Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

6616474634

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 2016**

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.

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[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. $\quad A = \pi rl$

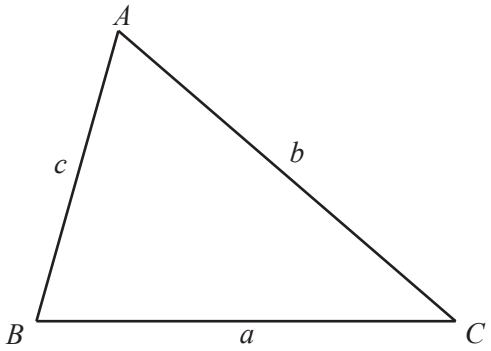
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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 Toby takes a journey from Johannesburg to Zurich.

(a) He changes 2500 rand into Swiss francs (CHF).
1 Swiss franc = 12.43 rand.

Calculate the amount Toby receives in Swiss francs.
Give your answer correct to the nearest Swiss franc.

..... CHF [2]

(b) Toby leaves Johannesburg at 19 30 and arrives in Zurich at 06 10 the next morning.
Local time in Zurich is the same as local time in Johannesburg.
The distance from Johannesburg to Zurich is 8350 km.

(i) Calculate the average speed of the journey.

.....km/h [3]

(ii) After arriving at 06 10, Toby takes a further 1 hour 55 minutes to reach his office.

Work out the time he arrives at his office.

..... [1]

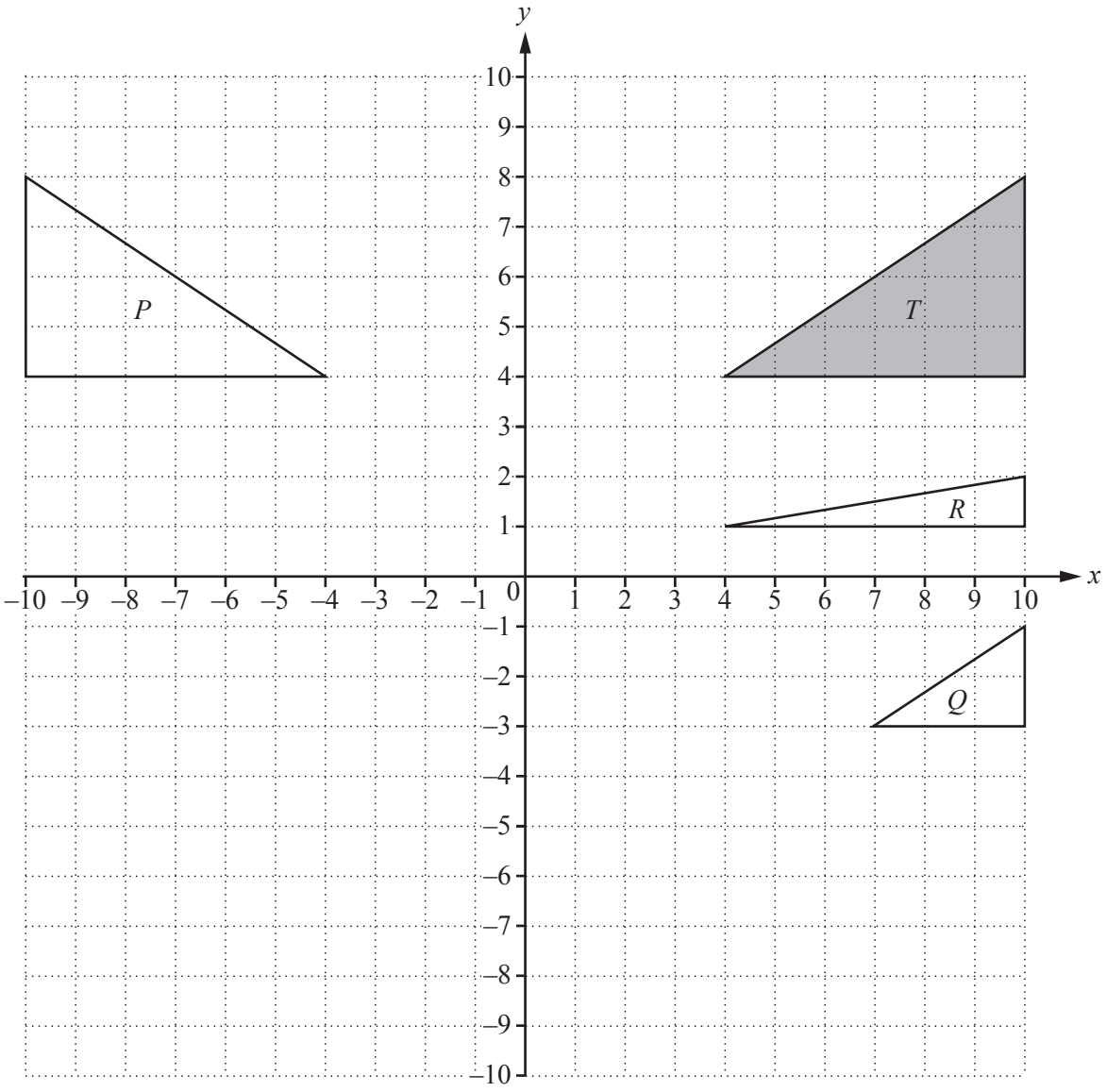
(iii) Later, Toby takes a taxi from his office to a hotel.
The taxi fare is made up of a fixed charge of 20 CHF plus 2.40 CHF per kilometre.
Toby paid 36.80 CHF altogether.

Work out the distance of Toby's taxi journey.

.....km [3]

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2



(a) $\mathbf{u} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} -5 \\ -3 \end{pmatrix}$

(i) Find $\mathbf{u} + \mathbf{v}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$

[1]

(ii) Draw the image of triangle T under the translation by the vector $\mathbf{u} + \mathbf{v}$. [2]

(iii) Calculate $|\mathbf{u} + \mathbf{v}|$.

..... [2]

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

(i) triangle T onto triangle P,

.....

..... [2]

(ii) triangle T onto triangle Q,

.....

..... [3]

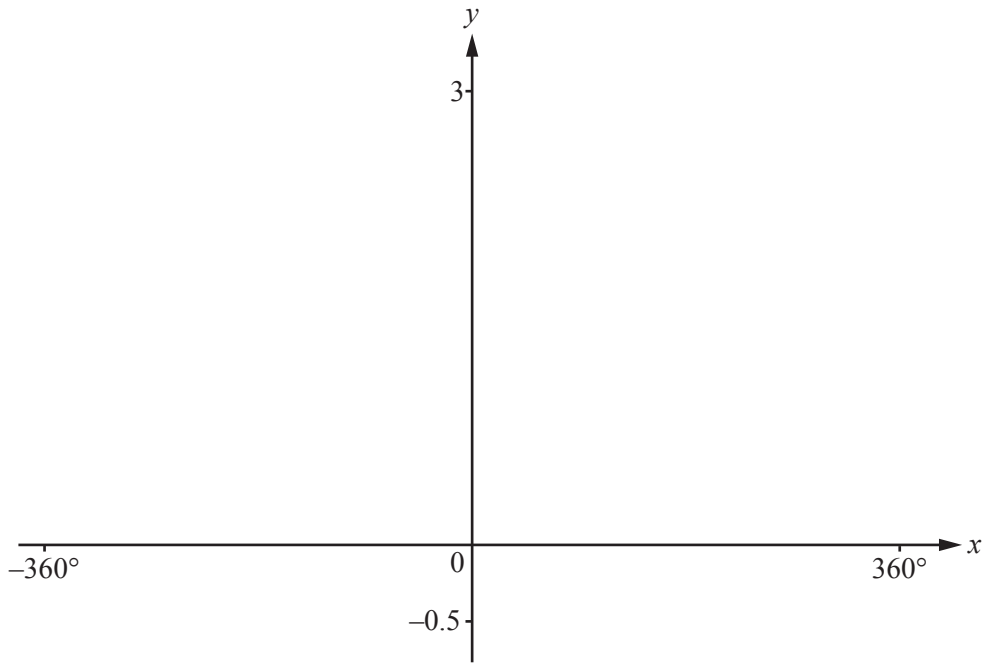
(iii) triangle T onto triangle R.

.....

..... [3]

3 $f(x) = 2^{\sin x}$

(a) On the diagram, sketch the graph of $y = f(x)$ for $-360° \leqslant x \leqslant 360°$.



[3]

(b) Find the range of $f(x)$.

..... [2]

(c) Find the value of $f(x)$ when

(i) $x = 3780°$,

..... [1]

(ii) $x = 4050°$.

..... [1]

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(d) (i) Find the four values of x from $-360°$ to $1080°$ for which $f(x) = 0.5$.

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

(ii) The values in the answer to **part (d)(i)** form the first four terms of a sequence.

Find the nth term of this sequence.

..... [2]

(e) $g(x) = \dfrac{x(360 - x)}{16200}$

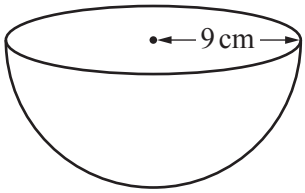
(i) On the diagram, sketch the graph of $y = g(x)$ for $0° \leqslant x \leqslant 360°$. [2]

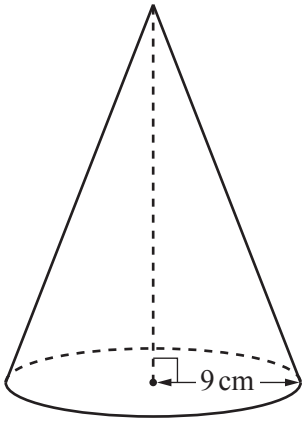
(ii) Solve the equation $f(x) = g(x)$.

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

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4





NOT TO SCALE

The diagrams show a solid hemisphere and a solid cone.
Both the hemisphere and the base of the cone have radius 9 cm.
The volumes of the two shapes are equal.

(a) Show that the perpendicular height of the cone is 18 cm.

[2]

(b) (i) Calculate the **total** surface area of the hemisphere.

..... cm^2 [2]

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(ii) Calculate the **curved** surface area of the cone.

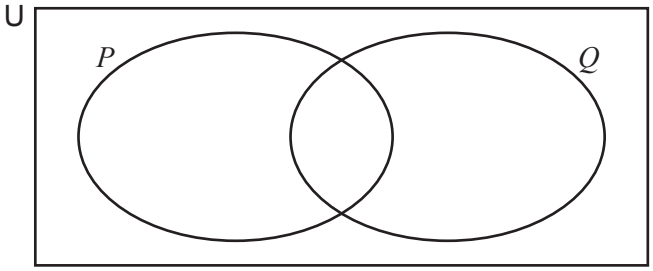
..... cm^2 [3]

(c) The hemisphere is made from metal.
The metal is melted down and made into **spheres** of radius 2 cm.

Calculate the number of spheres that are made.

..... [3]

5



$n(U) = 25$ $n(P) = 18$ $n(Q) = 12$ $n(P \cup Q)' = 3$.

(a) Show that $n(P \cap Q) = 8$.

[2]

(b) An element is chosen at random from U.

Find the probability that the element is a member of

(i) $P \cup Q$,

..... [1]

(ii) $P \cup Q'$.

..... [1]

(c) An element is chosen at random from P.

Find the probability that this element is also a member of Q.

..... [1]

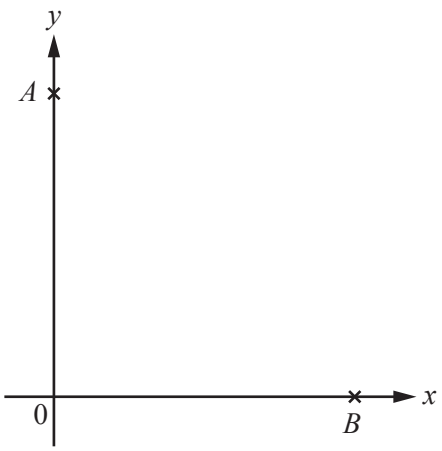
(d) The probability of a single event is $\frac{2}{3}$.

Describe this event in terms of P and Q.

..... [1]

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6



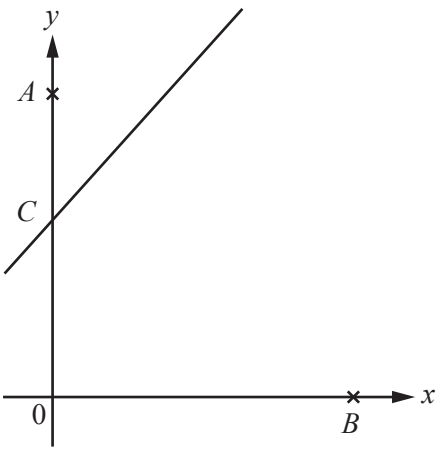
NOT TO SCALE

A is the point (0, 6) and B is the point (4, 0).

(a) Find the equation of the perpendicular bisector of AB.

..... [5]

(b)



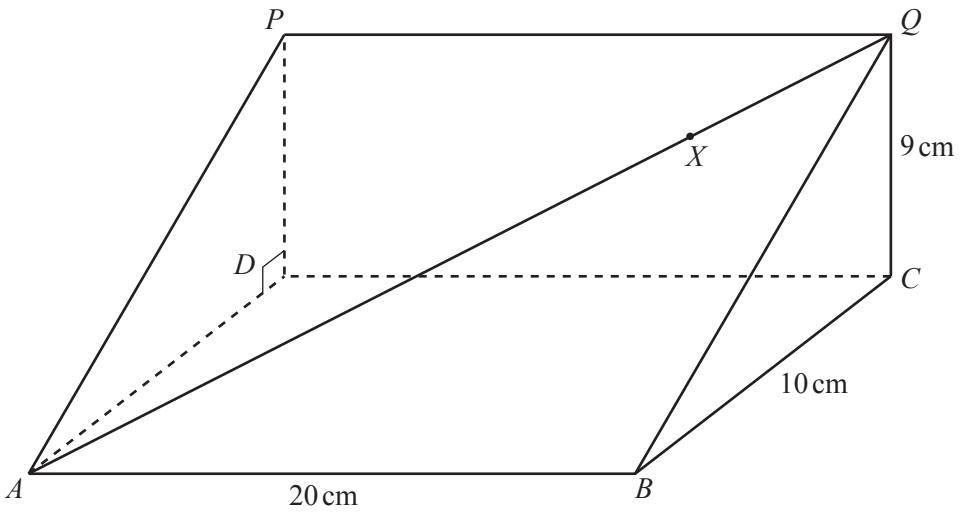
NOT TO SCALE

The line $y = 2x + 3$ cuts the y-axis at C.
The perpendicular bisector of AB cuts the y-axis at D.

Find the length CD.

$CD =$ ..... [2]

7



NOT TO SCALE

The diagram shows a triangular prism with a horizontal base $ABCD$.
X is a point on the line AQ.
$AB = 20$ cm, $BC = 10$ cm, $CQ = 9$ cm and angle $BCQ = 90°$.

(a) Calculate angle QBC.

Angle QBC = ... [2]

(b) Calculate angle BAQ and show that it rounds to 33.9°, correct to 1 decimal place.

[3]

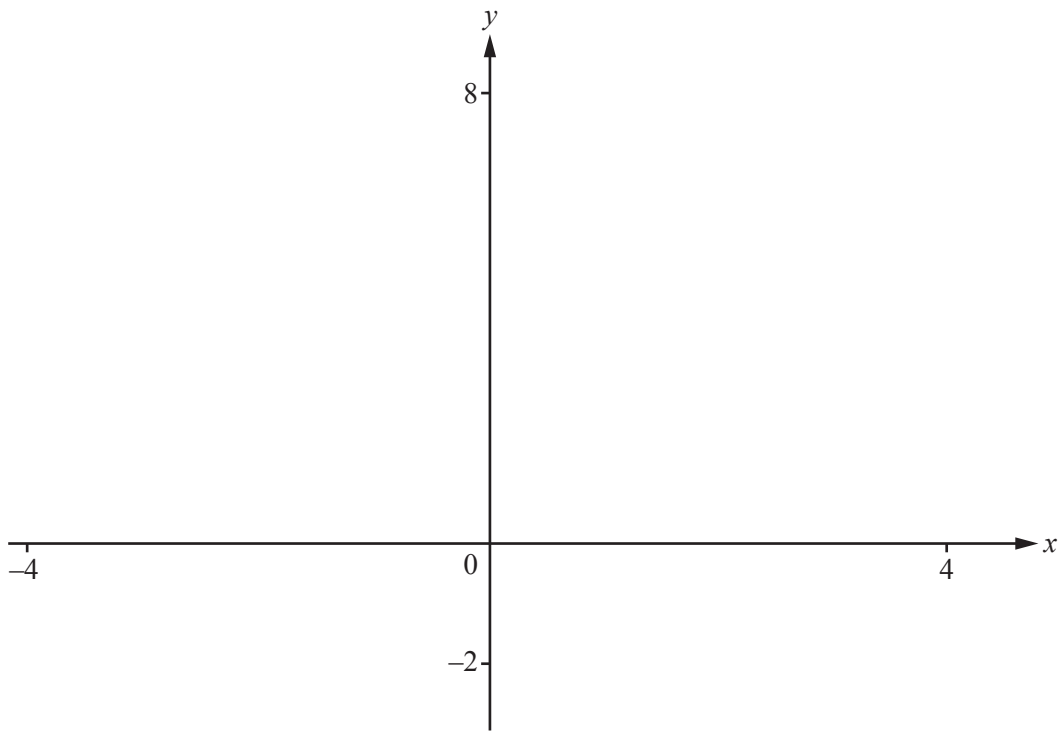
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(c) $AX = 22$ cm.

Calculate the length of BX.

$BX =$ ..... cm [3]

8



$$f(x) = x + \frac{1}{x} + 3$$

(a) On the diagram, sketch the graph of $y = f(x)$ for values of x between -4 and 4. [2]

(b) Find the zeros of $f(x)$.

..... [2]

(c) Solve the inequality $f(x) < 0$.

..... [3]

(d) The asymptotes of the graph are $x = a$ and $y = x + b$, where a and b are integers.

Find the value of a and the value of b.

$a =$ .....

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

(e) $g(x) = x + \frac{1}{x}$

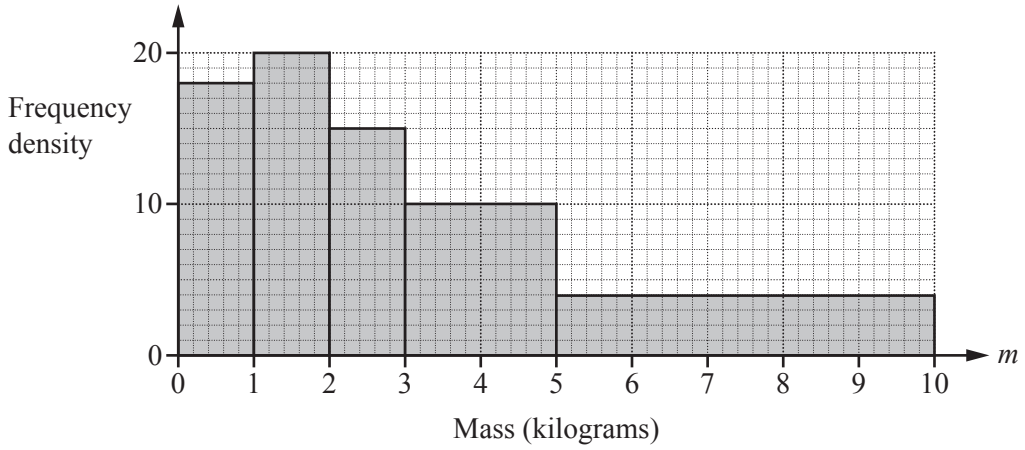
Describe fully the **single** transformation that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$.

.....

..... [2]

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9 In one day a delivery company delivers 93 parcels.
The histogram shows information about the masses, m kg, of these parcels.



(a) Complete the frequency table.

Mass (m kg)	$0 < m \leqslant 1$	$1 < m \leqslant 2$	$2 < m \leqslant 3$	$3 < m \leqslant 5$	$5 < m \leqslant 10$
Frequency					

[3]

(b) Calculate an estimate of the mean mass.

..... kg [2]

(c) Two parcels are chosen at random.

Find the probability that they both have a mass greater than 1 kg.
Give your answer as a decimal, correct to 3 significant figures.

..... [2]

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10 **(a)** Solve.

$7x + 2 = 11$

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

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

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

..... [2]

(c) Simplify the following.

(i) $\dfrac{8x^4y^2}{4x^3y^4}$

..... [2]

(ii) $\dfrac{x^2-9}{x^2-2x-3}$

..... [4]

11 $f(x) = 3x + 1$ $g(x) = \log x$

(a) Find the value of g(f(33)).

..... [2]

(b) Find the value of x when $g(x) = f(-1)$.

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

(c) Find

(i) $f^{-1}(x)$,

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

(ii) $g^{-1}(x)$.

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

12 **(a)** In 2015, Ahmed had a monthly salary of $1375.
In 2016, his monthly salary is $1540.

(i) Calculate the percentage increase in Ahmed's monthly salary.

..... % [3]

(ii) Work out $1375 as a percentage of $1540.

..... % [1]

(iii) In 2015, Ahmed's monthly salary of $1375 was 10% more than his monthly salary in 2014.

Calculate Ahmed's monthly salary in 2014.

$ ..... [3]

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(b) Samia invested \$500 in each of two Schemes.

Scheme A 3% per year simple interest.

Scheme B 2.5% per year compound interest.

(i) Calculate the difference between the value of Scheme A and the value of Scheme B after 5 years. Show all your working.

\$ ..... [5]

(ii) Find the number of complete years it will take for the value of Scheme B to be greater than the value of Scheme A.

..... [4]

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