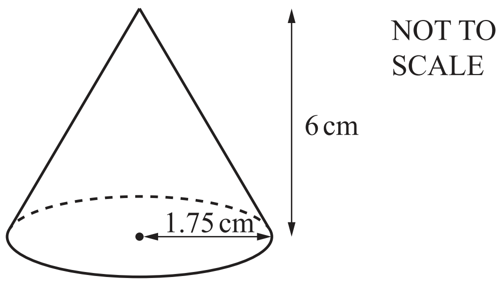
[2]

(ii) The tin is completely full of soup.
When all the soup is poured into the empty bowl, 80% of the volume of the bowl is filled.

Calculate the radius of the tin.

.... cm [4]

(b)

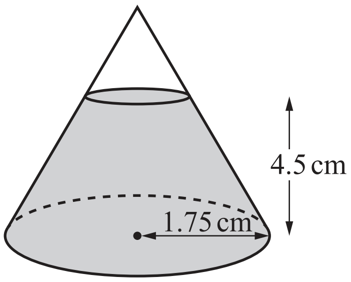


The diagram shows a cone with radius 1.75 cm and height 6 cm.

(i) Calculate the total surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

.... cm^2 [5]

(ii)



NOT TO SCALE

The cone contains salt to a depth of 4.5 cm.
The top layer of the salt forms a circle that is parallel to the base of the cone.

(a) Show that the volume of the salt inside the cone is $18.9\,\text{cm}^3$, correct to 1 decimal place.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

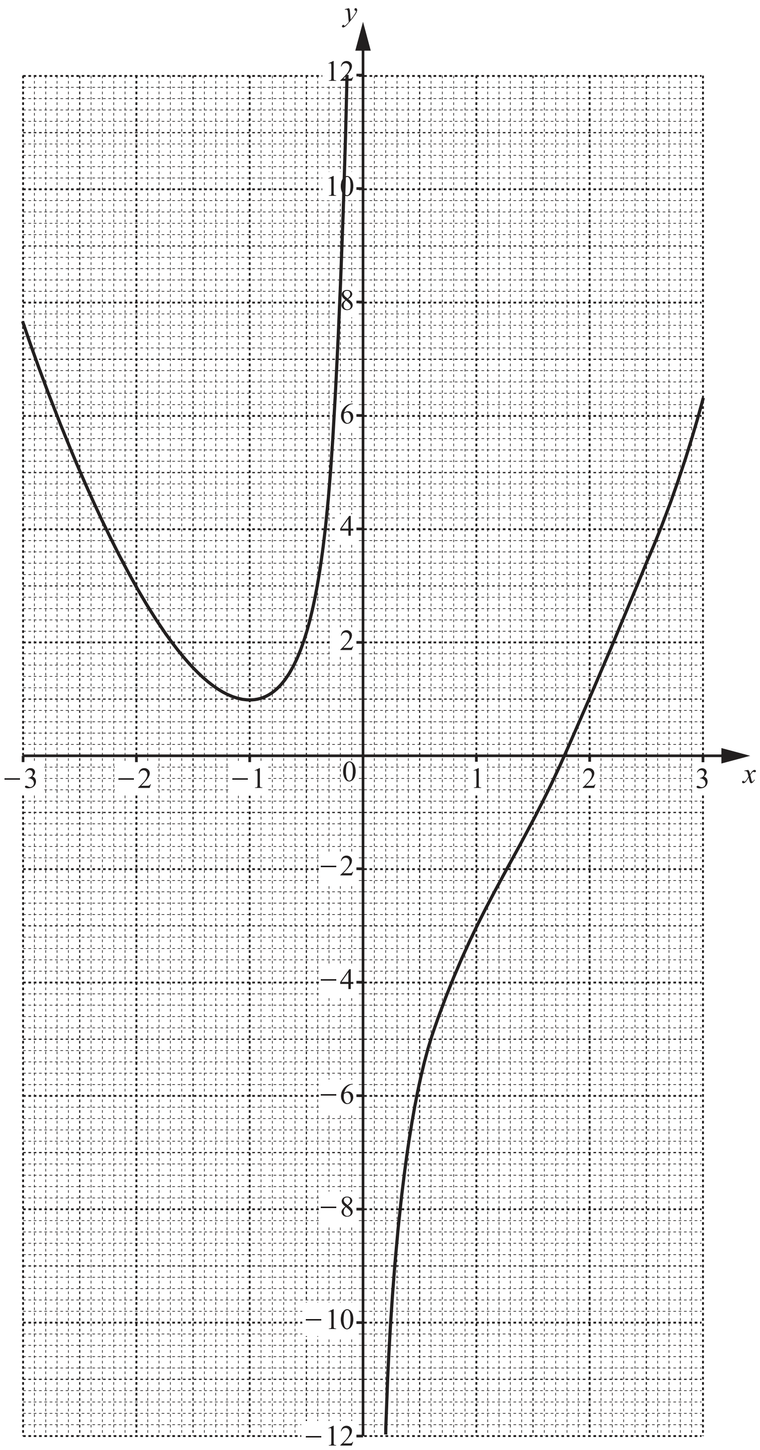
[4]

(b) The salt is removed from the cone at a constant rate of $200\,\text{mm}^3$ per second.

Calculate the time taken for the cone to be completely emptied.
Give your answer in seconds, correct to the nearest second.

.... s [3]

5 The diagram shows the graph of $y = f(x)$ where $f(x) = x^2 - \frac{2}{x} - 2,\ x \neq 0$.



(a) Use the graph to find

(i) $f(1)$,

.... [1]

(ii) $ff(-2)$.

.... [2]

(b) On the grid opposite, draw a suitable straight line to solve the equation
$x^2 - \frac{2}{x} - 7 = -3x$ for $-3 \leqslant x \leqslant 3$.

$x =$ .... or $x =$ .... [4]

(c) By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = -2$.

.... [3]

(d) **(i)** Complete the table for $y = g(x)$ where $g(x) = 2^{-x}$ for $-3 \leqslant x \leqslant 3$.

x	-3	-2	-1	0	1	2	3
y			2	1	0.5		0.125

[3]

(ii) On the grid opposite, draw the graph of $y = g(x)$. [3]

(iii) Use your graph to find the **positive** solution to the equation $f(x) = g(x)$.

$x =$ .... [1]

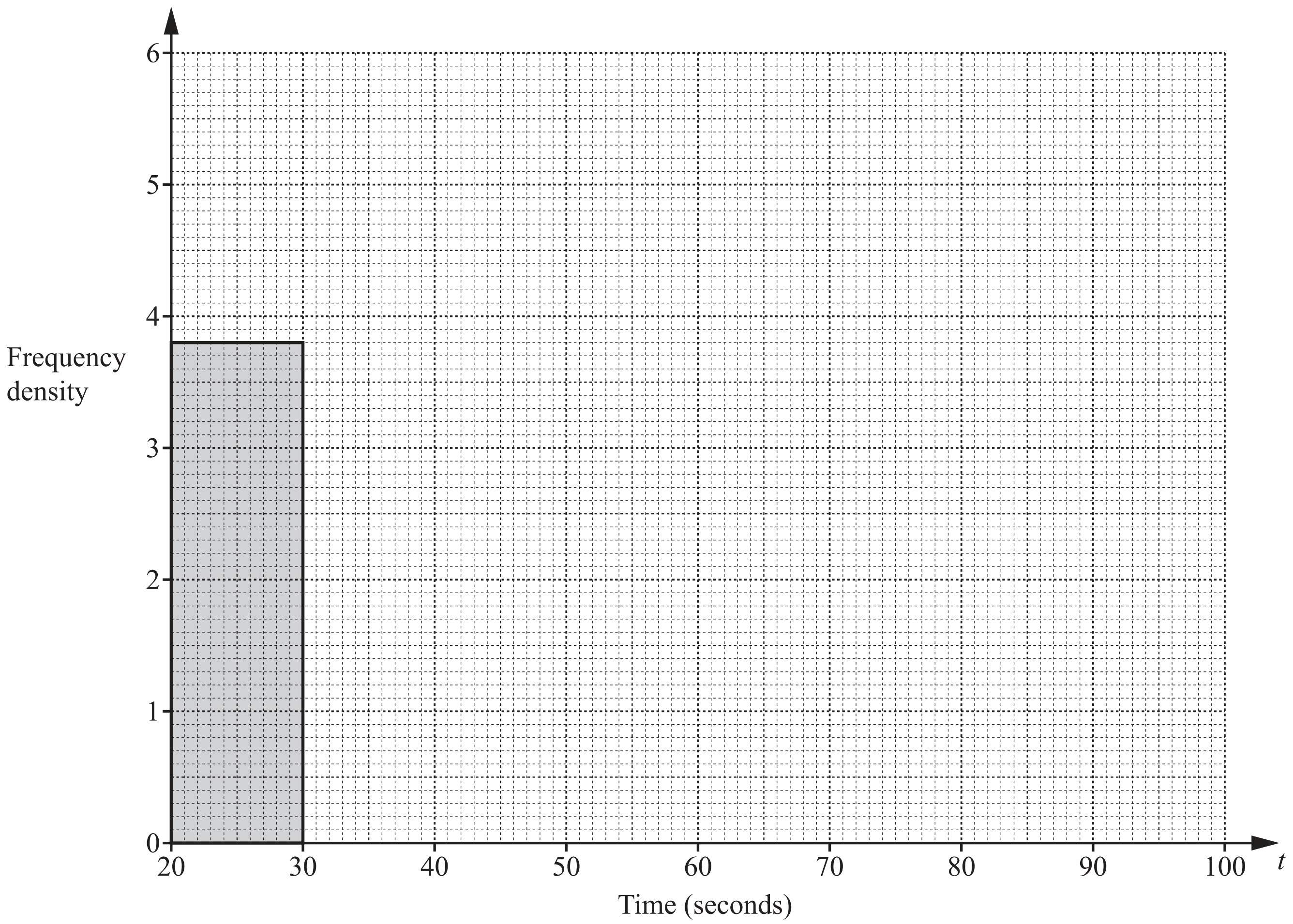
6 The table shows the time, t seconds, taken by each of 120 boys to solve a puzzle.

Time (t seconds)	$20 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 100$
Frequency	38	27	21	16	18

(a) Calculate an estimate of the mean time.

.... s [4]

(b) On the grid, complete the histogram to show the information in the frequency table.



[4]

7 A straight line joins the points A $(-2, -3)$ and C $(1, 9)$.

(a) Find the equation of the line AC in the form $y = mx + c$.

$y =$ .... [3]

(b) Calculate the acute angle between AC and the x-axis.

.... [2]

(c) $ABCD$ is a kite, where AC is the longer diagonal of the kite.
B is the point $(3.5, 2)$.

(i) Find the equation of the line BD in the form $y = mx + c$.

$y =$ .... [3]

(ii) The diagonals AC and BD intersect at $(-0.5, 3)$.

Work out the co-ordinates of D.

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

8 **(a)** Angelo has a bag containing 3 white counters and x black counters.
He takes two counters at random from the bag, without replacement.

(i) Complete the following statement.

The probability that Angelo takes two black counters is

$$\frac{x}{x+3} \times \frac{\dots\dots\dots\dots}{\dots\dots\dots\dots}.$$

[2]

(ii) The probability that Angelo takes two black counters is $\frac{7}{15}$.

(a) Show that $4x^2 - 25x - 21 = 0$.

[4]

(b) Solve by factorisation.

$$4x^2 - 25x - 21 = 0$$

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

(c) Write down the number of black counters in the bag.

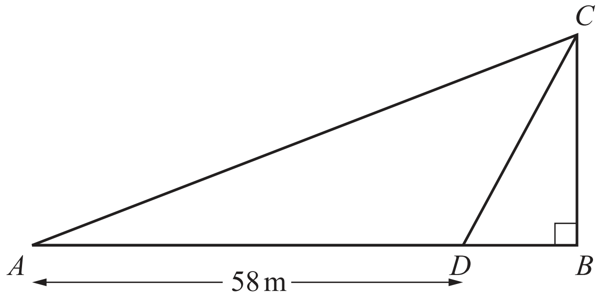
.... [1]

(b) Esme has a bag with 5 green counters and 4 red counters.
She takes three counters at random from the bag without replacement.

Work out the probability that the three counters are all the same colour.

.... [4]

9 **(a)**



NOT TO SCALE

In the diagram, BC is a vertical wall standing on horizontal ground AB.
D is the point on AB where $AD = 58$ m.
The angle of elevation of C from A is 26°.
The angle of elevation of C from D is 72°.

(i) Show that $AC = 76.7$ m, correct to 1 decimal place.

[5]

(ii) Calculate BD.

$BD =$ .... m [3]

(b) Triangle EFG has an area of $70\,\text{m}^2$.
$EF : FG = 1 : 2$ and angle $EFG = 40°$.

(i) Calculate EF.

$EF =$ .... m [4]

(ii) A **different** triangle PQR also has an area of $70\,\text{m}^2$.
$PQ : QR = 1 : 2$ and $PQ = EF$.

Find angle PQR.

Angle $PQR =$ .... [1]

Question 10 is printed on the next page.

10 **(a)** 19, 15, 11, 7, ...

(i) Write down the next two terms of the sequence.

.... , ... [2]

(ii) Find the nth term of this sequence.

.... [2]

(iii) Find the value of n when the nth term is -65.

n = ... [2]

(b) Another sequence has nth term $2n^2 + 5n - 15$.

Find the difference between the 4th term and the 5th term of this sequence.

.... [2]