

1. Find the third side of each right triangle with legs a and b and hypotenuse c .

(i) $a = 3, b = 4, c = ?$

(ii) $a = 5, c = 13, b = ?$

(iii) $b = 5, c = 61, a = ?$

Solution:

(i) $a = 3$

$$b = 4$$

$$c = ?$$

$$c^2 = a^2 + b^2 \quad \text{By Pythagoras theorem}$$

$$c^2 = (3)^2 + (4)^2 \quad \text{Putting values of } a, b$$

$$c^2 = 9 + 16$$

$$c^2 = 25$$

$$\sqrt{c^2} = \sqrt{25} \quad \text{Taking square root}$$

$$\boxed{c=5}$$

(ii) $a = 5, \quad c = 13, \quad b = ?$

By Pythagoras theorem

$$c^2 = a^2 + b^2$$

$$b^2 = c^2 - a^2 \quad \text{or}$$

Putting values of a, c

$$b^2 = (13)^2 - (5)^2$$

$$b^2 = 169 - 25$$

$$b^2 = 144$$

$$\sqrt{b^2} = \sqrt{144} \quad \text{Taking square root}$$

$$\boxed{b=12}$$

(iii) $b = 5$

$$c = 61$$

$$a = ?$$

By Pythagoras theorem

$$c^2 = a^2 + b^2$$

$$a^2 = c^2 - b^2 \quad \text{therefore}$$

Putting values of b, c

$$a^2 = (61)^2 - (5)^2$$

$$a^2 = 3721 - 25$$

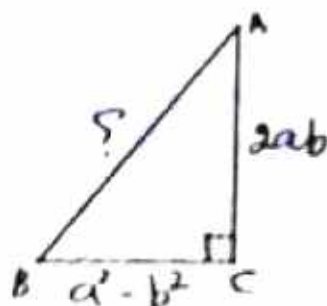
$$a^2 = 3696$$

$$a^2 = 3696 \quad \text{Taking square root}$$

$$\sqrt{a^2} = \sqrt{16 \times 231}$$

$$a = 4\sqrt{231}$$

2. If the legs of a right triangle are $2ab$ and $a^2 - b^2$, prove that hypotenuse is $a^2 + b^2$.



Sol

one side = $2ab$

2nd side = $a^2 - b^2$

Hypotenuse = ?

By Pythagoras theorem

$$(\text{Hypotenuse})^2 = (2ab)^2 + (a^2 - b^2)^2$$

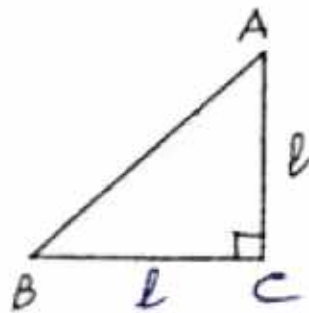
$$\begin{aligned} \text{Hypotenuse} &= \sqrt{(a^2 - b^2)^2 + (2ab)^2} \\ &= \sqrt{a^4 + b^4 - 2a^2b^2 + 4a^2b^2} \end{aligned}$$

$$= \sqrt{a^4 + b^4 + 2a^2b^2}$$

$$= \sqrt{(a^2 + b^2)^2}$$

$$\text{Hypotenuse} = (a^2 + b^2)$$

3. Find the hypotenuse of the right isosceles triangle each of whose legs is l .



Sol:

$$m\overline{AC} = l$$

$$m\overline{BC} = l$$

$$m\overline{AB} = ?$$

By Pythagoras theorem

$$(m\overline{AB})^2 = (m\overline{AC})^2 + (m\overline{BC})^2$$

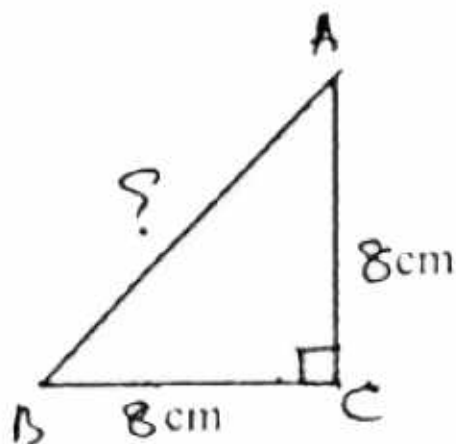
$$= l^2 + l^2$$

$$= 2l^2$$

$$\sqrt{m\overline{AB}^2} = \sqrt{2l^2} \quad \text{Taking square root}$$

$$m\overline{AB} = \sqrt{2} l \text{ units}$$

4. Find the hypotenuse of a right isosceles triangle whose legs are 8cm



Sol:

$$a = 8 \text{ cm} \quad \text{here}$$

$$b = 8 \text{ cm}$$

$$c = ?$$

By Pythagoras theorem

$$c^2 = a^2 + b^2$$

Putting values of a, b

$$c^2 = (8)^2 + (8)^2$$

$$c^2 = 64 + 64$$

$$c^2 = 128$$

$$\sqrt{c^2} = \sqrt{128} \quad \text{Taking square root}$$

$$c = \sqrt{8 \times 8 \times 2}$$

$$c = 8\sqrt{2} \text{ cm}$$

5. If the numbers represent the lengths of the sides of a triangle, which triangles are right triangles?

- (i) 3, 4, 5
- (ii) 9, 17, 25
- (iii) 11, 61, 60

Sol: Length of sides 3, 4, 5

We observe that, is the square of big side equal or not equal the square of the other two sides? Then these sides will be right angle Δ otherwise not.

$$\begin{array}{c|c} (5)^2 = 25 & (3)^2 + (4)^2 \\ & = 9 + 16 \\ & = 25 \end{array}$$

These sides are sides of right angle Δ .

(ii)

$$\begin{array}{c|c} (25)^2 & (9)^2 + (17)^2 \\ = 625 & = 81 + 289 \\ & = 370 \\ 625 \neq 370 \end{array}$$

Sides 9, 17, 25 are not the sides of right angle triangle.

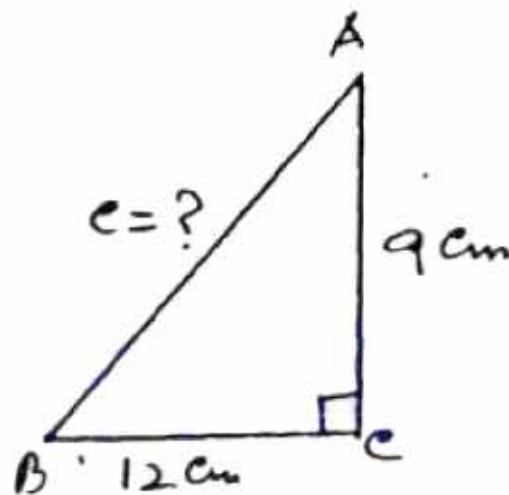
(iii)

$$\begin{array}{c|c} (61)^2 & (11)^2 + (60)^2 \\ = 3721 & = 121 + 3600 \\ & = 3721 \end{array}$$

Sides 11, 61, 60 are the sides of right angle triangle.

6. $\triangle ABC$ is right angled at C . If $m\overline{AC} = 9\text{ m}$ and $m\overline{BC} = 12\text{ m}$, find the length $\overline{AB}$, using Pythagoras theorem.

Sol. In $\triangle ABC$



$$b = 9\text{ cm}$$

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

$$c = ?$$

By Pythagoras theorem

$$c^2 = a^2 + b^2$$

Putting values of a, b

$$c^2 = (12)^2 + (9)^2$$

$$= 144 + 81$$

$$c^2 = 225$$

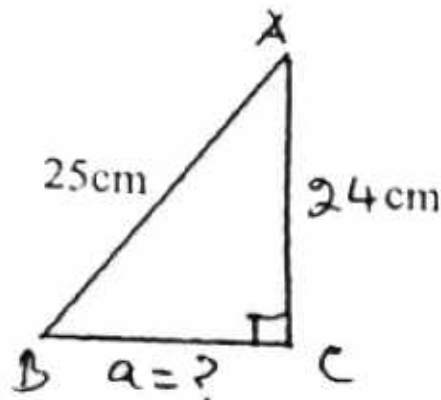
$$\sqrt{c^2} = \sqrt{225}$$

Taking square root

$$\boxed{c = 15}\text{ cm}$$

7. The hypotenuse of a right triangle is 25cm. If one of the sides are of length 24cm, find the length of the other side.

Sol:



$$c = 25 \text{ cm} \quad \text{here}$$

$$b = 24 \text{ cm}$$

$$a = ?$$

By Pythagors theorem

$$c^2 = a^2 + b^2$$

$$a^2 = c^2 - b^2 \quad \text{or}$$

Putting values of b, c

$$a^2 = (25)^2 - (24)^2$$

$$= 625 - 576$$

$$a^2 = 49$$

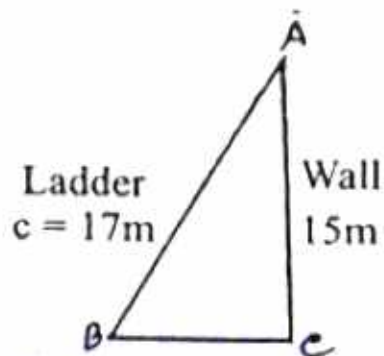
$$\sqrt{a^2} = \sqrt{49}$$

Taking square root

$$\boxed{a = 7 \text{ cm}}$$

8. A ladder 17m long when set against the wall of a house just reaches a window at a height of 15m from the ground. How far is the lower end of the ladder from the base of the wall?

Sol:



Lower end of the ladder from the wall = a

$$b = 15\text{m} \quad \text{here}$$

$$c = 17\text{m}$$

$$a = ?$$

By Pythagoras theorem

$$a^2 = c^2 - b^2$$

Putting values of c, b

$$a^2 = (17)^2 - (15)^2$$

$$= 289 - 225$$

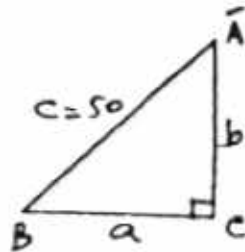
$$a^2 = 64$$

$$\sqrt{a^2} = \sqrt{64} \quad \text{Taking square root}$$

$$\boxed{a = 8} \text{m}$$

9. The two legs of a right triangle are equal and the square of the hypotenuse is 50. Find the length of each leg.

Sol:



$$c = 50 \quad \text{here}$$

$$a = b$$

By Pythagoras theorem

$$c^2 = a^2 + b^2$$

$$c^2 = a^2 + a^2 \quad (a = b)$$

$$c^2 = 2a^2$$

$$2a^2 = c^2 \quad \text{or}$$

Putting values of c^2

$$2a^2 = (50)^2$$

$$a^2 = \frac{2500}{2}$$

$$a^2 = 1250$$

$$\sqrt{a^2} = \sqrt{1250} \quad \text{taking square root}$$

$$a = \sqrt{625 \times 2}$$

$$a = 25\sqrt{2}$$

Length of each side = $25\sqrt{2}$ units

10. The sides of a triangle are 15cm, 36cm and 39cm. Show that it is a right angled triangle.

Sol:

The length of big side = 39 cm

The length of small side = 15cm, 36cm

$$(\text{Lengths of big side})^2 = (39)^2$$

$$= 1521 \quad (\text{i})$$

$$\text{The sum of the square of small sides} = (15)^2 + (36)^2$$

$$= 225 + 1296$$

$$\text{Now its prove that} = 1521 \quad (\text{ii})$$

These lengths are the lengths of right angle triangle.

Area

The surface inside the boundary of a shape is called area.

We see that, Is the big side of square equal or not equal the square of the other two sides? Then these sides will be sides of right angle triangle otherwise not.

Area of a Triangle when all the three sides are given

A triangle ABC with sides a, b, c and

$$2S = a + b + c \Rightarrow S = \frac{a + b + c}{2},$$

where 'S' is half the perimeter of a triangle.

Then area of any triangle is $A = \sqrt{S(S-a)(S-b)(S-c)}$.

This is called **Hero's Formula** for finding the area of a triangle.



1. A verandah 40m long, 15m wide is to be paved with stones each measuring 6cm by 5cm. Find the number of stones.

Sol: Length of verandah = 40m

Width of verandah = 15m

$$\text{Area of veranda} = 40 \times 15$$

$$= 600 \text{ sq. m}$$

$$\text{Area of one stone} = 6 \times 5 \quad \text{Now}$$

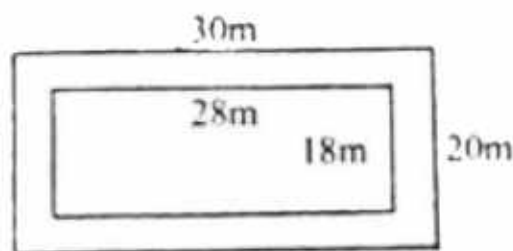
$$= 30 \text{ sq. m}$$

$$\begin{aligned} \text{Number of stones} &= \frac{\text{Total area}}{\text{area of one stone}} \\ &= \frac{600}{30} \end{aligned}$$

$$\text{Number of stones} = 20 \text{ tiles}$$

2. How many tiles of 40cm^2 will be required to pave the footpath 1m wide carried round the outside of a grassy plot 28m by 18m?

Sol: Tiles fixed round the out side of a plot therefore,



$$\text{External length} = 28 + 1 + 1$$

$$= 30 \text{ m}$$

$$\text{External width} = 18 + 1 + 1$$

$$= 20 \text{ m}$$

$$\text{Area of plot with path} = 30 \times 20$$

$$= 600 \text{ sq m}$$

$$\text{The area of plot} = 28 \times 18$$

$$= 504 \text{ sq m}$$

$$\text{Area of path} = 600 - 504$$

$$= 96 \text{ sq m}$$

$$\text{Area of one tile} = 40 \text{ sq m}$$

$$= \frac{40}{100 \times 100} \text{ sq m}$$

$$\text{Number of tiles} = \frac{\text{Area of Path}}{\text{area of one tile}}$$

$$= \frac{96}{40}$$

$$= \frac{100 \times 100}{100 \times 100}$$

$$= \frac{2400 \times 100 \times 100}{40}$$

$$\text{Number of tiles} = 24000$$

3. Find the area of a room 5.49m long and 3.87m wide. What is the cost of carpeting the room if the rate of carpet is Rs. 10.50 per m^2 ?

Sol. Length of room = 5.49m

Width of room = 3.87m

Area of room = Length $\times$ Width

$$= 5.49 \times 3.87$$

$$= 21.2463 \text{ sq. m}$$

Cost of carpeting one square m = Rs. 10.50

Cost of carpeting 21.2463 sq m = 10.50×21.2463

$$= 223.08615$$

Cost of carpeting = Rs. 223 Approx

4. The area of a rectangular rice field is 2.5 hectares and its sides are in the ratio 3 : 2. Find the perimeter of the field.

Area of field = 2.5 hectares

Area of field = 25000 sq. m

Length of field = $3x$ m

Width of field = $2x$ m and

$$\text{Area} = 3x \times 2x$$

$$\text{Area} = 6x^2 \text{ sq. m}$$

from (i) and (ii)

$$6x^2 = 25000$$

$$x^2 = \frac{25000}{6}$$

$$x^2 = 4166.67 \text{ Taking square root}$$

$$x = 64.55$$

$$\text{Length } 3x = 193.65$$

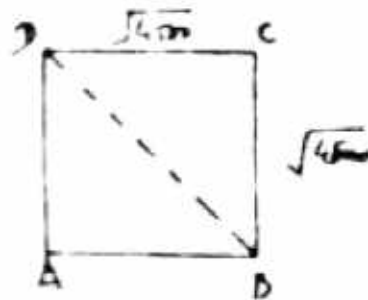
$$\text{Width } 2x = 129.10$$

$$\text{Perimeter} = 2(3x + 2x) = 2(193.65 + 129.10)$$

$$= 2(322.75)$$

$$= 645.50 \text{ m}$$

5. The area of a square playground is 4500 m^2 . How long will a man take to cross it diagonally at the speed of 3 km per hour?



$$= 4500 \text{ sq m}$$

$$= \sqrt{4500} \text{ m}$$

$$\text{Length of diagonal of a square} = m\overline{BD} = \sqrt{(\sqrt{4500})^2 + (\sqrt{4500})^2}$$

$$\text{By Pythagoras theorem} : 4500 + 4500$$

$$= \sqrt{9000}$$

$$m\overline{BD} = 94.87 \text{ m}$$

$$\text{Time spent to cross } 3 \text{ km distance} = 60 \text{ min}$$

$$\text{Time spent to cross } 3000 \text{ km distance} = 60 \text{ min}$$

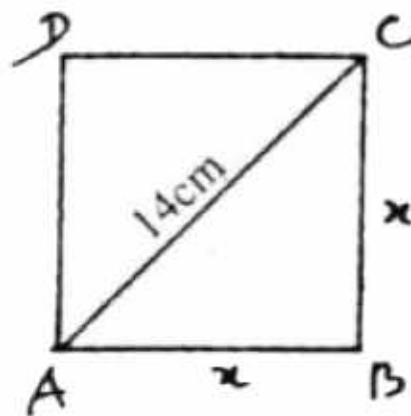
$$\text{Time spent to cross } 94.87 \text{ m distance} = \frac{60}{3000} \times 94.87 \text{ min}$$

$$= \frac{94.87}{50}$$

$$= 1.8974 \text{ min}$$

$$= 1 \text{ min } 54 \text{ sec}$$

6. The diagonal of a square is 14cm. Find its area.



Diagonal of square = 14cm

$$\begin{aligned}\text{Area of a square} &= \frac{14 \times 14}{2} \\ &= 14 \times 7 \\ &= 98 \text{ sq. cm}\end{aligned}$$

2nd method:

Suppose that side of a square = x cm

By Pythagoras theorem

$$\begin{aligned}x^2 + x^2 &= (14)^2 \\ 2x^2 &= 14 \times 14 \\ x^2 &= \frac{14 \times 14}{2} \\ &= 14 \times 7 = 98\end{aligned}$$

and x^2 is area of a square.

Thus, Area of square = 98 sq.cm

7. Find the area of a triangle whose sides are.

(i) 120cm, 150cm and 200cm

(ii) 50dm, 78dm and 112dm

Sol: $a = 200$ here

$$b = 150$$

$$c = 120$$

$$S = \frac{a+b+c}{2}$$

$$S = \frac{200+150+120}{2}$$

$$S = \frac{470}{2}$$

$$S = 235$$

$$S - a = 235 - 200 = 35$$

$$S - b = 235 - 150 = 85$$

$$S - c = 235 - 120 = 115$$

$$\text{Area of } \Delta A = A = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{235 \times 35 \times 85 \times 115}$$

$$= \sqrt{5 \times 47 \times 5 \times 7 \times 5 \times 17 \times 5 \times 23}$$

$$= \sqrt{5^2 \times 47 \times 7 \times 5^2 \times 17 \times 23}$$

$$= 5 \times 5 \sqrt{47 \times 7 \times 17 \times 23}$$

$$= 25 \sqrt{128639}$$

$$= 25 \times 358.66$$

$$= 8967 \text{ sq. cm approx}$$

(ii) $a = 112$ dm here

$$b = 78 \text{ dm}$$

$$c = 50 \text{ dm}$$

$$\begin{aligned} S &= \frac{a+b+c}{2} \\ &= \frac{112+78+50}{2} \\ &= \frac{240}{2} \end{aligned}$$

$$S = 120$$

$$\begin{aligned} \text{Area (A)} &= A = \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{120(120-112)(120-78)(120-50)} \\ &= \sqrt{120 \times 8 \times 42 \times 70} \\ A &= \sqrt{3 \times 5 \times 8 \times 8 \times 7 \times 2 \times 3 \times 7 \times 5 \times 2} \\ &= \sqrt{3^2 \times 5^2 \times 8^2 \times 7^2 \times 2^2} \\ &= 3 \times 5 \times 8 \times 7 \times 2 \\ &= 1680 \text{ sq. dm} \end{aligned}$$

8. The perimeter of a triangular field is 540m and its sides are in the ratio 25 : 17 : 12. Find the area of triangle.

Hint: Let the sides be $25x$, $17x$, $12x$ meters.

$$\text{Then } 25x + 17x + 12x = 540 \Rightarrow x = 10$$

Sol: Let sides are $25x$, $17x$, $12x$

$$\text{perimeter} = 25x + 17x + 12x$$

$$= 54x$$

$$\text{perimeter} = 540 \text{ m} \quad \text{but}$$

then $540 = 54x$

$$x = 10$$

sides $25 \times 10, 17 \times 10, 12 \times 10$

$$= 250, 170, 120 \text{ m}$$

$$\begin{aligned} S &= \frac{a+b+c}{2} \\ &= \frac{250+170+120}{2} \\ &= \frac{540}{2} = 270 \end{aligned}$$

$$S - a = 270 - 250 = 20$$

$$S - b = 270 - 170 = 100$$

$$S - c = 270 - 120 = 150$$

$$\begin{aligned} \text{Area (A)} &= A = \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{270 \times 20 \times 100 \times 150} \\ &= \sqrt{27 \times 10 \times 2 \times 10 \times 2 \times 50 \times 3 \times 50} \\ &= \sqrt{10^2 \times 2^2 \times 50^2 \times 3 \times 27} \\ &= 10 \times 2 \times 50 \times \sqrt{3 \times 27} \\ &= 1000 \times \sqrt{3 \times 3 \times 3 \times 3} \\ &= 1000 \times 3 \times 3 \\ &= 9000 \text{ sq. meter} \end{aligned}$$

9. Find the area of a parallelogram if its two adjacent sides are 12cm and 14cm and diagonal is 18cm.

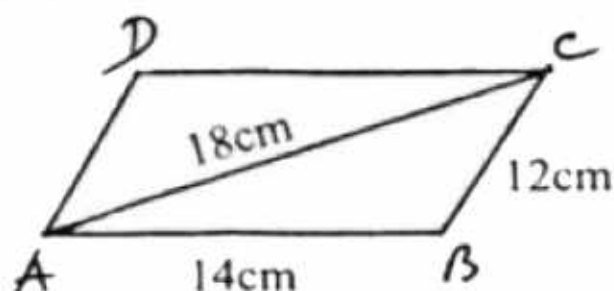
Hints:

Let ABCD is a $\parallel^m$ in which .

Find area of ΔABC .

Area of $\parallel^m = 2$ (Area of ΔABC)

Sol: Find area of ΔACB



$$a = 18 \text{ cm}$$

$$b = 14 \text{ cm}$$

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

$$S = \frac{a+b+c}{2}$$

$$S = \frac{18+14+12}{2}$$

$$S = \frac{44}{2}$$

$$S = 22$$

$$S - a = 22 - 18 = 4$$

$$S - b = 22 - 14 = 8$$

$$S - c = 22 - 12 = 10$$

$$\text{Area of } \Delta ABC = A = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{22 \times 4 \times 8 \times 10}$$

$$= \sqrt{11 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5}$$

$$= \sqrt{11 \times 2^2 \times 2^2 \times 2^2 \times 2 \times 5}$$

$$\begin{aligned}
 &= 2 \times 2 \times 2 \sqrt{110} \\
 &= 8 \sqrt{110} \text{ sq. cm} \dots\dots (i)
 \end{aligned}$$

Area of ΔACD = Area of ΔABC and

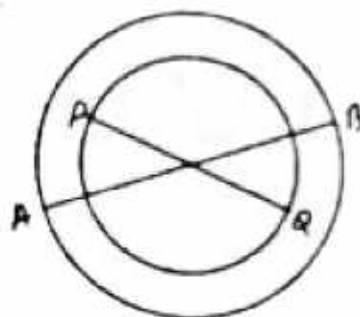
$$= 8 \sqrt{110} \text{ sq. cm} \dots\dots (ii)$$

Area of $\parallel^m ABCD$ = (i) + (ii)

$$\begin{aligned}
 &= 8 \sqrt{110} + 8 \sqrt{110} \\
 &= (8 + 8) \sqrt{110} \\
 &= 16 \sqrt{110} \text{ sq. cm}
 \end{aligned}$$

10. Find the area of the following washers whose external and internal diameters are:

- (i) 15cm and 13cm (ii) 1.2m and 0.9m
 (iii) 40mm and 33mm.



$$\begin{aligned}
 m AB &= 15 \text{ cm} \\
 m PQ &= 13 \text{ cm}
 \end{aligned}$$

Sol: External diameter = $\frac{15}{2} \text{ cm}$

Internal diameter = $\frac{13}{2} \text{ cm}$

Total area = πr^2

$$= \pi \left(\frac{15}{2} \right)^2$$

$$\text{Internal area} = \pi r^2$$

$$= \pi \left(\frac{13}{2} \right)^2$$

$$\text{Area of washers} = \pi \left(\frac{15}{2} \right)^2 - \pi \left(\frac{13}{2} \right)^2$$

$$= \pi \left[\left(\frac{15}{2} \right)^2 - \left(\frac{13}{2} \right)^2 \right]$$

$$= \frac{22}{7} \left[\frac{225}{4} - \frac{169}{4} \right]$$

$$= \frac{22}{7} \left(\frac{225 - 169}{4} \right)$$

$$= \frac{22}{7} \left(\frac{56}{4} \right)$$

$$= 44 \text{ sq cm}$$

Sol External diameter = $\frac{12}{2} = 6 \text{ m} = \frac{6}{10} \text{ m}$

$$\begin{aligned} \text{Internal diameter} &= \frac{9}{2} = \frac{9}{10 \times 2} \\ &= \frac{9}{20} \text{ m} \end{aligned}$$

$$\text{Total area} = \pi r^2$$

$$= \pi \left(\frac{6}{10} \right)^2$$

$$\text{Internal area} = \pi r^2$$

$$= \pi \left(\frac{9}{20} \right)^2$$

$$\begin{aligned}
 \text{Area of washers} &= \pi \left(\frac{6}{10} \right)^2 - \pi \left(\frac{9}{20} \right)^2 \\
 &= \pi \left[\left(\frac{6}{10} \right)^2 - \left(\frac{9}{20} \right)^2 \right] \\
 &= \frac{22}{7} \left[\frac{36}{100} - \frac{81}{400} \right] \\
 &= \frac{22}{7} \left[\frac{144 - 81}{400} \right] \\
 &= \frac{22}{7} \left(\frac{63}{400} \right) \\
 &= \frac{198}{400} \\
 &= 0.495 \text{ sq. mm}
 \end{aligned}$$

Sol:

$$\text{Diameter of big half circle} = \frac{40}{2} = 20 \text{ mm}$$

$$\text{Internal diameter} = \frac{33}{2} \text{ mm}$$

$$\begin{aligned}
 \text{Total area} &= \pi r^2 \\
 &= \pi (20)^2
 \end{aligned}$$

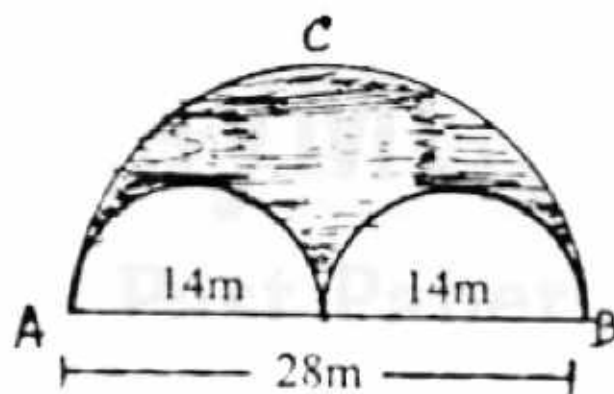
$$\begin{aligned}
 \text{Internal area} &= \pi r^2 \\
 &= \pi \left(\frac{33}{2} \right)^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Area of washers} &= \pi (20)^2 - \pi \left(\frac{33}{2} \right)^2 \\
 &= \pi \left[(20)^2 - \left(\frac{33}{2} \right)^2 \right]
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{22}{7} \left[400 - \frac{1089}{4} \right] \\
 &= \frac{22}{7} \left[\frac{1600 - 1089}{4} \right] \\
 &= \frac{22}{7} \left(\frac{511}{4} \right) \\
 &= \frac{11 \times 73}{2}
 \end{aligned}$$

$$= 401.5 \text{ sq. mm}$$

11. Find the area of the shaded region.



$$\text{Diameter of big half circle} = \frac{28}{2} = 14 \text{ m}$$

$$\begin{aligned}
 \text{Area of big half circle} &= \frac{1}{2} \pi r^2 \\
 &= \frac{1}{2} \pi (14)^2 \\
 &= \frac{1}{2} \times \frac{22}{7} \times 14^2 \times 14 \\
 &= 308 \text{ sq. m}
 \end{aligned}$$

$$\text{Diameter of every small half circle} = \frac{14}{2} = 7 \text{ m}$$

$$\text{Total area of both} = \frac{1}{2} \pi r^2$$

$$\begin{aligned}
 &= \frac{1}{2} \times \frac{22}{7} \times (7)^2 \\
 &= \frac{1}{2} \times \frac{22^{11}}{7} \times 7 \times 7 \\
 &= 77 \text{ sq m}
 \end{aligned}$$

$$\begin{aligned}
 \text{small circles} &= 2 \times 77 \\
 &= 154 \text{ sq m}
 \end{aligned}$$

$$\begin{aligned}
 \text{Area of shaded region} &= 308 - 154 \\
 &= 154 \text{ sq. m}
 \end{aligned}$$

12. Find the area of an equilateral triangle whose side is 8m

Sol. $a = b = c = 8\text{m}$

$$S = \frac{a+b+c}{2} = \frac{8+8+8}{2} = \frac{24}{2} = 12$$

$$S - a = 12 - 8 = 4$$

$$S - b = 12 - 8 = 4$$

$$S - c = 12 - 8 = 4$$

$$\begin{aligned}
 \text{Area of } \Delta &= A = \sqrt{S(S-a)(S-b)(S-c)} \\
 &= \sqrt{12 \times 4 \times 4 \times 4} \\
 &= \sqrt{3 \times 4 \times 4 \times 4 \times 4} \\
 &= 4 \times 4 \sqrt{3} \\
 &= 16\sqrt{3} \text{ sq. m}
 \end{aligned}$$

13. The side of an equilateral triangle is 6cm. Find its area.

$$a = b = c = 6 \quad \text{here}$$

$$S = \frac{a+b+c}{2} = \frac{6+6+6}{2} = \frac{18}{2} = 9$$

$$S - a = 9 - 6 = 3$$

$$S - b = 9 - 6 = 3$$

$$S - c = 9 - 6 = 3$$

$$\begin{aligned} \text{Area of } \Delta &= A = \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{9 \times 3 \times 3 \times 3} \\ &= \sqrt{3 \times 3 \times 3 \times 3 \times 3} \\ &= 3 \times 3\sqrt{3} = 9\sqrt{3} \text{ sq. cm} \end{aligned}$$

14. Find the area of the right triangle with legs 12cm and 35cm.

$$\text{Length of one side} = 12 \text{ cm}$$

$$\text{Length of 2nd side} = 35 \text{ cm}$$

$$\begin{aligned} \text{Area of right angles} &= \frac{\text{base} \times \text{altitude}}{2} \\ &= \frac{35 \times 12}{2} \\ &= 35 \times 6 \\ &= 210 \text{ sq.cm} \end{aligned}$$

15. The base of a rectangle is three times its altitude. The area is 147cm^2 . Find the dimensions of the rectangle.

Sol Let altitude = x

$$\text{Length of base} = 3x \text{ cm}$$

$$\begin{aligned} \text{Area} &= (x)(3x) \\ &= 3x^2 \end{aligned}$$

$$\text{Area} = 147 \text{ sq. cm} \quad \text{but}$$

$$3x^2 = 147 \quad \text{therefore}$$

$$x^2 = \frac{147}{3}$$

$$x^2 = 49$$

$$\sqrt{x^2} = \sqrt{49} \quad \text{Taking square root}$$

$$x = 7$$

$$\text{altitude} = 7 \text{ cm}$$

$$\begin{aligned} \text{Base} &= 3x \\ &= 3 \times 7 \end{aligned}$$

$$\text{Base} = 21 \text{ cm}$$

16. Find the base of the parallelogram whose altitude is 18cm and whose area is 3m^2 .

$$\text{Length of altitude} = 18 \text{ cm}$$

$$\text{Area} = 3 \text{ sq.m}$$

$$\text{Area} = 3 \times 100 \times 100 \text{ sq.m}$$

$$\begin{aligned} \text{Length of base} &= \frac{\text{area}}{\text{altitude}} \\ &= \frac{3 \times 100 \times 100}{18} \\ &= \frac{5000}{3} \end{aligned}$$

$$\text{Length of base} = 1666.67 \text{ cm}$$

17. The area of a parallelogram is 144cm^2 . Find the altitude if the base is 2m long.

Area of a parallelogram = 144 sq. m

Length of base = 2 cm

$$\begin{aligned}\text{Length of altitude} &= \frac{\text{area}}{\text{base}} \\ &= \frac{144}{2}\end{aligned}$$

Length of altitude = 72 cm

18. Find the area of the rectangle 2m long and 18cm wide.

Length of a rectangle = 2m

$$= 200 \text{ cm}$$

Width = 18 cm

Area = Length $\times$ Width

$$= 200 \times 18$$

$$= 3600 \text{ sq.cm}$$

19. The area of an equilateral triangle is $4\sqrt{3}\text{cm}^2$. Find the length of a side.

Sol: If side of an any equilateral triangle are "a" units then its

area will be $\frac{\sqrt{3} a^2}{4}$.

therefore
$$\frac{\sqrt{3} a^2}{4} = 4\sqrt{3}$$

$$a^2 = (4\sqrt{3})\left(\frac{4}{\sqrt{3}}\right)$$

$$a^2 = 4 \times 4$$

$$\sqrt{a^2} = \sqrt{4 \times 4} \quad \text{Taking square root}$$

$$a = 4 \text{ cm}$$

$$\begin{aligned}\text{Volume of a cube} &= V = l \times l \times l \\ &= (l)^3\end{aligned}$$

Volume of a cuboid of length l , breadth b and height h is

$$\text{Volume of cuboid} = V = l \times b \times h$$

Volume of a cuboid of length l , breadth b and height h

$$\text{Volume of cylinder} = \pi r^2 h$$

where " r " is radius of the base and " h " is height.

$$\text{Volume of cylinder} = \frac{1}{3} \pi r^2 h$$

where ' r ' is radius of base and " h " is height.

$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

where ' r ' is radius of sphere.

Remember that:

$$1- \quad \text{As} \quad 1\text{cm} = 10\text{mm},$$

$$\text{therefore,} \quad 1\text{cm}^3 = 10 \times 10 \times 10\text{mm}^3$$

$$1\text{cm}^3 = 1000\text{mm}^3$$

$$2- \quad 1\text{m}^3 = 100 \times 100 \times 100\text{cm}^3$$

$$= 1000000 \text{ cm}^3$$

$$\boxed{1\text{m}^3 = 10^6 \text{ cm}^3}$$

$$\text{also} \quad 1\text{m}^3 = 1000 \times 1000 \times 1000 \text{ mm}^3$$

$$1m^3 = 10^9 mm^3$$

- 3- For measurement of volumes of liquids, we use the terms liters (*l*) and milliliters (*ml*).

$$1cm^3 = 1ml$$

$$1000cm^3 = 1l$$

$$\text{and } 1m^3 = 1000000 cm^3 = 1000 l$$

$$1m^3 = 1kl \text{ (1 kiloliter)}$$

Exercise 9.3

Find the Volume of the Solids

1. A cube of a side 4cm

Sol: A cube of a side = 4

$$\text{Volume of cube} = (l)^3$$

$$= (4)^3$$

$$= 64 \text{ cubic cm}$$

2. A cube whose total area is $96cm^2$.

$$\text{Total area of cube} = 96$$

$$\text{areas of cube} = 6$$

$$\text{area of 1 face} = \frac{96}{6}$$

$$= 16 \text{ sq. cm}$$

$$\text{Length of edge} = \sqrt{16}$$

$$= 4 \text{ cm}$$

$$\text{volume of cube} = (l)^3$$

$$= (4)^3$$

$$= 64 \text{ cm}^3$$

3. A rectangular box with length 4m breadth 3m and height 2m .

$$\text{length of rectangular} = 4 \text{ m}$$

$$\text{Breadth of rectangular} = 3 \text{ m}$$

$$\text{Height of rectangular} = 2 \text{ m}$$

$$\text{volume of cuboid} = l \times b \times h$$

$$= 4 \times 3 \times 2$$

$$= 24 \text{ (m)}^3$$

4. Right cylinder, with radius of base 4cm , altitude 10cm , use

$$\pi = \frac{22}{7}$$

Sol: Radius of base $= (r) = 4 \text{ cm}$

$$\text{altitude} = (h) = 10 \text{ cm}$$

$$\text{volume of cylinder} = \pi r^2 h$$

$$= \frac{22}{7} \times (4)^2 (10)$$

$$= \frac{22}{7} \times 16 \times 10$$

$$= \frac{3520}{7}$$

$$= 502.86 \text{ cm}^3$$

5. Circular cone, with radius of base 3cm, altitude 10cm.

$$\text{Radius of circular base} = r = 3 \text{ cm}$$

$$\text{Height of altitude} = h = 10 \text{ cm}$$

$$\begin{aligned} \text{Volume of circular cone} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \left(\frac{22}{7} \right) (3)^2 (10) \\ &= \frac{1}{3} \times \frac{22}{7} \times 3 \times 3 \times 10 \\ &= \frac{660}{7} \\ &= 94.3 \text{ cm}^3 \end{aligned}$$

6. Sphere, with radius 3cm.

$$\text{Radius of sphere} = r = 3 \text{ cm}$$

$$\begin{aligned} \text{Volume of sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times (3)^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 \\ &= \frac{4 \times 22 \times 3 \times 3}{7} \\ \text{Volume of sphere} &= \frac{792}{7} \\ &= 113.14 \text{ cm}^3 \end{aligned}$$

7. Right circular cylinder, with circumferences of base 4cm, altitude 1m.

Sol: Circumference of base = 4cm

$$\text{Circumference of base} = 2\pi r$$

$$\text{then } 2\pi r = 4$$

$$\begin{aligned} r &= \frac{4}{2\pi} \\ &= \frac{2}{\pi} \text{ cm} \quad (i) \end{aligned}$$

$$\text{Length of cylinder (h)} = 1\text{m}$$

$$= 100 \text{ cm}$$

$$\text{Volume of cylinder} = \pi r^2 \times h$$

$$\text{from (i)} \quad = \pi \left(\frac{2}{\pi} \right)^2 (100)$$

$$= \pi \times \frac{2 \times 2 \times 100}{\pi \times \pi}$$

$$= \frac{7 \times 2 \times 2 \times 100}{2^2_{11}}$$

$$= \frac{1400}{11}$$

$$= 127.3 \text{ cm}^3 \quad \text{approx}$$

8. Cone with altitude 9cm, radius of base 6cm.

Sol: Cone with altitude = $h = 9 \text{ cm}$

Cone with radius of base = $r = 6 \text{ cm}$

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 \times h$$

$$= \frac{1}{3} \left(\frac{22}{7} \right) (6)^2 \times 9$$

$$= \frac{1}{3} \times \frac{22}{7} \times 36 \times 9$$

$$= \frac{22 \times 12 \times 9}{7}$$

$$= \frac{2376}{7}$$

$$= 339.4 \text{ cm}^3$$