Exercise 5

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

Area of veranda = 40 × 15

= 600 sq. m

Area of one stone = 6 × 5 Now

= 30 sq. m

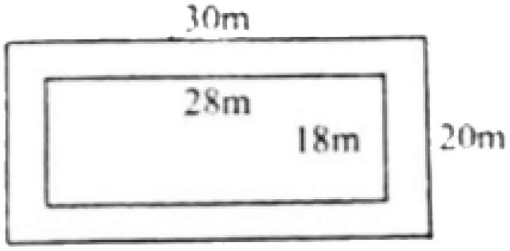
$$\text{Number of stones} = \frac{\text{Total area}}{\text{area of one stone}}$$

$$= \frac{600}{30}$$

Number of stones = 20 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,



External length = 28 + 1 + 1

$= 30$ m

External width $= 18 + 1 + 1$

$= 20$ m

Area of plot with path $= 30 \times 20$

$= 600$ sq m

The area of plot $= 28 \times 18$

$= 504$ sq m

Area of path $= 600 - 504$

$= 96$ sq m

Area of one tile $= 40$ sq m

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

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

$$= \frac{96}{\frac{40}{100 \times 100}}$$

$$= \frac{96 \times 100 \times 100}{40}$$

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 $= 5\ 49$m

Width of room $= 3\ 87$m

Area of room $=$ Length $\times$ Width

$= 5.49 \times 3.87$

$= 21.2463$ 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 filed = $3x$ m

Width of field = $2x$ m and

Area = $3x \times 2x$

Area = $6x^2$ sq. m

from (i) and (ii)

$6x^2 = 25000$

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

$x^2 = 4166.67$ Taking square root

$x = 64.55$

Length $3x$ = 193.65

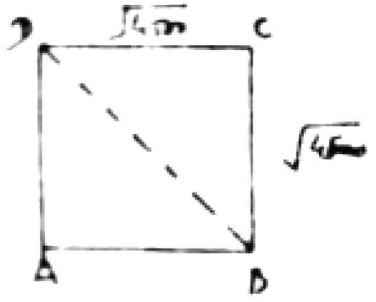
Width $2x$ = 129.10

Perimeter = $2(3x + 2x) = 2(193.65 + 129.10)$

$= 2(322.75)$

$= 645.50$ 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 3km per hour?



$= 4500$ sq m

$= \sqrt{4500}$ m

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

By Pythagoras theorem $= 4500 + 4500$

$= \sqrt{9000}$

$m\overline{BD} = 94.87$ m

Time spent to cross 3km distane = 60min

Time spent to cross 3000 km distance = 60 min

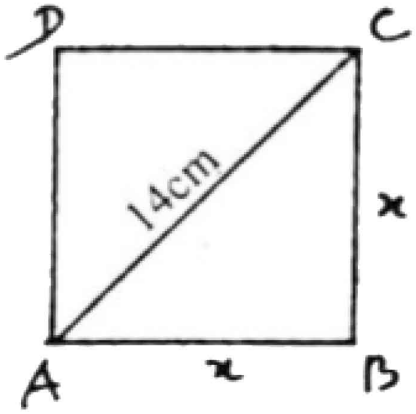
Item spent to cross 94.87m distance = $\frac{60}{3000} \times 94.87$ min

$= \frac{94.87}{50}$

$= 1.8974$ min

$= 1$ min 54 sec

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



Diagonal of square = 14cm

$$\text{Area of a square} = \frac{14 \times 14}{2}$$

$$= 14 \times 7$$

$$= 98 \text{ sq. cm}$$

2nd method:

Suppose that side of a square = x cm

By Pythagoras theorem

$$x^2 + x^2 = (14)^2$$

$$2x^2 = 14 \times 14$$

$$x^2 = \frac{14 \times 14}{2}$$

$$= 14 \times 7 = 98$$

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

$b = 150$

$c = 120$

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

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

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

$$S = 235$$

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

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

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

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

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

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

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

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

$$= 25\sqrt{128639}$$

$$= 25 \times 358.66$$

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

(ii) $a = 112$ dm here

$b = 78$ dm

$c = 50$ dm

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

$$= \frac{112+78+50}{2}$$

$$= \frac{240}{2}$$

$$S = 120$$

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

$$= \sqrt{120(120-112)(120-78)(120-50)}$$

$$= \sqrt{120 \times 8 \times 42 \times 70}$$

$$A = \sqrt{3 \times 5 \times 8 \times 8 \times 7 \times 2 \times 3 \times 7 \times 5 \times 2}$$

$$= \sqrt{3^2 \times 5^2 \times 8^2 \times 7^2 \times 2^2}$$

$$= 3 \times 5 \times 8 \times 7 \times 2$$

$$= 1680 \text{ sq. dm}$$

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.

Then $25x + 17x + 12x = 540 \implies x = 10$

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

perimeter $= 25x + 17x + 12x$

$$= 54x$$

perimeter $= 540$ m but

then $540 = 54x$

$x = 10$

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

$= 250, 170, 120$ m

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

$$= \frac{250+170+120}{2}$$

$$= \frac{540}{2} = 270$$

$S - a = 270 - 250 = 20$

$S - b = 270 - 170 = 100$

$S - c = 270 - 120 = 150$

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

$= \sqrt{270 \times 20 \times 100 \times 150}$

$= \sqrt{27 \times 10 \times 2 \times 10 \times 2 \times 50 \times 3 \times 50}$

$= \sqrt{10^2 \times 2^2 \times 50^2 \times 3 \times 27}$

$= 10 \times 2 \times 50 \times \sqrt{3 \times 27}$

$= 1000 \times \sqrt{3 \times 3 \times 3 \times 3}$

$= 1000 \times 3 \times 3$

$= 9000$ sq. meter

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

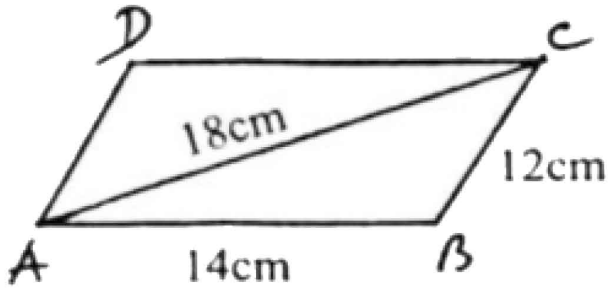
Hints:

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

Find area of ΔABC .

Area of $\|^m$ = 2 (Area of ΔABC)

Sol: Find area of $\Delta\ ACB$



$a = 18$ cm

$b = 14$ cm

$c = 12$ cm

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

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

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

$$S = 22$$

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

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

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

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

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

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

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

$= 2 \times 2 \times 2\sqrt{110}$

$= 8\sqrt{110}$ sq. cm .....(i)

Area of ΔACD = Area of ΔABC and

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

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

$= 8\sqrt{110} + 8\sqrt{110}$

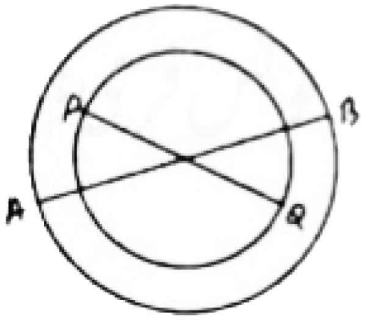
$= (8+8)\sqrt{110}$

$= 16\sqrt{110}$ sq. cm

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

(i) 15cm and 13cm (ii) 1.2m and 0.9m

(iii) 40mm and 33mm.



$m\,AB = 15$ Cm

$m\,\overline{PQ} = 13$ Cm.

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

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

Total area $= \pi r^2$

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

Internal area $= \pi r^2$

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

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

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

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

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

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

$= 44.94$ cm

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

Internal diameter $= \frac{0.9}{2} = \frac{9}{10 \times 2}$

$= \frac{9}{20}m$

Total area $= \pi r^2$

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

Internal area $= \pi r^2$

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

$$\text{Area of washers} = \pi\left(\frac{6}{10}\right)^2 - \pi\left(\frac{9}{20}\right)^2$$

$$= \pi\left[\left(\frac{6}{10}\right)^2 - \left(\frac{9}{20}\right)^2\right]$$

$$= \frac{22}{7}\left(\frac{36}{100} - \frac{81}{400}\right)$$

$$= \frac{22}{7}\left[\frac{144 - 81}{400}\right]$$

$$= \frac{22}{\cancel{7}_1}\left(\frac{\overset{9}{\cancel{63}}}{400}\right)$$

$$= \frac{198}{400}$$

$$= 0.495 \text{ sq. mm}$$

Sol:

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

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

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

$$= \pi(20)^2$$

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

$$= \pi\left(\frac{33}{2}\right)^2$$

$$\text{Area of washers} = \pi(20)^2 - \pi\left(\frac{33}{2}\right)^2$$

$$= \pi\left[(20)^2 - \left(\frac{33}{2}\right)^2\right]$$

$$= \frac{22}{7}\left[400 - \frac{1089}{4}\right]$$

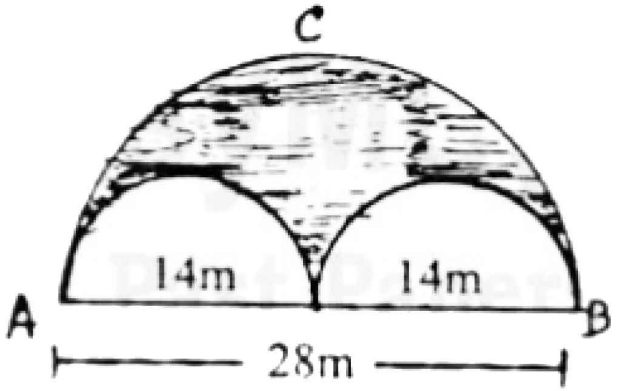
$$= \frac{22}{7}\left[\frac{1600 - 1089}{4}\right]$$

$$= \frac{22}{7}\left(\frac{511}{4}\right)$$

$$= \frac{11 \times 73}{2}$$

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

11. Find the area of the shaded region.



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

$$\text{Area of big half circle} = \frac{1}{2}\pi r^2$$

$$= \frac{1}{2}\pi(14)^2$$

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

$$= 308 \text{ sq. m}$$

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

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

$$= \frac{1}{2} \times \frac{22}{7} \times (7)^2$$

$$= \frac{1}{\cancel{2}} \times \frac{\cancel{22}^{11}}{\cancel{7}} \times \cancel{7} \times 7$$

$$= 77 \text{ sq. m}$$

small circles $= 2 \times 77$

$$= 154 \text{ sq. m}$$

Area of shaded region $= 308 - 154$

$$= 154 \text{ sq. m}$$

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

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

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

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

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

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

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

$$= \sqrt{12 \times 4 \times 4 \times 4}$$

$$= \sqrt{3 \times 4 \times 4 \times 4 \times 4}$$

$$= 4 \times 4\sqrt{3}$$

$$= 16\sqrt{3} \text{ sq. m}$$

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

$a = b = c = 6$ here

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

$S - a = 9 - 6 = 3$

$S - b = 9 - 6 = 3$

$S - c = 9 - 6 = 3$

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

$= \sqrt{9 \times 3 \times 3 \times 3}$

$= \sqrt{3 \times 3 \times 3 \times 3 \times 3}$

$= 3 \times 3\sqrt{3} = 9\sqrt{3}$ sq. cm

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

Length of one side = 12 cm

Length of 2nd side = 35 cm

Area of right angles $= \frac{base \times altitude}{2}$

$= \frac{35 \times 12}{2}$

$= 35 \times 6$

$= 210$ sq.cm

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 $= x$

Length of base $= 3x$ cm

Area $= (x)(3x)$

$= 3x^2$

Area = 147 sq. cm but

$3x^2 = 147$ therefore

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

$$x^2 = 49$$

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

$x = 7$

altitude = 7 cm

Base = $3x$

$= 3 \times 7$

Base = 21 cm

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

Length of altitude = 18 cm

Area = 3 sq.m

Area = $3 \times 100 \times 100$ sq.m

$$\text{Length of base} = \frac{area}{altitude}$$

$$= \frac{3 \times 100 \times 100}{18}$$

$$= \frac{5000}{3}$$

Length of base = 1666.67 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

$$\text{Length of altitude} = \frac{area}{base}$$

$$= \frac{144}{2}$$

Length of altitude = 72 cm

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

Length of a rectangle = 2m

= 200 cm

Width = 18 cm

Area = Length × Width

= 200 × 18

= 3600 sq.cm

19. The area of an equilateral triangle is $4\sqrt{2}cm^2$. 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 $\frac{\sqrt{3}\ a^2}{4} = 4\sqrt{3}$

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

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

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

$a = 4$ cm

Volume of a cube $= V = l \times l \times l$

$= (l)^3$

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

Volume of cuboid $= V = l \times b \times h$

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

Volume of cylinder $= \pi r^2 h$

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

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

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

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

where 'r' is radius of sphere.

Remember that:

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

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

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

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

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

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

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

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

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

$$1cm^3 = 1ml$$

$$1000cm^3 = 1l$$

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

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

Exercise 9.5

Find the Volume of the Solids

1. A cube of a side 4cm

Sol: A cube of a side = 4

Volume of cube = $(l)^3$

$= (4)^3$

$= 64$ cubic cm

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

Total area of cube = 96

areas of cube = 6

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

$= 16$ sq. cm

Length of edge = $\sqrt{16}$