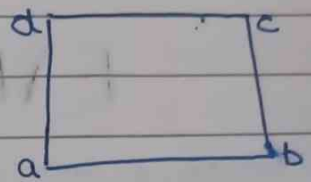
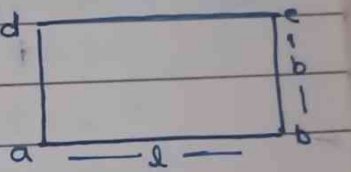
Chapter - 10
Perimeter and Area

Concept :



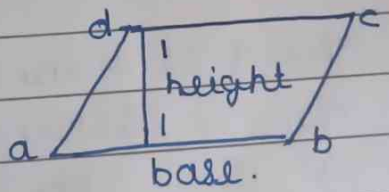
Perimeter of square = $4a$
Area of square = a^2
Where a is length of side of squares

Rectangle :



Perimeter of rectangle = $2 \times (l + b)$
Area of rectangle = $l \times b$
Where l = length, b = breadth

Parallelogram :



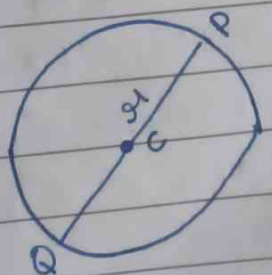
Area of ||gm = base × height
= Ab × DE

Triangle :

Area of Triangle = $\frac{1}{2}$ × base × Height

= $\frac{1}{2} \times BC \times Ad$

Circle :



C is centre
CP is radius
OP = diameter

Length of diameter = 2 × radius
$d = 2r$

Area of circle = πr^2

(where $\pi = \frac{22}{7}$ or 3.14)

Circumferances of circle = $2\pi r$

EXERCISE 10.1

1) Nagma runs around a rectangular park 180 long and 120 m wide at the rate of 7.5 km/h In how much time will she complete five ro

Sol:- Perimeter of rectangular path

$2(l + b) \Rightarrow 2(180 + 120)$

$= 2 \times 300 \Rightarrow 600$ m

Distance covered in 5 rounds = 5×600

$= 3000$ m

$= \frac{3000}{1000}$ km = 3 km

Speed of running = 7.5 km/hr

Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{3 \text{ km}}{7.5 \text{ km/h}}$

$= \frac{8 \times 60^{12} \times 10^{2}}{75_{25}} = 24$ mins

Hence, she completes 5 rounds in 24 mins.

2) The area of a rectangular plot is 340 m^2 and its breadth is 17 m. Find the cost of surrounding the plot with a fence at ₹ 15.70 per metre.

Area of rectangular plot = 340 m^2

Breadth = 17 m

Length = $\frac{\text{Area}}{\text{breadth}} = \frac{340}{17}$

Length = 20 m

Perimeter of rectangle = $2(l + b)$

$= 2 \times (20 + 17$

$2 \times 37 = 74\text{m}$

Cost of surrounding in 1m plot = ₹ 15.70

Cost of 74 m plot = 15.70×74

= ₹ 1161.80

3) A wire is in the shape of a rectangle. Its length is 40 cm and breadth is 22 cm. If the same wire is rebent into the shape of a square, what will be the measure of each side? Also find which shape encloses more area and by how much?

Perimeter of rectangle = $2(l+b)$

$= 2(40+22) \Rightarrow 2 \times 62$

$= 124$ cm

Perimeter of rectangle = Perimeter of square.

Perimeter of square = $4 \times$ side

$124 = 4 \times$ side

Side = $\frac{124}{4} = 31$ cm | Side = 31 cm

Area of rectangle = $l \times b \Rightarrow 40 \times 22$

$= 880\ \text{cm}^2$

Area of square = side × side

$= 31 \times 31 = 961\ \text{cm}^2$

Area of square is more than area of rectangle by

$(961 - 880) = 81\ \text{cm}^2$

4) A door of width 1m and height 2m is fitted in a wall. The length of the wall is 4.5 m and the height is 3.6 m. Find the cost of white washing the wall, if the rate of white washing the wall is ₹ 37 per m^2

Area of door = $2 \times 1 = 2\text{m}^2$

Area of wall = $4.5 \times 3.6 = 16.2\text{m}^2$

Area left for white washing the wall = $16.2 - 2$

$= 14.2\text{m}^2$

Cost of white washing 1m^2 = ₹ 37 per m^2

Cost of white washing $14.2\text{m}^2 = 37 \times 14.2$

$\Rightarrow$ ₹ 525.4

5) A rectangular room is 10 m long and 7.5 m wide. Find the cost of covering the floor with carpet 1.25 m wide at ₹ 1250 per metre.

Area of floor = 7.5 m × 10 m
= 75 m

Area of floor = Area of carpet
= 75 m^2

Width of carpet = 1.25 m

Length = $\frac{\text{Area}}{\text{width}} = \frac{75 \times 100}{1.25\,m} = 60\,m$

Cost of 1 m carpet = ₹ 1250

Cost of 60 m carpet = 1250 × 60 = ₹ 75000

6) The floor of a room is in the shape of a square of side 4.8 m. The floor is to be covered with square tiles of perimeter 1.2 m. Find the cost of covering the floor if each tile costs ₹ 87

Area of square floor = 4.8 × 4.8 = 23.04 m^2

Perimeter of square tile = 1.2 m

Side = $\frac{1.2}{4}$ = 0.3 m

Area of square tile = 0.3 × 0.3 = 0.09 m^2

No. of tiles required to cover floor = $\frac{23.04}{0.09}$

= 256

Cost of one tile = ₹ 87

Cost of 256 tiles = 256 × 87 = ₹ 22272

Cost of covering floor = ₹ 22272

7) A rectangular plot of land is 50 m wide. The cost of fencing the plot at the rate of ₹ 18 per metre is ₹ 4680. Find

i) the length of the plot

Breadth of rectangle = 50m

Let the length be l m

Cost of fencing for 1 m = ₹18

Total cost = ₹4680

Perimeter of rectangular plot = $\frac{4680}{18}$ = 260m

$2(l+b) = 260$

$2(l+50) = 260$

$l + 50 = 260 - 130$

$l = 130 - 50$ | $l = 80m$ |

ii) the cost of levelling the plot at the rate of ₹7.6 per m^2?

Area of plot = $l \times b$ ⇒ 80×50

$= 4000\ m^2$

Cost of levelling the plot =

at $1m^2$ = ₹7.6

Cost of levelling the plot

at $4000\ m^2$ =

7.6×4000 = ₹30400

8) The area of a rectangular plot is $460m^2$. If the length is 15% more than its breadth, find the perimeter of the plot.

Let the breath be b m

$l = b + 15\%$ of b

$b + \frac{15}{100}^{3} \times b$
$\quad 20$

$= \frac{b}{1} + \frac{3b}{2}$

$\frac{2b + 3b}{2} = \frac{5b}{2}$

Area of rectangular plot = $460m^2$

$l \times b = 460$

$\frac{23b}{20} \times b = 460$

$\frac{23}{20} b^2 = 460$

$b^2 = \frac{460}{23} \times 20$

$l = \frac{23}{20} \times 20 = 23\,m$ | $b^2 = 400$, $b = 20\,m$

Perimeter of plot $= 2(l+b)$

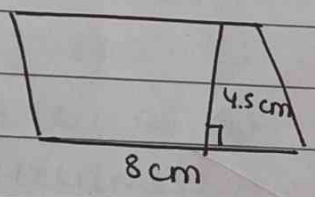
$2(23+20) \Rightarrow 2 \times 43$

$= 86m$

EXERCISE 10.2

1) Find the area of each of the following parallelo-grams:-

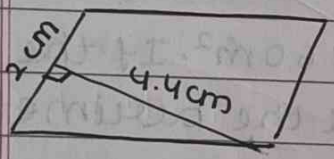
i)



Area $= B \times H$

$8 \times 4.5 = 36\ cm^2$

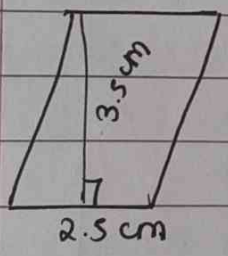
ii)



Area $= B \times H$

$2 \times 4.4 = 8.8\ cm^2$

iii)

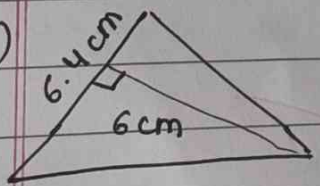


Area $= B \times H$

$2.5 \times 3.5 = 8.75\ cm^2$

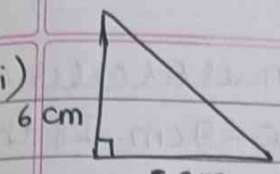
2) Find the area of each of the following triangl

i)



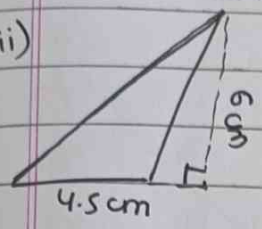
Area $= \frac{1}{2} \times B \times H$

$\frac{1}{2} \times 6.4 \times 6^3 = 19.2\ cm^2$

ii) 

Area = $\frac{1}{2} \times B \times H$

$\frac{1}{2} \times 5 \times 6 = 15\ cm^2$

iii) 

Area = $\frac{1}{2} \times B \times H$

$\frac{1}{2} \times 4.5 \times 6 = 13.5\ cm^2$

3) Find the missing values:

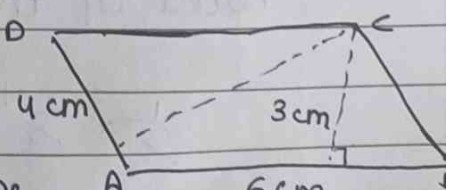
BASE	HEIGHT	A. OF PARALELOGRAM
7.5 cm	5.6 cm	42 cm^2
20 cm	12.3 cm	246 cm^2
10.3 cm	15 cm	154.5 cm^2
5.8 cm	8.4 cm	48.72 cm^2

4) Find the missing values:

BASE	HEIGHT	A. OF TRIANGLE
23.2 cm	16.7 m	193.72 m
15 cm	11.6 cm	87 cm^2
22 mm	15.5 mm	170.5 mm^2
80 cm	31.4 cm	1256 cm^2

5) In the adjoining figure, ABCD is a parallelogram whose two adjacent sides are 6 cm and 4 cm. If the height corresponding to the base AB is 3 cm, find:

i) the area of parallelogram ABCD



Area = B × H

6 cm × 3 cm = 18 cm^2

ii) the height of the corresponding to the base AD.

Area = B × H

$H = \frac{Area}{B}$

$H = \frac{18}{4} = 4.5$

H = 4.5 cm

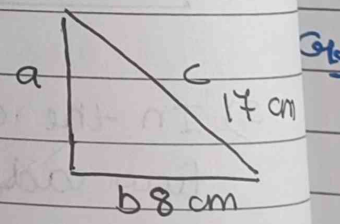
1) If the base of a right angled triangle is 8 cm and the hypotenuse is 17 cm, find its area

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

$a^2 = c^2 - b^2 \Rightarrow (17)^2 - (8)^2$

$289 - 64 = 225$

$a^2 = (15)^2 \Rightarrow a = 15$



Area of the triangle $= \frac{1}{2} \times b \times H$

$\frac{1}{2} \times 8 \times 15 = 60\ cm^2$

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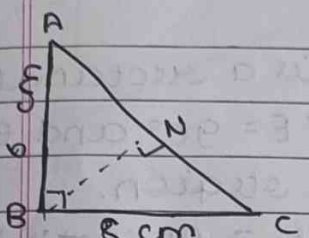
8) In the adjoining figure, ΔABC is right angled at B. Its legs are 8 cm and 6 cm. Find the length of perpendicular BN on the side AC.



Area of $\Delta ABC = \frac{1}{2} \times BC \times AB$

$= \frac{1}{2} \times 8 \times 6 = 24 \text{ cm}^2$

By Pythagoras Theorem.

$(AC)^2 = (AB)^2 + (BC)^2$

$(6)^2 + (8)^2 = 36 + 64 = 100$

$(AC)^2 = 100 \Rightarrow \boxed{AC = 10 \text{ cm}}$

Area of $\Delta ABC = \frac{1}{2} \times AC \times BN$

$24 = \frac{1}{2} \times 10 \times BN$

$BN = \frac{24}{5} = 4.8 \text{ cm}$

9) In the adjoining figure, area of ΔABE is equal to the area of parallelogram ABCD. If altitude EF is 16 cm long, find the length of the altitude of the parallelogram to the base AB of length 10 cm. What is the area of ΔAMD, where M is the mid-point of side DC?

Area of ΔABE = Area of ||gm ABCD

EF = 16 cm | AB = 10 cm

Given Area of ΔABE = Area ||gm ABCD

$\frac{1}{2} \times AB \times EF = AB \times GF$

$\frac{1}{2} \times 10 \times 16 = 16 \times GF \quad \boxed{GF = 8 \text{ cm}}$

Length of ||gm = 8 cm

AB = DC = 10 cm

DM = MC = 5 cm (M is mid point of DC)

EG = 16 − 8 = 8 cm

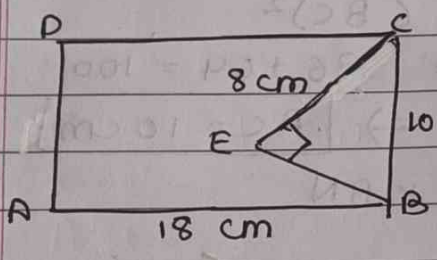
Area of ΔADM = Area of ΔMEC

$= \frac{1}{2} \times MC \times EG$

$\frac{1}{2} \times 5 \times 8 = 20 \text{ cm}^2$

Area of $\triangle ADH = 20 \text{ cm}^2$

10) In the adjoining figure, ABCD is a rectangle of size 18 cm by 10 cm. In $\triangle BEC$, $\angle E = 90°$ and ED = 8 cm. Find the area of the shaded region.



Area of rect. = ABCD = 18×10
$= 180 \text{ cm}^2$

Ar. of $\triangle BEC = \frac{1}{2} \times BE \times CE$

By pythagoras theorem

In $\triangle BEC$

$(BC)^2 = (CE)^2 + (BE)^2$

$(10)^2 = (8)^2 + (BE)^2$

$(BE)^2 = 100 - 64 = 36$

$BE = 6 \text{ cm}$

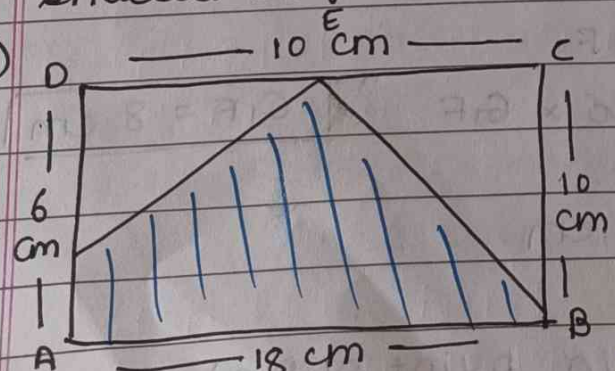
Area of $\triangle BEC = \frac{1}{2} \times BE \times EC \Rightarrow \frac{1}{2} \times 6 \times 8$
$= 24 \text{ cm}^2$

Area of shaded region = Area of rect. ABCD − Area of $\triangle BEC$

$180 - 24 = 156 \text{ cm}^2$

11) In the following figures, find the area of the shaded regions:

i)



Area of rectangle ABCD
$= 18 \times 10 = 180 \text{ cm}^2$

Area of $\triangle DEF = \frac{1}{2} \times DE \times FD$
$= \frac{1}{2} \times 10 \times 6 = 30 \text{ cm}^2$

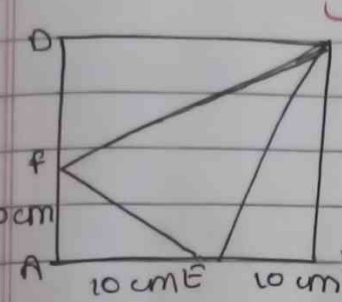
$EC = 18 - 10 = 8 \text{ cm}$

Ar. of $\triangle BEC = \frac{1}{2} \times 8 \times 10$
$= 40 \text{ cm}^2$

Area of shaded region = Area of rect ABCD = (Ar. of $\triangle DEF + \triangle BEC$)

$180 - (30 + 40) \Rightarrow 180 - 70$
$= 110\ cm^2$

ii)



Area of square $= S \times S = 20 \times 2$
$= 400$ sq cm

Area of $\Delta FAE = \frac{1}{2} \times 10^5 \times 10 = 50$ sq cm

Area of $\Delta EBC = \frac{1}{2} \times 10^5 \times 20 = 100\ cm^2$

Area of $\Delta DFC = \frac{1}{2} \times 10^5 \times 20 = 100\ cm^2$

Area of shaded region $= 400 - 50 + 100 + 100$
$= 400 - 250 = 150\ cm^2$

EXERCISE 10.3

Take $\pi = \frac{22}{7}$, unless started otherwise.

1) Find the circumference of the circles with the following radius:

i) 7 cm $\Rightarrow r = 7$ cm

Circumference of circle $= 2\pi r$

$2 \times \frac{22}{7} \times 7 = 44$ cm

ii) 21 cm $\Rightarrow r = 21$ cm

Circumference of circle $= 2\pi r$

$2 \times \frac{22}{7} \times 21 =$

iii) 28 mm $\Rightarrow r = 28$ mm

Circumference of circle $= 2\pi r$

$2 \times \frac{22}{7} \times 28 =$

iv) 3.5 cm $\Rightarrow$ Circumference of circle $= 2\pi r$

$2 \times \frac{22}{7} \times 3.5 = 22$ cm.

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2) Find the area of circles, given that;

i) radius = 14 mm

Area of circle = πr^2

$= \frac{22}{7} \times 14 \times 14 = 616\ mm^2$

iii) diameter = 9.8m

$d = 2r \quad | \quad r = \frac{d}{2}$

$r = \frac{9.8}{2} = 4.9\ m$

$r = 4.9\ m$

Area of circle = πr^2

$= \frac{22}{7} \times 4.9 \times 4.9 = 75.46\ m^2$

3) Find the circumference and area of a circle of radius 20 cm. (use $\pi = 3.14$)

$r = 20$ cm

Circumference of circle = $2\pi r$

$= 2 \times 3.14 \times 20$

$= 125.6$ cm.

Area of circle = πr^2

$3.14 \times 20 \times 20 = 1256\ cm^2$

4) The minute hand of a tower clock is 1.4m long. How far does the tip of the hand move in 1 hour?

Length of the minute hand = 1.4 m

Circumference = $2\pi r$

$= 2 \times \frac{22}{7} \times 1.4 = 8.8$m

The tip of the hand moves 8.8m in 1 hour.

5) A gardener wants to fence a circular garden of diameter 21m. Find the length of the rope he needs to purchase, if he makes two rounds of fence. Also find the cost of the rope, if it costs ₹ 20 per meter.

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$d = 21$ m

radius $= \frac{21}{2}$ m

Length of rope $= 2\pi r$

$2 \times \frac{22}{7} \times \frac{21}{2} = 66$ m

Length of rope in 2 rounds $= 2 \times 66 = 132$ m

Cost of 1m rope = ₹20

Cost of 132 m rope $= 20 \times 132$ = ₹2640

6) If the circumfrance of a circle exceeds its diameter by 30 cm, find the radius of the circle.

circumference = diameter + 30

$2\pi r = 2r + 30$

$2\pi r - 2r = 30$

$2r(\pi - 1) = 30$

$2r\left(\frac{22}{7} - 1\right) = 30 \Rightarrow 2r\left(\frac{22-7}{7}\right) = 30$

$\frac{15}{7} r \times 2 = 30 \Rightarrow r = \frac{7 \times 30^{15}}{2 \times 15} = 7$ cm

$r = 7$ cm

7) Find the length of the diameter of a circle whose circumference is 44 cm.

circumference = 44 cm

$2\pi r = 44 \Rightarrow 2 \times \frac{22}{7} \times r = 44$

$r = \frac{44^{22} \times 7}{2 \times 22}$

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

$d = 2r \Rightarrow 2 \times 7 = 14$ cm

9) Find the radius and circumfrance of a circle whose area is 44 cm.

Area of circle = 144π cm²

$\pi r^2 = 144\pi$

$r^2 = 144$

$\boxed{r = 12 \text{ cm}}$

circumference of circle $= 2\pi r = 2\pi \times 12 = 24\pi$ cm

10) How many times will the wheel of a car rotate in a journey of 88 km, given that the diameter of the wheel is 56 cm?

Diameter of wheel = 56 cm

Radius = $\frac{56}{2}$ = 28 cm

Circumfrance = $2\pi r = 2 \times \frac{22}{7} \times 28^{4} = 176$ cm.

1 km = 1000 m

88 km = 88000 cm. (×100)

No. of rotation = $\frac{88 \times 1000 \times 100}{176} = 50,000$

11) From a square cardboard of side 21 cm, a circle of maximum area is cut out. Find the area of the cardboard left.

Side of square = 21 cm

Area of square = Side × Side ⇒ 21 × 21 = 441 cm.

diameter of square = 21 cm.

radius = $\frac{21}{2}$

Area of circle = $\pi r^2 \Rightarrow \frac{22^{11}}{7} \times \frac{21^{3}}{2} \times \frac{21}{2}$

= 346.5 cm²

Area of left cardboard = A. of sq − A. of circle

= 441 − 346.5 = 94.5 cm²

12) A piece of wire is bent into the shape of an equilateral triangle of side 4.4 cm. If this wire is rebent to form a circle, then find the radius and area of the circle.

Side of equilateral triangle = 4.4 cm

Perimeter of triangle = 4.4 + 4.4 + 4.4 = 13.2 cm.

Circumfrance of circle = 13.2 cm.

$2\pi r = 13.2$

$2 \times \frac{22}{7} \times r = 13.2$

$r = \frac{13.2 \times 7}{2 \times 22 \times 10}$

$r = \frac{21}{10}$ cm.

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Area of circle = πr^2

$= \frac{22}{7} \times \frac{21}{10} \times \frac{21}{10} = \frac{1386}{100} = 13.86\ cm^2$

14) A wire is in the form of a rectangle 18.7 cm long and 14.3 cm wide. If this wire is reshaped and bent in the form of circle, find the radius and the area of the circle so formed.

Length of rectangle = 18.7 cm

Breadth of rectangle = 14.3 cm

Perimeter of rectangle = $2(L+B)$

$2(18.7+14.3) = 66$ cm

circumference of circle = 66 cm

$2\pi r = 66$ cm

$2 \times \frac{22}{7} \times r = 66$

$r = \frac{66 \times 7}{2 \times 22} \Rightarrow r = \frac{21}{2}$ cm.

Area of circle = $\pi r^2 \Rightarrow \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = \frac{693}{2}$

$= 346.5\ cm^2$

15) The diameter of a circular park is 84m. There is a 3.5m wide road around it on the outside. Find the cost of constructing the road at ₹ 480 per m^2.

Diameter of circular park = 84m

Radius (r) = $\frac{84}{2} = 42$m

Radius of circular road (R) = 42m + 3.5m = 45.5m

Area of road = Area of circular road − Ar. of circular park

$\pi R^2 - \pi r^2 \Rightarrow \pi(R^2 - r^2)$

$\pi [(45.5)^2 - (42)^2]$

$\pi (2070.25 - 1764]$

$= \frac{22}{7} \times 306.25 \; 43.75 = 962.5 m^2$

Cost of constructing road at $1 m^2 = ₹ 480$

Cost of constructing road at $962.5 m^2$

$= 962.5 \times 480$

$\Rightarrow ₹ 462000$

16) A circular pond is surrounded by 2m wide circular path. If the outer circumfrance of the circular path is 44m, find the inner circumfrance of the circular path. Also find the area of the path.

Circumfrance of outer circle $= 2\pi R$

$44 = 2 \times \frac{22}{7} \times R \Rightarrow R = \frac{44 \times 7}{2 \times 22} = 7 m$

Radius of inner circle $r = 7 - 2 = 5 m$

Circumfrance of inner circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 5 = \frac{220}{7} = 31.45 m$

Area of path = Area of circle − Ar. of pond

$\pi R^2 - \pi r^2$

$\pi [(7)^2 - (5)^2 \Rightarrow \frac{22}{7} (49 - 25)$

$\frac{22}{7} \times 24 = \frac{528}{7} = 75\frac{3}{7} m^2$

17) In the adjoining figure, the area enclosed between the concentric circles is 770 cm^2. If the radius of the outer circle is 21 cm, calculate the radius of the inner circle.

Area enclosed b/w the concentric circles = 770 cm^2

Radius outer circle R = 21 cm

Let Radius of inner circle be r

A/T/Q Ar. of outer circle − Ar. of inner circle = 770

$\pi R^2 - \pi r^2 = 770$

$\pi (R^2 - r^2) = 770$

$\frac{22}{7} ((21)^2 - r^2 = 770$

$441 - r^2 = \frac{770 \times 7}{22} = 245$

$r^2 = 196$

$r = 14$ cm

17) Take circumference of a circle is 31.4 cm, find the radius of and the area of the circle.

Circumference of circle = 31.4 cm.

$2\pi r = 31.4$

$2 \times \frac{22}{7} \times r = 31.4 \Rightarrow r = \frac{31.4 \times 7}{22 \times 2} = 5$ cm

Area of the circle $= \pi r^2 = \frac{22}{7} \times 5 \times 5 = 78.5 \text{ cm}^2$

18) A circular pond is ~~surrounded~~ has a 1m wide footpath along the edge. A man walks around the outer edge of the footpath with 1.1 m long steps. In 240 steps, he makes a full round. What is the radius of the pond.

Circumference of outer circle = 240×1.1

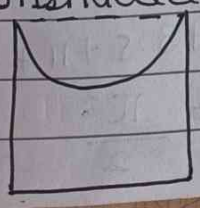
$2\pi R = 240 \times 1.1$

$R = \frac{240 \times 1.1 \times 7}{2 \times 22 \times 10} = 42$ m.

Radius of pond $r = 42 - 1 = 41$ m

19) Calculate the length of the boundary and the area of the shaded region in the following diagram. All measurements are in centimeters.

i) Unshaded part is a semicircle



Circumference of semi-circle $= \pi r$

$= \frac{22}{7} \times \frac{7}{2} = 11$ cm

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Length of the boundary = 10 + 7 + 10 + 11 = 38 cm.

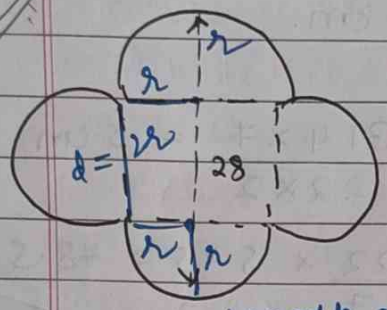
Area of shaded region = Ar. of rec − Ar. of circle

$l \times b - \pi r^2$

$10 \times 7 - \frac{22}{7} \times 7 \times 7$ $= 70 - \frac{77}{4}$

$\frac{280 - 77}{4} = \frac{203}{4} = 50.75 \text{ cm}^2$

ii) Four semicircle on a square.



$r + d + r = 28$

$r + 2r + r = 28$

$4r = 28 \Rightarrow r = 7 \text{ cm}$

Side of square $= 2r$

$= 2 \times 7 = 14 \text{ cm}$

Length of the boundary = 4 × Cir. of semi circle

$= 4 \times \frac{2\pi r}{2}$

$= 4 \times \frac{22}{7} \times 7 = 88 \text{ cm}$

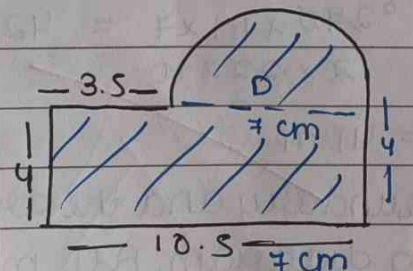
Area of shaded region = Ar. of Sq + Ar. of 4 semi circle

$= (14)^2 + 4 \frac{\pi r^2}{2} = 196 + 4 \times \frac{22 \times 7 \times 7}{7 \times 2}$

$196 + 308 = 504 \text{ cm}^2$

20) Find the perimeter and the area of the shaded region in the following figures. All measurements are in centimeters.

i)



Diameter of semi circle =

$10.5 - 3.5 = 7 \text{ cm}$

Radius of semi circle $= \frac{7}{2} = 3.5 \text{ cm}$

Circumference of semi circle

$\pi r = \frac{22}{7} \times 3.5$

Perimeter of the figure $= 10.5 + 4 + 3.5 + 11 + 4 = 33 \text{ cm}$

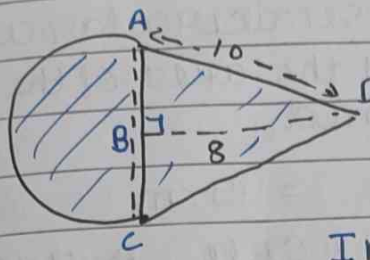
$= l \times b + \frac{\pi^2}{2}$

Ar. of shaded region = Ar. of rec + Ar. of semi circle.

$\frac{10.5 \times 4}{1} + \frac{22}{7} \times \frac{3.5}{1} \times \frac{3.5}{2} = 42 + 19.25$

$\Rightarrow 61.25 \text{ cm}^2$.

ii)



Perimeter of the figure, = Cir. of circle

In ΔABD

$(AD)^2 = (AB)^2 + (BD)^2$

$(10)^2 = (AB)^2 + (8)^2$

$100 = (AB)^2 + 64$

$(AB)^2 = 100 - 64 = 36$

$AB = 6$

Radius of semi circle $r = 6$ cm

Perimeter of given figure = cir. of semi circle + $10 + 10$

$\pi r + 20 \Rightarrow \frac{22}{7} \times 6 + 20 = \frac{132}{7} + 20$

$= \frac{132 + 140}{7} = \frac{272}{7} = 38.85$ cm

$d = 2r = 2 \times 6 = 12$ cm $= AC$

Area of shaded region = Ar. of semi circle + Ar. of ΔACD

$= \frac{\pi r^2}{2} + \frac{1}{2} \times b \times h \Rightarrow \frac{22}{7} \times \frac{6 \times 6}{2} + \frac{1}{2} \times 12 \times 8$

$= \frac{396}{7} + \frac{48}{1} = \frac{396 + 336}{7} = \frac{732}{7} = 104\frac{4}{7} \text{ cm}^2$

13) A wire is in the form of a square of side 27.5 cm. It is straightened and bent into the shape of a circle. Find the area of the circle.

Perimeter of square = $4 \times S \Rightarrow 27.5 \times 4 = 110$ cm.

Circumference of circle = Perimeter of square

$2\pi r = 110 \Rightarrow r = \frac{110 \times 50}{2 \times 3.14} = 17.51$ cm

Area of circle = $\pi r^2 = 3.14 \times 17.51 \times 17.51 = 962.72 \text{ cm}^2$

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21) If a wire is bent into the shape of a square, the area of the square is 81 cm². When the same wire is bent into the form of a semicircular arc bounded by its diameter, find the area of the shape formed.

Area of sq = 81 cm²

$a^2 = 81 \Rightarrow a = \sqrt{81} = 9$ cm

Perimeter of square = 4 × Side ⇒ 4 × 9 = 36

Wire bent in form of semi-circle = bounded by diameter

$\frac{2\pi r}{2} + d = 36 \Rightarrow \pi r + 2r = 36$

$r\left(\frac{22}{7} + 2\right) = 36 \Rightarrow r\left(\frac{22 + 14}{7}\right) = 36$

$r\left(\frac{36}{7}\right) = 36 \Rightarrow \frac{36 \times 7}{7} = 7$ cm

Area of semi circle = $\frac{\pi r^2}{2}$

$\Rightarrow \frac{22}{7} \times \frac{7 \times 7}{2} = 77$ cm²