

N5 EXPRESSIONS & FORMULAE 1.4

This resource is to support pupils in passing the appropriate National 5 Assessment Standard. The questions and marking schemes used are from SQA past papers and as such test the topics in their entirety from grade A to C and *may* include other areas from the course.

In addition the questions from **Paper 1 (P1)** should be completed **without** the use of a calculator and questions from **Paper 2 (P2)** permit the use of a calculator.

Each Assessment Standard is used to ensure pupils have the minimum competency on the specified sub-skills for the National 5 course. As such each Assessment Standard will test grade C work on that specific topic.

This resource is divided into two sections:

- Section A has an example on each sub skill for the relevant Assessment Standard and the marking scheme for these questions
- Section B has extra practice questions on this Assessment Standard and the marking scheme for these questions

<u>Unit Assessment Standard</u>	<u>Sub skills</u>	Section A – Question Number
Expressions & Formulae 1.4 Applying geometric skills linked to the use of formulae	determining the gradient of a straight line given two points calculating the volume of a standard solid with rounding to a given number of significant figures calculating the length of arc or the area of a sector of a circle	Q1 Q2 (prism) Q3 (cylinder) Q4 (sphere) Q5 (cone) Q6 (length of arc) Q7 (area of sector)

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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

Cosine rule: $a^2 = b^2 + c^2 - 2bcc \cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2}ab \sin C$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

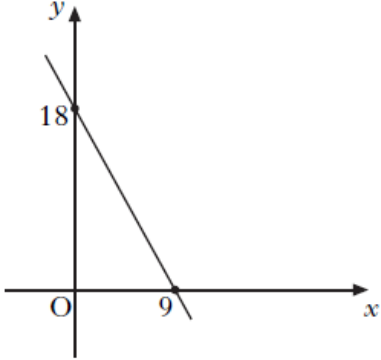
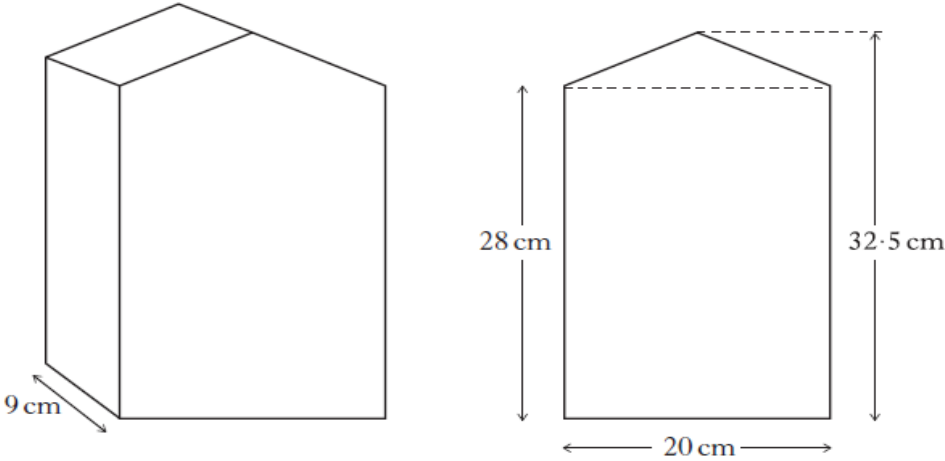
Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

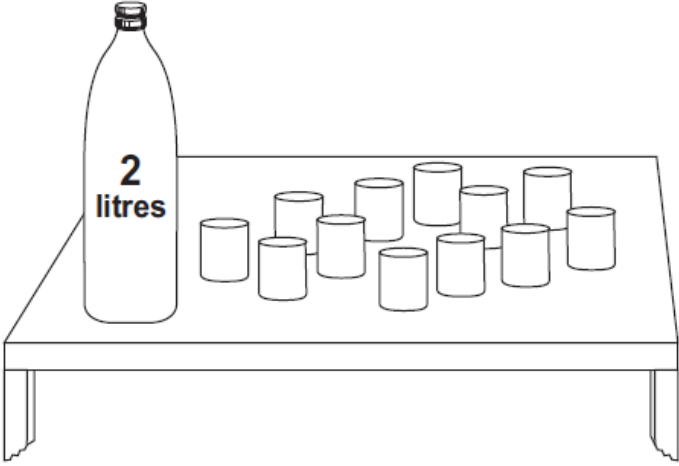
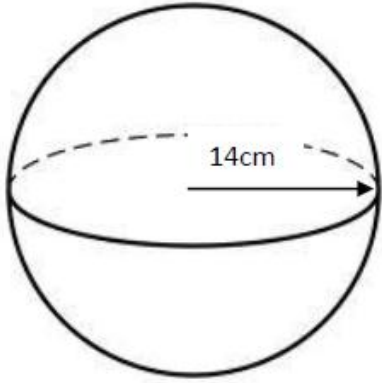
Volume of a pyramid: $V = \frac{1}{3}Ah$

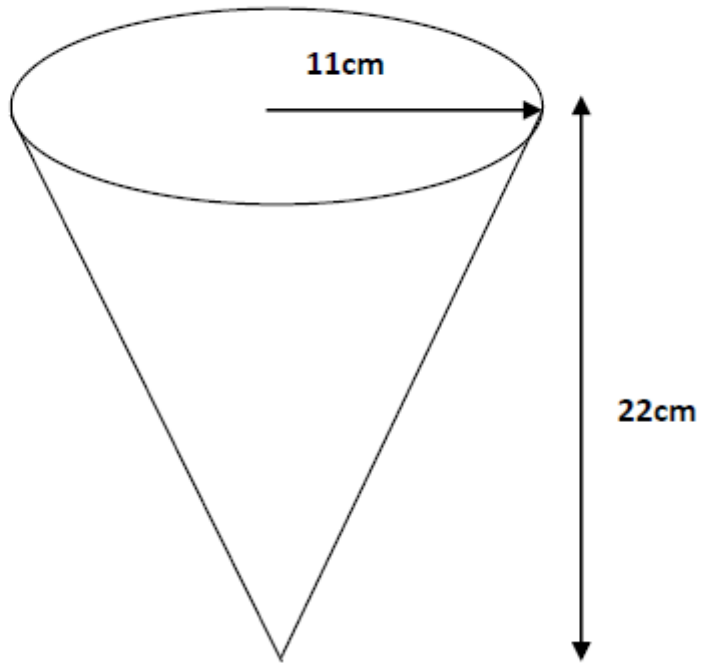
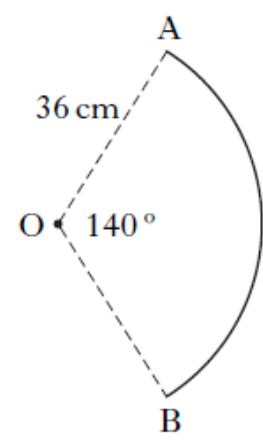
Standard deviation: $s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

Section A

Section A

Q		Marks
<p>1 P1</p>	<p>4. A straight line cuts the x-axis at the point $(9, 0)$ and the y-axis at the point $(0, 18)$ as shown.</p>  <p>Find the gradient of this line.</p>	<p>1</p>
<p>2 P2</p>	<p>3. A container for oil is in the shape of a prism. The width of the container is 9 centimetres. The uniform cross section of the container consists of a rectangle and a triangle with dimensions as shown.</p>  <p>Calculate the volume of the container, correct to the nearest litre.</p>	<p>4</p>

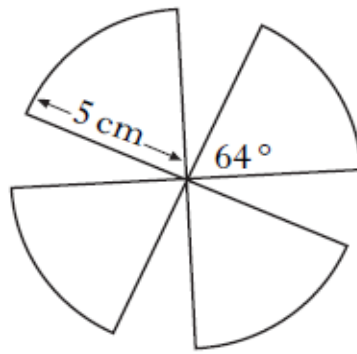
<p>3 P2</p>	<p>2. Lemonade is to be poured from a 2 litre bottle into glasses. Each glass is in the shape of a cylinder of radius 3 centimetres and height 8 centimetres.</p>  <p>How many full glasses can be poured from the bottle?</p>	<p>4 (2.1) (2.2)</p>
<p>4 P2</p>	<p>1. Calculate the volume of a sphere with radius 14 cm, giving your answer correct to two significant figures.</p> 	<p>3</p>

<p>5 P2</p>	<p>2. Calculate the volume of the cone:</p>  <p>The diagram shows a cone with a circular base. A horizontal line from the center of the base to the edge is labeled "11cm". A vertical line from the top edge of the base to the apex is labeled "22cm".</p>	<p>2</p>
<p>6 P2</p>	<p>6. A circle, centre O, has radius 36 centimetres. Part of this circle is shown. Angle AOB = 140°.</p>  <p>The diagram shows a circular sector with center O. Two radii OA and OB are shown as dashed lines, both labeled "36 cm". The angle AOB is labeled "140°". A solid curved line connects points A and B, representing the arc AB.</p> <p>Calculate the length of arc AB.</p>	<p>3</p>

7
P2

7. A fan has four identical plastic blades.

3



Each blade is a sector of a circle of radius 5 centimetres.

The angle at the centre of each sector is 64° .

Calculate the **total** area of plastic required to make the blades.

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Section A

MARKING

SCHEME

Section A - Marking Scheme		
1	4. Gradient = -2	1
2	<p style="text-align: center;">3</p> <p>Ans: 5 litres</p> <p>Method 1</p> <ul style="list-style-type: none"> • strategy (area of cross section) • strategy (volume of prism) • all calculations correct • correct rounding 	<ul style="list-style-type: none"> • $(28 \times 20) + \left(\frac{1}{2} \times 20 \times 4 \cdot 5\right)$ (605) • $\left[(28 \times 20) + \left(\frac{1}{2} \times 20 \times 4 \cdot 5\right)\right] \times 9$ • 5445 • 5 <p style="text-align: right;">4KU</p>
	<p>Method 2</p> <ul style="list-style-type: none"> • strategy (volume of cuboid) • strategy (volume of triangular prism) • all calculations correct • correct rounding 	<ul style="list-style-type: none"> • $9 \times 20 \times 28$ (5040) • $9 \times \left[\frac{1}{2} \times 20 \times 4 \cdot 5\right]$ (405) • 5445 • 5 <p style="text-align: right;">4KU</p>
	<p>Method 3</p> <ul style="list-style-type: none"> • strategy (volume of extended cuboid) • strategy (volume of triangular prism) • all calculations correct • correct rounding 	<ul style="list-style-type: none"> • $9 \times 20 \times 32 \cdot 5$ (5850) • $9 \times \left[\frac{1}{2} \times 20 \times 4 \cdot 5\right]$ (405) • 5445 • 5 <p style="text-align: right;">4KU</p>
	<p>NOTES:</p> <p>(i) for candidates who calculate $28 \times 9 \times 20 \times 32 \cdot 5$, only the final mark is available</p>	

3	2	<p>Ans: 8</p> <ul style="list-style-type: none"> • valid strategy • processing • processing a division • solution 	<ul style="list-style-type: none"> • knows to use $\pi \cdot^2 h$ • $\pi \times 3^2 \times 8 (= 226.19)$ • $\frac{2000}{72\pi} (= 8.84)$ • 8 (rounding down) <p style="text-align: right;">4RE</p>
	<p>NOTES:</p> <p>(i) the second mark is available only for a calculation involving π and h</p> <p>(ii) the 3rd mark is available for either: explicit evidence of division of 2000 or: implicit evidence (unrounded consistent value)</p> <p>(iii) the final mark is available for an answer consistent with the division (unrounded answer need not be stated)</p> <p>(iv) if no rounding is required, the final mark cannot be awarded</p>		
4	<ul style="list-style-type: none"> •¹ substitute and start calculation •² complete calculation •³ round calculation to 2 significant figures 	<ul style="list-style-type: none"> • $\frac{4}{3} \times \pi \times 14^3$ • $\frac{4}{3} \times \pi \times 2744$ • = 11494.04032 <i>or equivalent</i> • 11000cm³ 	
5	<ul style="list-style-type: none"> •¹ substitute and start calculation •² complete calculation 	<ul style="list-style-type: none"> • $\frac{1}{3} \times \pi \times 11^2 \times 22$ • $\frac{1}{3} \times \pi \times 121 \times 22$ • = 2787.639881 <i>or equivalent</i> 	

N5 - EF 1.4 - Remediation

6	6	<p>Ans: 88.0 cm</p> <ul style="list-style-type: none"> • fraction of circumference • use of formula • all calculations correct 	<ul style="list-style-type: none"> • $\frac{140}{360}$ • $\frac{140}{360} \times \pi \times 72$ • 87.96 <p style="text-align: right;">3KU</p>		
	<p>NOTES:</p> <p>(i) for 87.96 with or without working award 3/3</p> <p>(ii) for 1583.36 from $\frac{140}{360} \times \pi \times 36^2$ award 2/3</p> <p>(iii) the 3rd mark is available only for a calculation involving π</p>				
7	Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark		
	7	<p>Ans: 55.84 cm²</p> <ul style="list-style-type: none"> • fraction of area • use of formula • all calculations correct 	<ul style="list-style-type: none"> • $\frac{64}{360}$ • $\frac{64}{360} \times \pi \times 5^2$ • $13.96 \times 4 = 55.84$ <p style="text-align: right;">3KU</p>		
<p>Notes:</p> <p>(i) for 55.84 with or without working award $\frac{3}{3}$</p> <p>(ii) the 3rd mark is available only for a calculation involving π</p>					

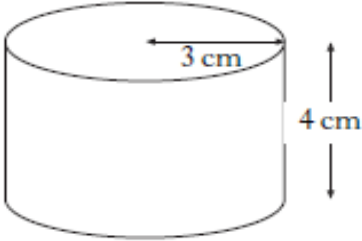
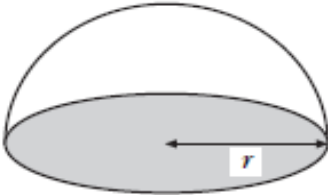
Section B

Section B

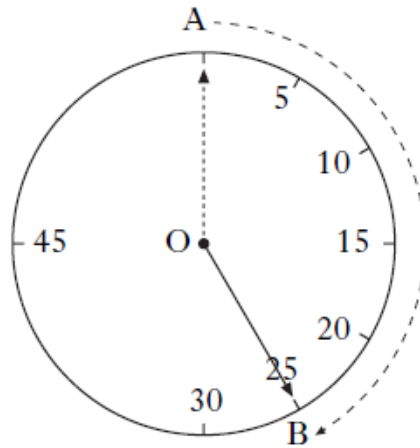
Paper 1 Questions

Q		Marks
1	<p data-bbox="236 465 718 542">8. A square, OSQR, is shown below. Q is the point (8, 8).</p> <div data-bbox="502 604 933 1019" style="text-align: center;"> </div> <p data-bbox="287 1124 1141 1160">The straight line TR cuts the y-axis at T (0, 12) and the x-axis at R.</p> <p data-bbox="287 1173 766 1209">(a) Find the equation of the line TR.</p> <p data-bbox="287 1240 678 1276">The line TR also cuts SQ at P.</p> <p data-bbox="287 1308 670 1344">(b) Find the coordinates of P.</p>	<p data-bbox="1316 1173 1340 1209">4</p> <p data-bbox="1316 1308 1340 1344">3</p>

Paper 2 Questions

Q	Marks
2	2
12. (a) A cylindrical paperweight of radius 3 centimetres and height 4 centimetres is filled with sand.	
 A diagram of a cylinder representing a paperweight. A horizontal arrow from the center of the top circular face to the edge is labeled '3 cm'. A vertical double-headed arrow on the right side of the cylinder is labeled '4 cm'.	
Calculate the volume of sand in the paperweight.	
(b) Another paperweight, in the shape of a hemisphere, is filled with sand.	
 A diagram of a hemisphere with its flat circular base shaded in grey. A horizontal arrow from the center of the base to the edge is labeled 'r'.	
It contains the same volume of sand as the first paperweight.	
Calculate the radius of the hemisphere.	
[The volume of a hemisphere with radius r is given by the formula, $V = \frac{2}{3}\pi r^3$].	
	3

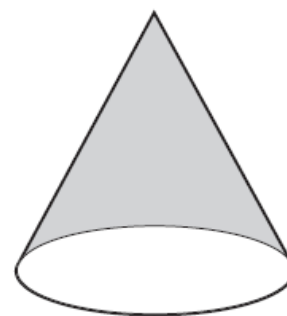
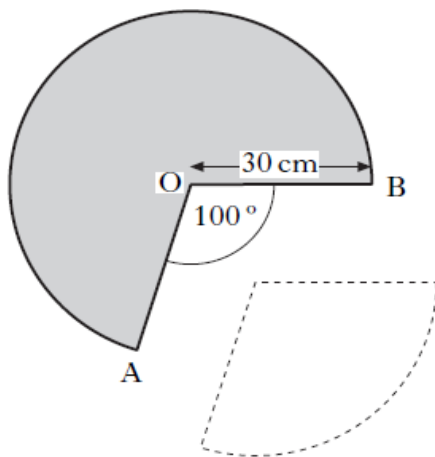
- 3** 9. Contestants in a quiz have 25 seconds to answer a question.
 This time is indicated on the clock.
 The tip of the clock hand moves through the arc AB as shown.



- (a) Calculate the size of angle AOB.
 (b) The length of arc AB is 120 centimetres.
 Calculate the length of the clock hand.

1
4

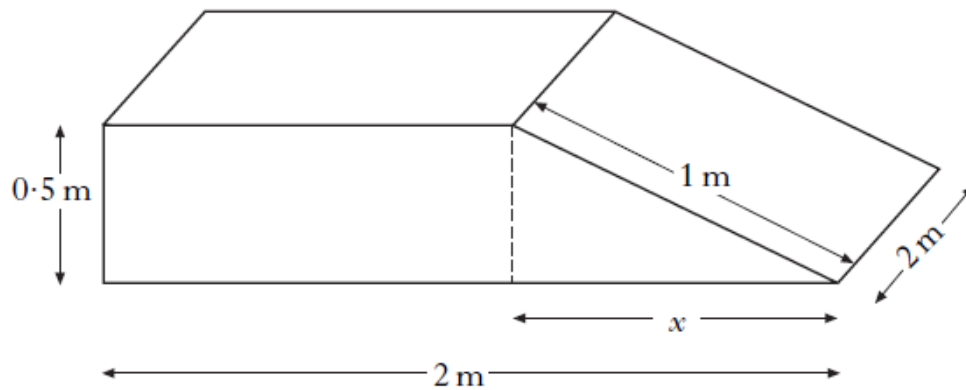
- 4** 11. A cone is formed from a paper circle with a sector removed as shown.
 The radius of the paper circle is 30 cm.
 Angle AOB is 100° .



- (a) Calculate the area of paper used to make the cone.
 (b) Calculate the circumference of the base of the cone.

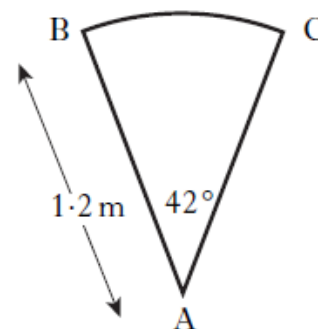
3
3

- 5.** A concrete ramp is to be built.
The ramp is in the shape of a cuboid and a triangular prism with dimensions as shown.



- (a) Calculate the value of x . 2
(2.1)
- (b) Calculate the volume of concrete required to build the ramp. 3
(2.2)

- 6.** A spiral staircase is being designed.

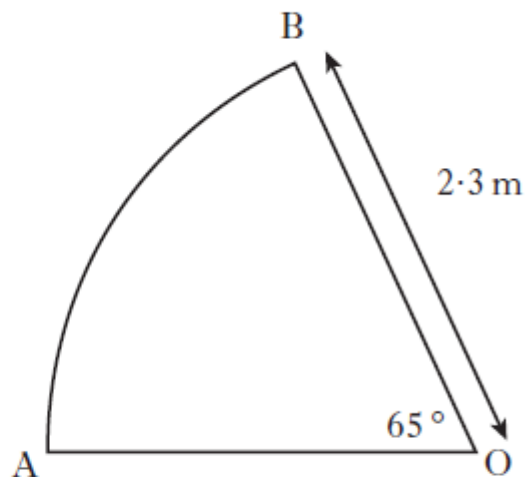


Each step is made from a sector of a circle as shown.
The radius is 1.2 metres.
Angle BAC is 42° .
For the staircase to pass safety regulations, the arc BC must be at least 0.9 metres.
Will the staircase pass safety regulations?

- 4
(2.1)
(2.2)

7

4. A sector of a circle, centre O, is shown below.



The radius of the circle is 2.3 metres.

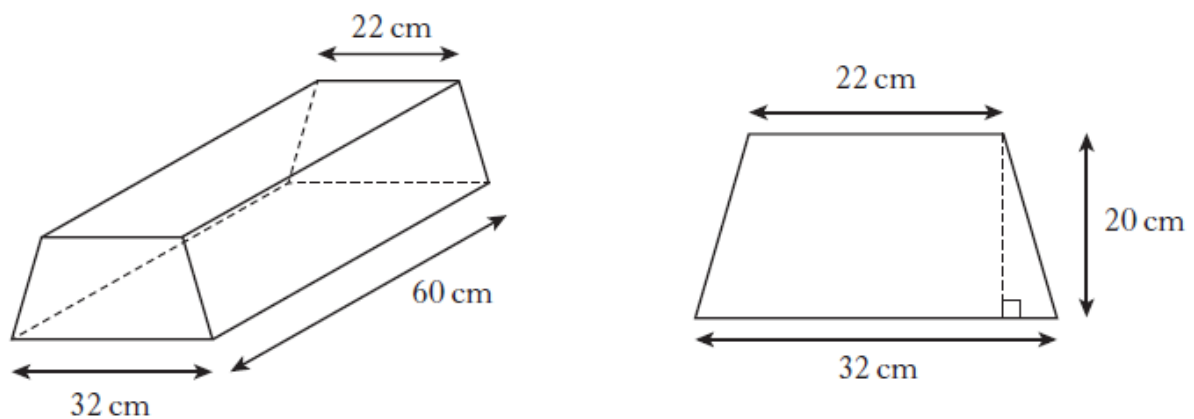
Angle AOB is 65° .

Find the length of the arc AB.

3

8

3. A concrete block is in the shape of a prism.



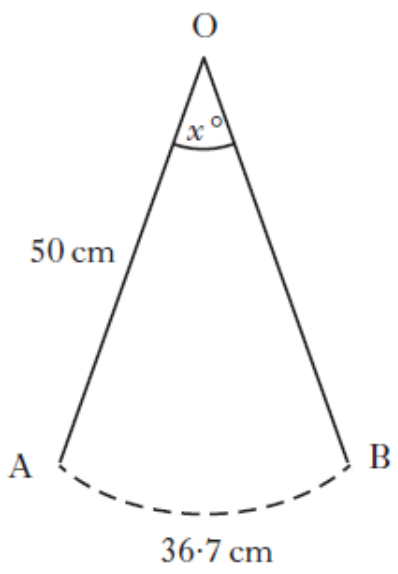
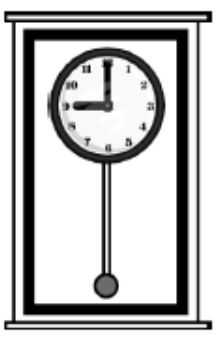
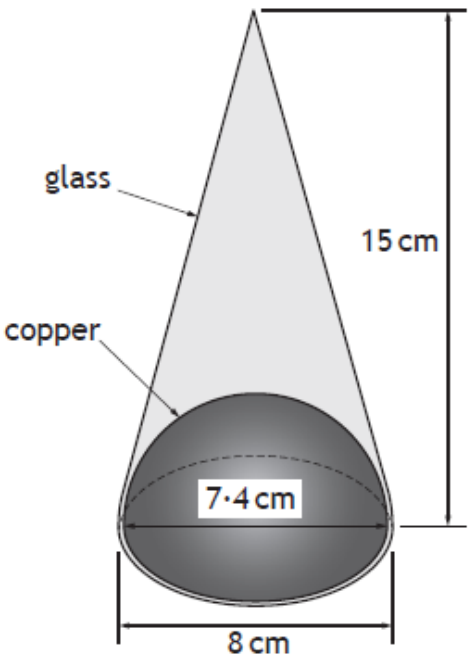
The cross section of the prism is a trapezium with dimensions as shown.

(a) Calculate the area of the cross section.

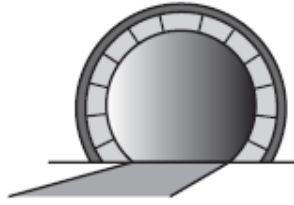
(b) Calculate the volume of the concrete block.

3

1

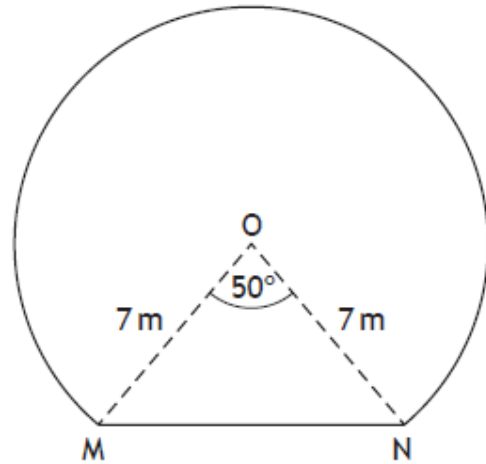
<p>9</p>	<p>8. As the pendulum of a clock swings, its tip moves through an arc of a circle. 3</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <p>The length of the pendulum is 50 centimetres. The length of the arc is 36.7 centimetres.</p> <p>Calculate x°, the angle through which the pendulum swings.</p>	<p></p>
<p>10</p>	<p>7. An ornament is in the shape of a cone with diameter 8 centimetres and height 15 centimetres.</p> <p>The bottom contains a hemisphere made of copper with diameter 7.4 centimetres. The rest is made of glass, as shown in the diagram below.</p> <div style="text-align: center;">  </div> <p>Calculate the volume of the glass part of the ornament. Give your answer correct to 2 significant figures.</p>	<p>5</p>

- 11** 13. The picture shows the entrance to a tunnel which is in the shape of part of a circle. 5



The diagram below represents the cross-section of the tunnel.

- The centre of the circle is O.
- MN is a chord of the circle.
- Angle MON is 50° .
- The radius of the circle is 7 metres.



Calculate the area of the cross-section of the tunnel.

Section B

MARKING

SCHEME

Section B – Marking Scheme

Marking Scheme

Paper 1

Q			Marks
1	8 (a)	<p>Ans: $y = -\frac{3}{2}x + 12$</p> <ul style="list-style-type: none"> • gradient • y-intercept • equation 	<ul style="list-style-type: none"> • $m = -\frac{12}{8}$ • $c = 12$ • $y = -\frac{3}{2}x + 12$ <p style="text-align: right;">3KU</p>
	<p>NOTES:</p> <p>(i) for a correct equation without working award 3/3</p> <p>(ii) where the gradient and/or y-intercept are wrong, but explicitly stated, the 3rd mark is still available</p>		
	(b)	<p>Ans: $\left(\frac{8}{3}, 8\right)$</p> <ul style="list-style-type: none"> • method • substitution • solving equation • solution 	<ul style="list-style-type: none"> • recognising $y_p = 8$ • $8 = -\frac{3}{2}x + 12$ • $x = \frac{8}{3}$ • $\left(\frac{8}{3}, 8\right)$ <p style="text-align: right;">4RE</p>
<p>NOTES:</p> <p>(i) for the 4th mark, both coordinates must be consistent with the candidate's response for 1st and 3rd marks</p>			

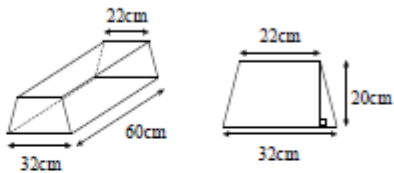
Q				Marks
2	12 (a)	<p>Ans: 113.1 cm²</p> <ul style="list-style-type: none"> • formula • solution 	<ul style="list-style-type: none"> • $V = \pi \times 3^2 \times 4$ • 113.1 <p style="text-align: right;">2KU</p>	
	<p>Notes:</p> <p>(i) 452.4 (using $\pi d^2 h$) may be awarded the 2nd mark</p> <p>(ii) 75.4 (using πdh) may be awarded the 2nd mark</p> <p>(iii) for the use of any other wrong formula award $\frac{0}{2}$</p>			
	(b)	<p>Ans: 3.78 cm</p> <ul style="list-style-type: none"> • forming equation • rearranging • solution 	<ul style="list-style-type: none"> • $\frac{2}{3}\pi \times r^3 = 113.1$ • $r^3 = 54$ • 3.78 <p style="text-align: right;">3RE</p>	
	<p>Notes:</p> <p>(i) for 452.4 → 216 → 6.0 award $\frac{3}{3}$</p> <p>(ii) for 75.4 → 36 → 3.3 award $\frac{3}{3}$</p> <p>(iii) the third mark is available only for the cube root of a number</p>			

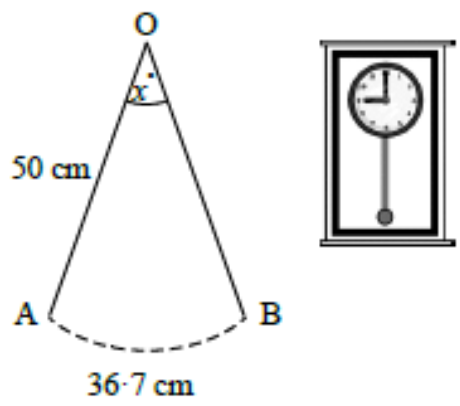
3	9 (a)	<p>Ans: 150°</p> <ul style="list-style-type: none"> • solution 	<ul style="list-style-type: none"> • 150° 	1KU
	(b)	<p>Ans: 45.8 cm</p> <ul style="list-style-type: none"> • correct ratio • processing • processing • solution 	<ul style="list-style-type: none"> • $\frac{150}{360}$ • $\frac{150}{360} = \frac{120}{2\pi r}$ • $r = \frac{360}{150} \times \frac{120}{2\pi}$ • 45.8 <div style="display: flex; align-items: center; justify-content: center; margin: 10px 0;"> <div style="text-align: center;">or</div> <div style="border-left: 1px solid black; padding-left: 10px; margin-left: 10px;"> <ul style="list-style-type: none"> $\frac{5}{12}$ $\frac{120}{\frac{5}{12}} = 288$ $r = \frac{288}{2\pi}$ 45.8 </div> </div>	4RE
	<p>Notes:</p> <p>(i) a calculation using πr^2 (which leads to $r = 9.57$) cannot be awarded the 2nd mark</p>			

4	11(a)	<p>Ans: 2042 cm²</p> <ul style="list-style-type: none"> • strategy • processing • solution 	<ul style="list-style-type: none"> • $\frac{260}{360}$ • $\frac{260}{360} \times \pi \times 30^2$ • 2042 	3KU
	<p>Notes:</p> <p>(i) $\frac{100}{360}$ can be awarded the 1st mark only within the strategy $\pi r^2 - \frac{100}{360} \pi r^2$</p>			
	(b)	<p>Ans: 136.1 cm</p> <ul style="list-style-type: none"> • strategy • process • process 	<ul style="list-style-type: none"> • circumference of base = length of arc • $C = \frac{260}{360} \times \pi \times 60$ • 136.1 	3RE
	<p>Notes:</p> <p>(i) calculating only $C = \pi \times 60$</p>			

5	5 (a)	<p>Ans: 0.866 m</p> <ul style="list-style-type: none"> • method • solution 	<ul style="list-style-type: none"> • $1^2 = x^2 + 0.5^2$ • $x = 0.866\dots$ 	2RE
	NOTES:			
	(b)	<p>Ans: 1.57 m³</p> <ul style="list-style-type: none"> • process – area of cross section • process – volume of prism • all calculations correct <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • process – volume of cuboid • process – volume of prism added to volume of cuboid • all calculations correct 	<ul style="list-style-type: none"> • $0.5 \times 0.5 \times 0.866 + 0.5 \times (2 - 0.866)$ • 0.7835×2 • 1.567 • $0.5 \times 1.134 \times 2 = 1.134$ • $0.5 \times 0.5 \times 0.866 \times 2 + 1.134$ • 1.567 	3RE

6	5	<p>Ans: no, plus justification</p> <ul style="list-style-type: none"> • strategy • processing • processing • communication 	<ul style="list-style-type: none"> • $\frac{42}{360}$ • $\frac{42}{360} \times \pi \times 2.4$ • 0.879 • no, as $0.879 < 0.9$ 	4RE
	<p>NOTES:</p> <p>(i) $\frac{42}{360} \times \pi \times 1.2 = 0.439 \rightarrow$ no etc award 3/4</p> <p>(ii) $\frac{42}{360} \times \pi \times 1.2^2 = 0.527 \rightarrow$ no etc award 2/4</p> <p>(iii) $\frac{42}{360} \times \pi \times 2.4^2 = 2.11 \rightarrow$ yes etc award 2/4</p> <p>(iv) the communication must include reference to both values, the difference between them or the use of comparative language</p>			
7	4	<p>Ans: 2.61m</p> <ul style="list-style-type: none"> • ratio • strategy • all calculations correct 	<ul style="list-style-type: none"> • $\frac{65}{360}$ or $\frac{360}{65}$ • $\frac{65}{360} \times \pi \times 4.6$ or $\pi \times 4.6 \div \frac{360}{65}$ • 2.609 	3KU
	<p>NOTES:</p> <p>(i) for 2.61 with or without working award 3/3</p> <p>(ii) for $1 \cdot 3 (\times \pi \times 2.3)$ award 2/3</p> <p>(iii) for $3 \cdot 0 (\times \pi \times 2.3^2)$ award 1/3</p> <p>(iv) the 3rd mark is available only for a calculation involving π</p>			

8	3	a	<p>A concrete block is in the shape of a prism.</p>  <p>The cross section of the prism is a trapezium with dimensions as shown.</p> <p>Calculate the area of the cross section.</p> <p>Ans: 540 cm²</p> <ul style="list-style-type: none"> •¹ beginning process •² processing •³ calculation 	3	<ul style="list-style-type: none"> •¹ $2 \times \frac{1}{2} \times 5 \times 20 + (22 \times 20)$ or $\frac{1}{2} \times 20 \times (22 + 32)$ •² 100 + 440 or 10 × 54 •³ 540 <p>(KU)</p>
	3	b	<p>Calculate the volume of the concrete block.</p> <p>Ans: 32 400 cm³</p> <ul style="list-style-type: none"> •¹ calculation 	1	<ul style="list-style-type: none"> •¹ 32 400 <p>(KU)</p>

9	8	<p>As the pendulum of a clock swings, its tip moves through an arc of a circle.</p>  <p>The length of the pendulum is 50 centimetres. The length of the arc is 36.7 centimetres. Calculate x°, the angle through which the pendulum swings.</p> <p>Ans: 42°</p> <ul style="list-style-type: none"> •¹ strategy •² strategy •³ solution 	<p>3</p> <p>(RE)</p>	<ul style="list-style-type: none"> •¹ $\frac{x}{360}$ •² $\frac{36.7}{100\pi}$ •³ 42°
<p>Notes:</p> <p>(i) for use of $C = \pi r^2$, the 1st and 3rd marks are still available</p>				

10	7.	Give one mark for each - Ans: 150 cm ³	Mark 5	Awarding a mark at each -																																																	
		<ul style="list-style-type: none"> •¹ substitute correctly into formula for volume of cone •² substitute correctly into formula for volume of sphere or hemisphere •³ know to subtract volume of hemisphere from volume of cone •⁴ carry out all calculations correctly (must involve difference or sum of two volume calculations) •⁵ round final answer to 2 significant figures 		<ul style="list-style-type: none"> •¹ $\frac{1}{3} \times \pi \times 4^2 \times 15$ (= 251.32....) •² $\frac{4}{3} \times \pi \times 3 \cdot 7^3$ (= 212.17....) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3$ (= 106.08....) •³ evidence •⁴ 145.24.... •⁵ 150 (cm³) 																																																	
Notes: 1. Accept variations in π . 2. Some common answers (working must be shown):																																																					
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">(i)</td> <td style="width: 40%;">$39 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 - \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$</td> <td style="width: 15%;">award 4/5</td> <td style="width: 10%;">✓✓x✓✓</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> </tr> <tr> <td>(ii)</td> <td>$120 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3 \right)$</td> <td>award 4/5</td> <td>✓x✓✓✓</td> <td></td> <td></td> </tr> <tr> <td>(iii)</td> <td>$110 \left(\frac{1}{3} \times \pi \times 3 \cdot 7^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$</td> <td>award 4/5</td> <td>x✓✓✓✓</td> <td></td> <td></td> </tr> <tr> <td>(iv)</td> <td>$160 \left(\frac{1}{3} \times \pi \times 8^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 7 \cdot 4^3 \right)$</td> <td>award 4/5</td> <td>x✓✓✓✓</td> <td></td> <td></td> </tr> <tr> <td>(v)</td> <td>$360 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 + \frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$</td> <td>award 4/5</td> <td>✓✓x✓✓</td> <td></td> <td></td> </tr> <tr> <td>(vi)</td> <td>$460 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 + \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$</td> <td>award 4/5</td> <td>✓✓x✓✓</td> <td></td> <td></td> </tr> <tr> <td>(vii)</td> <td>$80 \left(\frac{1}{3} \times \pi \times 3 \cdot 7^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3 \right)$</td> <td>award 3/5</td> <td>xx✓✓✓</td> <td></td> <td></td> </tr> <tr> <td>(viii)</td> <td>$250 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 \right)$</td> <td>award 2/5</td> <td>✓xxx✓</td> <td></td> <td></td> </tr> </table>						(i)	$39 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 - \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$	award 4/5	✓✓x✓✓			(ii)	$120 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3 \right)$	award 4/5	✓x✓✓✓			(iii)	$110 \left(\frac{1}{3} \times \pi \times 3 \cdot 7^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$	award 4/5	x✓✓✓✓			(iv)	$160 \left(\frac{1}{3} \times \pi \times 8^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 7 \cdot 4^3 \right)$	award 4/5	x✓✓✓✓			(v)	$360 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 + \frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$	award 4/5	✓✓x✓✓			(vi)	$460 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 + \frac{4}{3} \times \pi \times 3 \cdot 7^3 \right)$	award 4/5	✓✓x✓✓			(vii)	$80 \left(\frac{1}{3} \times \pi \times 3 \cdot 7^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3 \right)$	award 3/5	xx✓✓✓			(viii)	$250 \left(\frac{1}{3} \times \pi \times 4^2 \times 15 \right)$	award 2/5	✓xxx✓		
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3. The final mark is only available where answers to all intermediate steps involve at least three significant figures. eg $251.32 - 106.08 = 250 - 110 = 140$ award 4/5 ✓✓✓✓x																																																					

11	Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
	13.	<p>Ans: 151.3 m²</p> <ul style="list-style-type: none"> •¹ know how to find area of segment •² know to express sector as a fraction of a circle •³ know how to find area of sector •⁴ know how to calculate area of triangle •⁵ carry out all calculations correctly within a valid strategy 	5	<ul style="list-style-type: none"> •¹ evidence of e.g. major sector + triangle or circle – minor sector + triangle •² $\frac{310}{360}$ or $\frac{50}{360}$ •³ $\frac{310}{360} \times \pi \times 7^2$ (= 132.56) or $\frac{50}{360} \times \pi \times 7^2$ (= 21.38) •⁴ $\frac{1}{2} \times 7 \times 7 \times \sin 50$ (=18.77) •⁵ 151.3 m²
Notes:				
1. Accept variations in π ; disregard premature or incorrect rounding of $\frac{310}{360}$ or $\frac{50}{360}$.				
2. Use of RAD or GRAD (working must be shown) (a) For 149.9 [uses GRAD] award 5/5 (b) Where the use of RAD leads to an answer of 126.1(–6.43+132.56) or 139.0(6.43+132.56) award 4/5				
3. Some common answers (working must be shown):				
56.6 $\left(\frac{310}{360} \times \pi \times 14 + \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ \right)$ award 4/5 ✓✓x✓✓				
40.1 $\left(\frac{50}{360} \times \pi \times 7^2 + \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ \right)$ award 4/5 x✓✓✓✓				
2.6 $\left(\frac{50}{360} \times \pi \times 7^2 - \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ \right)$ award 4/5 x✓✓✓✓				
24.9 $\left(\frac{50}{360} \times \pi \times 14 + \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ \right)$ award 3/5 x✓x✓✓				
132.6 $\left(\frac{310}{360} \times \pi \times 7^2 \right)$ award 2/5 x✓✓xx				
21.4 $\left(\frac{50}{360} \times \pi \times 7^2 \right)$ award 2/5 x✓✓xx				
18.8 $\left(\frac{1}{2} \times 7 \times 7 \times \sin 50^\circ \right)$ award 1/5 xxx✓x				
153.9 $\left(\pi \times 7^2 \right)$ award 0/5				
4. The fifth mark is only available when the area of triangle MON is calculated using trigonometry.				