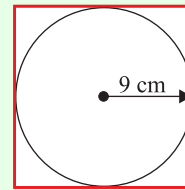


**AREA & VOLUME (Q 1, PAPER 2)**

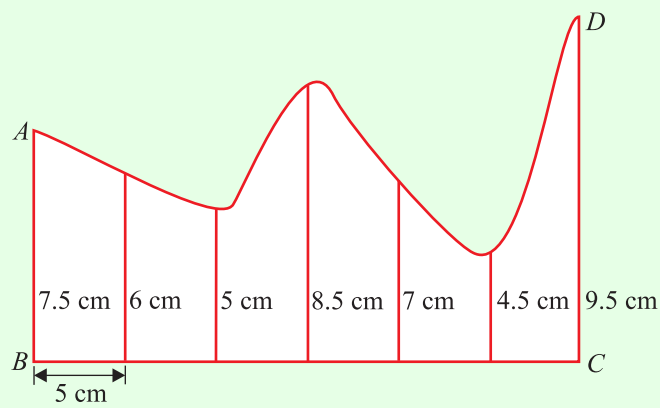
**2010**

- 1 (a) A circle is inscribed in a square as shown.  
The radius of the circle is 9 cm.



- (i) Find the perimeter of the square.  
(ii) Calculate the area of the square.

- (b) The diagram shows a sketch of a field  $ABCD$  that has one uneven edge. At equal intervals of 5 m along  $[BC]$ , perpendicular measurements are made to the uneven edge, as shown on the sketch.

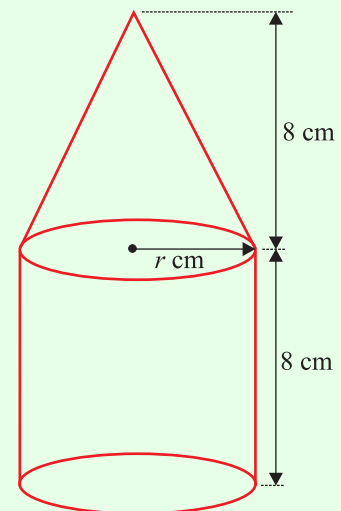


- (i) Use Simpson's rule to estimate the area of the field.  
(ii) The actual area of the field is  $200 \text{ m}^2$ .  
Find the percentage error in the estimate.
- (c) The diameter of a solid metal sphere is 9 cm.

- (i) Find the volume of the sphere in terms of  $\pi$ .

The sphere is melted down. All of the metal is used to make a solid shape which consists of a cone on top of a cylinder, as shown in the diagram.

The cone and the cylinder both have height 8 cm.  
The cylinder and the base of the cone both have radius  $r$  cm.



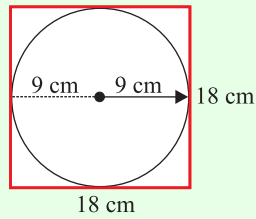
- (ii) Calculate  $r$ , correct to one decimal place.

**SOLUTION**

**1 (a)**

$$P = 4l = 4(18) = 72 \text{ cm}$$

$$A = l^2 = 18^2 = 324 \text{ cm}^2$$



**SQUARE**

$l$ : Length

$A = l \times l = l^2$
$P = 4l$

**1 (b) (i)**

$$A \approx \frac{5}{3}[(7.5 + 9.5) + 4(6 + 8.5 + 4.5) + 2(5 + 7)]$$

$A \approx \frac{h}{3} [(First + Last) + 4(Evens) + 2(Remaining Odds)]$
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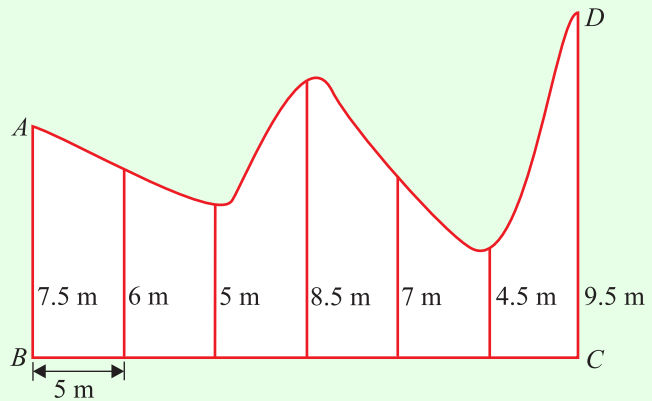
$$\approx \frac{5}{3}[(17) + 4(19) + 2(12)]$$

$$\approx \frac{5}{3}[17 + 76 + 24]$$

$$\approx \frac{5}{3}[117]$$

$$\approx 5[39]$$

$$\approx 195 \text{ m}^2$$



**1 (b) (ii)**

$$\text{Absolute Error} = 200 \text{ m}^2 - 195 \text{ m}^2 = 5 \text{ m}^2$$

$$\text{True Value} = 200 \text{ m}^2$$

$$\% \text{ Error} = \frac{195}{200} \times 100\% = 2.5\%$$

$\% \text{ Error} = \frac{\text{Absolute Error}}{\text{True Value}} \times 100\%$
---

**1 (c) (i)**

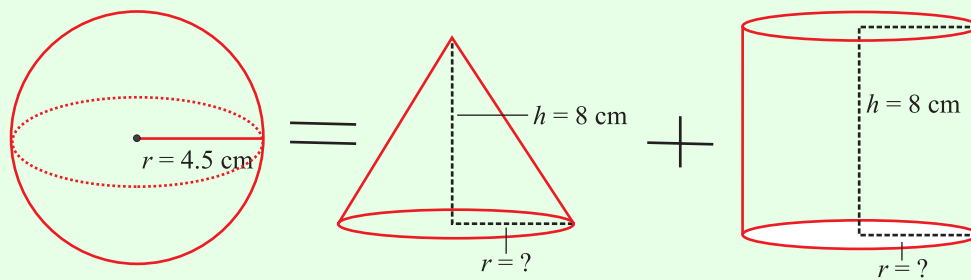
$$r = 4.5 \text{ cm}$$

$$V = \frac{4}{3} \pi r^3 \Rightarrow V = \frac{4}{3} \pi (4.5)^3 = 121.5 \pi \text{ cm}^3$$

**SPHERE**

$V = \frac{4}{3} \pi r^3$
Curved SA: $A = 4\pi r^2$

**1 (c) (ii)**



**CYLINDER**

$V = \pi r^2 h$   
Curved SA:  $A = 2\pi rh$   
Total SA:  $A = 2\pi rh + 2\pi r^2$

A diagram of a cylinder with radius  $r$  and height  $h$ .

**CONE**

$V = \frac{1}{3}\pi r^2 h$   
Curved SA:  $A = \pi rl$   
Total SA:  $A = \pi rl + \pi r^2$

A diagram of a cone with height  $h$ , radius  $r$ , and slant height  $l$ .

Volume of sphere = Volume of cone + Volume of cylinder

$$121.5\pi = \pi r^2(8) + \frac{1}{3}\pi r^2(8)$$

$$121.5 = 8r^2 + \frac{8}{3}r^2$$

$$121.5 = \frac{32}{3}r^2$$

$$\frac{729}{64} = r^2$$

$$\therefore r = \sqrt{\frac{729}{64}} = \frac{27}{8} = 3.4 \text{ cm}$$