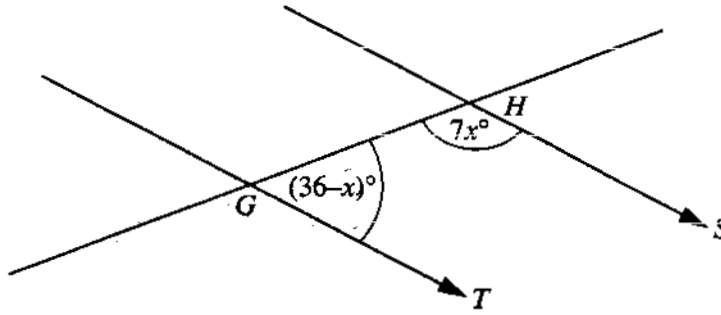## Question 1

NOT TO SCALE

In the diagram *GT* is parallel to *HS*.
Angle *HGT* = $(36 - x)°$ and angle *GHS* = $7x°$.
Find the value of *x*.

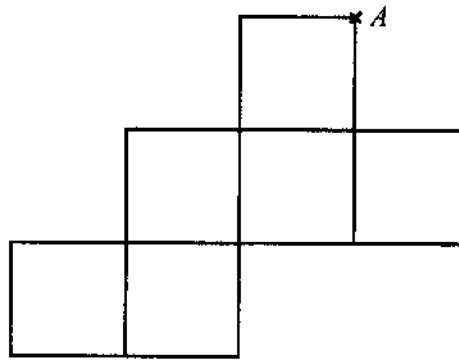*Answer* $x =$ .... [2]

Question 2

NOT TO SCALE
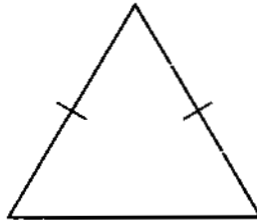
The equal sides of the isosceles triangle are each 7.7 cm, correct to the nearest millimetre.
The perimeter is 21.7 cm, also correct to the nearest millimetre.
Calculate the **smallest** possible length of the third side of the triangle. Show your working.

Answer ....cm   [2]

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Question 3

The diagram shows a net of a cube. One corner is marked and labelled A.
Mark and label A' the two points on the diagram which will touch the point A when the net is folded to make the cube.   [2]
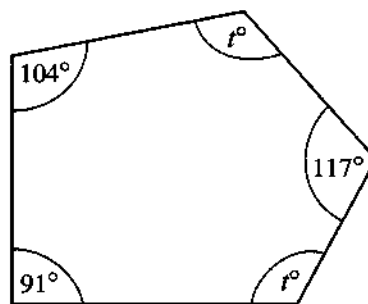
Question 4

The volume of the planet Uranus is 64 times the volume of the planet Earth.
Assuming that Uranus and Earth are geometrically similar, calculate the ratio of

Surface area of Uranus : **Surface area** of Earth   in the form $n : 1$.

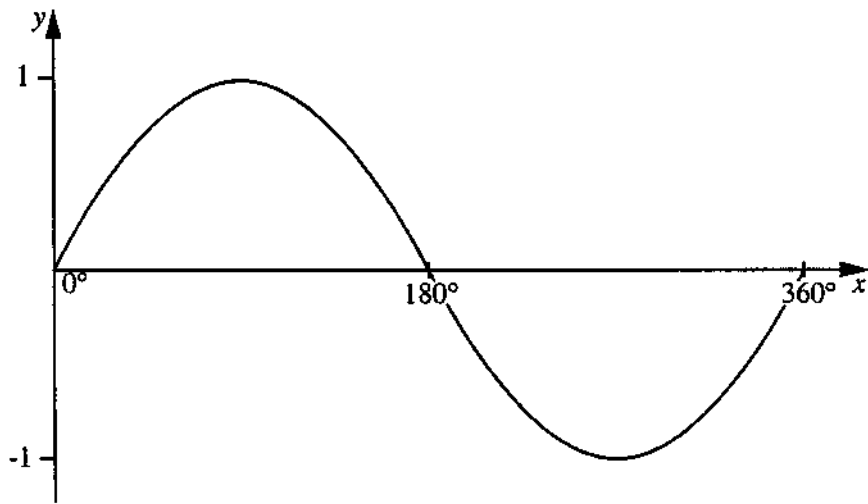*Answer* .... : 1   [2]

Question 5

NOT TO SCALE

In the pentagon the two angles labelled $t°$ are equal.
Calculate the value of t.

Answer $t =$ ....   [3]

Question 6

The sketch graph shows $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

(a) Find the obtuse angle x for which $\sin x = \sin 50°$.
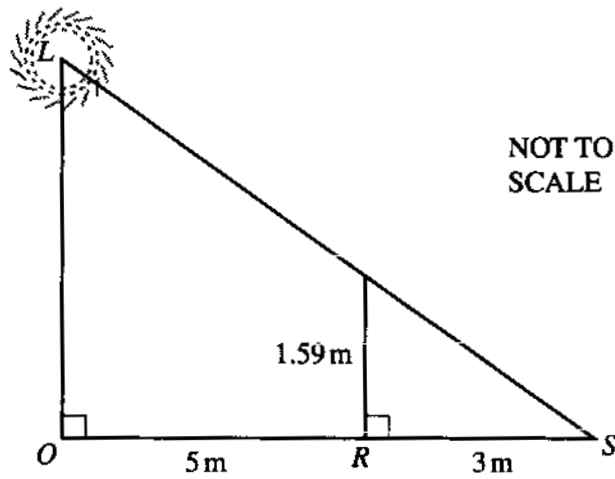
Answer (a) x = ... [1]

(b) Find the two values of x for which $\sin x = -\sin 50°$ and $0° \leqslant x \leqslant 360°$.

Answer (b) x = ... or *x =* .... [2]
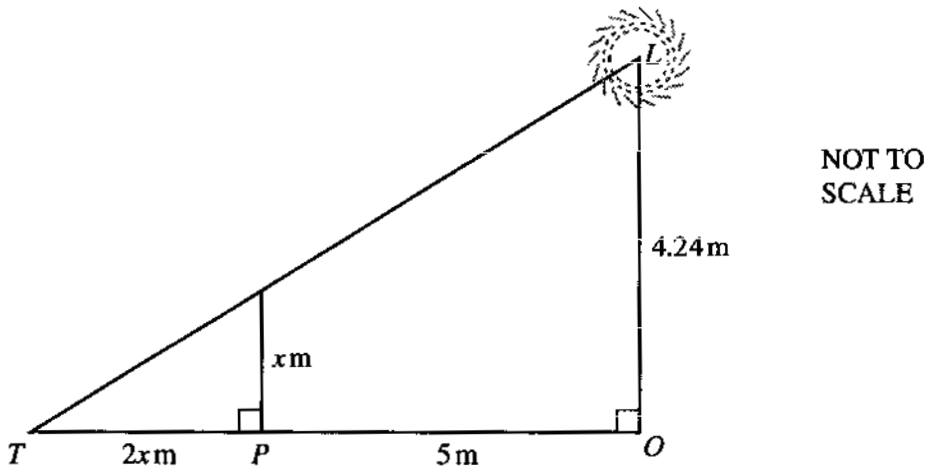
Question 7

(a)

Robert stands at the point R on level ground, 5 metres from the base of a lamppost OL.
Robert is 1.59 m tall and his shadow RS is 3 m long.

Show by calculation that the height of the lamppost OL is 4.24 m.

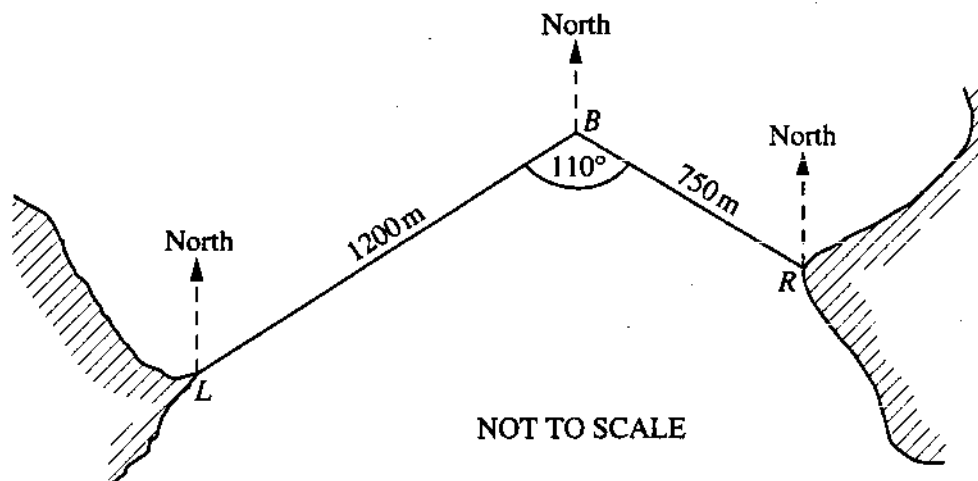*Answer (a)*

[2]

(b)

Pierre stands on level ground at the point P, 5 metres from O.
Pierre is x metres tall and his shadow PT is $2x$ metres long.
Find the value of x.

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

Question 8

NOT TO SCALE

A boat B is 1200 metres from a lighthouse L and 750 metres from a rock R. Angle $LBR = 110°$.

(a) Calculate

    (i) the length LR, correct to the nearest metre, [4]

    (ii) angle BLR, correct to the nearest degree. [4]

(b) The bearing of B from L is 053°.
    Calculate

    (i) the bearing of L from B, [2]

    (ii) the bearing of B from R. [2]

(c) The boat is sailing due south.
    Calculate, to the nearest metre, its closest distance to the lighthouse. [3]

Question 9
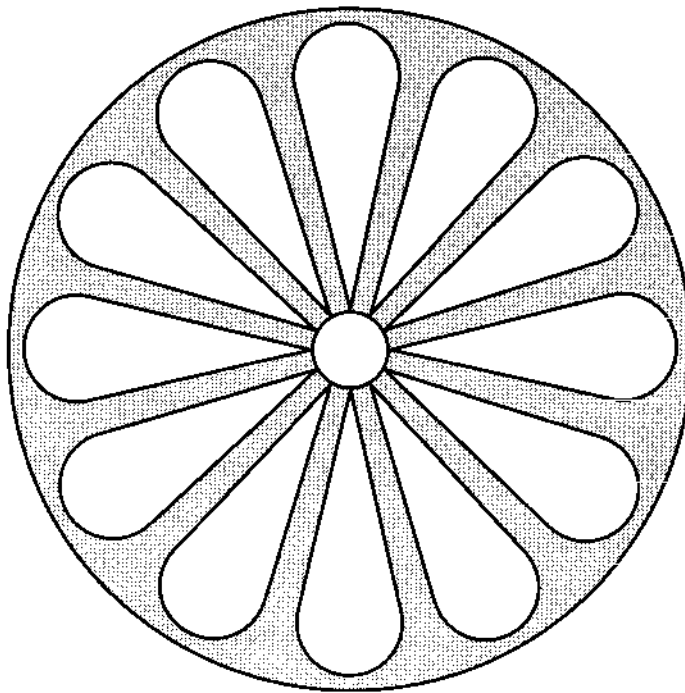
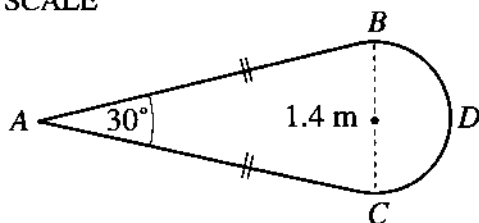A large circular window is shown in the diagram. The unshaded part is glass and is made up of a small circle and 12 identical shapes. The shaded part is stone.

[For π, use either your calculator value or 3.142.]

(a)

NOT TO
SCALE

The diagram shows one of the 12 identical shapes.

ABC is an isosceles triangle and BCD is a semicircle.

$BC = 1.4$ m and angle $BAC = 30°$.

Calculate
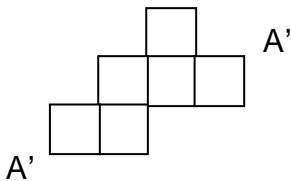
    (i) the area of the semicircle BCD,   [2]

   (ii) the length of AC, showing that it rounds off to 2.705 m,   [4]

  (iii) the area of triangle ABC,   [4]

  (iv) the area of the shape $ABDC$.   [1]

(b) The radius of the small circle is 0.3 m.

    Calculate the total area of glass, including the small circle.   [3]

(c) The radius of the large circular window is 4 m.

    Calculate the percentage of the window's area which is stone.   [3]

QUESTION	ANSWER	MARK	
1	24	2	(M1) for $36 - x + 7x = 180$ or equivalent
2	6.15	2	(B1) for 7.75 **or** 15.5 **or** 21.65 seen (or mm equivalent)
3		2	(B1) for each point correctly labelled
4	16	2	(M1) for $x^3 = 64$ or equivalent
5	114	3	(B1) for 540 seen (M1) for $312 + 2t$ seen or equivalent (SC2) for 66
6 (a)	130°	1	Condone omission of degree signs
(b)	210° and 330°	1, 1	
7 (a)	$\frac{OL}{1.59} = \frac{8}{3}$ or equivalent Derives OL = 4.24m correctly	M1 A1	Any correct numerical use of similar triangles **Note: no working $\Rightarrow$ no marks**
(b)	1.74	2	(M1) for $\frac{x}{2x} = \frac{4.24}{2x + 5}$ or eqivalent
8 (a)(i)	1618	4	(M2) for $1200^2 + 750^2 - 2(1200)(750\cos110^0)$ (M1) for $\sqrt{2618136.3}$ dependent on the previous M2 (M3 + A0) for correct answer to a greater accuracy than required
(a)(ii)	26°	4	$\surd$ award (M1) for $\frac{\sin BLR}{750} = \frac{\sin 110^0}{(a)(i)}$ $\surd$ award (M1) for $\sin BLR = 0.43558$ or equivalent After A0, award (SC1) if answer rounds to 26°
(b)(i)	233°	2	
(b)(ii)	303°	2	
(c)	958	3	(M1) for $\sin 53° = \frac{x}{1200}$ **or** $\cos 37° = \frac{x}{1200}$ (M1) for $1200\sin 52^0$ **or** $1200\cos 37^0$ (M2 + A0) for correct answer to a greater accuracy than required
9 (a)(i)	0.769 to 0.770	2	(M1) for $\frac{1}{2}\pi(0.7)^2$
(a)(ii)	2.7046 (accept 2.7045….)	4	(B1) for 75° **or** 15° seen (M1) for $\frac{AC}{\sin 75°} = \frac{1.4}{\sin 30°}$ **or** $\frac{0.7}{AC} = \sin 15^0$ (M1) for $AC = \frac{1.4\sin 75°}{\sin 30°}$ **or** $AC = \frac{0.7}{\sin 15°}$ (implies first M1)
(a)(iii)	1.828 to 1.83	4	(M2) for $\frac{1}{2}(2.705)^2 \sin 30°$ **or** $\frac{1}{2}(1.4)(2.705)\sin 75°$
(a)(iv)	2.597 to 2.60	1	$\surd$ award (B1) for a(i) + (a)(iii)

QUESTION		ANSWER	MARK	
	(b)	31.4 to 31.5	3	(M1) for $\pi(0.3)^2$ **or** 0.283 √ award (M1) for 'his' 0.283 + 12{(a)(iv)}
	(c)	37.3 to 37.5	3	(M1) for $\pi(4)^2$ **or** 50.265 √ award (M1) for $\dfrac{\text{'his'}50.265 - (b)}{\text{'his'}50.265} \times 100\%$

TYPES OF MARK

Most of the marks (those without prefixes and 'B' marks) are given for accurate results, drawings or statements.

'M' marks are awarded for any correct method applied to the appropriate numbers.

'B' marks are given for a correct statement or step.

'A' marks are for accurate results or statements but are awarded only if the relevant 'M' marks have been earned.

'SC' marks are awarded in special cases.

The symbol '√' indicates that a previous error is to be 'followed through' i.e. the mark can be gained if the candidate has made no further error in obtaining the relevant result.