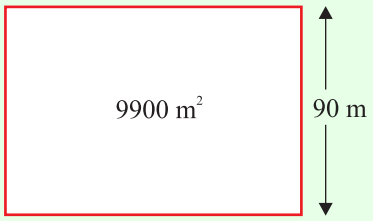
Area & Volume (Q 1, Paper 2)

2009

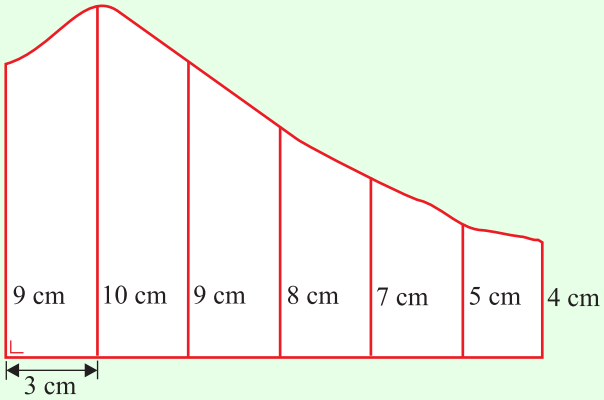
1 (a) The area of a rectangular playing pitch is 9900 m^2.
The width of the playing pitch is 90 m.



(i) Find the length of the playing pitch.

(ii) Find the perimeter of the playing pitch.

(b) The sketch shows the garden of a house. At equal intervals of 3 m along one side, perpendicular measurements are made to the boundary, as shown on the sketch.

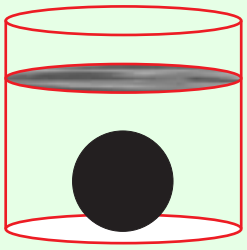


(i) Use Simpson's rule to estimate the area of the garden.

(ii) The owner of the house digs an ornamental pond in the garden. The surface area of the pond is 7 m^2.
What percentage of the area of the garden is taken up by the pond?
Give your answer correct to the nearest percent.

(c) (i) The volume of a sphere is 36π cm^3.
Find the radius of the sphere.

(ii) When the sphere is fully immersed in a cylinder of water, the level of the water rises by 2·25 cm.
Find the radius of the cylinder.



Solution

1 (a)

$A = 9900$ m^2

$b = 90$ m

$$A = l \times b$$
$$P = 2l + 2b = 2(l + b)$$

1 (a) (i)

$l = ?$

$$l = \frac{A}{b} = \frac{9900 \text{ m}^2}{90 \text{ m}} = 110 \text{ m}$$

1 (a) (ii)

$P = ?$

$P = 2(l + b) = 2(110 + 90) = 2(200) = 400$ m

2 (b) (i)

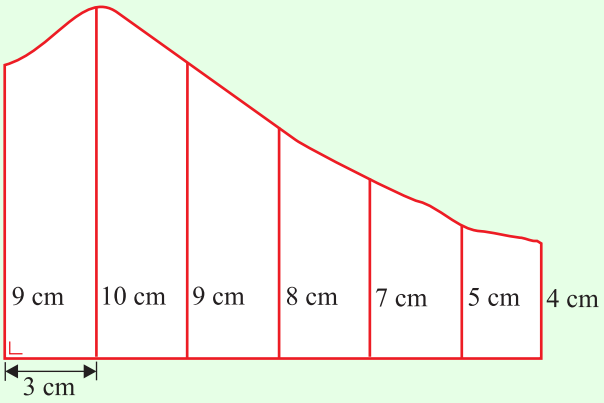
$h \approx \frac{3}{3}[(9+4)+4(10+8+5)+2(9+7)]$

$\approx 1[(13)+4(23)+2(16)]$

$\approx [13+92+32]$

$\approx 137 \text{ m}^2$

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



2 (b) (ii)

Percentage Area of pond:

$\frac{7}{137} \times 100\% \approx 5\%$

1 (c) (i)

$V = 36\pi \text{ cm}^3$

$r = ?$

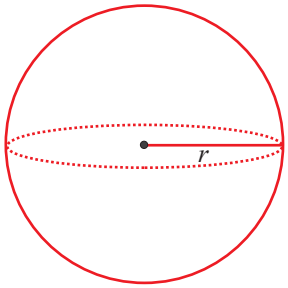
$V = \frac{4}{3}\pi r^3 \Rightarrow 36\pi = \frac{4}{3}\pi r^3$

$9 = \frac{1}{3}r^3$

$27 = r^3$

$3 = r$

SPHERE

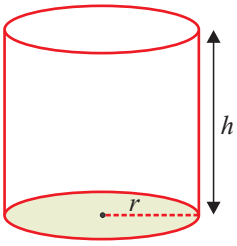


$V = \frac{4}{3}\pi r^3$

Curved SA: $A = 4\pi r^2$

1 (c) (ii)

CYLINDER



$V = \pi r^2 h$

Curved SA: $A = 2\pi rh$

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

Cylinder of water:

$V = 36\pi \text{ cm}^3$

$h = 2.25 \text{ cm}$

$V = \pi r^2 h \Rightarrow 36\pi = \pi r^2 (2.25)$

$\frac{36}{2.25} = r^2$

$16 = r^2$

$\therefore r = 4 \text{ cm}$