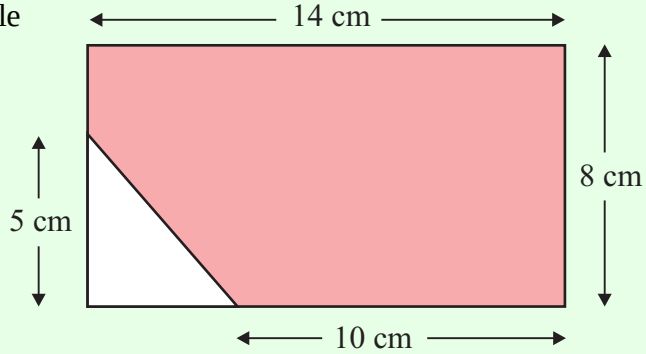
Area & Volume (Q 1, Paper 2)

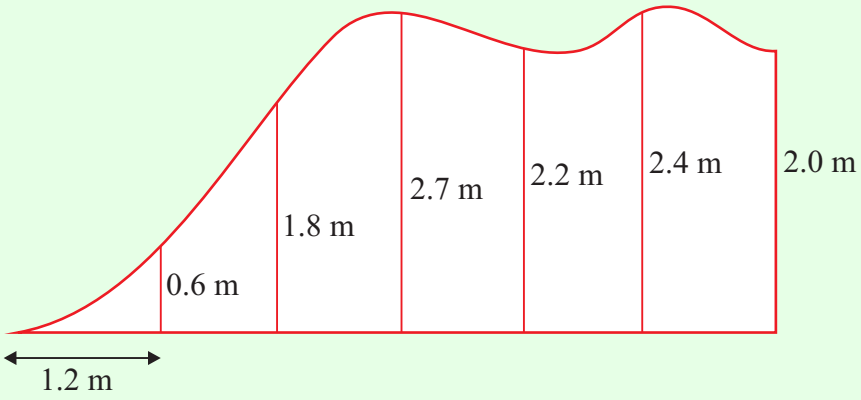
2011

1. (a) (i) Calculate the area of the rectangle shown in the diagram.

(ii) Hence, calculate the area of the shaded region.



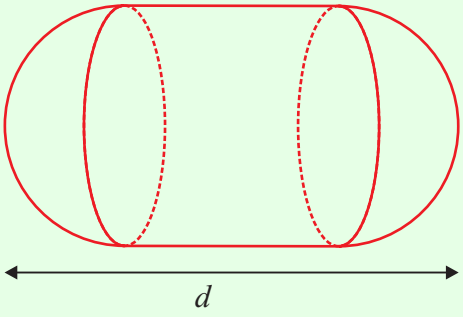
(b) The sketch shows a section of a wall that is to be painted.
At equal intervals of 1.2 m along the bottom of the wall, perpendicular measurements are made to the uneven edge, as shown on the sketch.



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

(ii) How many litres of paint are required to paint the section of the wall, if 1 litre of paint covers an area of 2.2 m^2? Give your answer correct to the nearest litre.

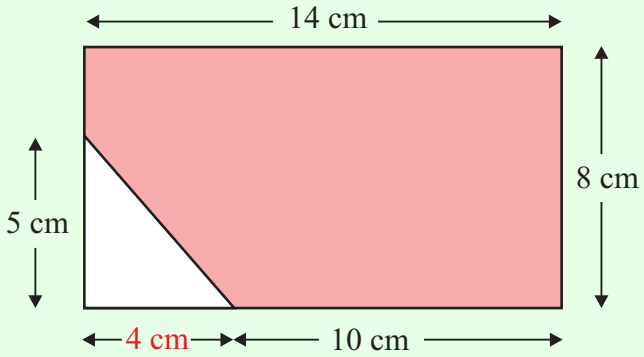
(c) A solid object consists of a cylinder with hemispherical ends, as shown.
The cylinder and hemispheres have the same radius.
The volume of each hemisphere is 144π cm^3.



(i) Find the radius of each hemisphere.

(ii) The total volume of the object is 144π cm^3.
Find d, the length of the object.

1 (a) (i)



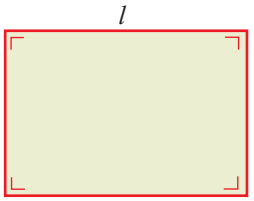
Area of rectangle:

$l = 14$ cm

$b = 8$ cm

$A = 14 \times 8 = 112$ cm^2

RECTANGLE



l: Length
b: Breadth

$A = l \times b$

$P = 2l + 2b = 2(l + b)$

1 (a) (ii)

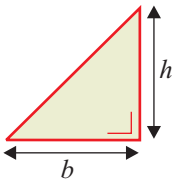
Area of right-angled triangle:

$h = 5$ cm

$b = 4$ cm

$A = \frac{1}{2} \times 5 \times 4 = 10$ cm^2

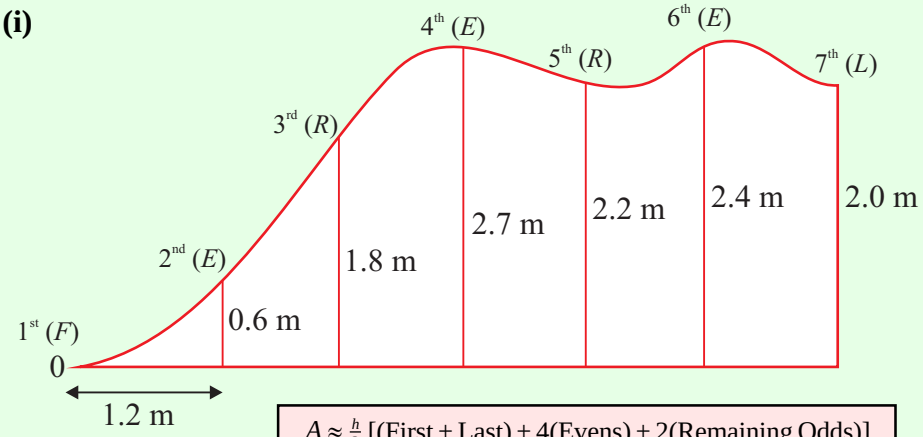
RIGHT-ANGLED TRIANGLES



$A = \frac{1}{2}bh$

Shaded area = 112 cm^2 – 20 cm^2 = 102 cm^2

1 (b) (i)



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

$h = 1.2$ m

$A \approx \frac{1.2}{3}[(0 + 2) + 4(0.6 + 2.7 + 2.4) + 2(1.8 + 2.2)]$

$\approx 0.4[2 + 4(5.7) + 2(4)]$

$\approx 0.4[2 + 22.8 + 8]$

$\approx 0.4[32.8]$

$\approx 0.4[32.8]$

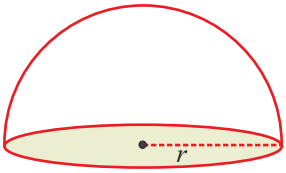
≈ 13.12 m^2

1 (b) (ii)

$$\text{Number of litres} = \frac{13.12\ \text{m}^2}{2.2\ \text{m}^2} \approx 6 \text{ litres}$$

1 (c) (i)

HEMISPHERE



$V = \frac{2}{3}\pi r^3$

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

Total SA: $A = 3\pi r^2$

$V = 144\pi \text{ cm}^3$

$\therefore \frac{2}{3}\pi r^3 = 144\pi$

$r^3 = 144 \times \frac{3}{2}$

$r^3 = 216$

$r = \sqrt[3]{216} = 6 \text{ cm}$

1 (c) (ii)

Total volume = Volume of 2 hemisperes + Volume of cylinder V_C

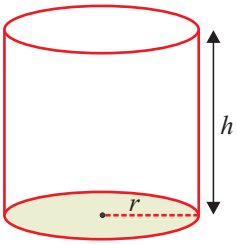
$\therefore 720\pi = 2 \times 144\pi + V_C$

$720\pi = 288\pi + V_C$

$720\pi - 288\pi = V_C$

$\therefore V_c = 432\pi \text{ cm}^3$

CYLINDER



$V = \pi r^2 h$

Curved SA: $A = 2\pi rh$

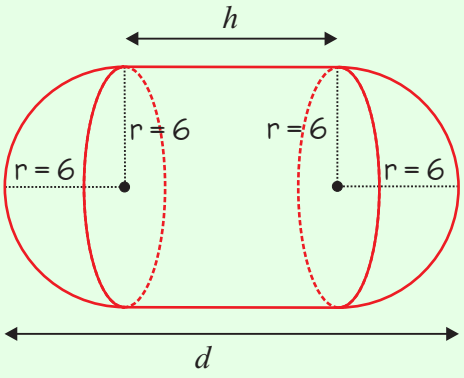
Total SA: $A = 2\pi rh + 2\pi r^2$

$V_c = 432\pi \text{ cm}^3$

$\therefore \pi(6)^2 h = 432\pi$

$36h = 432$

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



d = 6 cm + 12 cm + 6 cm = 24 cm