Cambridge IGCSE

**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

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| CANDIDATE NAME | |
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*1512289387*

**MATHEMATICS** **0580/42**

Paper 4 (Extended) **October/November 2019**

**2 hours 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
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.
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 $\pi$, 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 **18** printed pages and **2** blank pages.


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**[Turn over**

**1** **(a)** Mohsin has 600 pear trees and 720 apple trees on his farm.

**(i)** Write the ratio pear trees : apple trees in its simplest form.

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

**(ii)** Each apple tree produces 16 boxes of apples each year.
One box contains 18 kg of apples.

Calculate the total mass of apples produced by the 720 trees in one year.
Give your answer in standard form.

..... kg [3]

**(b)** **(i)** One week, the total mass of pears picked was 18 540 kg.
For this week, the ratio mass of apples : mass of pears = 13 : 9.

Find the mass of apples picked that week.

..... kg [2]

**(ii)** The apples cost Mohsin \$0.85 per kilogram to produce.
He sells them at a profit of 60%.

Work out the selling price per kilogram of the apples.

\$ ..... [2]

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**(c)** Mohsin exports some of his pears to a shop in Belgium.
The shop buys the pears at \$1.50 per kilogram.
The shop sells the pears for 2.30 euros per kilogram.
The exchange rate is \$1 = 0.92 euros.

Calculate the percentage profit per kilogram made by the shop.

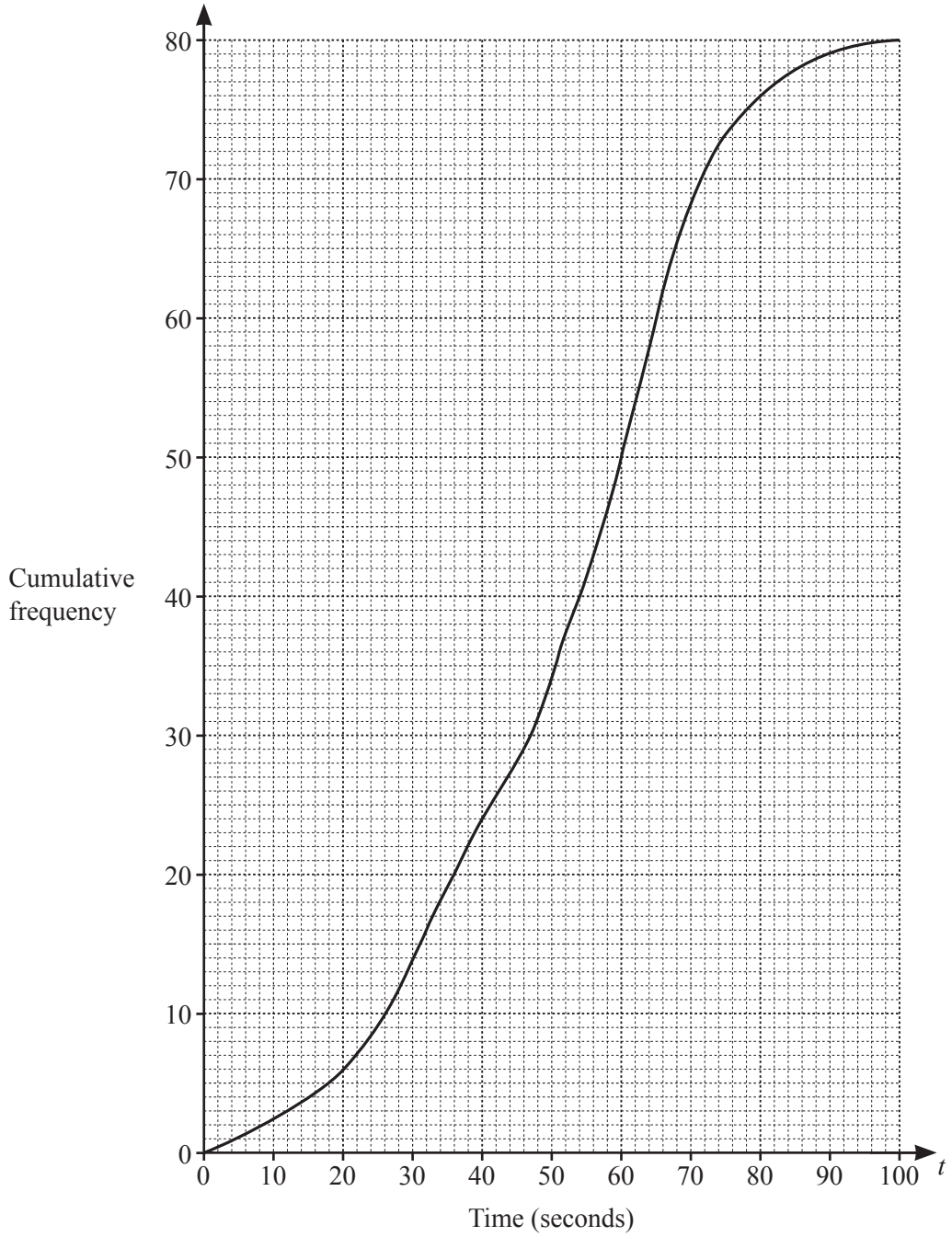
..... % [5]

**(d)** Mohsin's earnings increase exponentially at a rate of 8.7% each year.
During 2018 he earned \$195 600.

During 2027, how much **more** does he earn than during 2018?

\$ ..... [3]

**2** The cumulative frequency diagram shows information about the time taken, $t$ seconds, for a group of girls to each solve a maths problem.




**(a)** Use the cumulative frequency diagram to find an estimate for

**(i)** the median,

..... s [1]

**(ii)** the interquartile range,

..... s [2]

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**(iii)** the 20th percentile,

..... s [1]

**(iv)** the number of girls who took more than 66 seconds to solve the problem.

..... [2]

**(b) (i)** Use the cumulative frequency diagram to complete the frequency table.

| Time ($t$ seconds) | $0 < t \leqslant 20$ | $20 < t \leqslant 40$ | $40 < t \leqslant 60$ | $60 < t \leqslant 80$ | $80 < t \leqslant 100$ |
|---|---|---|---|---|---|
| Frequency | 6 | | | | 4 |

[2]

**(ii)** Calculate an estimate of the mean time.

..... s [4]

**(c)** A group of boys solved the same problem.
The boys had a median time of 60 seconds, a lower quartile of 46 seconds and an upper quartile of 66 seconds.

**(i)** Write down the percentage of boys with a time of 66 seconds or less.

..... % [1]

**(ii)** Howard says

The boys' times vary more than the girls' times.

Explain why Howard is incorrect.

.....

..... [2]

**3** A line joins $A$ (1, 3) to $B$ (5, 8).

**(a)** **(i)** Find the midpoint of $AB$.

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

**(ii)** Find the equation of the line $AB$.
Give your answer in the form $y = mx + c$.

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

**(b)** The line $AB$ is transformed to the line $PQ$.

Find the co-ordinates of $P$ and the co-ordinates of $Q$ after $AB$ is transformed by

**(i)** a translation by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$,

$P$ (..... , .....)

$Q$ (..... , .....) [2]

**(ii)** a rotation through 90° anticlockwise about the origin,

$P$ (..... , .....)

$Q$ (..... , .....) [2]

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**(iii)** a reflection in the line $x = 2$,

$P$ (..... , .....)

$Q$ (..... , .....) [2]

**(iv)** a transformation by the matrix $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix}$.

$P$ (..... , .....)

$Q$ (..... , .....) [2]

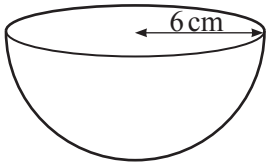
**(c)** Describe fully the **single** transformation that maps the line $AB$ onto the line $PQ$ where $P$ is the point $(-2, -6)$ and $Q$ is the point $(-10, -16)$.

.....

..... [3]

**4 (a)**

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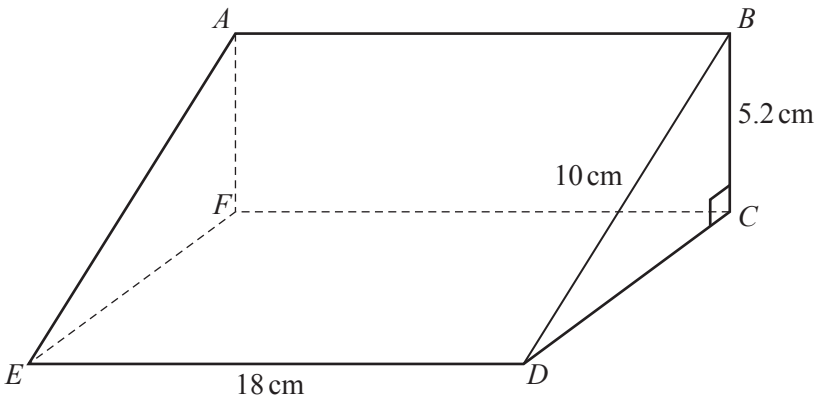

The diagram shows a hemisphere with radius 6 cm.

Calculate the volume.
Give the units of your answer.

[The volume, $V$, of a sphere with radius $r$ is $V = \frac{4}{3}\pi r^3$.]

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

**(b)**




NOT TO SCALE

The diagram shows a prism $ABCDEF$.
The cross-section is a right-angled triangle $BCD$.
$BD = 10$ cm, $BC = 5.2$ cm and $ED = 18$ cm.

**(i) (a)** Work out the volume of the prism.

..... $cm^3$ [6]

**(b)** Calculate angle *BEC*.

Angle *BEC* = ..... [4]

**(ii)** The point *G* lies on the line *ED* and *GD* = 7 cm.

Work out angle *BGE*.

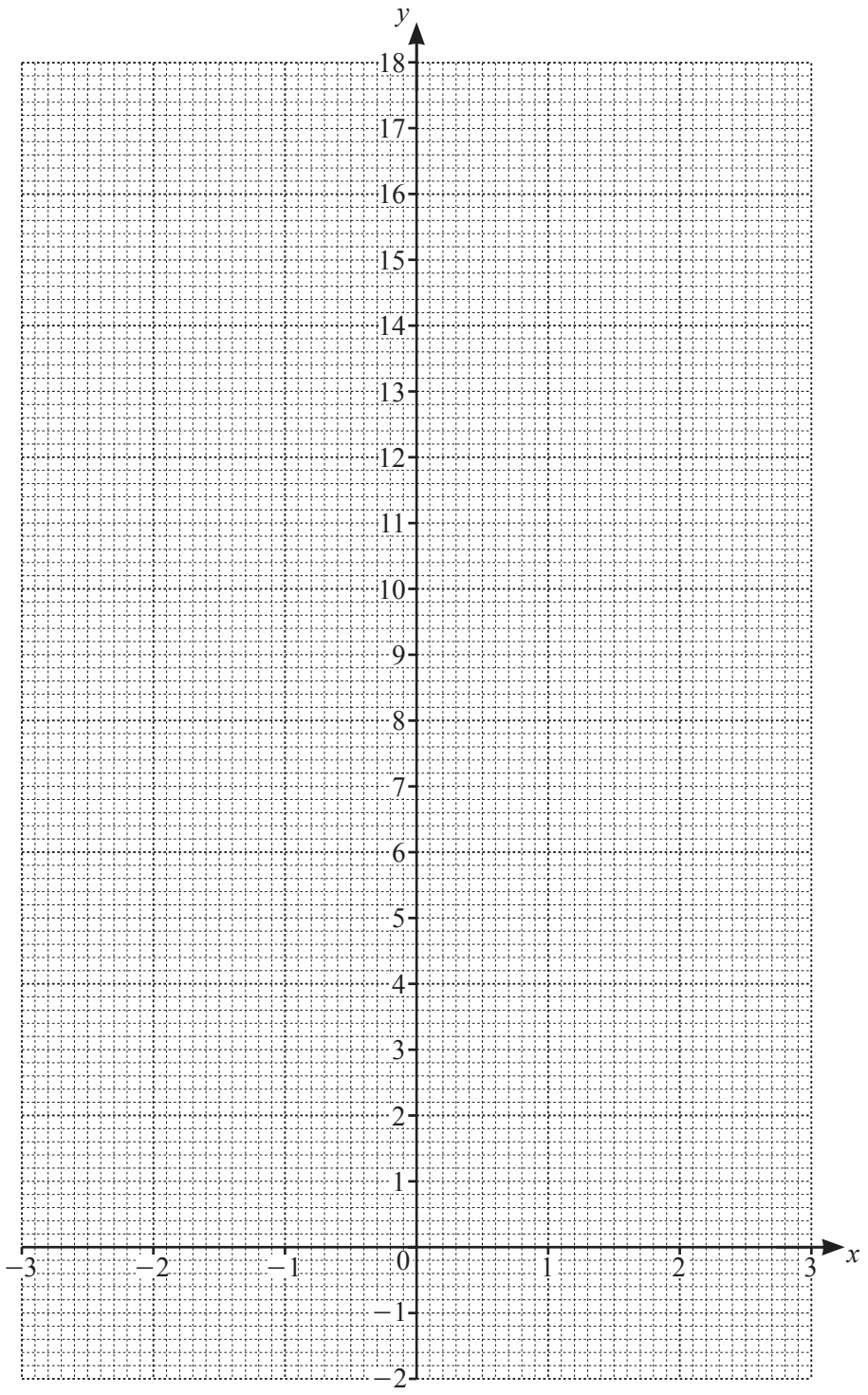
Angle *BGE* = ..... [3]

**5** The table shows some values of $y = \frac{x^2}{2} + \frac{1}{x^2} - \frac{2}{x}, \ x \neq 0$.

| $x$ | −3 | −2 | −1 | −0.5 | −0.3 | | 0.2 | 0.3 | 0.5 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | 5.3 | 3.3 | | 8.1 | 17.8 | | | 4.5 | 0.1 | −0.5 | 1.3 | |

**(a)** Complete the table. [3]

**(b)** On the grid, draw the graph of $y = \frac{x^2}{2} + \frac{1}{x^2} - \frac{2}{x}$ for $-3 \leqslant x \leqslant -0.3$ and $0.2 \leqslant x \leqslant 3$.




[5]

**(c)** Use your graph to solve $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}\leqslant 0$.

..... $\leqslant x \leqslant$ ..... [2]

**(d)** Find the smallest positive integer value of $k$ for which $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=k$ has two solutions for $-3\leqslant x\leqslant -0.3$ and $0.2\leqslant x\leqslant 3$.

..... [1]

**(e)** **(i)** By drawing a suitable straight line, solve $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=3x+1$ for $-3\leqslant x\leqslant -0.3$ and $0.2\leqslant x\leqslant 3$.

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

**(ii)** The equation $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=3x+1$ can be written as $x^4+ax^3+bx^2+cx+2=0$.

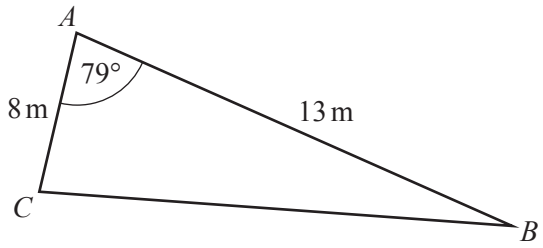
Find the values of $a$, $b$ and $c$.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

**6 (a)**




NOT TO SCALE

The diagram shows triangle $ABC$.

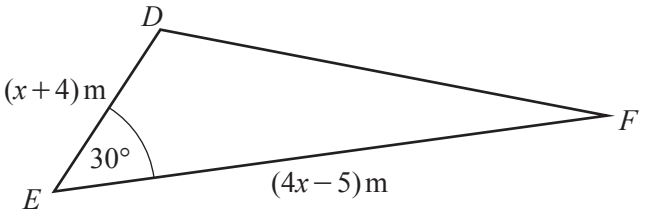
**(i)** Use the cosine rule to calculate $BC$.

$BC =$ ..... m [4]

**(ii)** Use the sine rule to calculate angle $ACB$.

Angle $ACB =$ ..... [3]

**(b)**




NOT TO SCALE

The area of triangle $DEF$ is $70\,m^2$.

**(i)** Show that $4x^2 + 11x - 300 = 0$.

[4]

**(ii)** Use the quadratic formula to solve $4x^2 + 11x - 300 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

**(iii)** Find the length of $DE$.

$DE =$ ..... m [1]

**7** $f(x) = 7 - 2x$ $g(x) = \frac{10}{x}$, $x \neq 0$ $h(x) = 27^x$

**(a)** Find

**(i)** $f(-3)$,

..... [1]

**(ii)** $hg(30)$,

..... [2]

**(iii)** $f^{-1}(x)$.

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

**(b)** Solve.

$g(2x+1) = 4$

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

**(c)** Simplify, giving your answer as a single fraction.

$$\frac{1}{\mathrm{f}(x)} + \mathrm{g}(x)$$

..... [3]

**(d)** Find $\mathrm{h}^{-1}(19\,683)$.

..... [1]

**8** **(a)** Make $p$ the subject of

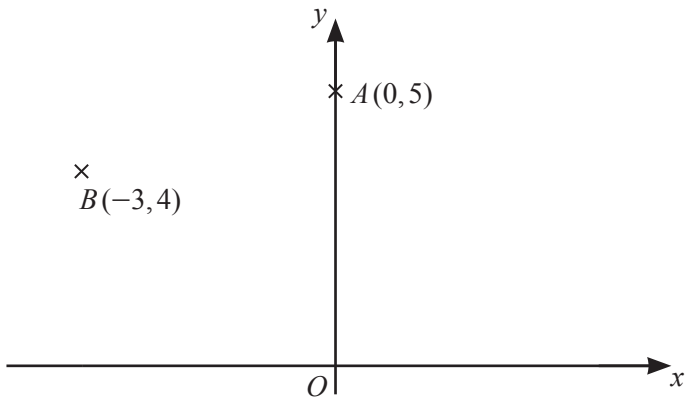
**(i)** $5p + 7 = m$,

$p =$ ..... [2]

**(ii)** $y^2 - 2p^2 = h$.

$p =$ ..... [3]

**(b)**




NOT TO SCALE

**(i)** Write $\overrightarrow{OA}$ as a column vector.

$\overrightarrow{OA} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(ii)** Write $\overrightarrow{AB}$ as a column vector.

$\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(iii)** $A$ and $B$ lie on a circle, centre $O$.

Calculate the length of the arc $AB$.

..... [6]

**9** Car *A* and car *B* take part in a race around a circular track.
One lap of the track measures 7.6 km.

Car *A* takes 2 minutes and 40 seconds to complete each lap of the track.
Car *B* takes 2 minutes and 25 seconds to complete each lap of the track.
Both cars travel at a constant speed.

**(a)** Calculate the speed of car *A*.
Give your answer in kilometres per hour.

..... km/h [3]

**(b)** Both cars start the race from the same position, *S*, at the same time.

**(i)** Find the time taken when both car *A* and car *B* are next at position *S* **at the same time**.
Give your answer in minutes and seconds.

..... min ..... s [4]

**(ii)** Find the distance that car *A* has travelled at this time.

..... km [2]

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