

*School Name*  
*Mathematics Test 2017*

Year 10

*Volume and Surface Area  
of Other Solids*

Calculator  
Allowed

**Skills and Knowledge Assessed:**

- Solve problems involving surface area and volume of right pyramids, right cones, spheres and related composite solids (ACMMG271)

Name \_\_\_\_\_

**Section 1**      Short Answer Section

Write all working and answers in the spaces provided on this test paper.

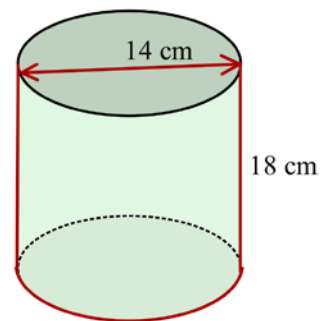
1. Find the volume of the cylinder shown (to the nearest cm).

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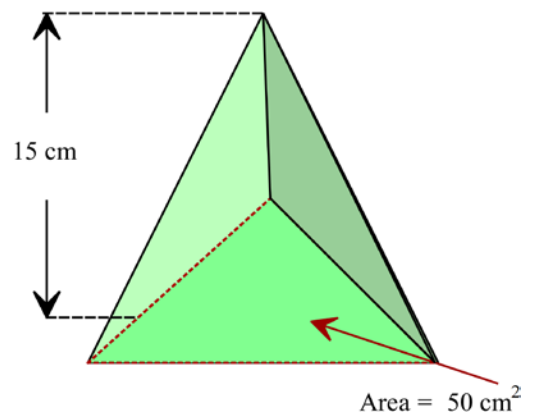
2. The perpendicular height of a triangular pyramid is 15 cm and its base has an area of  $50 \text{ cm}^2$ . What is its volume?

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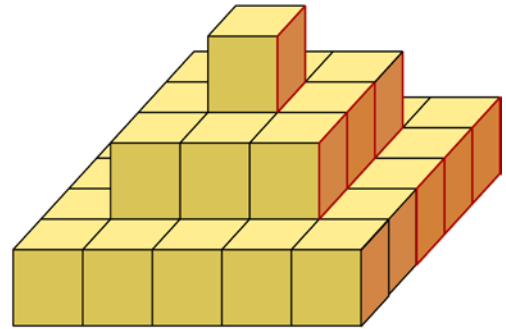
3. This “stepped pyramid” is made by stacking cubes which measure 2 cm along each edge. What is the total volume of the solid formed?

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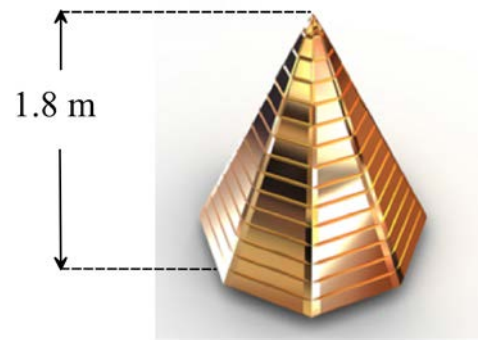
4. A pyramid used in a movie promotion stands 1.8 m high and has a base whose area is  $1.5 \text{ m}^2$ . Find its volume.

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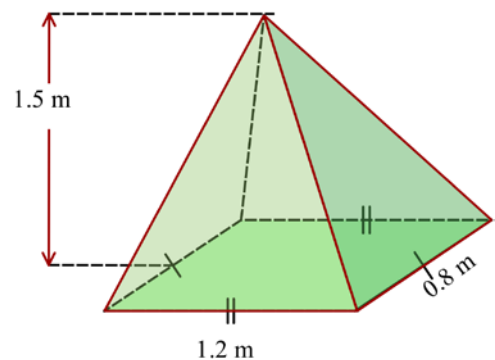
5. What is the volume of the rectangular pyramid?

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6. What is the volume of a sphere which has a radius of 1.6 metres?

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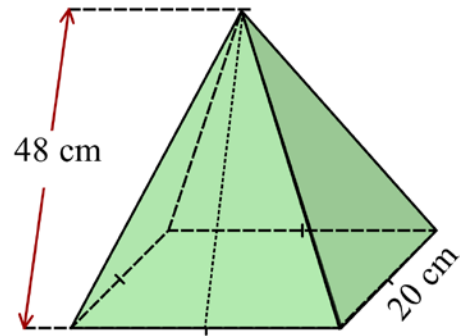
7. What is the surface area of the square pyramid?

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8. A glass sphere has a diameter of 12 cm.  
What volume of glass is used in the sphere?

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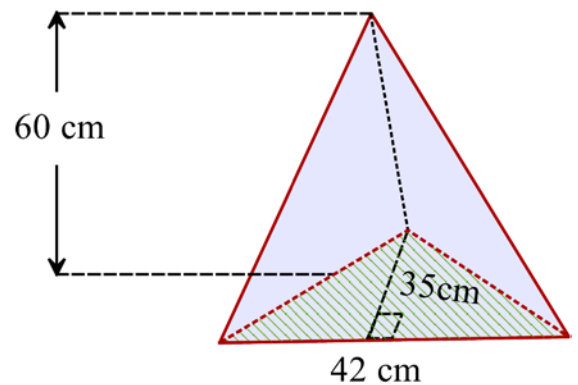
9. Calculate the volume of the triangular pyramid shown.

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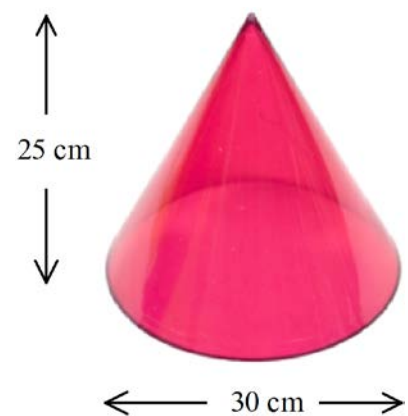
10. What is the volume of the plastic cone shown?

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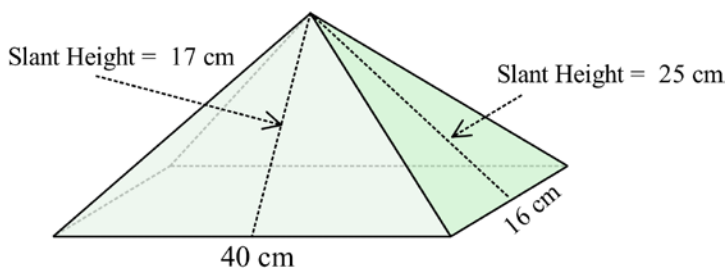
11. What is the surface area of the rectangular pyramid shown?

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12. A cake is in the shape of a hemisphere with a diameter of 30 centimetres. What is the approximate curved surface area which needs to be covered with icing?

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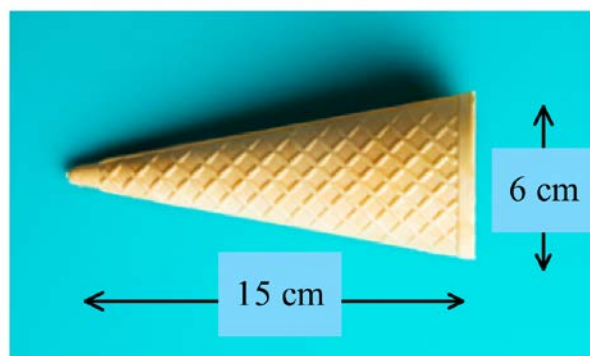
13. A waffle cone maker produces cones of the size shown. What is the approximate surface area of this cone?

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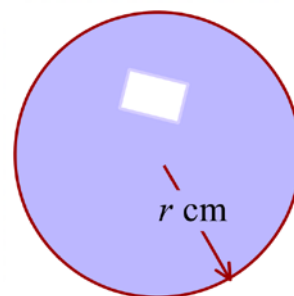
14. A sphere has a volume of  $17\,157\text{ cm}^3$ . What is its radius, to the nearest cm?

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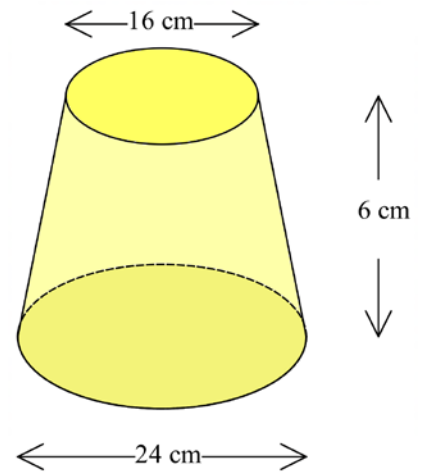
15. The truncated cone shown is formed by cutting the top 12 cm in height from a cone which was originally 18 cm high. The diameter of the circular base is 24 cm and of the top is 16 cm. What is the volume of the truncated cone?

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*School Name*  
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Year  
10

*Volume and Surface Area  
of Other Solids*

Calculator Allowed

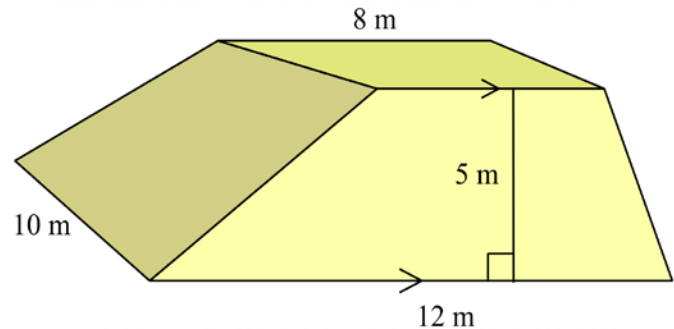
Name \_\_\_\_\_

**Section 2** Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

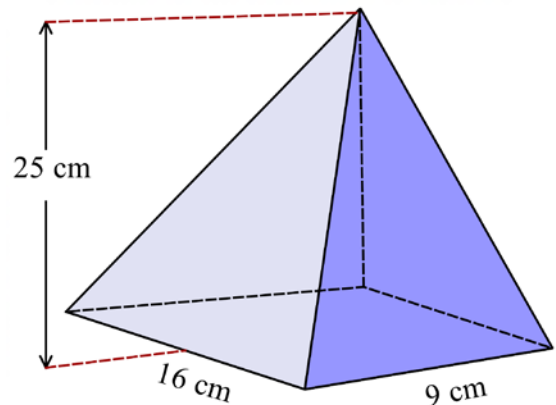
1. What is the volume of the prism shown?

- A.  $250 \text{ m}^3$
- B.  $400 \text{ m}^3$
- C.  $500 \text{ m}^3$
- D.  $600 \text{ m}^3$



2. Find the volume of this rectangular pyramid.

- A.  $1200 \text{ cm}^3$
- B.  $1800 \text{ cm}^3$
- C.  $2400 \text{ cm}^3$
- D.  $3600 \text{ cm}^3$

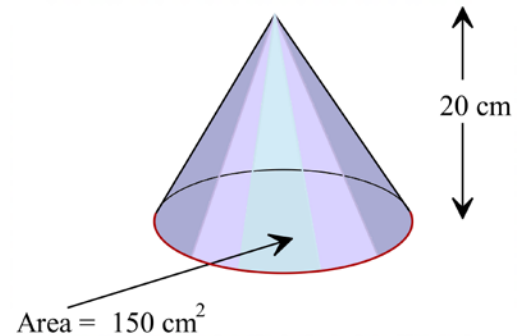


3. A square pyramid has base edges 2.5 m and a perpendicular of height 12 m.  
What is its volume?

- A.  $12.5 \text{ m}^3$
- B.  $25 \text{ m}^3$
- C.  $37.5 \text{ m}^3$
- D.  $75 \text{ m}^3$

4. A cone has a height of 20 cm and the area of its base is  $150 \text{ cm}^2$ .  
What is its volume?

- A.  $300 \text{ cm}^3$   
B.  $600 \text{ cm}^3$   
C.  $900 \text{ cm}^3$   
D.  $1000 \text{ cm}^3$



5. The Glass Pyramid at the Louvre in Paris has a square base which is 34 m long and the slant height of each face is 27.5 m.

What is the total surface area of its glass faces?

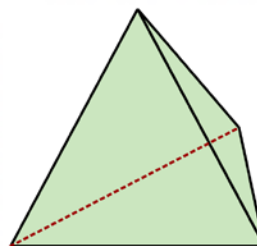
- A.  $935 \text{ m}^2$   
B.  $1870 \text{ m}^2$   
C.  $3740 \text{ m}^2$   
D.  $5610 \text{ m}^2$



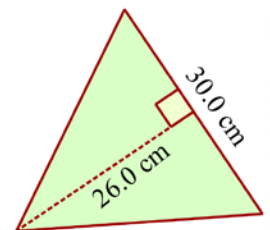
6. A regular tetrahedron (a special triangular pyramid) has 4 congruent triangular faces.  
The dimensions (to the nearest half cm) of one face of the tetrahedron are shown on the diagram.

Its perpendicular height of the pyramid is 24.5 cm

What is the volume of the regular tetrahedron?



The Regular Tetrahedron

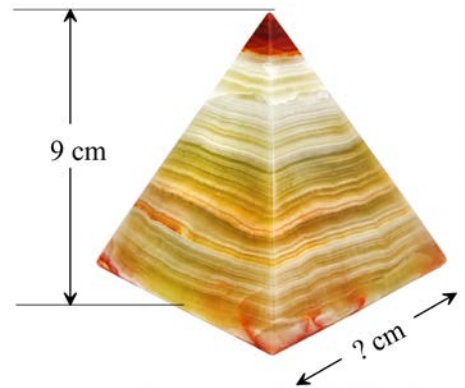


One face of the Tetrahedron.

- A.  $390 \text{ cm}^3$       B.  $1560 \text{ cm}^3$       C.  $9555 \text{ cm}^3$       D.  $19\,110 \text{ cm}^3$

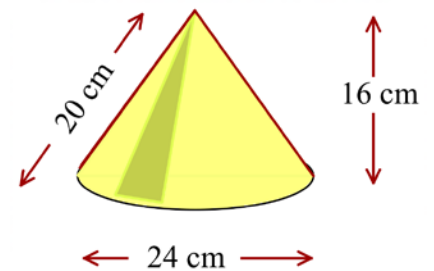
7. A paperweight is in the shape of the square pyramid, shown. Its perpendicular height is 9 cm and its volume is  $192 \text{ cm}^3$ . How long are the base edges of the pyramid?

- A. 8 cm  
B. 16 cm  
C. 21.3 cm  
D. 32 cm



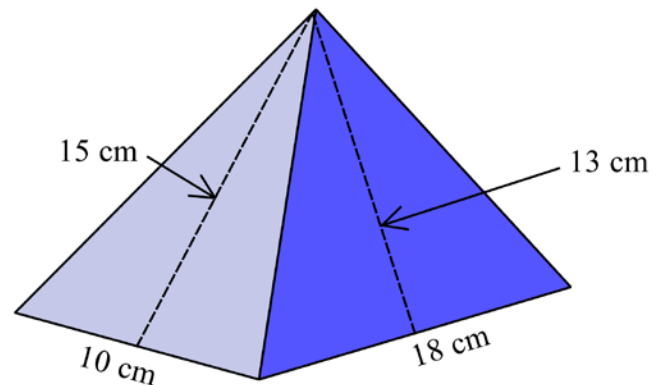
8. Which calculation would give the total surface area of this cone?

- A.  $SA = \pi \times 12 \times 16 + \pi \times 12 \times 20$   
B.  $SA = \pi \times 12^2 + \pi \times 12 \times 20$   
C.  $SA = \pi \times 16^2 + \pi \times 12 \times 20$   
D.  $SA = \pi \times 20^2 + \pi \times 24 \times 20$



9. What is the surface area of the rectangular pyramid shown?

- A.  $330 \text{ cm}^2$   
B.  $510 \text{ cm}^2$   
C.  $534 \text{ cm}^2$   
D.  $564 \text{ cm}^2$





10. A decorative concrete ball in a garden has a diameter of 0.5 m.

A cubic metre of concrete weighs 2400 kg.

How much does the concrete ball weigh?

- A. 157 kg
- B. 628 kg
- C. 1257 kg
- D. 1885 kg



11. The dome of this observatory in NZ can be approximated by a hemisphere of diameter 12 metres.

What is the surface area of the dome (in terms of  $\pi$ )?

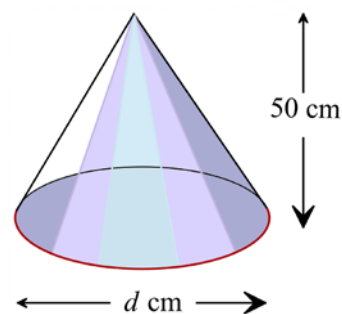
- A.  $36\pi \text{ m}^2$
- B.  $48\pi \text{ m}^2$
- C.  $54\pi \text{ m}^2$
- D.  $72\pi \text{ m}^2$



12. This cone has a volume of  $21\,600\pi \text{ cm}^3$ .

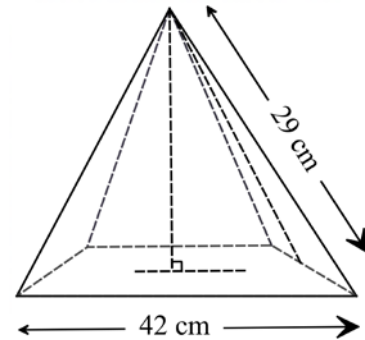
What is the diameter of its base?

- A. 36 cm
- B. 48 cm
- C. 60 cm
- D. 72 cm



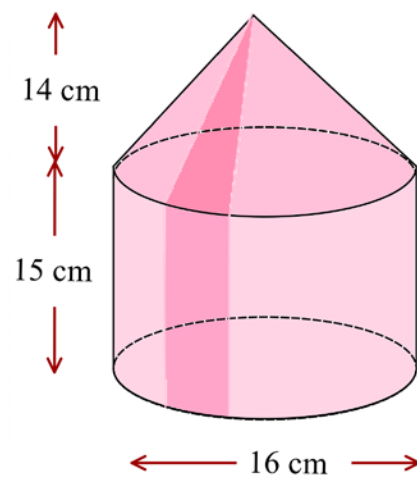
13. The square pyramid shown has base edges 42 cm, and a slant height of 29 cm. Calculate the volume of the pyramid.

- A.  $11\,760\text{ cm}^3$   
B.  $13\,230\text{ cm}^3$   
C.  $17\,052\text{ cm}^3$   
D.  $35\,280\text{ cm}^3$



14. What is the volume of the solid shown?

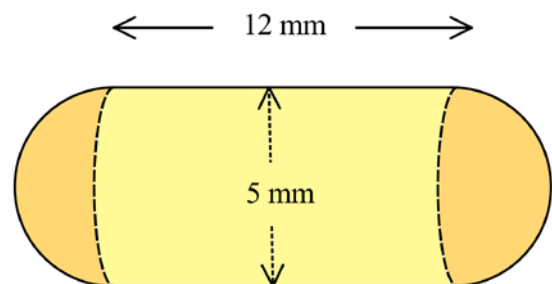
- A.  $3016\text{ cm}^3$   
B.  $3820\text{ cm}^3$   
C.  $3954\text{ cm}^3$   
D.  $5831\text{ cm}^3$



15. The capsule for pain medication is in the shape of a cylinder with hemispherical ends, as shown.

What is the surface area of the capsule?

- A.  $60\pi\text{ mm}^2$   
B.  $85\pi\text{ mm}^2$   
C.  $90\pi\text{ mm}^2$   
D.  $108\pi\text{ mm}^2$



*School Name*  
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*Volume and Surface  
Area of Other Solids*

Calculator Allowed

Name \_\_\_\_\_

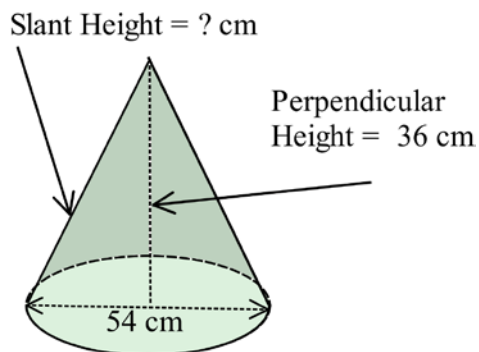
**Section 3**

Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

**Marks**

1. The cone below has a base which measures 54 cm and has a perpendicular height of 36 cm.



- (a) Calculate the volume of the cone.

**1**

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- (b) Calculate the slant height of the cone.

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- (c) Calculate the surface area of the cone.

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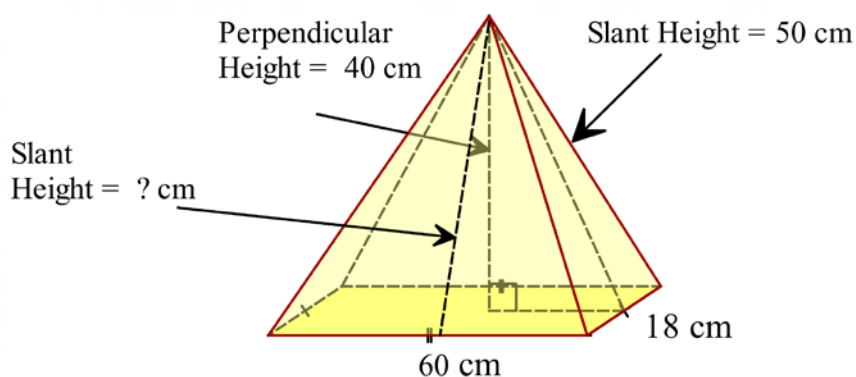
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## Marks

2. The rectangular pyramid below has a base which measures 60 cm by 18 cm and has a perpendicular height of 40 cm.

The slant height of the left hand triangular face is 50 cm.



- (a) Calculate the volume of the pyramid.

1

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- (b) Calculate the slant height of the front triangular face.

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- (c) Calculate the surface area of the pyramid.

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*School Name*

*Mathematics 2017*

*Multiple Choice Answer Sheet*

*Volume and Surface Area of Other Solids*

Name \_\_\_\_\_

Completely fill the response oval representing the most correct answer.

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|-----|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|
| 1.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 2.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 3.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 4.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 5.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 6.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 7.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 8.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 9.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 10. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 11. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 12. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 13. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 14. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 15. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |

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Non Calculator Section

## ANSWERS

Question	Working and Answer
1.	<p>Radius = 7 cm</p> $V = \pi r^2 h$ $= \pi \times 7^2 \times 18$ $= 2770.88472$ $= \mathbf{2771 \text{ cm}^2}$
2.	$V = \frac{1}{3} Ah$ $= \frac{1}{3} \times 50 \times 15$ $= \mathbf{250 \text{ cm}^3}$
3.	<p>The base has 25 cubes, the next level has 9 cubes and the top has 1 cube.</p> <p>Altogether there are <math>25 + 9 + 1 = 35</math> cubes</p> <p>Each cube measures 2 cm on its side</p> <p>so volume of 1 cube <math>= 2 \times 2 \times 2 = 8 \text{ cm}^3</math></p> <p>Volume of solid <math>= 35 \times 8</math></p> <p><b>Volume = <math>280 \text{ cm}^3</math></b></p>
4.	$V = \frac{1}{3} Ah$ $= \frac{1}{3} \times 1.8 \times 1.5$ $= \mathbf{0.9 \text{ m}^3}$

Question	Working and Answer
5.	$V = \frac{1}{3} Ah$ $= \frac{1}{3} \times 1.2 \times 0.8 \times 1.5$ $= \mathbf{0.48 \text{ m}^3}$
6.	$V = \frac{4}{3} \pi r^3$ $= \frac{4}{3} \times \pi \times 1.6^3$ $= 17.15728$ $= \mathbf{17.2 \text{ cm}^3}$
7.	$SA = 4 \times \frac{1}{2} \times 20 \times 48 + 20 \times 20$ $= 1920 + 400$ $= \mathbf{2320 \text{ cm}^2}$
8.	<p>Radius = 6 cm</p> $V = \frac{4}{3} \pi r^3$ $= \frac{4}{3} \times \pi \times 6^3$ $= 904.77868$ $= \mathbf{905 \text{ cm}^3}$
9.	$A = \frac{1}{2} \times 42 \times 35 = 735 \text{ cm}^2$ $V = \frac{1}{3} Ah$ $= \frac{1}{3} \times 735 \times 60$ $= \mathbf{14\,700 \text{ cm}^3}$
10.	$V = \frac{1}{3} \pi r^2 h$ $= \frac{1}{3} \times \pi \times 15^2 \times 25$ $= 5890.486$ $= \mathbf{5890 \text{ cm}^3 \text{ (nearest cm}^3\text{)}}$

Question	Working and Answer
11.	$SA = 2 \times \frac{1}{2} \times 40 \times 17 + 2 \times \frac{1}{2} \times 16 \times 25 + 40 \times 16$ $= 680 + 400 + 640$ $= \mathbf{1720 \text{ cm}^2}$
12.	$r = 15 \text{ cm}$ $\text{Sphere } SA = 4\pi r^2$ $= 4 \times \pi \times 15^2$ $= 2827.433$ $\text{Hemisphere } SA = \frac{2827.433}{2}$ $= 1413.716694$ $= \mathbf{1414 \text{ cm}^2}$
13.	<p>Need slant height <math>l</math></p> $l^2 = 15^2 + 3^2$ $= 234$ $l = \sqrt{234} = 15.297$ $\approx 15.3 \text{ cm}$ $SA = \pi r l$ $= \pi \times 3 \times 15.3$ $= 144.171380$ $= \mathbf{144.2 \text{ cm}^2 \text{ (to 1 decimal place)}}$
14.	$V = \frac{4}{3} \pi r^3$ $17157 = \frac{4}{3} \times \pi \times r^3$ $17157 \times 3 = 4 \times \pi \times r^3$ $51471 = 4 \times \pi \times r^3$ $\frac{51471}{4\pi} = r^3$ $r^3 = \frac{4095.932}{1}$ $r = \sqrt[3]{4095.932}$ $= 15.999911$ $= \mathbf{16 \text{ cm (nearest cm)}}$



Question	Working and Answer
15.	$\text{Volume}_{\text{Original Cone}} = \frac{1}{3} \times \pi \times 12^2 \times 18 = 2714.336 \text{ cm}^3$ $\text{Volume}_{\text{Section cut off cone}} = \frac{1}{3} \times \pi \times 8^2 \times 12 = 804.248 \text{ cm}^3$ $\text{Volume}_{\text{Truncated pyramid}} = 2714.336 - 804.248 = 1910.088 \text{ cm}^3$ $= \mathbf{1910 \text{ cm}^3 \text{ (nearest cm}^3\text{)}}$

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Area of Other Solids*

Calculator Allowed  
Multiple Choice  
Section

## ANSWERS

Question	Working	M C Answer
1.	$A = \frac{5}{2}(8 + 12)$ $= 50 \text{ cm}^2$ $V = 50 \times 10$ $= 500 \text{ m}^3$	<b>C</b>
2.	$V = \frac{1}{3} \times 9 \times 16 \times 25$ $= 1200 \text{ cm}^3$	<b>A</b>
3.	$V = \frac{1}{3} \times 2.5^2 \times 12$ $= 25 \text{ m}^3$	<b>B</b>
4.	$V = \frac{1}{3} \times 150 \times 20$ $= 1\,000 \text{ cm}^3$	<b>D</b>
5.	$SA = 4 \times \frac{1}{2} \times 34 \times 27.5$ $= 1870 \text{ m}^2$	<b>B</b>

6.	$\text{Area of face} = \frac{1}{2} \times 30 \times 26$ $= 390 \text{ cm}^2$ $\text{Volume} = \frac{1}{3} \times 390 \times 24.5$ $= 3185 \text{ cm}^3$	<b>C</b>
7.	$\text{Volume} = \frac{1}{3} \times \text{Area} \times \text{Height}$ $192 = \frac{1}{3} \times (x^2) \times 9$ $192 = 3 \times (x^2)$ $x^2 = \frac{192}{3}$ $= 64$ $x = \sqrt{64}$ $= 8 \text{ cm}$	<b>A</b>
8.	$\text{Radius } r = 12 \text{ cm}$ $\text{Slant height } l = 20 \text{ cm}$ $SA = \pi r^2 + \pi r l$ $= \pi \times 12^2 + \pi \times 12 \times 20$	<b>B</b>
9.	$SA = 2 \times \frac{1}{2} \times 18 \times 13 + 2 \times \frac{1}{2} \times 10 \times 15 + 10 \times 18$ $= 234 + 150 + 180$ $= 564 \text{ cm}^2$	<b>D</b>
10.	$V = \frac{4}{3} \pi r^3$ $= \frac{4}{3} \times \pi \times 0.25^3$ $= 0.0654498 \text{ m}^3$ $\text{Weight} = 0.0654498 \times 2400$ $= 157.07963$ $= \mathbf{157 \text{ kg (nearest kg)}}$	<b>A</b>
11.	$d = 12, \text{ so } r = 6$ $SA = \frac{1}{2} \times 4\pi r^2$ $= 2 \times \pi \times 6^2$ $= 72\pi \text{ cm}^2$	<b>D</b>

12.	$V = \frac{1}{3} \pi r^2 h$ $21600\pi = \frac{1}{3} \times \pi \times r^2 \times 50$ $21600\pi = \frac{50\pi}{3} r^2$ $21600\pi \times \frac{3}{50\pi} = r^2$ $r^2 = 1296$ $r = \sqrt{1296}$ $= 36$ $d = 36 \times 2 = 72 \text{ cm}$	<b>D</b>
13.	<p>First find Vertical height (<math>h</math>)</p> $h^2 = 29^2 - 21^2$ $= 400$ $h = \sqrt{400} = 20 \text{ cm}$ $V = \frac{1}{3} \times 42^2 \times 20$ $= 11\,760 \text{ cm}^3$	<b>A</b>
14.	<p>Radius of cone and cylinder = <math>16 \div 2 = 8 \text{ cm}</math></p> <p>Volume cone = <math>\frac{1}{3} \times \pi \times 8^2 \times 14 = 938.289</math></p> <p>Volume of cylinder = <math>\pi \times 8^2 \times 15 = 3015.929</math></p> <p>Total volume = <math>938.289 + 3015.929</math></p> $= 3954.218$ $= 3954 \text{ cm}^3$	<b>C</b>
15.	<p>Surface area is a sphere and the curved surface of a cylinder.</p> <p>Radius of both is 2.5 mm.</p> $SA = 4\pi r^2 + 2\pi r h$ $= 4 \times \pi \times 2.5^2 + 2 \times \pi \times 2.5 \times 12$ $= 25\pi + 60\pi$ $= 85\pi \text{ mm}^2$	<b>B</b>

*School Name*

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*Multiple Choice Answer Sheet*

*Volume and Surface Area of Other Solids*

Name \_\_\_\_\_

Completely fill the response oval representing the most correct answer.

- |     |   |                                  |   |                                  |   |                                  |   |                                  |
|-----|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 2.  | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 3.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 4.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 5.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 6.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 7.  | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 8.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 9.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 10. | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 11. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 12. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 13. | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 14. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 15. | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |

*School Name*  
*Mathematics Test 2017*

Year 10

*Volume and Surface  
Area of Other Solids*

Calculator Allowed  
Longer Answer  
Section

## ANSWERS

Question	Working and Answer	Marks
1.	<p>(a)</p> $V = \frac{1}{3} \times \pi \times 27^2 \times 36$ $= 27482.65253..$ $= 27\,483 \text{ cm}^3$	<b>1</b>
	<p>(b)</p> $h^2 = 27^2 + 36^2$ $= 2025$ $h = \sqrt{2025} = 45 \text{ cm}$	<b>1</b>
	<p>(c)</p> $SA = \pi r^2 + \pi r l$ $= \pi \times 27^2 + \pi \times 27 \times 45$ $= 2290.221 + 3817.035$ $= 6107.256$ $= 6107 \text{ cm}^2 \text{ (nearest cm}^2\text{)}$	<b>2</b>
2.	<p>(a)</p> $V = \frac{1}{3} \times 60 \times 18 \times 40$ $= 14\,400 \text{ cm}^3$	<b>1</b>

Question	Working and Answer	Marks
	<p>(b)</p> $l^2 = 40^2 + 9^2$ $= 1681$ $l = \sqrt{1681} = 41$	<b>1</b>
	<p>(c)</p> $SA = 2 \times \frac{1}{2} \times 60 \times 41 + 2 \times \frac{1}{2} \times 18 \times 50 + 60 \times 18$ $= 2460 + 900 + 1080$ $= 4440 \text{ cm}^2$	<b>2</b>