

Name: \_\_\_\_\_

Date: \_\_\_\_\_



**Baldivis**  
Secondary College

## Year 11 Applications

### Test 3, 2017

#### Topics – Perimeter, Area, Surface Area and Volume

55

= \_\_\_\_ %

**Total Time:** 58 minutes

**Total Reading:** 3 minutes

**Total Working:** 55 minutes

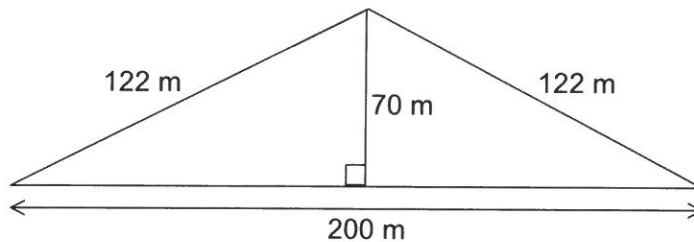
**Weighting:** 4% of the year, 8% of the semester.

**Equipment:** SCSA Formula Sheet; 1 page notes (A4 one side, **Unfolded**), CASIO ClassPad; Scientific Calculator

1. [7 marks]

Calculate the perimeter and the area of each of the following. Show all working.

(a)



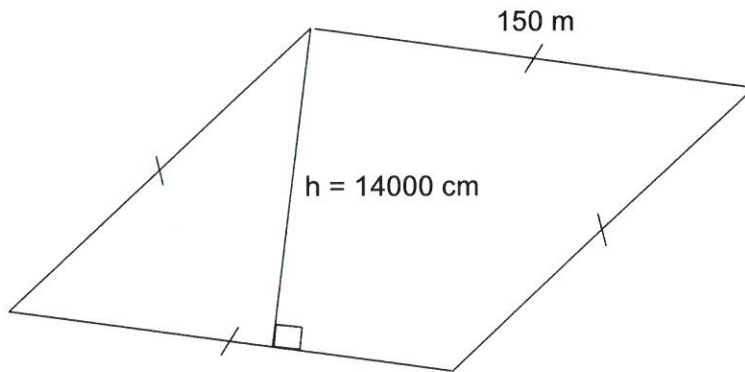
$$\begin{array}{r} 122m \\ + 122m \\ + 200m \\ \hline \end{array}$$

$$\begin{array}{l} \frac{1}{2} \times b \times h \\ \frac{1}{2} \times 200m \times 70m \end{array}$$

Perimeter = 444m ✓

Area = 7000m<sup>2</sup> ✓ [2 marks]

(b)



$$150 \times 4 = 600 \text{ m}$$

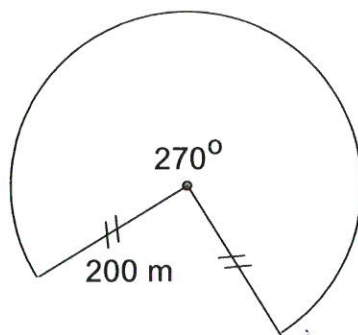
$$14000 \text{ cm} \rightarrow 140 \text{ m}$$

$$140 \text{ m} \times 150 \text{ m} = 21000$$

$$\text{Perimeter} = \underline{600 \text{ m}}$$

$$\text{Area} = \underline{21,000 \text{ m}^2} \quad [2 \text{ marks}]$$

(c)



$$\text{Area} = \frac{\pi \times 200 \text{ m}^2 \times 270}{360} \quad \checkmark$$

$$\frac{270}{360} \times 2\pi r + 400$$

$$\frac{270}{360} \times 2 \times \pi \times 200 + 400$$
$$= 1342.48 \text{ m}$$

$$\text{Perimeter} = \underline{1342.48 \text{ m}} \quad \checkmark$$

$$\text{Area} = 94247.78 \text{ m}^2$$

(round to 2 d.p.)

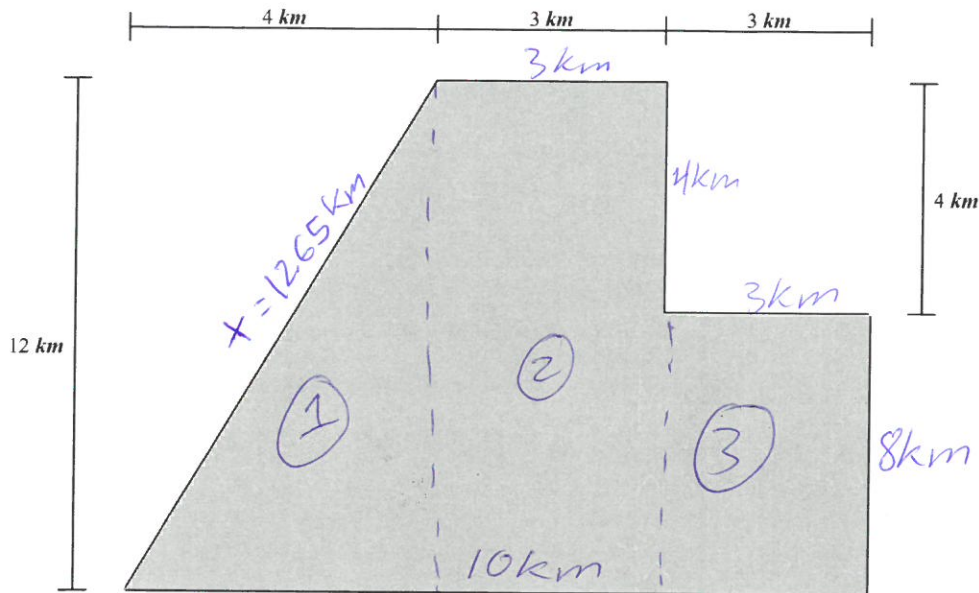
$$\text{Area} = \underline{94247.78 \text{ m}^2} \quad \checkmark$$

(2 d.p.)

[3 marks]

2. [5 marks]

Find the area and perimeter of the following shaded shape



$$x^2 = 4^2 + 12^2$$

$$x^2 = 160$$

$$x = 12.65 \text{ km}$$

$$\text{Area (1)} = \frac{1}{2} \times 4 \times 12 = 24 \text{ km}^2$$

$$\text{Area (2)} = 3 \times 4 = 12 \text{ km}^2$$

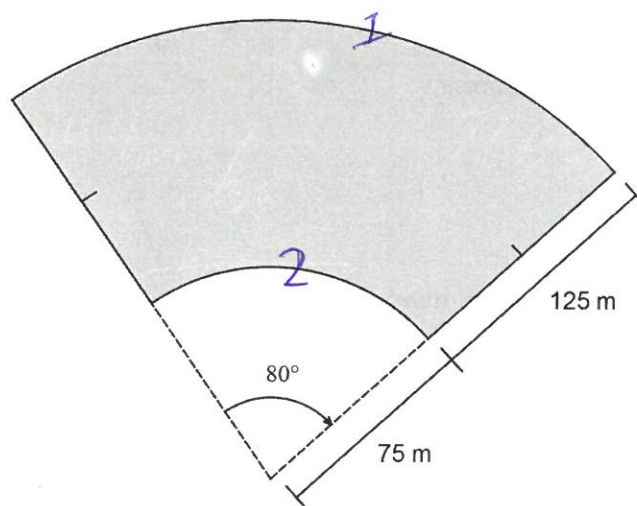
$$\text{Area (3)} = 8 \text{ km} \times 3 \text{ km} = 24 \text{ km}^2$$

$$\text{Total Area} = 84 \text{ km}^2$$

$$\text{Perimeter} = 40.65 \text{ km}$$

3. [5 marks]

To prepare for a concert the event organizers need to construct a barrier around the area that the crowd will be contained within. The diagram below has the relevant area shaded.



$$\textcircled{1} = \frac{2 \times \pi \times 125^2}{360} \times 80^\circ$$

$$279.25 \text{ m}$$

$$\textcircled{2} = \frac{2 \times \pi \times 75^2}{360} \times 80^\circ$$

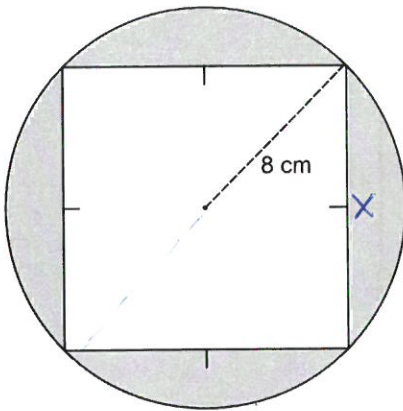
$$104.72 \text{ m}$$

Determine the length of the barrier that will need to be constructed.

$$279.25 + 104.72 + 125 + 125 = 633.97 \text{ m}$$

4. [3 marks]

Find the shaded area of the following shape.



$$\frac{1}{2} \pi \times 8^2$$

$$\text{Circle Area} = 201.06 \text{ cm}^2 \checkmark$$

$$\text{Square Area} = x^2$$

$$= 128 \text{ cm}^2 \checkmark$$

$$8 \times 2 = 16 \text{ cm}$$

$$16^2 = 2x^2$$

$$128 \text{ cm}^2 = x^2$$

$$\text{Circle Area} - \text{Square Area}$$

$$= 73.06 \text{ cm}^2 \checkmark$$

5. [9 marks]

Tennis balls are stored in a cylindrical container with a diameter of 4 cm as shown in the diagram. The tennis balls fill the entire vertical space of the container.

a. Calculate the total volume of all the tennis balls

$$3 \times V = \frac{4 \times \pi \times 2^3}{3} \checkmark$$

$$r = 2 \text{ cm}$$

$$\text{total Volume} = 100.53 \text{ cm}^3 \checkmark$$

b. Calculate the volume of the container

$$h = 4 \times 3 = 12 \text{ cm}$$

$$V = \pi \times 2^2 \times 12 = 150.80 \text{ cm}^3 \checkmark$$

c. Calculate the amount of unused space inside the container

$$150.80 - 100.53 = 50.27 \text{ cm}^3 \checkmark$$

d. The material used to make the container costs 2.50 cents/cm<sup>2</sup>.

Calculate the cost of making the tennis ball container, including the lid.

$$S = 2 \times \pi \times r \times h + 2 \times \pi \times r^2 \checkmark$$

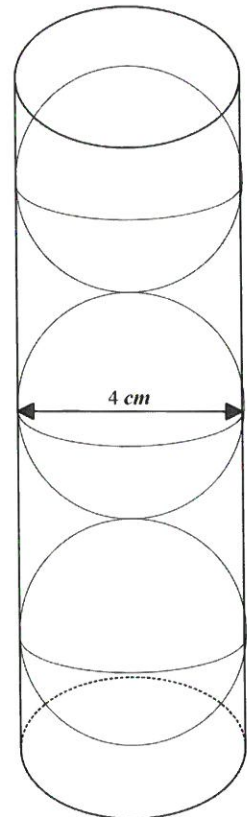
$$\text{TSA} = 175.93 \text{ cm}^2$$

$$\times 2.5 \text{ cents/cm}^2 \checkmark$$

$$r = 2 \text{ cm}$$

$$h = 12 \text{ cm}$$

$$439.825 \text{ cents} \rightarrow \$4.40 \checkmark$$



6. [4 marks]

What is the side length of a cube that has the same surface area as a sphere with a radius of 30 cm?

$$SA_{\text{sphere}} = 4\pi(30^2) = 11309.73 \text{ cm}^2 \checkmark$$

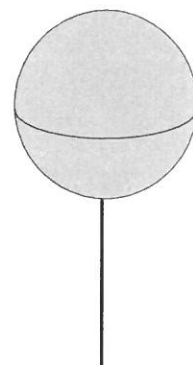
$$TSA_{\text{of cube}} = 6 \times S^2 = 11309.73 \checkmark$$

$$\div 6 \quad S^2 = 1884.955 \quad \div 6 \checkmark$$

$$S = 43.42 \text{ cm (round to 2 d.p.)} \checkmark$$

7. [7 marks]

The three dimensional logo outside the Baked Bean factory is a sphere erected on a metal pole. The sphere had an external radius of 60 cm and an internal radius of 59 cm.



(a) Calculate

(i) the volume of the outer sphere.

[1 mark]

$$\frac{4 \times \pi \times r^3}{3} = V = 904778.68 \text{ cm}^3 \checkmark$$

$r = 60 \text{ cm}$

(ii) the volume of the inner sphere.

[1 mark]

$$\frac{4 \times \pi \times r^3}{3} = V = 860289.54 \text{ cm}^3 \checkmark$$

$r = 59$

(b) (i) Hence determine the volume of metal, to the nearest  $\text{cm}^3$ , required to construct the sphere.

[2 marks]

$$\begin{array}{r} 904778.68 \text{ cm}^3 \\ - 860289.54 \text{ cm}^3 \\ \hline 44489.14 \text{ cm}^3 \rightarrow 44489 \text{ cm}^3 \end{array} \checkmark$$

(ii) Express the volume in (i) in  $\text{m}^3$ .

[1 mark]

$$44489.14 \div 100^3 = 0.04449 \text{ m}^3 \checkmark$$

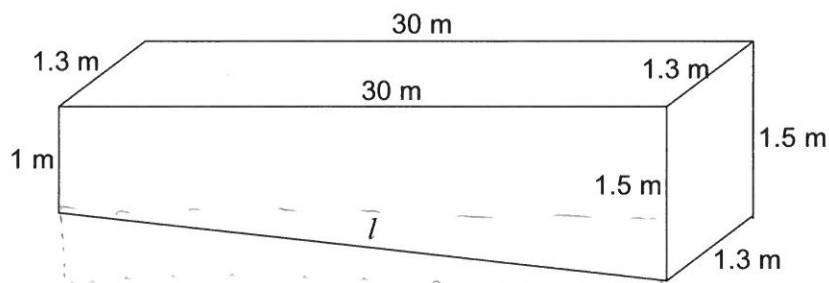
(c) Calculate the surface area of the outside of the sphere.

[2 marks]

$$\begin{aligned} SA &= 4 \times \pi \times 60^2 \checkmark \\ &= 45238.93 \text{ cm}^2 \checkmark \end{aligned}$$

8. [8 marks]

A narrow pool, designed for laps, is installed in a front garden. The pool is deeper at one end than the other.



(i) Determine the length of the bottom of the pool  $l$ . Round to 4 decimal places. [3 marks]

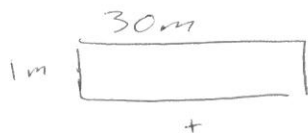
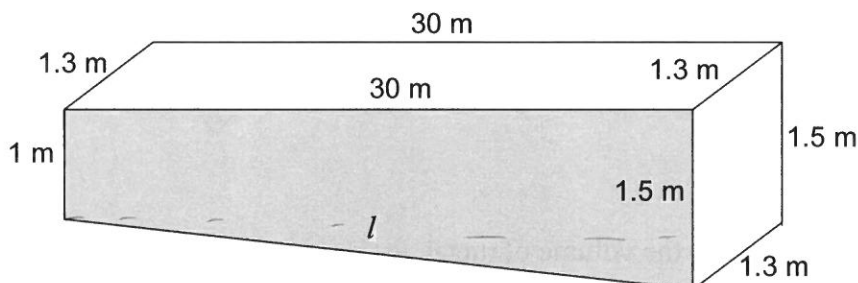


$$30^2 + 0.5^2 = l^2 \quad \checkmark$$

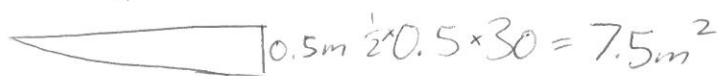
$$900.25 = l^2 \quad \checkmark$$

$$l = 30.0042 \text{ m} \quad \checkmark$$

(ii) Determine the area of the cross section of the pool as shown below. [2 marks]



$$1 \text{ m} \times 30 \text{ m} = 30 \text{ m}^2 \quad \checkmark$$



$$0.5 \text{ m} \times 0.5 \times 30 = 7.5 \text{ m}^2 \quad \checkmark$$

$$37.5 \text{ m}^2 \quad \checkmark$$

(iii) Determine the number of kilolitres of water required to fill the pool given one kilolitre =  $1 \text{ m}^3$ . [3 marks]

$$37.5 \text{ m}^2 \times 1.3 \text{ m} = 48.75 \text{ m}^3 \quad \checkmark$$

$$\times 1$$

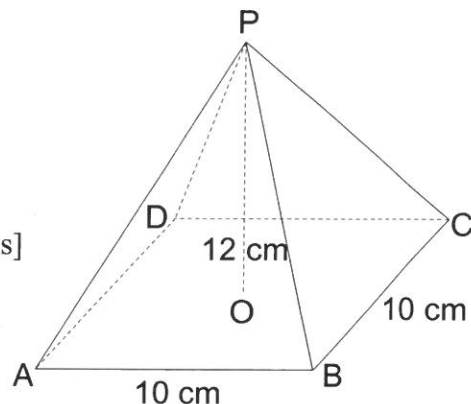
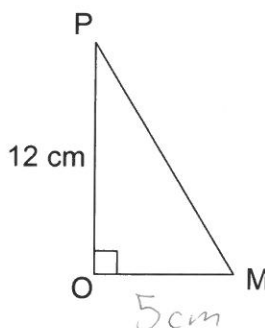
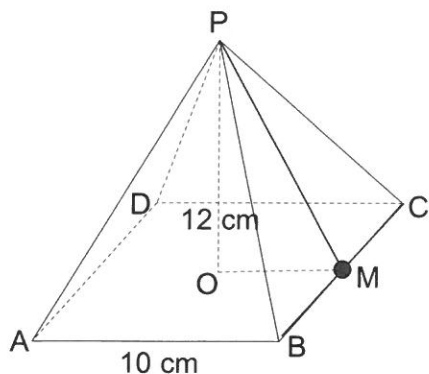
$$48.75 \text{ kL} \quad \checkmark$$



9. [7 marks]

Consider the square based pyramid of perpendicular height 12 cm and base of length 10 cm.

- (i) Let  $M$  be the midpoint of  $BC$ . Determine the length of  $MP$  [2 marks]



$MP = 13 \text{ cm}$  ✓

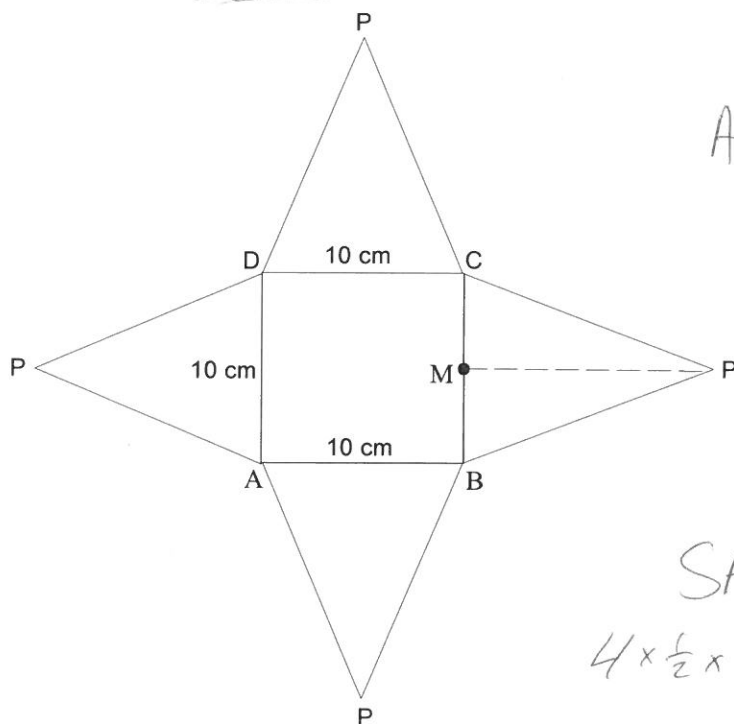
$$12^2 + 5^2 = (MP)^2$$

$$169 = x^2$$

$$13 = x$$

- (ii) Hence find the surface area and volume of the square based pyramid. [5 marks]

[5 marks]



Area of base =  $10 \text{ cm} \times 10 \text{ cm}$   
 $= 100 \text{ cm}^2$

$\frac{100 \text{ cm}^2 \times 12 \text{ cm}}{3} = 400 \text{ cm}^3$  ✓

SA =  $360 \text{ cm}^2$  ✓  
 $4 \times \frac{1}{2} \times 10 \times 13 + 10 \times 10$  ✓

- End of Test -

