Cambridge IGCSE

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

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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*2124200984*

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

Paper 4 (Extended) **February/March 2016**

**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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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


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**1** Aasha, Biren and Cemal share \$640 in the ratio 8 : 15 : 9.

**(a)** Show that Aasha receives \$160.

[1]

**(b)** Calculate the amount that Biren and Cemal receive.

Biren \$ .....

Cemal \$ ..... [2]

**(c)** Aasha uses her \$160 to buy some books.
Each book costs \$15.25 .

Find the greatest number of books that she can buy.

..... [2]

**(d)** Biren spends $\frac{3}{8}$ of his share on clothes and $\frac{1}{3}$ of his share on a computer.

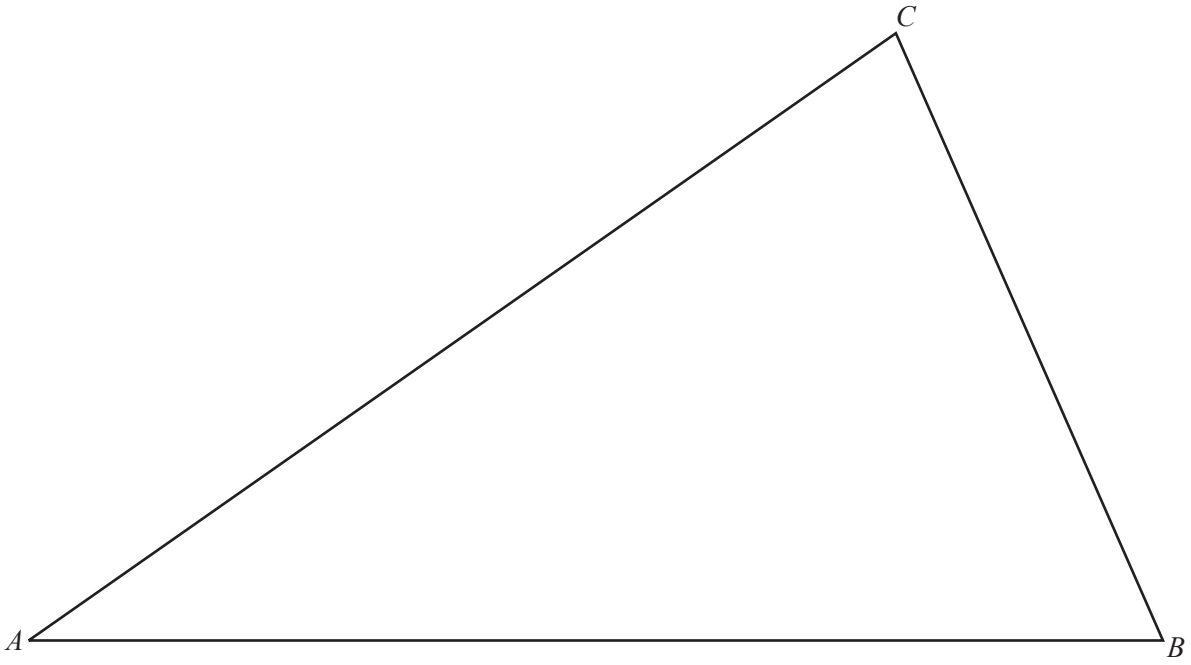
Find the fraction of his share that he has left.
Write your fraction in its lowest terms.

..... [3]

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**2 In this question use a ruler and compasses only.**
**Show all your construction arcs.**

The diagram shows a triangular field *ABC*.
The scale is 1 centimetre represents 50 metres.




Scale : 1 cm to 50 m

**(a)** Construct the locus of points that are equidistant from *A* and *B*. [2]

**(b)** Construct the locus of points that are equidistant from the lines *AB* and *AC*. [2]

**(c)** The two loci intersect at the point *E*.

Construct the locus of points that are 250 m from *E*. [2]

**(d)** Shade any region inside the field *ABC* that is

- more than 250 m from *E*

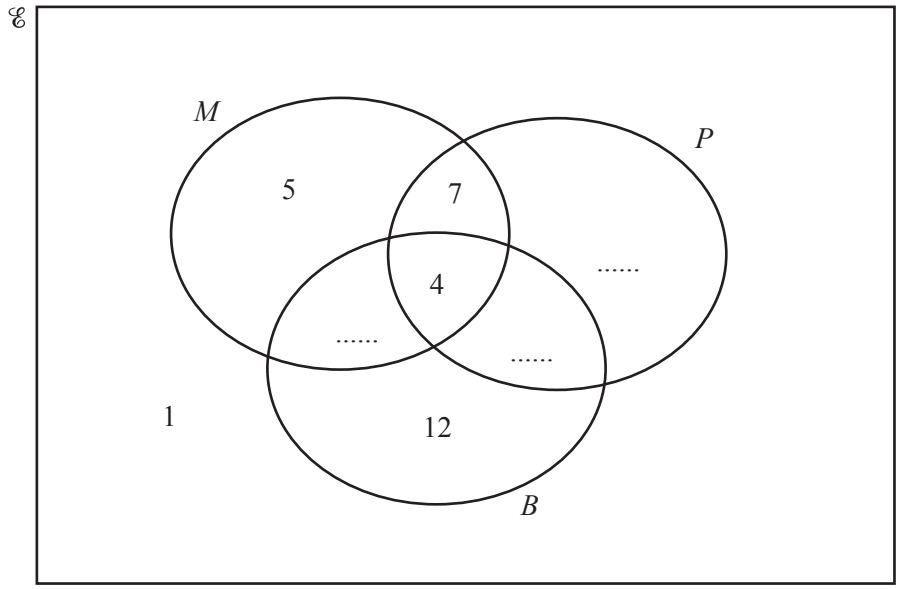
and

- closer to *AC* than to *AB*. [2]

**3** **(a)** Davinder asked some people if they ate mangoes, pineapples or bananas last week.

$M$ = { people who ate mangoes }
$P$ = { people who ate pineapples }
$B$ = { people who ate bananas }

The Venn diagram shows some of the information.




19 people said they ate mangoes.
6 people said they ate **only** pineapples.
18 people said they ate **exactly two** of the three types of fruit.

**(i)** Write the three missing values in the Venn diagram. [3]

**(ii)** Find the total number of people Davinder asked.

..... [1]

**(iii)** Find $n(M \cap P)$.

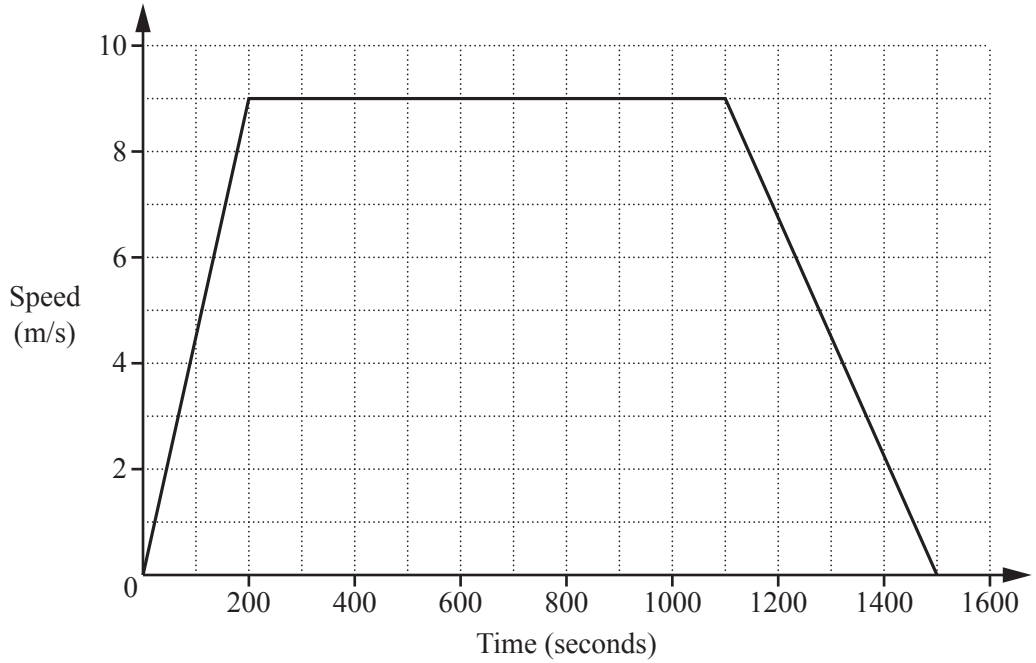
..... [1]

**(iv)** One person is chosen at random from the people who ate mangoes.

Write down the probability that this person also ate bananas.

..... [2]

**(b)** Davinder draws a speed-time graph for his bus journey to the market.




Find

**(i)** the acceleration of the bus during the first 200 seconds,

..... $m/s^2$ [1]

**(ii)** the total distance travelled by the bus,

..... m [3]

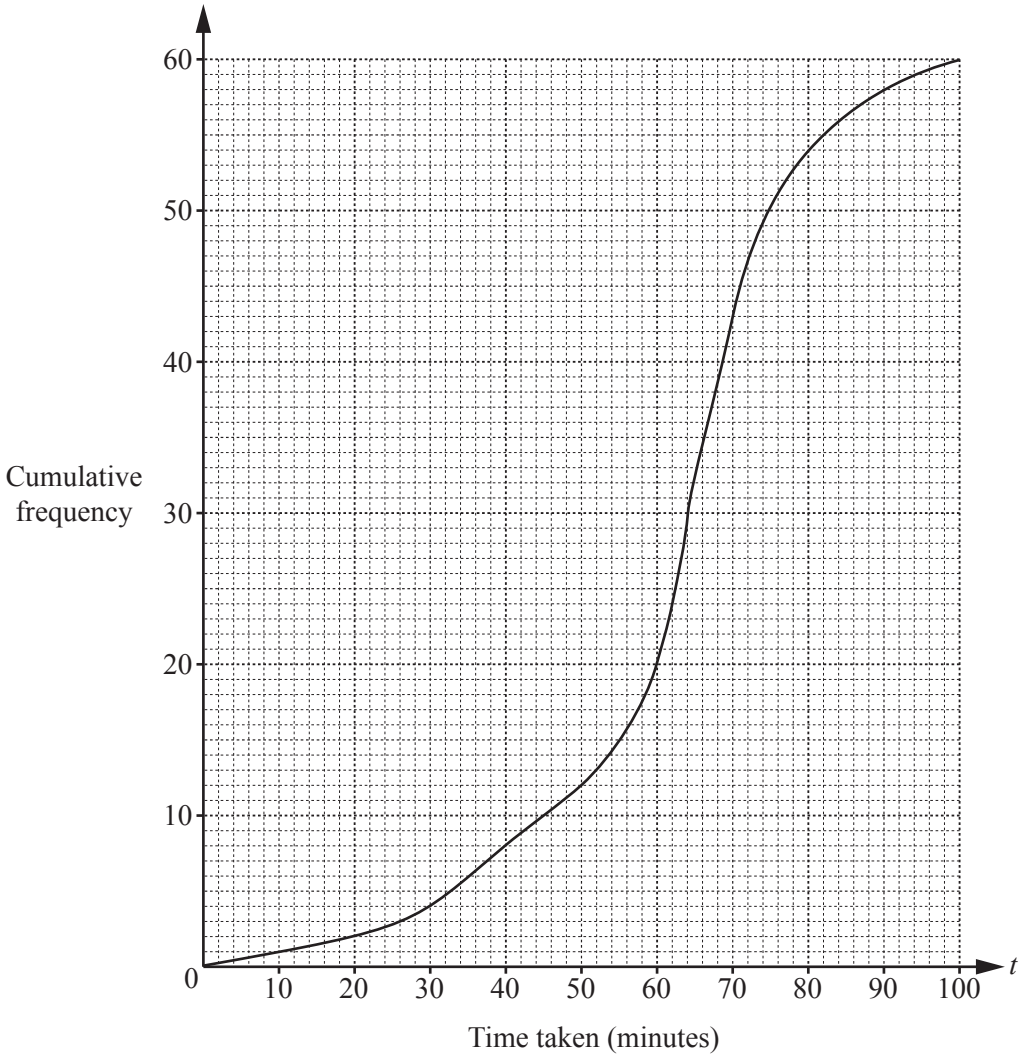
**(iii)** the average speed of the bus for the whole journey.

..... m/s [1]

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**[Turn over**

**4** The cumulative frequency diagram shows information about the time taken, $t$ minutes, by 60 students to complete a test.




**(a)** Find

**(i)** the median,

..... min [1]

**(ii)** the inter-quartile range,

..... min [2]

**(iii)** the 40th percentile,

..... min [2]

**(iv)** the number of students who took more than 80 minutes to complete the test.

..... [2]

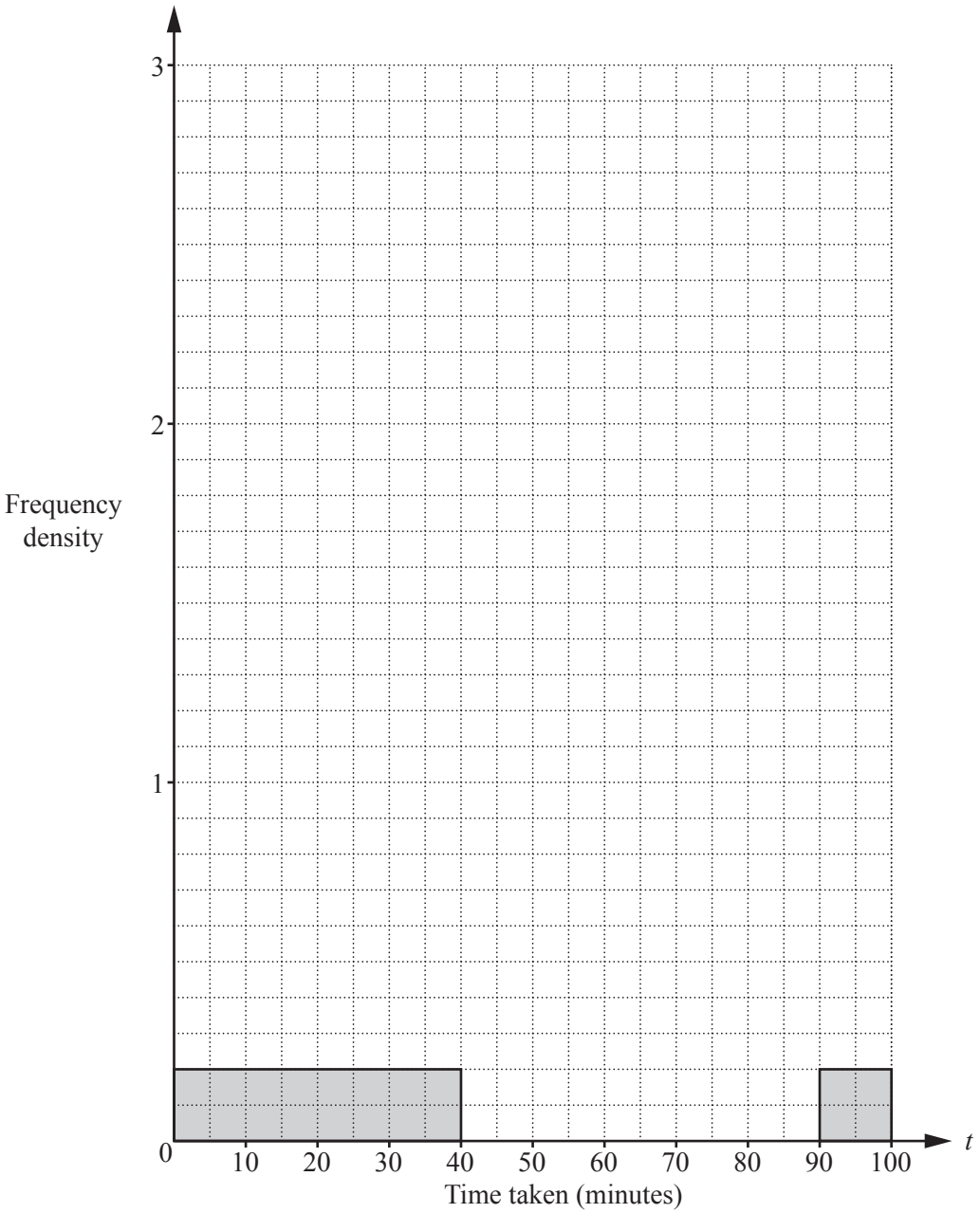
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**(b)** Use the cumulative frequency diagram to complete the frequency table below.

| Time taken ($t$ minutes) | $0 < t \leqslant 40$ | $40 < t \leqslant 60$ | $60 < t \leqslant 70$ | $70 < t \leqslant 80$ | $80 < t \leqslant 90$ | $90 < t \leqslant 100$ |
|---|---|---|---|---|---|---|
| Frequency | 8 | | | | 4 | |

[3]

**(c)** On the grid below, complete the histogram to show the information in the table in **part (b)**.




[4]

**5** **(a)** Meena sells her car for $6000.
This is a loss of 4% on the price she paid.

Calculate the price Meena paid for the car.

$ ..... [3]

**(b)** Eisha changes some euros (€) into dollars ($) when the exchange rate is €1 = $1.351 .
She receives $6000.

Calculate how many euros Eisha changes.
Give your answer correct to the nearest euro.

€ ..... [3]

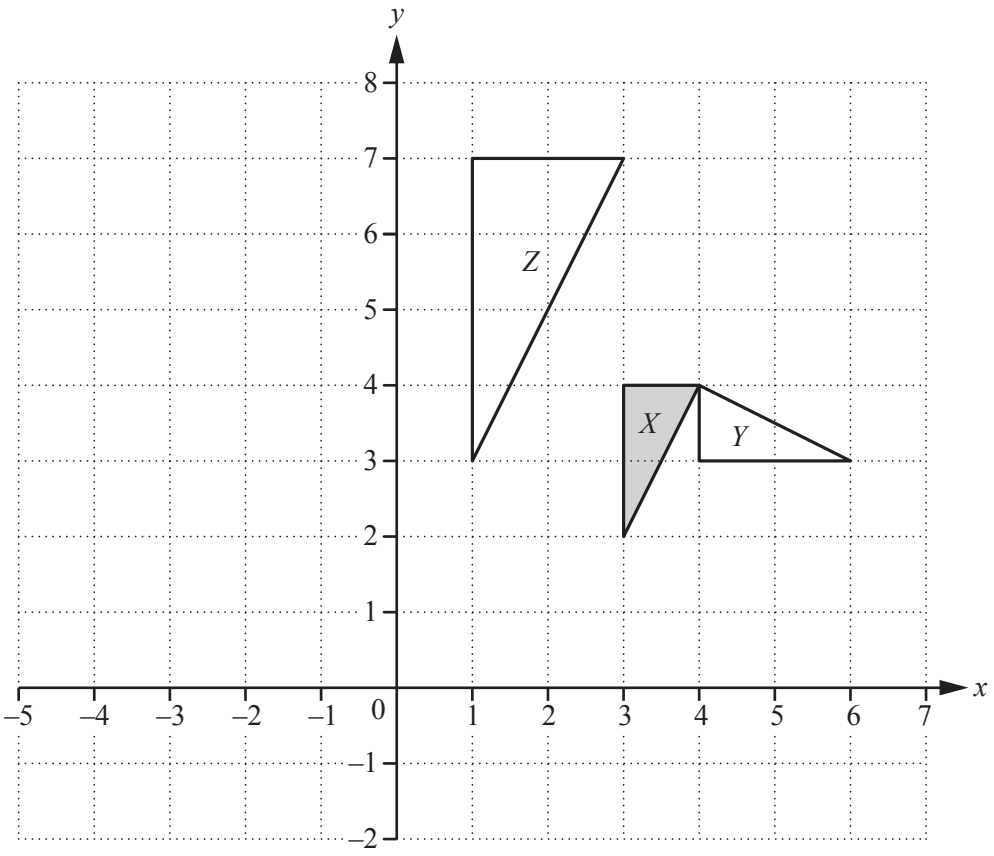
**(c)** Meena and Eisha both invest their $6000.
Meena invests her $6000 at a rate of 1.5% per year compound interest.
Eisha invests her $6000 in a bank that pays simple interest.
After 8 years, their investments are worth the same amount.

Calculate the rate of simple interest per year that Eisha received.

..... % [5]

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**6**




**(a)** Describe fully the **single** transformation that maps

**(i)** triangle $X$ onto triangle $Y$,

.....

..... [3]

**(ii)** triangle $X$ onto triangle $Z$.

.....

..... [3]

**(b)** **(i)** Draw the image of triangle $X$ after a translation by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$.

Label this triangle $P$. [2]

**(ii)** Draw the reflection of triangle $P$ in the line $y = 3$. [2]

**(c)** Draw the image of triangle $X$ after the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

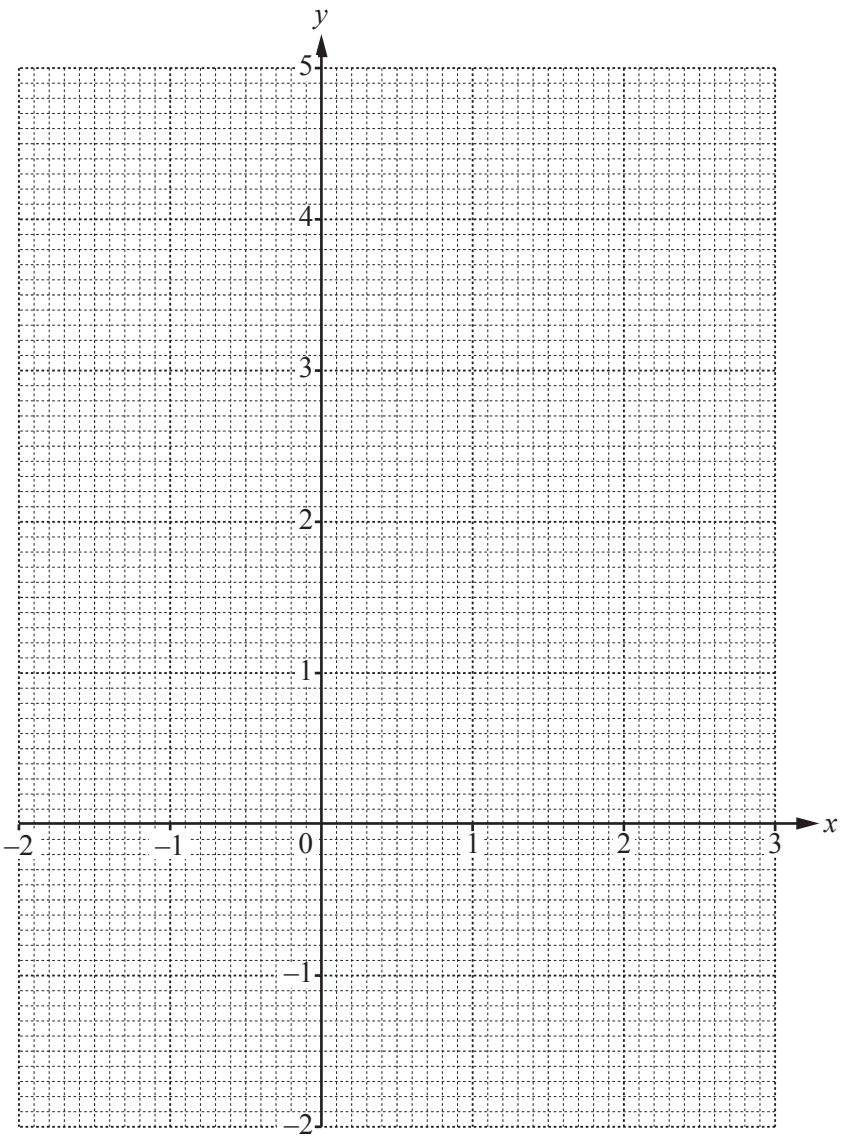
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**7** The table shows some values of $y = x + \frac{1}{x^2}, \ x \neq 0$.

| $x$ | –2 | –1.5 | –1 | –0.75 | –0.5 | | 0.5 | 0.75 | 1 | 1.5 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | –1.75 | –1.06 | 0 | 1.03 | | | 4.50 | 2.53 | 2 | | 2.25 | |

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

**(b)** On the grid, draw the graph of $y = x + \frac{1}{x^2}$ for $-2 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 3$.




[5]

**(c)** Use your graph to solve the equation $x + \frac{1}{x^2} = 1.5$.

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

**(d)** The line $y = ax + b$ can be drawn on the grid to solve the equation $\frac{1}{x^2} = 2.5 - 2x$.

**(i)** Find the value of $a$ and the value of $b$.

$a =$ .....

$b =$ ..... [2]

**(ii)** Draw the line $y = ax + b$ to solve the equation $\frac{1}{x^2} = 2.5 - 2x$.

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

**(e)** By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = 2$.

..... [3]

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**[Turn over**

**8** **(a)** $y$ is directly proportional to the positive square root of $(x + 2)$.
When $x = 7$, $y = 9$.

Find $y$ when $x = 23$.

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

**(b)** Simplify.

$$\frac{x^2 + 12x + 36}{x^2 + 4x - 12}$$

..... [5]

**(c)** $W = \sqrt{\frac{X-a}{a}}$

Make $a$ the subject of the formula.

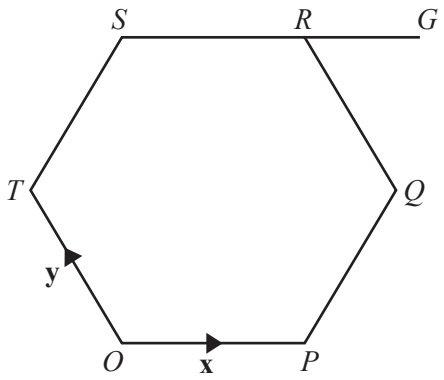
$a =$ ..... [5]

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

$$\frac{x-2}{x+1} - \frac{x+3}{x-1}$$

..... [5]

**9**




NOT TO SCALE

$O$ is the origin and $OPQRST$ is a regular hexagon.

$\overrightarrow{OP} = \mathbf{x}$ and $\overrightarrow{OT} = \mathbf{y}$.

**(a)** Write down, in terms of **x** and/or **y**, in its simplest form,

**(i)** $\overrightarrow{QR}$,

$\overrightarrow{QR}$ = ..... [1]

**(ii)** $\overrightarrow{PQ}$,

$\overrightarrow{PQ}$ = ..... [1]

**(iii)** the position vector of $S$.

..... [2]

**(b)** The line $SR$ is extended to $G$ so that $SR : RG = 2 : 1$.

Find $\overrightarrow{GQ}$, in terms of **x** and **y**, in its simplest form.

$\overrightarrow{GQ}$ = ..... [2]

**(c)** $M$ is the midpoint of $OP$.

**(i)** Find $\overrightarrow{MG}$, in terms of **x** and **y**, in its simplest form.

$\overrightarrow{MG}$ = ..... [2]

**(ii)** $H$ is a point on $TQ$ such that $TH : HQ = 3 : 1$.

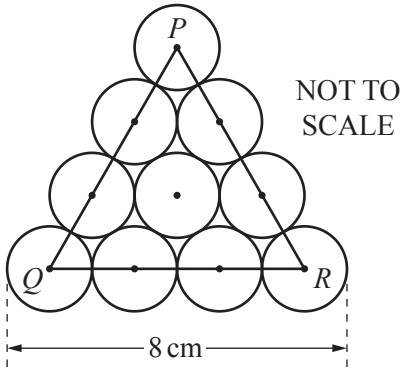
Use vectors to show that $H$ lies on $MG$.

[2]

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**10** **(a)** The ten circles in the diagram each have radius 1 cm.
The centre of each circle is marked with a dot.

Calculate the height of triangle $PQR$.

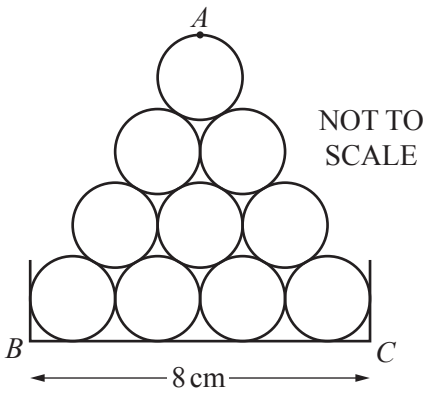



..... cm [3]

**(b)** Mr Patel uses whiteboard pens that are cylinders of radius 1 cm.

**(i)** The diagram shows 10 pens stacked in a tray.
The tray is 8 cm wide.
The point $A$ is the highest point in the stack.

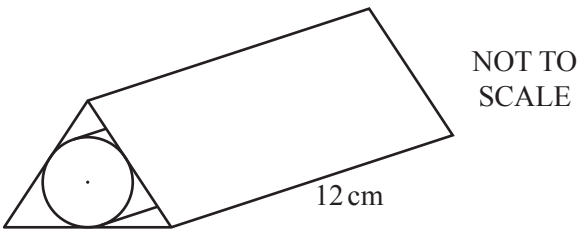
Find the height of $A$ above the base, $BC$, of the tray.




..... cm [1]

**(ii)** The diagram shows a box that holds one pen.
The box is a prism of length 12 cm.
The cross section of the prism is an equilateral triangle.
The pen touches each of the three rectangular faces of the box.

Calculate the volume of this box.




..... $cm^3$ [5]

**Question 11 is printed on the next page.**

**11** $f(x) = 2 - 3x$ $g(x) = 7x + 3$

**(a)** Find

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

..... [1]

**(ii)** $g(2x)$.

..... [1]

**(b)** Find $gf(x)$ in its simplest form.

..... [2]

**(c)** Find $x$ when $3f(x) = 7$.

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

**(d)** Solve the equation.

$$f(x + 4) - g(x) = 0$$

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

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