Volume surface area class 8th

Example 1: A wall in the form of a rectangle has base 15m and height 10m. If the cost of painting the wall is Rs. 16 per square metre, find the cost for painting the entire wall.

Solution: Let $b = 15$ and $h = 10$.

Then the area of the rectangle $= b \times h = 15 \times 10$

$= 150$ sq. metres.

Since the cost of painting 1sq. metre is Rs. 16,

the cost for painting the entire wall $= 16 \times 150 =$ Rs. 2400.

Figure 2.12

Example 2: The dimensions of a rectangular metal sheet are 4m × 3m. The sheet is to be cut into square sheets each of side 4 cm. Find the number of square sheets.

Solution: Area of the metal sheet $= 400 \times 300 = 12{,}0000$ cm^2.

Area of a square sheet $= 4 \times 4 = 16$ cm^2.

$\therefore$ No. of square sheets $= \dfrac{12{,}0000}{16} = 7500$.

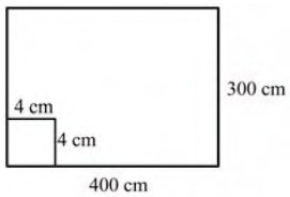


Figure 2.13

Example 3: Find the base of a parallelogram if its area is 40 cm^2 and altitude is 15 cm.

Solution: Area $= b \times h$. $\therefore$ $40 = b \times 15$.

$\therefore \quad b = \dfrac{40}{15} = \dfrac{8}{3}$.

$\therefore \quad$ Base $= \dfrac{8}{3}$ cm.

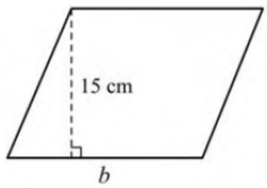


Figure 2.14

Example 4: If the lengths of the sides of a triangle are 11 cm, 60 cm and 61 cm, find the area and perimeter of the triangle.

Solution: Area $= \sqrt{s(s-a)(s-b)(s-c)}$.

Here $2s = a + b + c = 11 + 60 + 61 = 132$.

$\therefore$ $s = 66$, $s - a = 66 - 11 = 55$,

$s - b = 66 - 60 = 6$, $s - c = 66 - 61 = 5$.

$\therefore$ Area $= \sqrt{66 \times 55 \times 6 \times 5} = 330$ sq.cm.

Perimeter $= a + b + c = 11 + 60 + 61 = 132$ cm.

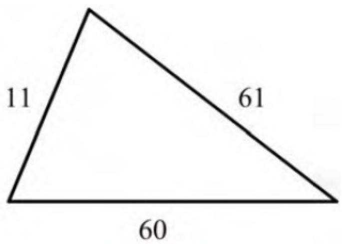


Figure 2.15

Example 5: Find the area of the quadrilateral *ABCD* given in Figure 2.16.

Solution: Area $= \dfrac{1}{2} d(h_1 + h_2) = \dfrac{1}{2} \times 50 \times (10 + 20)$

$= 25 \times 30$

$= 750$ m^2

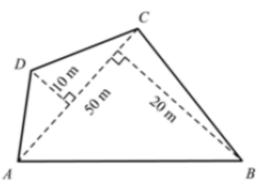


Figure 2.16

The perimeter of a rhombus is 20 cm. One of the diagonals is of length 8 cm. Find the length of the other diagonal and the area of the rhombus.

Solution: Let d_1 and d_2 be the lengths of the diagonals.

Then perimeter = $2\sqrt{d_1^{\ 2} + d_2^{\ 2}}$. But the perimeter is 20 cm. $\therefore$ $2\sqrt{d_1^{\ 2} + d_2^{\ 2}}$ = 20 cm or $d_1^{\ 2} + d_2^{\ 2}$ = 100. Here one of the diagonals is of length 8 cm. Take $d_1 = 8$. Then $64 + d_2^2 = 100$ or $d_2^2 = 36$. $\therefore$ $d_2 = 6$ cm. The area of the rhombus is $\frac{1}{2}\ d_1 \times d_2 = \frac{1}{2} \times 8 \times 6 = 24$ cm^2.

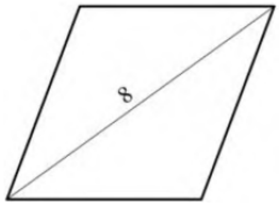


Figure 2.19

A wire of length 264 cm is cut into two equal portions. One portion is bent in the form of a circle and the other in the form of an equilateral triangle. Find the ratio of the areas enclosed by them.(use $\pi \approx \frac{22}{7}$)

Solution: Perimeter of the circle = $\frac{264}{2}$ =132 cm.

But perimeter of the circle = $2\pi r$.

$\therefore\ 2 \times \frac{22}{7} \times r = 132$ or $r = 21$ cm.

$\therefore$ Area of the circle = $\pi r^2 = \frac{22}{7} \times 21 \times 21 = 1386$ cm^2.

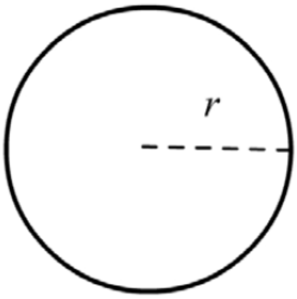


Figure 2.20

Perimeter of the equilateral triangle = $3a$

But perimeter = 132 cm. $\therefore$ $3a = 132$ or $a = 44$ cm.

$\therefore$ Area of the equilateral triangle = $\frac{\sqrt{3}}{4} \times a^2$

$$= \frac{\sqrt{3}}{4} \times 44^2 = 484\ \sqrt{3}\ \text{cm}^2$$

$\therefore$ The ratio of the area of circle to that of the equilateral triangle

$$= 1386 : 484\sqrt{3} = 21\sqrt{3} : 22$$

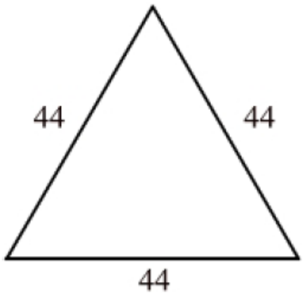
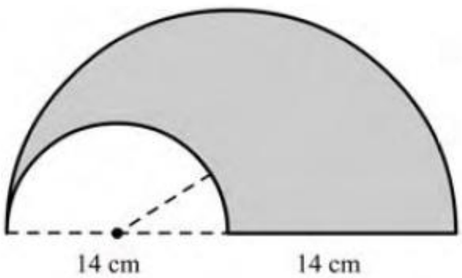


Figure 2.21

Find the area of the shaded portion



Solution: The area of the shaded portion is equal to
the area of the semicircle of radius 14 cm minus the area of the semicircle of radius 7 cm.

That is, $\frac{1}{2} \times \pi \times (14)^2 - \frac{1}{2} \times \pi \times (7)^2$

or $\frac{1}{2} \times \frac{22}{7} \times 14 \times 14 - \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 11 \times 2 \times 14 - 11 \times 7$

$= 308 - 77 = 231 \text{ cm}^2.$

Find the area of the design as in Figure 2.42. (Take $\pi \approx \frac{22}{7}$)

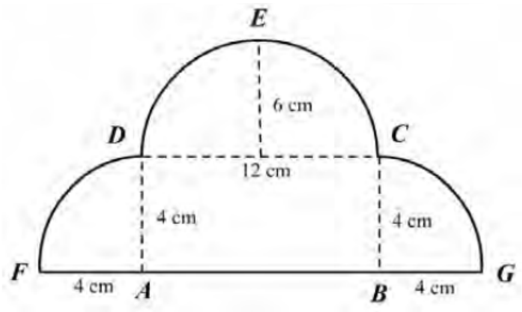


Figure 2.42

Solution: We observe that the plot is the combination of the rectangle *ABCD*, the semi-circle *CDE* and the quadrant circles *AFD*, *BCG*.

The area of the rectangle $ABCD = 12 \times 4 = 48 \text{ cm}^2$.

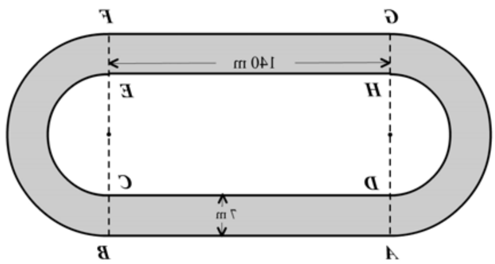
The area of the semi-circle $CDE = \frac{1}{2}\pi \times 6 \times 6 = \frac{22}{7} \times 3 \times 6 = \frac{396}{7} = 56\frac{4}{7} \text{ cm}^2$.

The area of the quadrant circle $AFD = \frac{1}{4}\pi \times 4 \times 4 = \frac{22}{7} \times 4 = \frac{88}{7} = 12\frac{4}{7} \text{ cm}^2$.

The area of the quadrant circle $BCG = 12\frac{4}{7} \text{ cm}^2$.

$\therefore$ The area of the given plot $= 48 + 56\frac{4}{7} + 12\frac{4}{7} + 12\frac{4}{7} = 128\frac{12}{7} = 129\frac{5}{7} \text{ cm}^2$.

A running track of 7m wide is as shown in Figure 2.46. The inside perimeter is 720m and the length of each straight portion is 140m. The curved portions are in the form of semi-circles. Find the area of the track



Solution: Let *r* be the radius of the inner semicircles. Then the inside perimeter is
$2 \times 140 + 2 \times (\pi \times r)$ or $280 + 2\pi r$. But this is given as 720m.
$\therefore 280 + 2\pi r = 720$ or $2\pi r = 440$ or $r = 70$m So the radius of the inner semicircle r = 70m. ∴The radius of the outer semicircle R = 70 + 7 = 77m.
the area of one semi-circular track

$$= \frac{1}{2}\pi(R^2 - r^2) = \frac{1}{2} \times \frac{22}{7}(77^2 - 70^2) = \frac{11}{7} \times 147 \times 7 = 1617 \text{ sq.m}$$

The area of one rectangular track = 140 × 7 = 980 sq. m.

$\therefore$ Area of the track = 2 × 1617 + 2 × 980 = 3234 + 1960 = 5194 sq.m.