

IGCSE Geometry I – All Difficult Questions (2022-2024)

Q1.

The diagram shows a cube $ABCDEFGH$ with sides of length 6 cm.

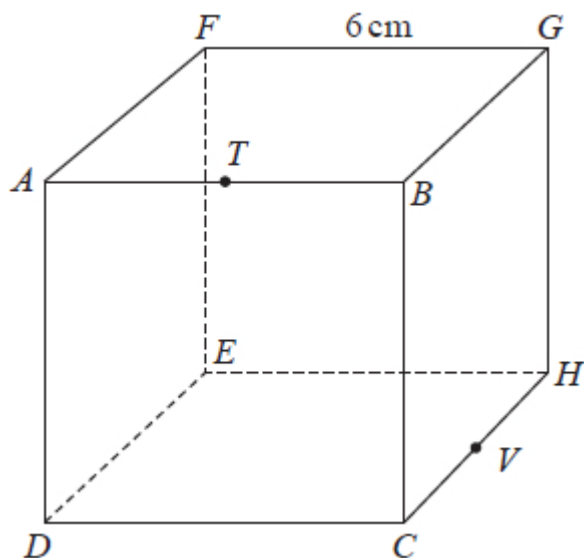


Diagram **NOT**
accurately drawn

T is the midpoint of AB and V is the midpoint of CH

Work out the distance from T to V in a straight line through the cube.

Give your answer in the form $\sqrt{a}$ cm where a is an integer.

..... cm

(Total for question = 4 marks)

Q2.

The diagram shows a triangular prism, $ABCDEF$, with a rectangular base $ABCD$

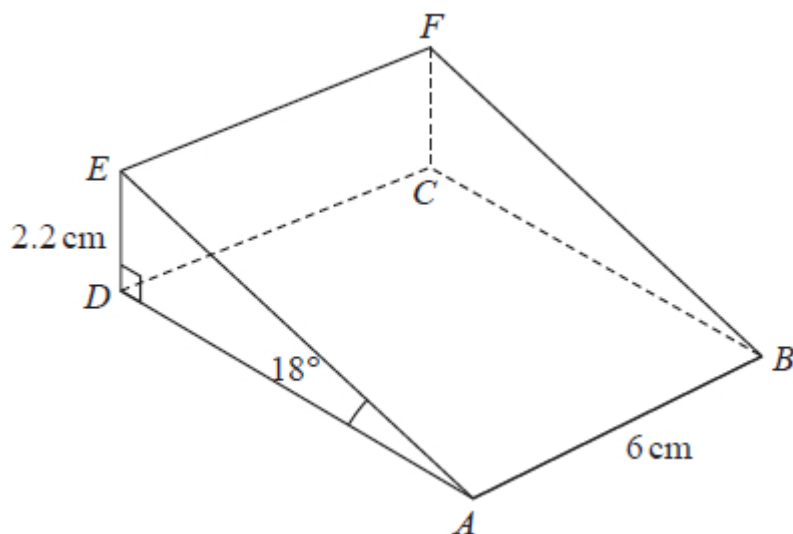


Diagram **NOT**
accurately drawn

$AB = 6 \text{ cm}$ $DE = 2.2 \text{ cm}$ angle $DAE = 18^\circ$ angle $ADE = 90^\circ$

Work out the angle that BE makes with the plane $ABCD$
Give your answer correct to one decimal place.

.....°

(Total for question = 4 marks)

Q3.

A cylinder is placed on a table.

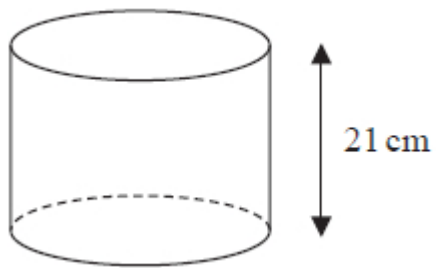


Diagram **NOT**
accurately drawn

The volume of the cylinder is 1575 cm^3

The force exerted by the cylinder on the table is 84 newtons.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the pressure on the table due to the cylinder.

..... newtons/cm²

(Total for question = 3 marks)

Q4.

Solid **A** is similar to solid **B**

Here is some information about solid **A** and solid **B**

	solid A	solid B
Height (cm)	3^x	
Area (cm ²)	7776	486
Volume (cm ³)	8^x	2^{x+4}

Work out the height of solid **B**

Give your answer as a decimal.

..... cm

(Total for question = 5 marks)

Q5.

The diagram shows a kite $ABCD$

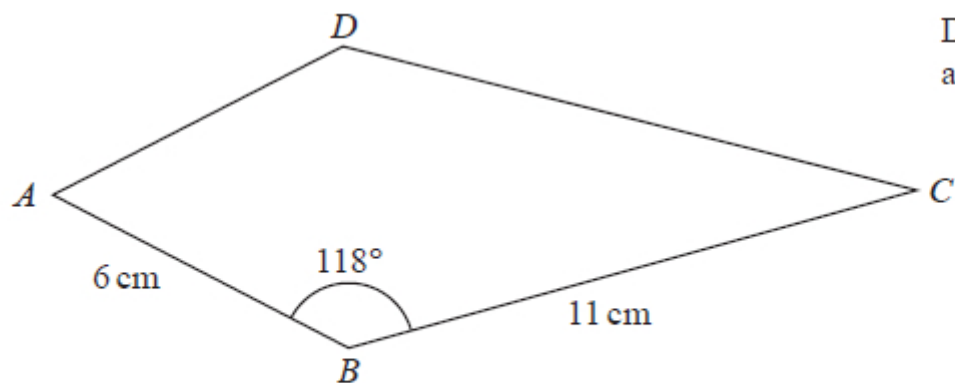


Diagram **NOT**
accurately drawn

$$AB = 6\text{ cm}$$

$$BC = 11\text{ cm}$$

$$\text{Angle } ABC = 118^\circ$$

Calculate the area of the kite.

Give your answer correct to 3 significant figures.

..... cm^2

(Total for question = 3 marks)

Q6.

The diagram shows an 8-sided shape $ABCDEFGH$.

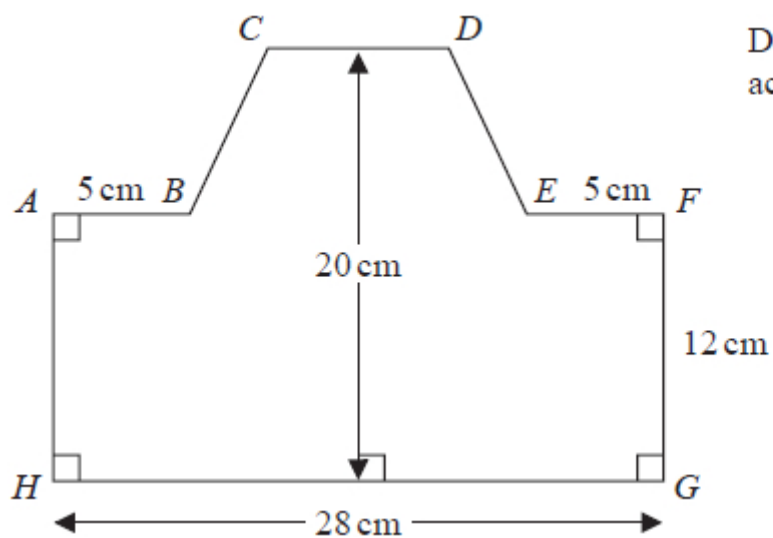


Diagram NOT
accurately drawn

$HG = 28 \text{ cm}$ $FG = 12 \text{ cm}$ $AB = EF = 5 \text{ cm}$

The height of the shape is 20 cm

CD is parallel to HG

The area of shape $ABCDEFGH$ is 434 cm^2

Find the length of CD .

..... cm

(Total for question = 4 marks)

Q7.

The diagram shows isosceles triangle ABC

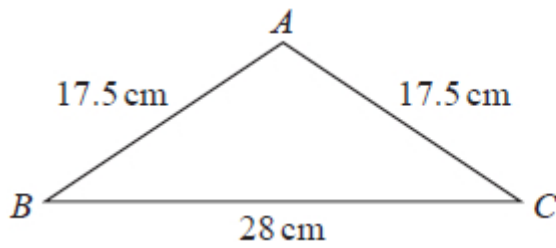


Diagram **NOT**
accurately drawn

$$AB = AC = 17.5\text{ cm} \quad BC = 28\text{ cm}$$

Calculate the area of triangle ABC

..... cm^2

(Total for question = 4 marks)

Q8.

The diagram shows a square $ABCD$ and a circle.

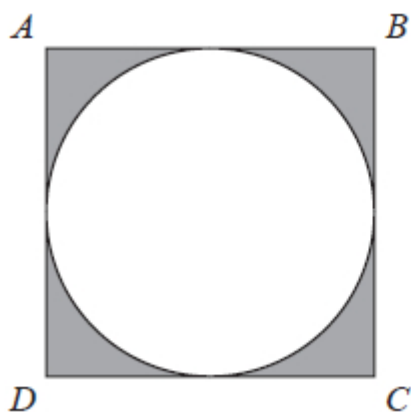


Diagram **NOT**
accurately drawn

The sides of the square are tangents to the circle.

The total area of the shaded regions is 80 cm^2

Work out the length of AC

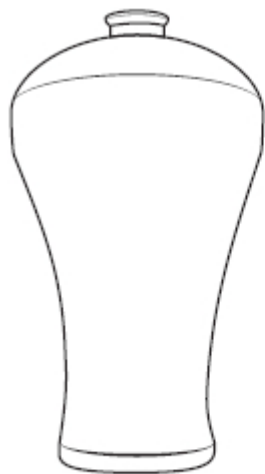
Give your answer correct to 3 significant figures.

..... cm

(Total for question = 5 marks)

Q9.

A and B are two similar vases.



A



B

Diagram NOT
accurately drawn

The vases are such that

surface area of vase B = $\frac{25}{64}$ × surface area of vase A
and that

$$\text{volume of vase A} - \text{volume of vase B} = 541.8 \text{ cm}^3$$

Calculate the volume of vase B

..... cm³

(Total for question = 4 marks)

Q10.

The diagram shows quadrilateral $ABCD$

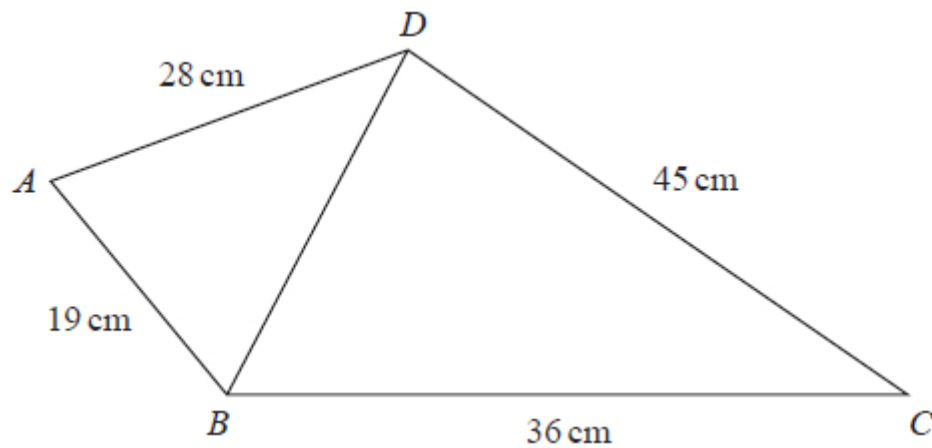


Diagram **NOT**
accurately drawn

The angle BCD is acute.

Given that the area of triangle $BCD = 405\text{ cm}^2$

work out the size of angle ABD

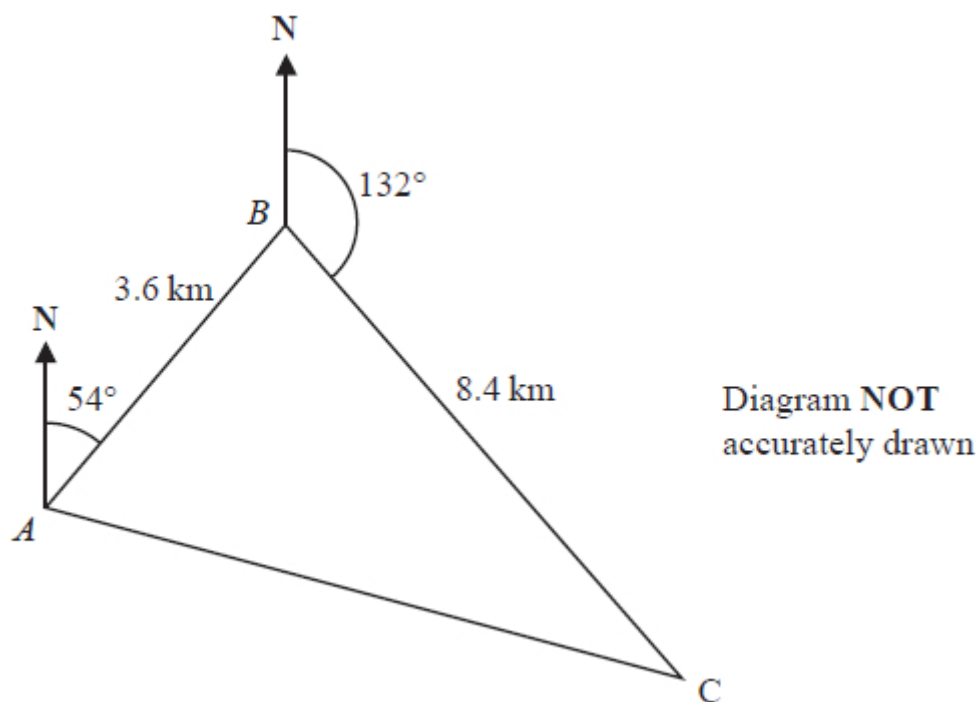
Give your answer correct to one decimal place.

.....°

(Total for question = 5 marks)

Q11.

The diagram shows the positions of three villages, A , B and C



The bearing of B from A is 054°

The bearing of C from B is 132°

Melur walks from A to B

She then walks from B to C and from C to A

Melur walks at an average speed of 6 km/h

Work out the total time Melur takes.

Give your answer in hours and minutes.

..... hours.....minutes

(Total for question = 5 marks)

Q12.

The diagram shows triangle ABC

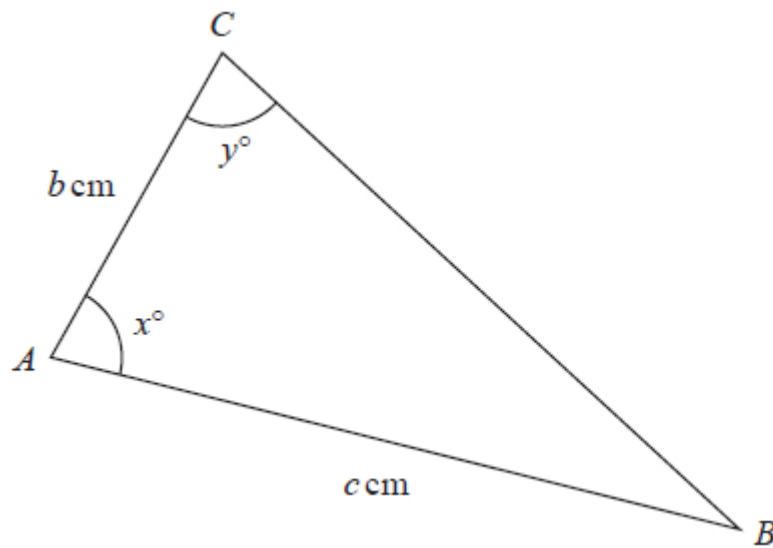


Diagram **NOT**
accurately drawn

- $c = 11.5$ correct to one decimal place
- $x = 80$ correct to the nearest whole number
- $y = 75$ correct to the nearest whole number

Calculate the upper bound for the value of b
Show your working clearly.
Give your answer correct to 3 significant figures.

.....

(Total for question = 4 marks)

Q13.

Here is a parallelogram $PQRS$, in which angle SPQ is acute.

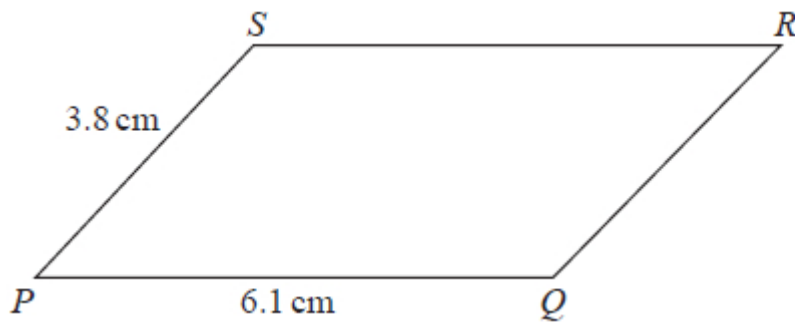


Diagram **NOT**
accurately drawn

$$PQ = 6.1\text{ cm} \quad PS = 3.8\text{ cm}$$

The area of the parallelogram is 18 cm^2

Work out the length of QS

Give your answer correct to 3 significant figures.

..... cm

(Total for question = 5 marks)

Q14.

The diagram shows triangle PQR

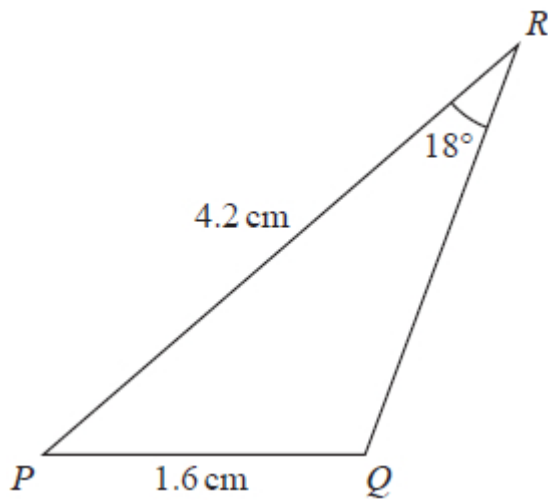


Diagram **NOT**
accurately drawn

$$PQ = 1.6 \text{ cm}$$

$$PR = 4.2 \text{ cm}$$

$$\text{Angle } PRQ = 18^\circ$$

Given that angle PQR is obtuse,

work out the area of triangle PQR

Give your answer correct to 3 significant figures.

..... cm^2

(Total for question = 6 marks)

Q15.

The diagram shows two solids, **A** and **B**, made from two different metals.

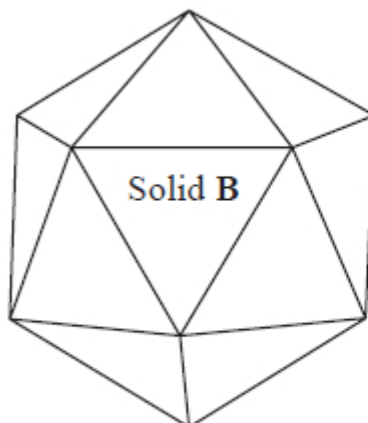
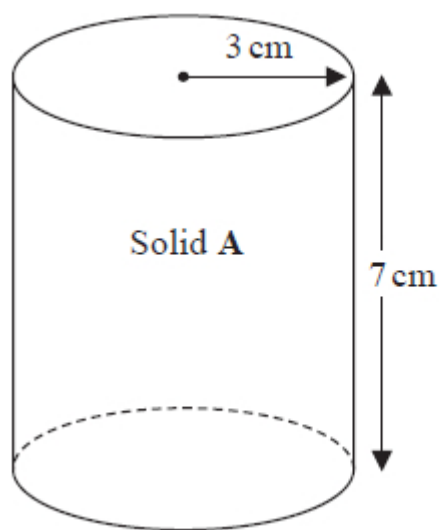


Diagram **NOT**
accurately drawn

Solid **A** is in the shape of a cylinder with radius 3 cm and height 7 cm
Solid **A** has a mass of 2000 g

Solid **B** has a mass of 3375 g
Solid **B** has a volume of 450 cm³

All of the metal from Solid **A** and Solid **B** is melted down to make a uniform Solid **C**

Given that there is no change to mass or volume during this process

work out the density of Solid **C**
Give your answer correct to one decimal place.

..... g / cm³

(Total for question = 3 marks)

Q16.

Here is a frustum of a cone.

The frustum is made by removing a small cone from a similar large cone.

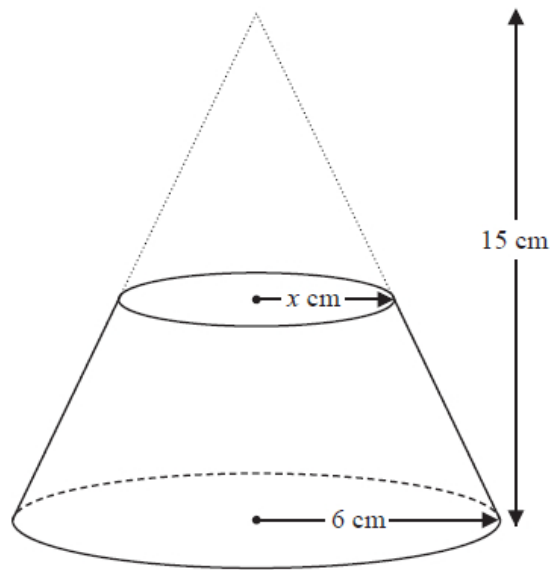


Diagram NOT
accurately drawn

The height of the large cone is 15 cm.

The radius of the base of the large cone is 6 cm.

The radius of the base of the small cone is x cm.

Given that the volume of the frustum is $\frac{4212}{25}\pi \text{ cm}^3$

work out the value of x

Show clear algebraic working.

x =

(Total for question = 5 marks)

Q17.

A solid shape is made by removing a hemisphere, shown shaded, from a cone as shown in the diagram.

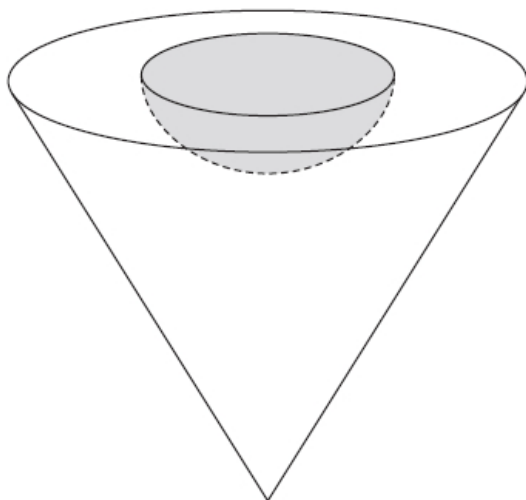


Diagram **NOT**
accurately drawn

The radius of the hemisphere is $2x$ cm

The radius of the base of the cone is $5x$ cm

The vertical height of the cone is $6x$ cm

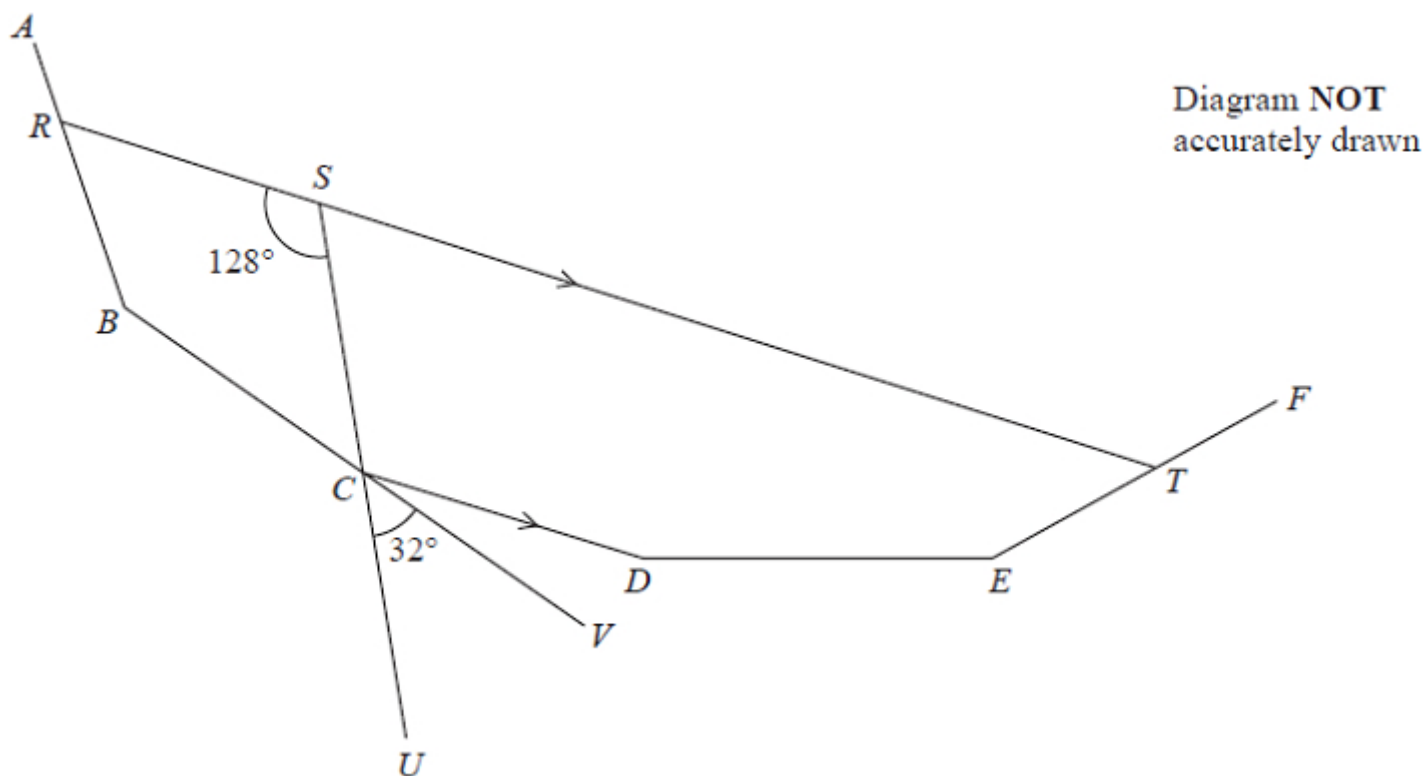
The volume of the solid shape is 6948π cm³

Work out the **total** surface area of the solid hemisphere that has been removed from the cone.
Give your answer correct to the nearest integer.

..... cm²

(Total for question = 5 marks)

Q18.



AB , BC , CD , DE and EF are five sides of a regular polygon.

RST , SCU and BCV are straight lines.

RST is parallel to CD

Angle $RSC = 128^\circ$

Angle $UCV = 32^\circ$

Work out how many sides the polygon has.

Show your working clearly.

.....

(Total for question = 4 marks)

Q19.

The diagram shows a sector AOB of a circle with centre O

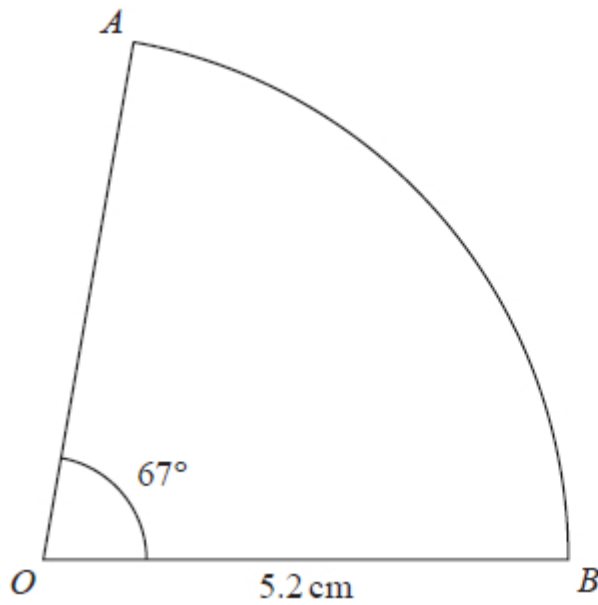


Diagram **NOT**
accurately drawn

Angle $AOB = 67^\circ$
 $OA = OB = 5.2\text{ cm}$

Calculate the perimeter of the sector.
Give your answer correct to 3 significant figures.

..... cm

(Total for question = 3 marks)

Q20.

The diagram shows parts of three regular polygons, **A**, **B** and **C**, meeting at a point.

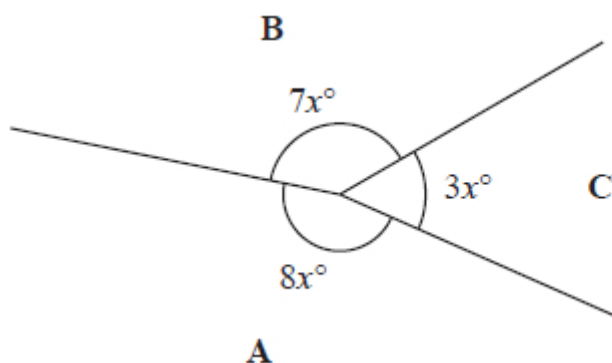


Diagram **NOT**
accurately drawn

Polygon **B** has n sides.

Work out the value of n .

$n = \dots\dots\dots$

(Total for question = 4 marks)

Q21.

The diagram shows a sector $OABC$ of a circle centre O

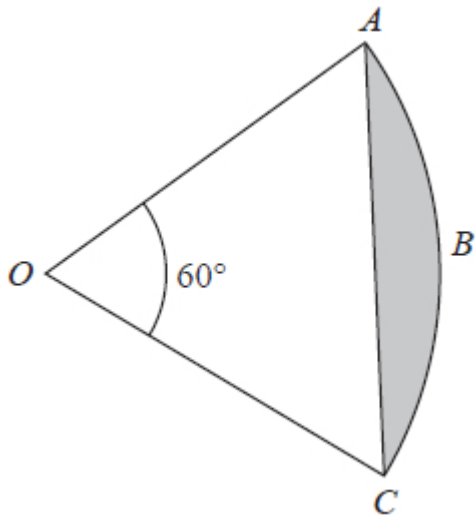


Diagram **NOT**
accurately drawn

Angle $AOC = 60^\circ$

The area of the shaded segment ABC is 38 cm^2

Work out the perimeter of the shaded segment ABC
Give your answer correct to one decimal place.

..... cm

(Total for question = 4 marks)

Q22.

The diagram shows two circles with centre O and a regular pentagon $ABCDE$

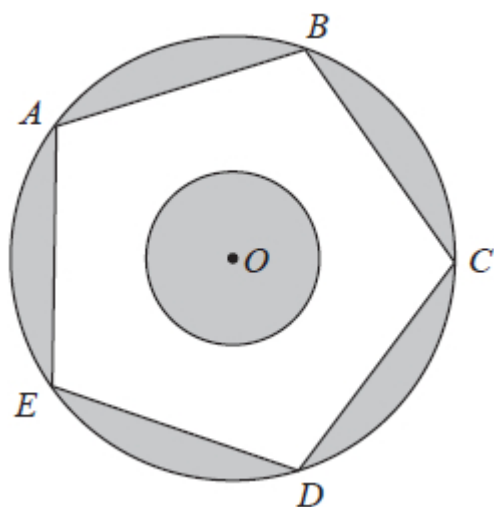


Diagram NOT
accurately drawn

A , B , C , D and E are points on the larger circle.
The pentagon has sides of length 8 cm.

The diagram is shaded such that

shaded area = unshaded area

Work out the radius of the smaller circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for question = 6 marks)

Q23.

Here is a 9-sided regular polygon $ABCDEFGHIJ$, with centre O

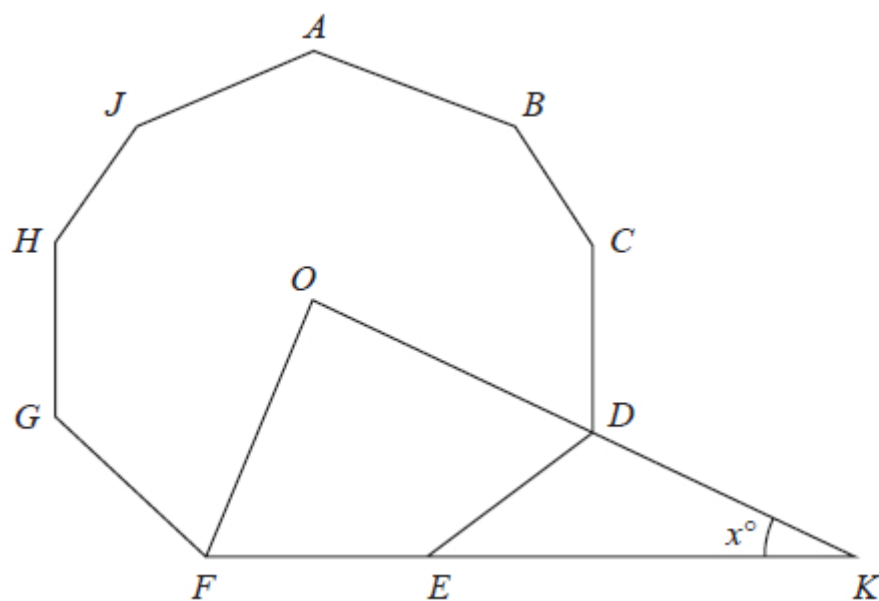


Diagram **NOT**
accurately drawn

ODK and FEK are straight lines.

Work out the value of x

$x = \dots\dots\dots$

(Total for question = 3 marks)

Q24.

The surface area of sphere **A** is nine times the surface area of sphere **B**

The difference between the volume of sphere **A** and the volume of sphere **B** is $117\pi \text{ cm}^3$

Find the radius of the smaller sphere.

Show your working clearly.

..... cm

(Total for question = 5 marks)

Q25.

Here is a cuboid $ABCDEFGH$

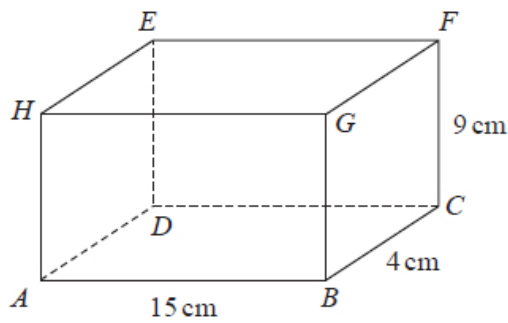


Diagram NOT
accurately drawn

$AB = 15\text{ cm}$, $BC = 4\text{ cm}$, $CF = 9\text{ cm}$

- (a) Work out the length of BE
Give your answer correct to 3 significant figures.

..... cm
(2)

Here is a cuboid $PQRSTUWV$

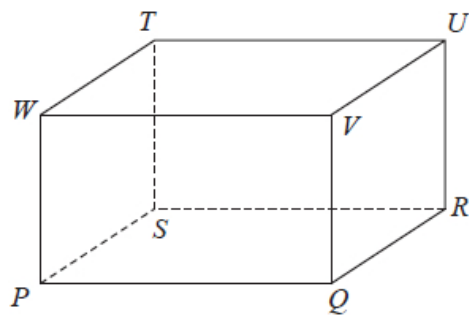


Diagram NOT
accurately drawn

$PR = 42\text{ cm}$

The size of the angle between PU and the plane $PQRS$ is 30°
 M is the midpoint of PR

- (b) Work out the size of angle UMR
Give your answer correct to 3 significant figures.

.....
(3)

(Total for question = 5 marks)

Q26.

The diagram shows a roof support.

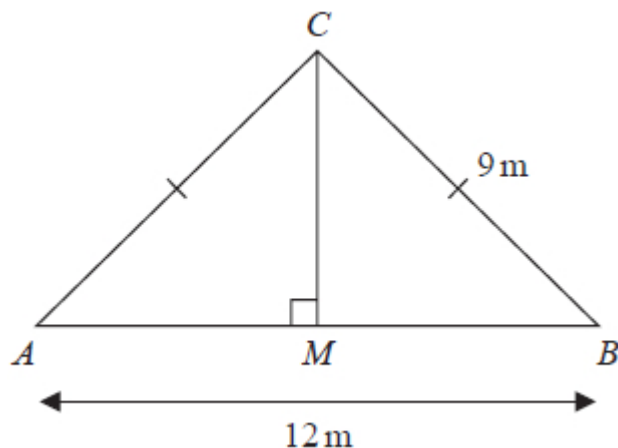


Diagram **NOT**
accurately drawn

The roof support is made from four lengths of wood, AB , AC , BC and MC

$$AC = BC = 9 \text{ m } AB = 12 \text{ m}$$

$$\text{angle } AMC = 90^\circ$$

Lewis is going to buy lengths of wood to make the roof support.

The wood costs 21.50 euros per metre.

Each length of wood he buys has to be a whole number of metres.

Work out the total cost of the wood Lewis needs to buy.

Show your working clearly.

..... euros

(Total for question = 4 marks)

Q27.

The diagram shows triangle ABC and triangle ECD

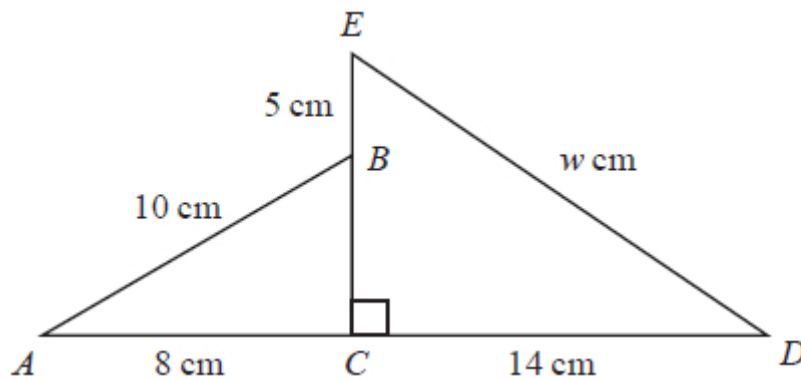


Diagram **NOT**
accurately drawn

ACD and EBC are straight lines.

$AB = 10 \text{ cm}$ $AC = 8 \text{ cm}$ $EB = 5 \text{ cm}$ $CD = 14 \text{ cm}$ $ED = w \text{ cm}$

Work out the value of w

Give your answer correct to one decimal place.

$w = \dots\dots\dots$

(Total for question = 4 marks)

Q28.

$ABCD$ is a trapezium.

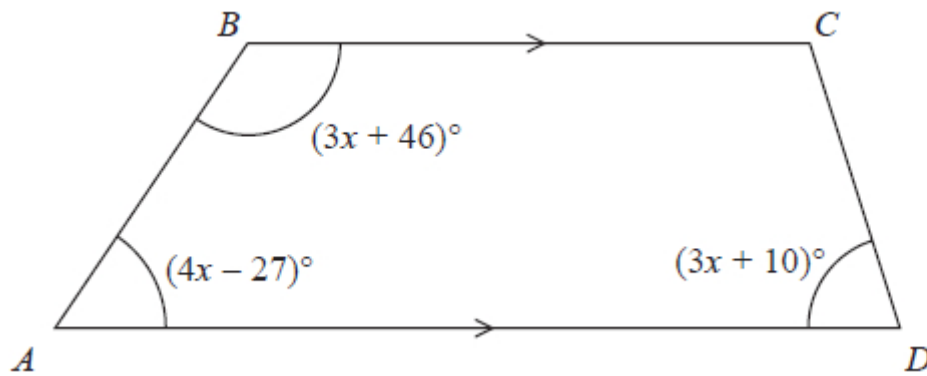


Diagram **NOT**
accurately drawn

BC is parallel to AD

Find the size of the largest angle inside the trapezium.

.....°

(Total for question = 4 marks)

Q29.

Here is a triangular prism $ABCDEF$

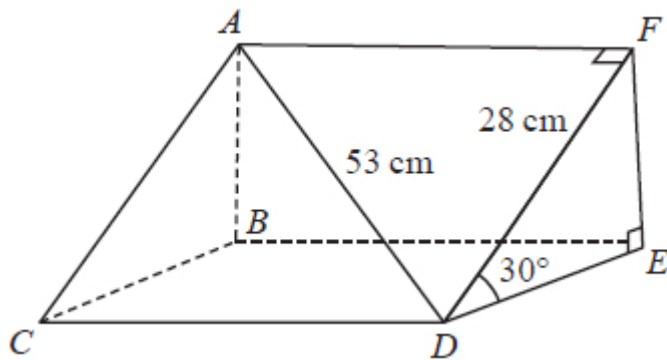


Diagram NOT
accurately drawn

$$AD = 53 \text{ cm}$$
$$DF = 28 \text{ cm}$$

Angle $FDE = 30^\circ$

Work out the volume of the triangular prism.

Give your answer correct to the nearest whole number.

..... cm³

(Total for question = 5 marks)

Mark Scheme

Q1.

Q	Working	Answer	Mark	Notes
	eg $(BV^2 =) 3^2 + 6^2 (= 45)$ or $(CT^2 =) 3^2 + 6^2 (= 45)$ or $(DH^2 =) 6^2 + 6^2 (= 72)$ or $(MV^2 =) 3^2 + 3^2 (= 18)$		4	M1 a correct expression for eg BV^2 or CT^2 or DH^2 or MV^2 where M is the midpoint of DC or a correct expression for $[\text{length}]^2$ for any length in the cube using Pythagoras
	eg $(BV =) \sqrt{3^2 + 6^2}$ $(= \sqrt{45} \text{ or } 3\sqrt{5} \text{ or } 6.70\dots)$ or $(CT =) \sqrt{3^2 + 6^2}$ $(= \sqrt{45} \text{ or } 3\sqrt{5} \text{ or } 6.70\dots)$ or $(DH =) \sqrt{6^2 + 6^2}$ $(= \sqrt{72} \text{ or } 6\sqrt{2} \text{ or } 8.48\dots)$ or $(MV =) \sqrt{3^2 + 3^2}$ $(= \sqrt{18} \text{ or } 3\sqrt{2} \text{ or } 4.24\dots)$			M1 for a complete method for eg BV or CT or DH or MV or any length in the cube using Pythagoras
	$(VT =) \sqrt{45 + 3^2}$ or $\sqrt{\left(\frac{\sqrt{72}}{2}\right)^2 + 6^2}$ or $\sqrt{18 + 6^2}$ or $3\sqrt{6} \text{ or } 7.34\dots$			M1 for a correct expression for VT (condone missing brackets around $3\sqrt{5}$ or $3\sqrt{2}$ or $\frac{\sqrt{72}}{2}$)
		$\sqrt{54}$		A1 if $\sqrt{54}$ seen and answer then given as $3\sqrt{6}$ isw and award full marks
Total 4 marks				

Q2.

Q	Working	Answer	Mark	Notes
	$(AD =) \frac{2.2}{\tan 18} (= 6.77...) \text{ or}$ $(EA =) \frac{2.2}{\sin 18} (= 7.11...)$		4	M1 a correct method to find AD or AE
	$(DB =) \sqrt{("6.77...")^2 + 6^2} (= 9.04...) \text{ or}$ $(EB =) \sqrt{6^2 + "7.11..."^2} (= 9.31...) \text{ or}$ $(EB =) \sqrt{6^2 + "6.77..."^2 + 2.2^2} (= 9.31...)$			M1 a correct method to find DB or EB
	$\tan DBE = \frac{2.2}{"9.04..."} \text{ or}$ $\sin DBE = \frac{2.2}{"9.31..."} \text{ or}$ $\sin DBE = \frac{2.2 \sin 90}{"9.31..."}$ $\cos DBE = \frac{"9.04..."}{"9.31..."}$ or use of cosine rule			M1 complete method to find one of $\tan DBE$ or $\sin DBE$ or $\cos DBE$ – NB: if using cosine, the student will need to have found DB and EB previously
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	13.7		A1 Allow answers in range 13.59 – 13.8
				Total 4 marks

Q3.

Q	Working	Answer	Mark	Notes
	$1575 = (\text{area}) \times 21 \text{ oe}$ or $(\text{area} =) 75$ or $1575 = \pi \times r^2 \times 21 \text{ oe}$ or $r^2 = \frac{1575}{21\pi} (= 23.8(732...)) \text{ oe}$ or $r = \sqrt{\frac{1575}{21\pi}} (= 4.88(602...)) \text{ oe}$		3	M1 for finding the area using $\text{Vol} = \text{cross sectional area} \times \text{height}$ or finding r or r^2 using $\text{vol} = \pi r^2 h$ NB r^2 and r can be rounded or truncated
	$\frac{84}{"75"} \text{ oe or } \frac{84}{\pi "4.88"^2} \text{ oe or } \frac{84}{\pi "23.8"} \text{ oe}$			M1 for $\frac{84}{\text{area of circle}}$
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	1.12		A1 accept 1.06 – 1.121
				Total 3 marks

Q4.

Q	Working	Answer	Mark	Notes
	$\sqrt{\frac{7776}{486}}$ or $\sqrt{16}$ or 4 oe or $\sqrt{\frac{486}{7776}}$ or $\sqrt{\frac{1}{16}}$ or $\frac{1}{4}$ oe	<u>Alternative for M2</u> a correct equation linking area and volume $\left(\frac{486}{7776}\right)^3 = \left(\frac{2^{x+4}}{8^x}\right)^2$ oe or $\left(\frac{7776}{486}\right)^3 = \left(\frac{8^x}{2^{x+4}}\right)^2$ oe	5	M1 for a correct linear scale factor
	$8^x = \left(\sqrt{\frac{7776}{486}}\right)^3 \times 2^{x+4}$ oe eg $8^x = 4^3 \times 2^{x+4}$ oe or $\frac{1}{8^x} = \left(\sqrt{\frac{486}{7776}}\right)^3 \times \frac{1}{2^{x+4}}$ oe			M1 for setting up a correct equation for volume
	eg $2^{3x} = 2^6 \times 2^{x+4}$ or $(4^{\frac{3}{2}})^x = 4^3 \times 4^{\frac{1}{2}(x+4)}$ $\frac{1}{2^{3x}} = \frac{1}{2^6} \times \frac{1}{2^{x+4}}$ oe or $3x = 6 + x + 4$ oe or $x = 5$	$\frac{1}{2^{12}} = \frac{2^{2x+8}}{2^{6x}}$ oe or $2^{12} = \frac{2^{6x}}{2^{2x+8}}$ oe or $12 = 6x - 2x - 8$ oe or $x = 5$		M1 for a correct equation using just powers of 2 or powers of 4 (or 8 or 16) or a correct linear equation in x or the correct value for x
	$3^5 \div 4$ oe or $3^5 \times \frac{1}{4}$ oe			M1 a correct calculation for the height of solid B
			60.75	A1 oe accept 60.8 or 61 (from correct working)
Total 5 marks				

Q5.

Q	Working	Answer	Mark	Notes
	$\frac{1}{2} \times 6 \times 11 \times \sin 118 (= 29.1...)$		3	M1 for the area of half of the kite
	eg $2 \times \frac{1}{2} \times 6 \times 11 \times \sin 118$			M1 for a complete method
		58.3		A1 accept 58.2 – 58.3
Total 3 marks				

Q6.

Q	Working	Answer	Mark	Notes
	$28 \times 12 (=336)$ or $5 \times 12 (= 60)$ or $18 \times 12 (= 216)$ or $28 \times 20 (=560)$ or $\frac{1}{2}(CD + "18")"8"$ oe eg $72 + 4CD$ [numbers in “ ” come from correct working] Check diagram for areas		4	M1 For a correct method to find the area of a rectangle (may be seen as part calculation) or a correct expression for the area of the trapezium with numbers substituted. Allow for other correct methods to find area linked to this shape.
	“336” + $0.5("18" + CD)"8" = 434$ oe eg $4("18" + CD) = 98$ or eg $0.5("18" + CD)"8" = "98"$ oe eg $\frac{1}{2}(18 + CD) = 12.25$ or $"560" - 2(0.5(5 + x)"8") = 434$ oe (where x is horizontal from D to perp with AF) [numbers in “ ” come from correct working]			M1 correct use of their values from correct working for an equation involving CD (CD could be labelled with any letter)
	eg $(CD =) \frac{196 - 144}{8} (= \frac{52}{8})$ or $(CD =) \frac{98 - 72}{4} (= \frac{26}{4})$ or $(CD =) \frac{434 + 152 - 560}{4}$ or $(CD =) 2 \times 12.25 - 18$ or $98 \times 2 (= 196), "196" \div 8 (= 24.5), "24.5" - 18$			M1 a correct process to solve a correct equation or a correct process to find CD using correct values
		6.5		A1 oe
				Total 4 marks

Q7.

Q	Working	Answer	Mark	Notes
	$17.5^2 - 14^2 (= 110.25)$		4	M1 or for use of cosine rule to find one of the angles eg $28^2 = 17.5^2 + 17.5^2 - 2 \times 17.5 \times 17.5 \times \cos A$ or eg $\cos B = \frac{14}{17.5}$
	$\sqrt{17.5^2 - 14^2} (= 10.5)$			M1 or for rearranging the cosine rule to eg $\cos A = \frac{17.5^2 + 17.5^2 - 28^2}{2 \times 17.5 \times 17.5}$ ($A = 106.26\dots$) or eg $B = \cos^{-1}(\frac{14}{17.5}) (= 36.86\dots)$
	$0.5 \times 28 \times "10.5"$ oe			M1 or for $0.5 \times 17.5 \times 17.5 \times \sin 106.26\dots$ oe eg $0.5 \times 17.5 \times 28 \times \sin 36.86\dots$ [clear use of Heron's formula: M1 for $S = 0.5(17.5 + 17.5 + 28)(=31.5)$ M2 for $\sqrt{31.5("31.5"-17.5)("31.5"-28)}$ oe]
		147		A1 accept awrt 147
				Total 4 marks

Q8.

Q	Working	Answer	Mark	Notes
$(2r)^2 - \pi r^2$ oe or $x^2 - \pi \times (0.5x)^2$		5	M1	A correct expression for the area of the shaded parts in one variable only for this mark only , accept without brackets (eg $2r^2 - \pi r^2$ or $x^2 - \pi \times \frac{1}{2}x^2$) (any letter can be used eg AB , x , y etc, here, r = radius, x = side of square)
$4r^2 - \pi r^2 = 80$ oe eg $r^2 - 0.25\pi r^2 = 20$ or $x^2 - 0.25\pi x^2 = 80$ or $4x^2 - \pi x^2 = 320$ oe			M1	A correct equation in one variable with brackets expanded (may be seen later in working)
$r^2 = \frac{80}{4-\pi}$ (= 93.19...) or $r = \sqrt{\frac{80}{4-\pi}}$ (= 9.65...) $x^2 = \frac{80}{1-0.25\pi}$ (= 372.78...) or $x = \sqrt{\frac{80}{1-0.25\pi}}$ (19.307...) oe eg $\sqrt{\frac{320}{4-\pi}}$			M1	A correct expression for the radius squared or radius or for the side of the square squared or for the side of the square
$(AC =) \sqrt{(2 \times 9.65)^2 + (2 \times 9.65)^2}$ oe or $(AC =) 2 \times \sqrt{9.65^2 + 9.65^2}$ $(AC =) \sqrt{19.307^2 + 19.307^2}$ oe eg $\sqrt{8 \times \frac{80}{4-\pi}}$ oe or $(AC =) \frac{2 \times 9.65}{\sin 45}$ or $\frac{2 \times 9.65}{\cos 45}$			M1	For a correct calculation to find the length of AC
Correct answer scores full marks (unless from obvious incorrect working)	27.3		A1	27.3 – 27.5
Total 5 marks				

Q9.

Q	Working	Answer	Mark	Notes
	eg $\sqrt{\frac{25}{64}} \left(= \frac{5}{8} = 0.625 \right)$ or $\sqrt{\frac{64}{25}} \left(= \frac{8}{5} = 1.6 \right)$ or $\sqrt{25}:\sqrt{64} \text{ (5:8) or } \sqrt{64}:\sqrt{25} \text{ (8:5) or}$ $\frac{(\sqrt{25})^3}{(\sqrt{64})^3} = \left(\frac{125}{512} = 0.244140625 \right)$ oe or $\frac{512}{125} = 4.096$ $\frac{25^3}{64^3} = \frac{(\text{vol of B})^2}{(\text{vol of B} + 541.8)^2}$ or $\frac{25}{64} = \frac{(\text{vol of B})^{\frac{2}{3}}}{(\text{vol of B} + 541.8)^{\frac{2}{3}}}$ oe		4	M1 for a correct scale factor for length – may be given as a fraction or decimal or ratio or a correct scale factor for volume given as a fraction or decimal or ratio or a correct equation for the volume of vase B
	eg $B \left(\frac{512}{125} - 1 \right) = 541.8$ or $3.096B = 541.8$ oe or eg $A \left(1 - \frac{125}{512} \right) = 541.8$ or $\frac{387}{512}A = 541.8$ $(8^3)k - (5^3)k (= 387k) = 541.8$ or eg $(k =) \frac{541.8}{387} \left(= \frac{7}{5} \right)$			M1 For a correct equation for the volume of B or a correct equation for the volume of A
	eg $(B) 541.8 \div \frac{387}{125}$ or $541.8 \div 3.096$ or eg $125 \times \frac{7}{5}$ or $(A) 541.8 \div \frac{387}{512} (= 716.8)$ oe			M1 For a completely correct method to find the volume of vase B or vase A
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	175		A1 cao
				Total 4 marks

Q10.

Q	Working	A	M	Notes
	$\frac{1}{2} \times 45 \times 36 \times \sin 'C' (= 405)$ $\sin 'C' = \left(\frac{405 \times 2}{45 \times 36} \right) ('C' = 30) \text{ oe}$	alternative $\frac{2 \times 405}{36} (= 22.5) \text{ or}$ $\frac{2 \times 405}{45} (= 18)$		M1 correct substitution into the sine area formula, with their choice of symbol to represent <i>C</i> . or work out the perpendicular height with <i>BC</i> or <i>CD</i> as the base.
		$\sqrt{45^2 - 22.5^2} (= \sqrt{1518.75} = 38.97)$ or $\sqrt{36^2 - 18^2} (= \sqrt{972} = 31.17)$		M1 correct rearrangement to make $\sin C$ the subject or use Pythagoras with their found perpendicular height.
	$(BD =) \sqrt{45^2 + 36^2 - 2 \times 45 \times 36 \times \cos '30'}$ $(= \sqrt{3321 - 3240 \times \cos '30'})$ $(= \sqrt{515.077...} = 22.695...)$	$\sqrt{(38.97 - 36)^2 + 22.5^2} (= \sqrt{515.077...})$ or $\sqrt{(45 - 31.17)^2 + 18^2} (= \sqrt{515.077...})$		M1 (dep on 1st M1, ft 30) correct expression for <i>BD</i> ft their <i>C</i> (must be less than 90°). or use Pythagoras to find an expression for <i>BD</i> .
	$\cos 'ABD' = \left(\frac{22.695...^2 + 19^2 - 28^2}{2 \times 22.695... \times 19} \right)$ leading to ' <i>ABD</i> ' = or $(BAD =) \cos^{-1} \left(\frac{28^2 + 19^2 - 22.695...^2}{2 \times 28 \times 19} \right)$ $(= 53.7...)$ and $\sin 'ABD' = \frac{\sin '53.7'}{22.695...} \times 28$ leading to ' <i>ABD</i> ' =			M1 for a complete method to find angle <i>ABD</i>
		83.9		A1 accept 83.85 – 83.9
				Total 5 marks

Q	Working	Answer	Mark	Notes
	(angle $ABC =$) $54 + (180 - 132) (= 102)$		5	M1 for finding angle ABC
	$(AC^2 =) 3.6^2 + 8.4^2 - 2 \times 3.6 \times 8.4 \times \cos[102]$			M1 for applying the cosine rule correctly ft <i>their</i> 102 provided less than 180 and not 90
	$(AC =) \sqrt{3.6^2 + 8.4^2 - 2 \times 3.6 \times 8.4 \times \cos[102]}$ or $\sqrt{96.094...}$ or 9.8(02...)			M1 for finding AC ft <i>their</i> 102 provided less than 180 and not 90
	$([9.8] + 8.4 + 3.6) \div 6 (= 3.63(3...))$ or $21.8(02...) \div 6 (= 3.63(3...))$ oe			M1 dep on previous M1M1 for finding the time taken to complete the journey (may be done in parts)
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	3 hours and 38 minutes		A1 Allow 3 hours and (37 – 38) minutes
				Total 5 marks

Q12.

Q	Working	Answer	Mark	Notes
	11.45 or 11.55 or 79.5 or 80.5 or 74.5 or 75.5		4	B1 Accept $11.54\dot{9}$ for 11.55 $80.4\dot{9}$ for 80.5 $75.4\dot{9}$ for 75.5
	$180 - (74.5 + 79.5) (= 26)$			M1 for a correct calculation to find the upper bound of angle B NB $180^\circ - (LB \text{ of } 75^\circ + LB \text{ of } 80^\circ)$
	$\frac{(AC)}{\sin(26)} = \frac{11.55}{\sin(74.5)}$ oe or $\frac{(AC)}{\sin(180 - 74.5 - 79.5)} = \frac{11.55}{\sin(74.5)}$			M1 for substituting the correct bounds into the sine rule $\frac{(YZ)}{\sin("26") } = \frac{UB_1}{\sin(LB_2)}$ oe where $11.5 < UB_1 \leq 11.55$ and $74.5 \leq LB_2 < 75$
		5.25		A1 awrt 5.25 from correct working
				Total 4 marks

Q13.

Q	Working	Answer	Mark	Notes
	(area $PQS =$) $\frac{1}{2} \times 6.1 \times 3.8 \times \sin P = 9$ or (area $PQRS =$) $6.1 \times 3.8 \times \sin P = 18$	$\frac{1}{2} \times 6.1 \times SX = 9$ or $(SX =) \frac{9}{\frac{1}{2} \times 6.1} (= 2.95...)$ or $6.1 \times SX = 18$ or $(SX =) 18 \div 6.1 (= 2.95...)$	5	M1 correct equation for the area of the triangle or parallelogram or a calculation to find the height of the parallelogram (where X is the point vertically below S on PQ)
	eg $(\sin P =) \frac{9}{\frac{1}{2} \times 6.1 \times 3.8}$ $\left(= 0.776... \text{ or } \frac{900}{1159} \right)$ or $(\sin P =) \frac{18}{6.1 \times 3.8}$ $\left(= 0.776... \text{ or } \frac{900}{1159} \right)$	$(PX^2 =) 3.8^2 - "2.95..."^2 (= 5.73...)$ or $(PX =) \sqrt{3.8^2 - "2.95..."^2} (= 2.39...)$		M1 correct expression for $\sin P$ OR for start of Pythagoras method to find length of PX (where X is the point vertically below S on PQ)
	$(P =) \sin^{-1} "0.776..."$ $(= 50.9...)$	$(QX =) 6.1 - \sqrt{5.73...} (= 3.70...)$ or $(QX =) 6.1 - "2.39..." (= 3.70...)$		M1 for complete method to find angle P OR for method to find length of QX
	$(QS^2 =) 3.8^2 + 6.1^2 - 2 \times 3.8 \times 6.1 \times \cos("50.9")$ $(= 22.4...)$ or $(QS =)$ $\sqrt{3.8^2 + 6.1^2 - 2 \times 3.8 \times 6.1 \times \cos("50.9")}$	$(QS^2 =) "2.95..."^2 + "3.70..."^2 (= 22.4...)$ or $(QS =) \sqrt{"2.95..."^2 + "3.70..."^2}$		M1 correct expression for QS^2 (or QS)
		4.74		A1 accept 4.73 – 4.74
				Total 5 marks

Q14.

Q	Working	Answer	Mark	Notes
	$\frac{\sin Q}{4.2} = \frac{\sin 18}{1.6}$ oe or $1.6^2 = 4.2^2 + RQ^2 - 2 \times 4.2 \times RQ \times \cos 18$ oe		6	M1 correct sine ratio - could be rearranged or correct substitution into the cosine rule using angle R
	$\sin^{-1} \left(4.2 \times \frac{\sin 18}{1.6} \right) (= 54.2) \text{ or } \sin^{-1} (0.811\dots)$ $\frac{2 \times 4.2 \times \cos 18 \pm \sqrt{(2 \times 4.2 \times \cos 18)^2 - 4 \times 1 \times 15.08}}{2}$			M1
	$180 - "54.2" (=125.8) \text{ or}$ $RQ = 3.0585\dots \text{ and } 4.933\dots$			M1 This can be implied by the correct value(s) (125.8 or 3.0585...) used later
	$(P =) 180 - "125.8" - 18 (=36.2)$ or $RQ = \sqrt{4.2^2 + 1.6^2 - 2 \times 4.2 \times 1.6 \times \cos "36.2"} (= 3.0585\dots)$ or 3.0585 chosen as value from cosine rule above or perpendicular height = $4.2 \sin "36.2" (= 2.4805\dots)$ (where "36.2" comes from correct working)			M1
	$(\text{Area} =) \frac{1}{2} \times 4.2 \times 1.6 \times \sin ("36.2")$ or $(\text{Area} =) \frac{1}{2} \times 4.2 \times "3.0585\dots" \times \sin 18$ or $(\text{Area} =) \frac{1}{2} \times 1.6 \times "2.4805\dots"$			M1
		1.98		A1 awrt 1.98
				Total 6 marks

Q15.

Q	Working	Answer	Mark	Notes
	eg $\pi \times 3^2 \times 7$ ($= 63\pi$ or 197.9...)		3	M1 for method to find the volume of Solid A
	eg $\frac{2000}{[\text{vol A}]}$ or $\frac{3375}{450}$ ($= 7.5$ oe) or $\frac{2000 + 3375}{[\text{vol A}] + 450}$			M1 (indep) for method to find the density of Solid A, B or C, allow use of their volume for Solids A and C
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	8.3		A1 accept 8.29 – 8.31
				Total 3 marks

Q16.

Question	Working	Answer	Mark	Notes
	$V = \frac{1}{3} \pi \times 6^2 \times 15 (= 180\pi = 565.48...)$		5	M1 a correct expression for volume of large cone
	$\frac{6}{15} = \frac{x}{\text{height}}$ or height $= \frac{15}{6}x = \frac{5}{2}x$ oe used or (vol sml cone $= \left(\frac{x}{6}\right)^3 V$ or $\left(\frac{x}{6}\right)^3 \times 180\pi$ or (vol sml cone $= \frac{1}{27} \times 180\pi = \frac{4212}{25}\pi (= \frac{288}{25}\pi = 11.52\pi = 36.19...)$)			M1 working with the scale factor (where V = vol of large cone) or formula for volume of sml cone, (ft their vol of large cone dep on a correct method) (NB: $\frac{4212}{25} = 168.48$, $\frac{4212}{25}\pi = 529.29...$)
	eg $\frac{1}{3} \pi \times x^2 \times \frac{5}{2}x$ ($= \frac{5}{6}\pi x^3$) oe or linear SF $= \sqrt[3]{\frac{180\pi}{\frac{4212}{25}\pi}} (= 2.5)$ oe or $\sqrt[3]{\frac{288}{180}} (= 0.4)$ oe <i>2.5 and 0.4 must be from correct working seen to award the mark (not from height/radius)</i>			M1 dep on previous M1 correct formula for volume of small cone in terms of x only, could be seen as part of an equation and π could be cancelled out or Correct calculation for linear SF of v to V
	eg $\frac{1}{3} \times \pi \times 6^2 \times 15 - \frac{1}{3} \times \pi \times x^2 \times \frac{5}{2}x = \frac{4212}{25}\pi$ or $180 - \frac{5}{6}x^3 = \frac{4212}{25}$ oe or $\left[1 - \left(\frac{x}{6}\right)^3\right] 180\pi = \frac{4212}{25}\pi$ oe or $x = \frac{6}{2.5}$ or $h = \frac{15}{2.5} = 6$ and $\frac{1}{3} \pi \times 6^2 \times 6 = \frac{288}{25}\pi (= 11.52\pi)$			M1 dep on M3 A correct equation in x (if using 2.5 this must come from a correct method)
	<i>Working required</i>	2.4		A1oe dep on M3
				Total 5 marks

Q17.

Q	Working	Answer	Mark	Notes
	$\frac{1}{3}\pi \times (5x)^2 \times 6x$ oe or $50\pi x^3$ oe or $\frac{1}{2} \times \frac{4}{3} \times \pi \times (2x)^3$ or $\frac{16}{3}\pi x^3$ oe or $\frac{4}{3} \times \pi \times (2x)^3$ or $\frac{32}{3}\pi x^3$ oe		5	M1 for finding the volume of cone or hemisphere or sphere NB Ignore missing brackets around $5x$ and $2x$ for this mark
	$\frac{1}{3}\pi \times (5x)^2 \times 6x - \frac{1}{2} \times \frac{4}{3} \times \pi \times (2x)^3 = 6948\pi$ oe or $50\pi x^3 - \frac{16}{3}\pi x^3 = 6948\pi$ or $\frac{134}{3}\pi x^3 = 6948\pi$ oe			M1 for a correct equation for the volume of the shape NB If not expanded at this stage then must see brackets
	$(x^3 =) \frac{6948\pi \times 3}{134\pi} \left(= \frac{10422}{67} = 155.(552...) \right)$ oe or $(x =) \sqrt[3]{\frac{6948\pi \times 3}{134\pi}}$ $\left(= \sqrt[3]{\frac{10422}{67}} = \sqrt[3]{155.(552...)} = 5.37(8...) \right)$ oe			M1 for rearranging the correct equation to find the value of x^3 or x Accept 5.4 or better
	$3 \times \pi \times (2 \times "5.37(8...)")^2$ oe or $12 \times \pi \times "5.37(8...)"^2$ oe			M1 for finding the surface area of the hemisphere
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	1090		A1 allow 1086 – 1100 Special case for using 6948 without π SC B3 for $x^3 = 49.5(138...)$ or $x = 3.67(205...)$ SC B4 for awrt 508
				Total 5 marks

Q18.

Q	Working	Answer	Mark	Notes	
	$SCD = 128^\circ$ or $BCS = 32^\circ$ or $TSC = 180 - 128 (= 52)$		4	M1 angles need to be identified or may be seen marked on the diagram	M2 for $(BCD =) 128 + 32 (= 160)$ or $(DCV =) 52 - 32 (= 20)$ (may be seen marked on the diagram). To award these marks 160 or 20 must be clearly used or identified as the interior or exterior angle.
	eg (int $\angle =$) $128 + 32 (= 160)$ or (ext $\angle =$) $180 - (128 + 32) (= 20)$ or (ext $\angle =$) $52 - 32 (= 20)$			M1 (dep on previous M1) for method to find the size of one interior or exterior angle, may be seen marked on the diagram.	
	eg $180(n - 2) = "160"n$ or $360 \div "20"$			M1 for setting up an equation for the sum of interior angles or $360 \div "20"$	
	<i>Working required</i>	18		A1 dep on M2	
				Total 4 marks	

Q19.

Q	Working	Answer	Mark	Notes	
	eg $2 \times \pi \times 5.2 (= 32.6... \text{ or } \frac{52}{5} \pi)$ oe $\frac{67}{360} \times 2 \times \pi \times 5.2 (= 6.08... \text{ or } \frac{871}{450} \pi)$ oe		3	M1 for finding the whole circumference or the arc length	
	$\frac{67}{360} \times 2 \times \pi \times 5.2 + 2 \times 5.2$ oe			M1 for a complete method	
		16.5		A1 accept 16.4 - 16.5 (not in terms of π)	
				Total 3 marks	

Q20.

Q	Working	Answer	Mark	Notes	
	$7x + 3x + 8x = 360$ oe		4	M1	M2 for $7x = 140$
	$(x =) 360 \div 18 (= 20)$			M1	(140 can be on diagram)
	$360 \div (180 - 7 \times "20")$ oe or $360 \div (180 - "140")$ $\frac{(n-2) \times 180}{n} = 7 \times "20"$ oe or $360 \div 40$			M1 for $360 \div$ exterior angle	
		9		A1	
				Total 4 marks	

Q21.

Q	Working	Answer	Mark	Notes	
	eg $\pi r^2 \times \frac{60}{360} - \frac{1}{2} r^2 \sin 60$ oe or $\frac{\pi r^2}{6} - \frac{\sqrt{3}}{4} r^2$ oe		4	M1 for a correct expression for the area of the segment Expression may be embedded in an equation, eg $\pi r^2 \times \frac{60}{360} - \frac{1}{2} r^2 \sin 60 = 38$ or $\pi r^2 \times \frac{60}{360} = 38 + \frac{1}{2} r^2 \sin 60$ or $\pi r^2 \times \frac{60}{360} - 38 = \frac{1}{2} r^2 \sin 60$	
	eg $(r^2 =) 38 \div \left(\frac{\pi}{6} - \frac{\sqrt{3}}{4} \right) (= 38 \div 0.09(058)) (=$ 419(.490...)) oe or $(r =) \sqrt{38 \div \left(\frac{\pi}{6} - \frac{\sqrt{3}}{4} \right)} (= 20.4(81...))$ oe			M1 dep on M1 for a correct expression for r^2 or r	
	$\frac{\pi}{6} \times "20.4(81...)" \times 2 (= 21.4(48...))$ oe or			M1 for using the value of r to find arc length	
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	41.9		A1 allow 41 - 42	
				Total 4 marks	

Q22.

Q	Working	Answer	Mark	Notes
	(radius of large circle $\Rightarrow \frac{4}{\cos 54}$ or $\frac{4}{\sin 36}$ or $\frac{8 \sin 54}{\sin 72}$ or $\sqrt{\frac{8^2}{2 - 2 \cos 72}}$ (= 6.805...) or (height of 1 triangle within pentagon $\Rightarrow 4 \tan 54$ (= 5.505...) oe		6	M1 for a complete method to find the radius of the large circle or the perpendicular height of one triangle within the pentagon
	(area of large circle $\Rightarrow \pi \times ("6.805...")^2$ (= 145.489...) oe or (area of sector $\Rightarrow \frac{72}{360} \times \pi \times ("6.805...")^2$ (= 29.097...) oe			M1 for a complete method to find the area of the large circle or the area of a sector of the large circle
	(area of pentagon $\Rightarrow 5 \times \frac{1}{2} \times 8 \times "5.505..."$ (= 80tan54 = 110.11...) or $10 \times \frac{1}{2} \times 4 \times "5.505..."$ (= 80tan54 = 110.11...) or $5 \times \frac{1}{2} \times "6.805..." \times "6.805..." \times \sin 72$ (= 110.11...) oe OR (area of one triangle $\Rightarrow \frac{1}{2} \times 8 \times "5.505..."$ (= 22.022...) or $\frac{1}{2} \times "6.805..." \times "6.805..." \times \sin 72$ (= 22.022...) or $\frac{1}{2} \times "6.805..." \times 8 \times \sin 54$ (= 22.022...) oe			M1 for a complete method to find the area of the pentagon OR the area of one triangle eg <i>OED</i> or equivalent
	"145.489..." - "110.11..." + πr^2 = "110.11..." - πr^2 oe or $5 \times ("29.097..." - "22.022...") + \pi r^2 = 5 \times "22.022..." - \pi r^2$ oe			M1 for a correct equation for the radius of the smaller circle
	$2\pi r^2 = 2 \times "110.11..." - "145.489..."$ (= 74.731...) oe			M1 for a correct rearranged equation with the area of the circle the subject or better
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	3.45		A1 accept 3.43 – 3.45
				Total 6 marks

Q23.

Q	Working	Answer	Mark	Notes
	eg $(DEK =) \frac{360}{9}$ or 40 or (interior angle =) $\frac{(9 - 2) \times 180}{9}$ or 140 or $OFK = 140 \div 2 (= 70)$ or $FOK = \frac{2}{9} \times 360 (= 80)$ or $EDK = 180 - 0.5 \times 140 (= 110)$ Angles marked correctly (any exterior or interior angle) gains this mark		3	M1 method to find interior or exterior angle or correct interior or exterior angle stated or shown correctly on diagram or for using 70° for OFK or 80° for FOK or 110 for EDK If a student has only found an interior or exterior angle and has clearly mixed up interior and exterior angles this mark cannot be awarded but can still be awarded for any of the other angles stated
	$EDK = 110$ and $DEK = 40$ or $FOK = 80$ and $OFK = 70$ or $ODE = 70$ and $DEK = 40$ or $FED = 140$ and $EDK = 110$ oe			M1 For two correct angles that can lead directly to the answer in a single step (eg $180 -$ both angles or one angle minus the other)
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	30		A1
				Total 3 marks

Q24.

	eg $4\pi R^3 = 9 \times 4\pi r^3$ oe or		5	M1	M2 for (vol SF $\Rightarrow$) 27 or $\frac{1}{27}$ or
	$R = 3r$ oe or 1:3 or 3:1 or 3 or $\frac{1}{3}$			M1 (a correct scale factor of 3 or $R = 3r$ oe implies the first M1)	3^3 or $\frac{1}{3^3}$
	eg $\frac{4}{3}\pi(3r)^3 - \frac{4}{3}\pi r^3 = 117\pi$ oe or $\frac{4}{3}\pi r^3 - \frac{4}{3}\pi\left(\frac{1}{3}r\right)^3 = 117\pi$ or $27 \times \frac{4}{3}\pi r^3 - \frac{4}{3}\pi r^3 = 117\pi$ oe or $\frac{4}{3}\pi r^3 - \frac{1}{27} \times \frac{4}{3}\pi r^3 = 117\pi$ oe or oe			M1 for a correct equation based on volumes with only one variable eg R or r or x (M3 for $26 \times \frac{4}{3}\pi r^3 = 117\pi$ oe or $26 \times (Vol)_r = 117\pi$ or $\frac{26}{27} \times \frac{4}{3}\pi r^3 = 117\pi$ oe or $\frac{26}{27} \times (Vol)_r = 117\pi$	
	$(r =) \sqrt[3]{\frac{117 \times 3}{104}} = \sqrt[3]{\frac{27}{8}}$ or $(R =) \sqrt[3]{\frac{117 \times 81}{104}} = \sqrt[3]{\frac{729}{8}} = \frac{9}{2}$			M1 dep on previous M mark	
	Working required	$\frac{3}{2}$		A1 oe dep on M2	
Total 5 marks					

Q25.

(a)	$\sqrt{4^2 + 9^2 + 15^2} (= \sqrt{322} = 17.9(443...))$ or $\sqrt{15^2 + 4^2} (= \sqrt{241} = 15.5(241...))$ and $\sqrt{9^2 + (\sqrt{241})^2} (= \sqrt{322} = 17.9(443...))$		2	M1	
		17.9		A1 awrt 17.9	
(b)	$(UR =) 42 \tan 30 (= 14\sqrt{3} = 24.2(487...))$ or $(UR =) \frac{42 \times \sin 30}{\sin(90 - 30)} (= 14\sqrt{3} = 24.2(487...))$		3	M1	
	$\tan(TIMR) = \left(\frac{24.248...}{42 \div 2}\right)$ or $\tan(TIMR) = \left(\frac{24.248...}{21}\right)$ or $\tan(UMR) = \left(\frac{14\sqrt{3}}{21}\right)$ or $(UMR =) \sqrt{\left(\frac{42}{2}\right)^2 + (14\sqrt{3})^2} (= 49.1(487...))$ and $\sin(UMR) = \left(\frac{14\sqrt{3}}{49.1(487...)}\right)$ or $\cos(UMR) = \left(\frac{21}{49.1(487...)}\right)$			M1	
	Correct answer scores full marks (unless from obvious incorrect working)	49.1		A1 awrt 49.1	
Total 5 marks					

Q26.

Q	Working	Answer	Mark	Notes
	$(CM)^2 + (12 \div 2)^2 = 9^2$ oe or $9^2 - (12 \div 2)^2 (= 81 - 36 = 45)$		4	M1 $AM = MB$ $CAM = CBM$ M2 for $(\cos^{-1}(CAM) =) \frac{12 \div 2}{9} = 48.1(896\dots)$ and $(CM =) (12 \div 2) \times \tan 48.1\dots (= 6.7\dots)$ or $(CM =) 9 \times \sin 48.1\dots (= 6.7\dots)$
	$\sqrt{9^2 - (12 \div 2)^2}$ oe $(= \sqrt{81 - 36} = \sqrt{45} = 3\sqrt{5} = 6.7(08\dots))$		M1	
	$(\text{"7"} + 9 + 9 + 12) \times 21.5(0)$ or $37 \times 21.5(0)$		M1	
	<i>Working required</i>	795.5(0)	A1 dep on M2 SC B3 for awrt 789 for using 6.7...	
				Total 4 marks

Q27.

Question	Working	Answer	Mark	Notes
	$10^2 - 8^2 (= 36)$ or $8^2 + BC^2 = 10^2$ oe or $\cos BAC = \frac{8}{10}$ ($BAC = 36.869\dots$)		4	M1
	$\sqrt{10^2 - 8^2} (= 6)$ or $\tan 36.869\dots \times 8 (= 6)$ or $\sin 36.869\dots \times 10 (= 6)$			M1 (beware that $14 - 8 = 6$ has been seen and scores zero)
	$w = \sqrt{(5 + 6)^2 + 14^2} (= \sqrt{317})$ or $EDC = \tan^{-1}\left(\frac{5 + 6}{14}\right) (= 38.157)$ and $w = \frac{11}{\sin 38.157\dots}$ or $w = \frac{14}{\cos 38.157\dots}$ or $CED = \tan^{-1}\left(\frac{14}{11}\right) (= 51.84\dots)$ and $w = \frac{11}{\cos 51.84\dots}$ or $w =$			M1 ft Allow use of <i>their</i> value of BC
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	17.8		A1 awrt 17.8 if no other marks scored then B1 for 22.6(5...)
				Total 4 marks

WATCH OUT FOR $\sqrt{10^2 + 8^2} (12.8...) + 5 = 17.8$

(which is the same as the answer....but a completely wrong method)

Q28.

Q	Working	Answer	Mark	Notes
	$(4x - 27) + (3x + 46) = 180$ oe or “expression for C” + $(3x + 10) = 180$ or $7x + 19 = 180$ or $3x + 46 + 4x - 27 + 3x + 10 +$ $[“180 - (3x + 10)”] = 360$		4	M1 Sum angles A and B to 180, or find an expression for BCD and sum all angles to 360. [condone missing brackets and condone use of any letter for angle C (even x or BCD)]
				A1 $x = 23$
	eg $3 \times “23” + 46 (= 115)$ or eg $180 - (3 \times “23” + 10) (= 101)$			M1ft dep on M1 using their x to calculate a value for angle B or C (cannot be a negative value and cannot just be x)
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	115		A1 Allow $3x + 46$ or ABC if 115 is clearly seen in working or on diagram
				Total 4 marks

Q29.

Q	Working	Answer	Mark	Notes
	$(FE =) 28 \sin 30 (=14)$ or $(FE =) 28 \cos 60 (=14)$ or $(DE =) 28 \cos 30 (=14\sqrt{3} = 24.2(48...))$ or $(DE =) 28 \sin 60 (=14\sqrt{3} = 24.2(48...))$		5	M1 for a method to find <i>FE</i> or <i>DE</i>
	$(FE =) 28 \sin 30 (=14)$ or $(FE =) 28 \cos 60 (=14)$ or $(FE =) \sqrt{28^2 - "24.2..." (= \sqrt{196} = 14)}$ and $(DE =) 28 \cos 30 (=14\sqrt{3} = 24.2(48...))$ or $(DE =) 28 \sin 60 (=14\sqrt{3} = 24.2(48...))$ or $(DE =) \sqrt{28^2 - "14" ^2} (= \sqrt{588} = 14\sqrt{3} = 24.2(48...))$			M1 for a method to find <i>FE</i> and <i>DE</i> (can now use their <i>FE</i> or <i>DE</i> found for first M1)
	$(AF =) \sqrt{53^2 - 28^2} (= \sqrt{2809 - 784} = \sqrt{2025} = 45)$			M1 (indep) for finding <i>AF</i>
	$\frac{1}{2} \times "14" \times "14\sqrt{3}" \times "45"$ oe or $\frac{1}{2} \times "14" \times "24.2" \times "45"$			M1 for finding the volume of the prism
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	7638		A1 allow in the range 7623 – 7639
				Total 5 marks