Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTER NUMBER	
CANDIDATE NUMBER	

1354282696

MATHEMATICS (US) **0444/43**

Paper 4 (Extended) **October/November 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Center 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 work is needed for any question it must be shown in the space provided.
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 digits.
Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 130.

Write your calculator model in the box below.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

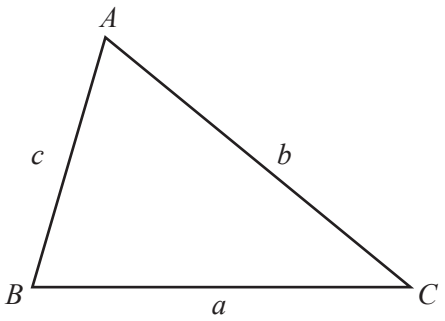
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

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 cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

1 **(a)** Kolyan buys water for \$2.60 .
He also buys cookies.

(i) The ratio cost of cookies : cost of water = 3 : 2.

Find the cost of the cookies.

Answer(a)(i) \$..... [2]

(ii) Kolyan has \$9 to spend.

Work out the total amount Kolyan spends on water and cookies as a fraction of the \$9.
Give your answer in its lowest terms.

Answer(a)(ii) ..... [2]

(iii) The \$9 is 62.5% less than the amount Kolyan had to spend last week.

Calculate the amount Kolyan had to spend last week.

Answer(a)(iii) \$..... [3]

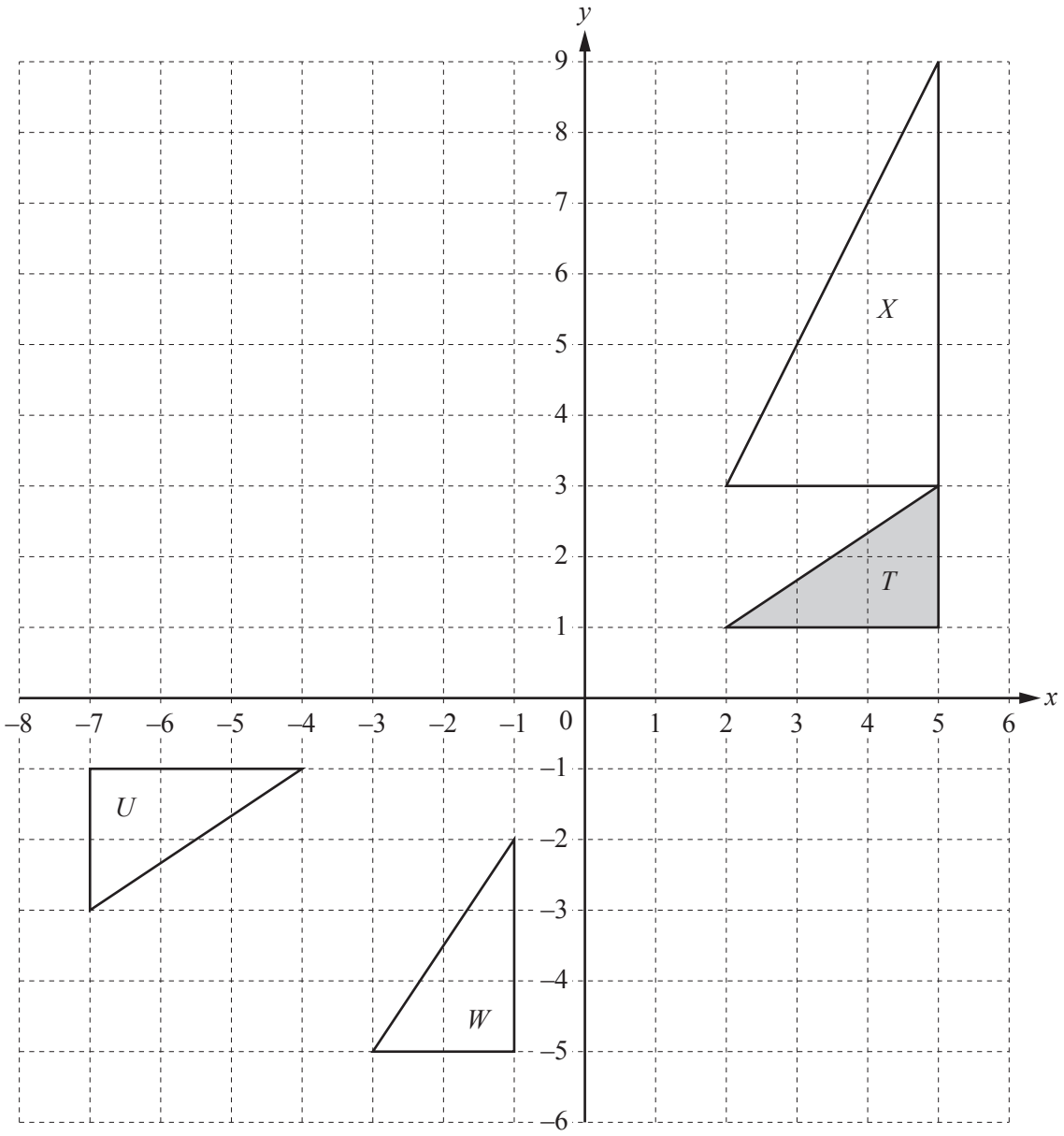
(b) Priya buys a bicycle for \$250.
Each year the value of the bicycle decreases by 8% of its value at the beginning of that year.

Calculate the value of Priya's bicycle after 10 years.
Give your answer correct to the nearest dollar.

Answer(b) \$..... [3]

[Turn over

2



(a) On the grid, draw the image of

(i) triangle T after a translation by the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$, [2]

(ii) triangle T after a reflection in the line $y = -1$. [2]

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

(i) triangle T onto triangle U,

Answer(b)(i) .....

..... [3]

(ii) triangle T onto triangle W,

Answer(b)(ii) .....

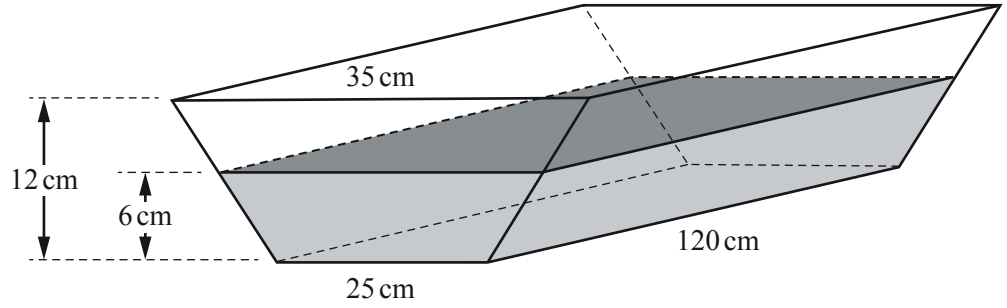
..... [2]

(iii) triangle T onto triangle X.

Answer(b)(iii) .....

..... [3]

3 The diagram shows a horizontal water trough in the shape of a prism.



NOT TO SCALE

The cross section of this prism is a trapezoid.
The trapezoid has parallel sides of lengths 35 cm and 25 cm and a perpendicular height of 12 cm.
The length of the prism is 120 cm.

(a) Calculate the volume of the trough.

Answer(a) ..... cm^3 [3]

(b) The trough contains water to a depth of 6 cm.

(i) Show that the volume of water is 19 800 cm^3.

Answer(b)(i)

[2]

(ii) Calculate the percentage of the trough that contains water.

Answer(b)(ii) ..... % [1]

(c) The water is drained from the trough at a rate of 12 liters per hour.

Calculate the time it takes to empty the trough.
Give your answer in hours and minutes.

Answer(c) ..... h ..... min [4]

(d) The water from the trough just fills a cylinder of radius r cm and height $3r$ cm.

Calculate the value of r.

Answer(d) $r =$ ..... [3]

(e) The cylinder has a mass of 1.2 kg.
1 cm^3 of water has a mass of 1 g.

Calculate the total mass of the cylinder and the water.
Give your answer in kilograms.

Answer(e) ..... kg [2]

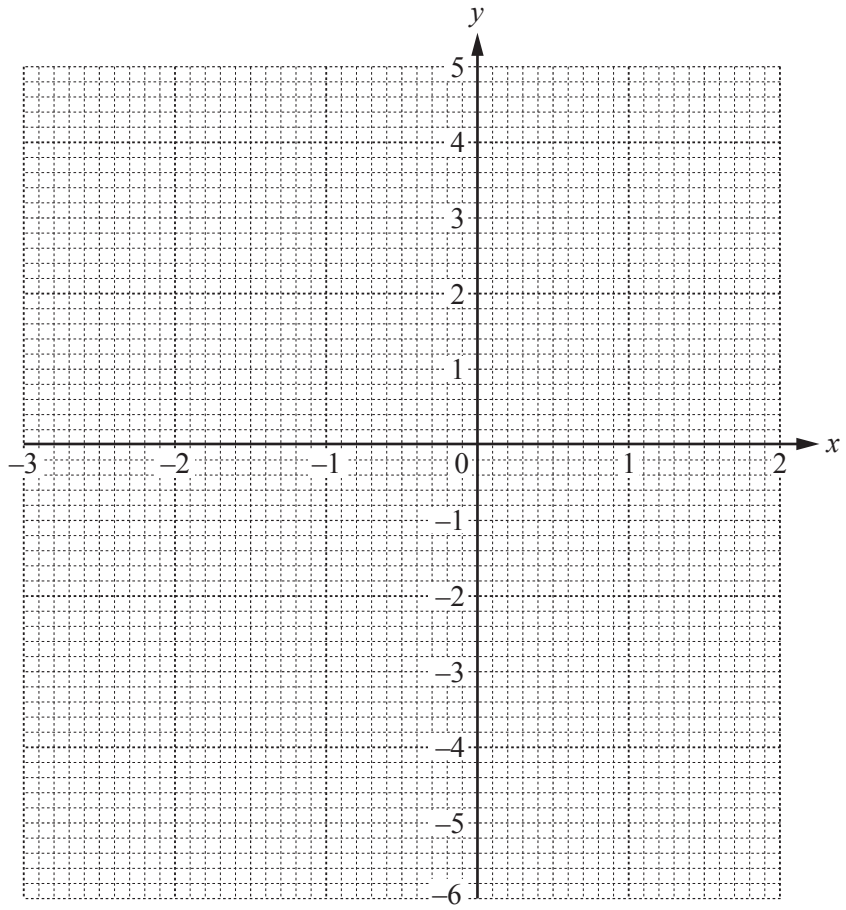
4 $f(x) = x - \frac{1}{2x^2}, \quad x \neq 0$

(a) Complete the table of values.

x	–3	–2	–1.5	–1	–0.5	–0.3		0.3	0.5	1	1.5	2
$f(x)$	–3.1	–2.1	–1.7		–2.5	–5.9		–5.3	–1.5		1.3	1.9

[2]

(b) On the grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 2$.



[5]

(c) Use your graph to solve the equation $f(x) = 1$.

Answer(c) $x =$ ..... [1]

(d) There is only one negative integer value, k, for which $f(x) = k$ has only one solution for all real x.

Write down this value of k.

Answer(d) k = ... [1]

(e) The equation $2x - \frac{1}{2x^2} - 2 = 0$ can be solved using the graph of $y = f(x)$ and a straight line graph.

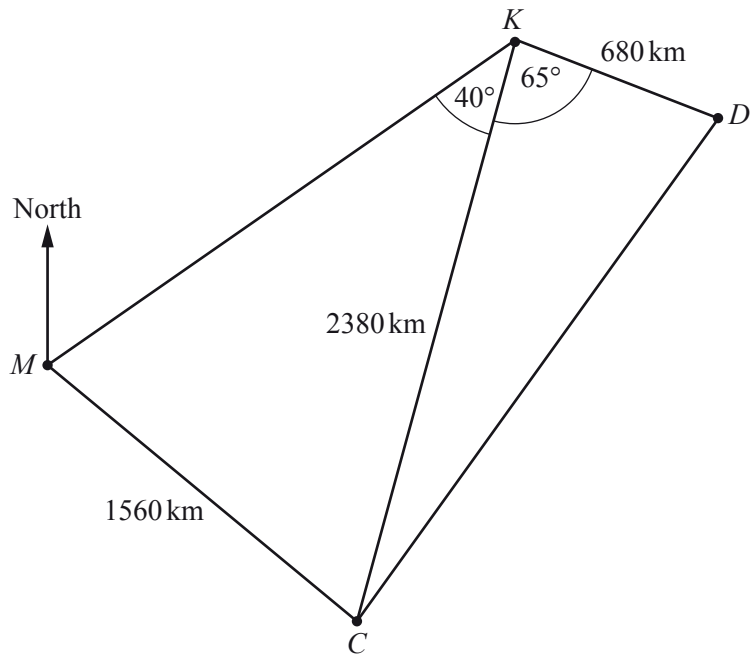
(i) Find the equation of this straight line.

Answer(e)(i) y = ... [1]

(ii) On the grid, draw this straight line and solve the equation $2x - \frac{1}{2x^2} - 2 = 0$.

Answer(e)(ii) x = ... [3]

5



NOT TO SCALE

The diagram shows some distances between Mumbai (M), Kathmandu (K), Dhaka (D) and Colombo (C).

(a) Angle $CKD = 65°$.

Use the cosine rule to calculate the distance CD.

Answer(a) CD = ... km [4]

(b) Angle $MKC = 40°$.

Use the sine rule to calculate the acute angle KMC.

Answer(b) Angle KMC = ... [3]

(c) The bearing of K from M is 050°.

Find the bearing of M from C.

Answer(c) ..... [2]

(d) A plane from Colombo to Mumbai leaves at 21 15 and the journey takes 2 hours 24 minutes.

(i) Find the time the plane arrives at Mumbai.

Answer(d)(i) ..... [1]

(ii) Calculate the average speed of the plane.

Answer(d)(ii) ..... km/h [2]

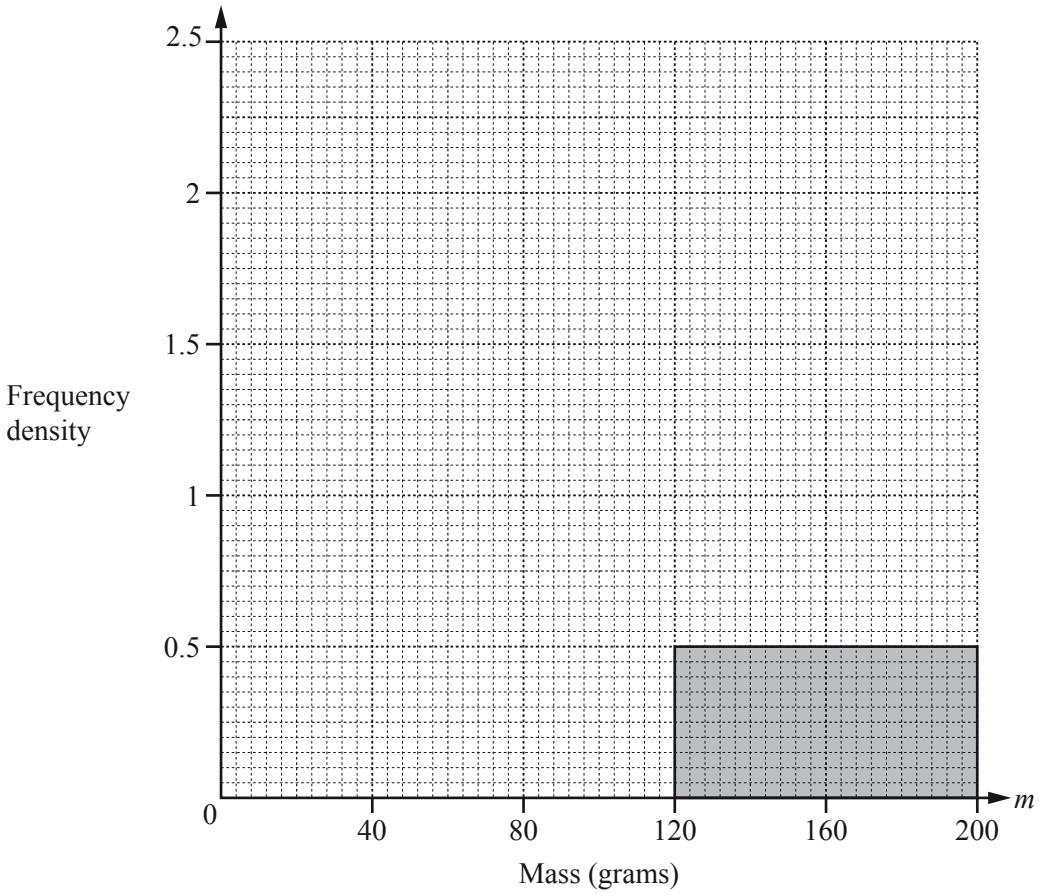
6 The table shows information about the masses, m grams, of 160 apples.

Mass (m grams)	$30 < m \leqslant 80$	$80 < m \leqslant 100$	$100 < m \leqslant 120$	$120 < m \leqslant 200$
Frequency	50	30	40	40

(a) Calculate an estimate of the mean.

Answer(a) ..... g [4]

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



[3]

(c) An apple is chosen at random from the 160 apples.

Find the probability that its mass is more than 120 g.

Answer(c) ..... [1]

(d) Two apples are chosen at random from the 160 apples, without replacement.

Find the probability that

(i) they both have a mass of more than 120 g,

Answer(d)(i) ..... [2]

(ii) one has a mass of more than 120 g and one has a mass of 80 g or less.

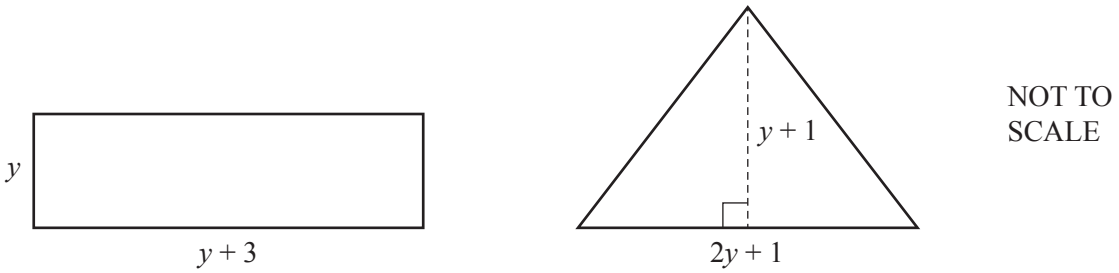
Answer(d)(ii) ..... [3]

7 **(a)** The cost of a loaf of bread is x cents.
The cost of a cake is $(x - 5)$ cents.
The total cost of 6 loaves of bread and 11 cakes is \$13.56 .

Find the value of x.

Answer(a) $x =$ ..... [4]

(b)



The area of the rectangle and the area of the triangle are equal.

Find the value of y.

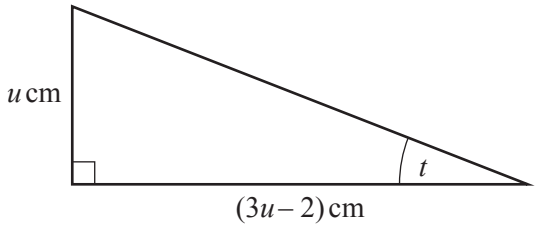
Answer(b) $y =$ ..... [4]

(c) The cost of a bottle of water is $(w - 1)$ cents.
The cost of a bottle of milk is $(2w - 11)$ cents.
A certain number of bottles of water costs \$4.80 .
The same number of bottles of milk costs \$7.80 .

Find the value of w.

Answer(c) $w =$ ..... [4]

(d)



NOT TO SCALE

The area of the triangle is $2.5\,\text{cm}^2$.

(i) Show that $3u^2 - 2u - 5 = 0$.

Answer(d)(i)

[2]

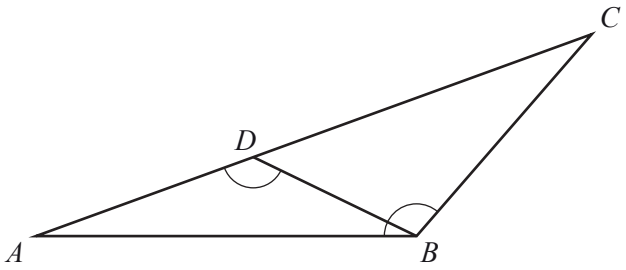
(ii) Factor $3u^2 - 2u - 5$.

Answer(d)(ii) ..... [2]

(iii) Find the size of angle t.

Answer(d)(iii) $t =$ ..... [3]

8 (a)



NOT TO SCALE

In the diagram, D is on AC so that angle ADB = angle ABC.

(i) Show that angle ABD is equal to angle ACB.

Answer(a)(i)

[2]

(ii) Complete the statement.

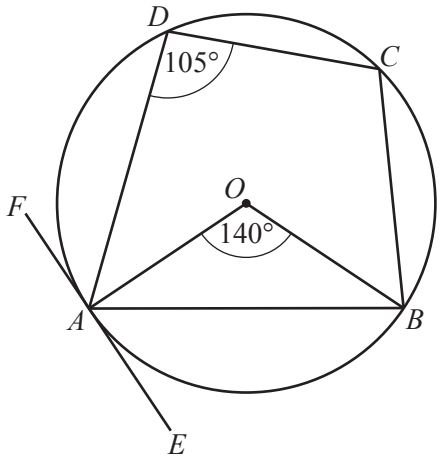
Triangles ABD and ACB are ..... . [1]

(iii) $AB = 12$ cm, $BC = 11$ cm and $AC = 16$ cm.

Calculate the length of BD.

Answer(a)(iii) BD = ... cm [2]

(b)



NOT TO SCALE

A, B, C and D lie on the circle, center O.
EAF is a tangent to the circle at A.
Angle $ADC = 105°$ and angle $AOB = 140°$.

Find

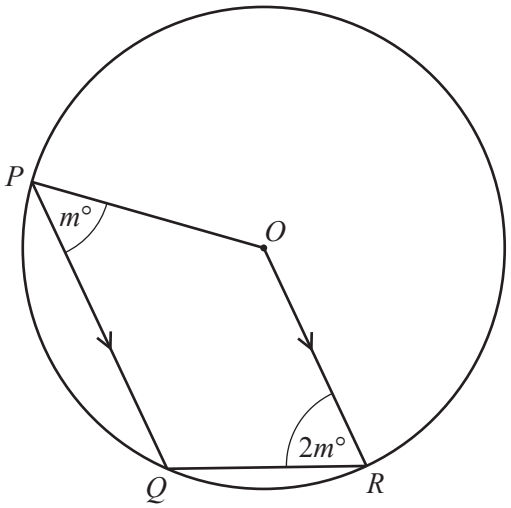
(i) angle *ABC*,

Answer(b)(i) Angle *ABC* = ... [1]

(ii) angle *BAE*.

Answer(b)(ii) Angle *BAE* = ... [2]

(c)



NOT TO SCALE

In the diagram, *P*, *Q* and *R* lie on the circle, center *O*.
PQ is parallel to *OR*.
Angle *QPO* = *m*° and angle *QRO* = 2*m*°.

Find the value of *m*.

Answer(c) m = ... [5]

9 $f(x) = 2x - 1$ $g(x) = \frac{1}{x}, \ x \neq 0$ $h(x) = 2^x$

(a) Find h(3).

Answer(a) ..... [1]

(b) Find f(g(0.5)).

Answer(b) ..... [2]

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

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

(d) Find f(f(x)), giving your answer in its simplest form.

Answer(d) ..... [2]

(e) Find $(f(x))^2 + 6$, giving your answer in its simplest form.

Answer(e) ..... [2]

(f) Simplify $h(h^{-1}(x))$.

Answer(f) ..... [1]

(g) Which of the following statements is true?

$f^{-1}(x) = f(x)$

$g^{-1}(x) = g(x)$

$h^{-1}(x) = h(x)$

Answer(g) ..... [1]

(h) Use two of the functions $f(x)$, $g(x)$ and $h(x)$ to find the composite function which is equal to $2^{x+1} - 1$.

Answer(h) ..... [1]

Question 10 is printed on the next page.

10 Complete the table for each sequence.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term		*n*th term
A	15	8	1	–6				
B	$\frac{5}{18}$	$\frac{6}{19}$	$\frac{7}{20}$	$\frac{8}{21}$				
C	2	5	10	17				
D	2	6	18	54				

[11]