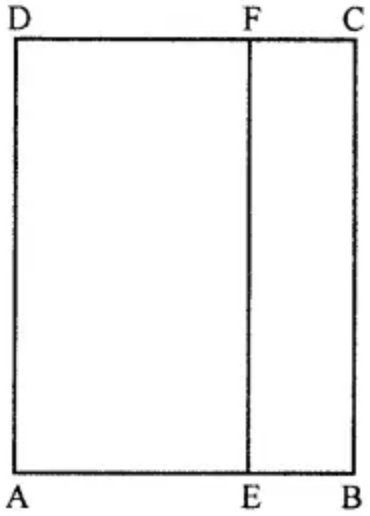
Chapter 16

Perimeter and Area

Exercise 16.1

Question 1.
ABCD is a square of side 24 cm. EF is parallel to BC and AE = 15 cm. By how much does
(i) the perimeter of AEFD exceed the perimeter of EBCF?
(ii) the area of AEFD exceed the area of EBCF?

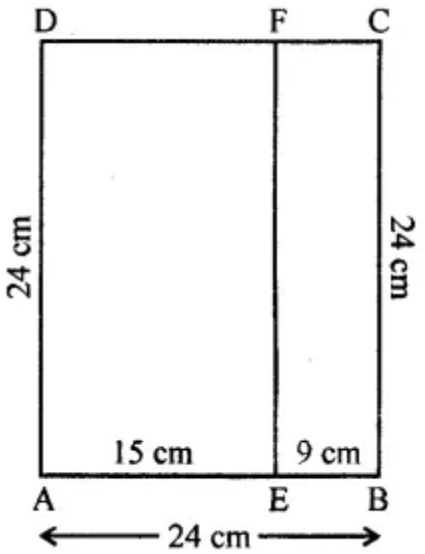


Solution:

Side of the square ABCD = 24 cm

EF || BC || AB is drawn and AE = 15 cm

EB = 24 – 15 = 9 cm



(i) Now perimeter of AEFD = 2(15 + 24) cm = 2 × 39 = 78 cm

and perimeter of EBCF = 2(9 + 24) = 2 × 33 cm = 66 cm

Difference of perimeter = 78 – 66 = 12 cm

(ii) Now Area of AEFD = l × b = 15 × 24 = 360 sq. cm

and area of EBCF = 9 × 24 = 216 sq. cm

Difference = 360 – 216 = 144 sq. cm

Question 2.

Nagma runs around a rectangular park 180 m long and 120 m wide at the rate of 7.5 km/ hour. In how much time will she complete five rounds?

Solution:

Length of rectangular plot (l) = 180 m

and breadth (b) = 120 m

Perimeter = 2(l + b) = 2(180 + 120) m = 2 × 300 = 600 m

Distance travelled in 5 rounds = 600 × 5 = 3000 m = 3 km

Speed = 7.5 km/hr

$$\text{Time taken} = \frac{3}{7.5}\text{h} = \frac{3\times10}{75}\text{h}$$

$$= \frac{2}{5}\text{h} = \frac{2}{5} \times 60 = 24 \text{ minutes}$$

Question 3.
The area of a rectangular plot is 540 m². if its length is 27 m, find its breadth and perimeter.
Solution:

Area of a rectangular plot = 540 m^2

Length (l) = 27 m

$$\therefore \text{ Breadth} = \frac{\text{Area}}{\text{Length}} = \frac{540}{24} = 20 \text{ m}$$

and perimeter = 2(l + b) = 2(27 + 20) m = 2 × 47 = 94 m

Question 4.
The perimeter of a rectangular field is 151 m. If its breadth is 32 m, find its length and area.
Solution:

Perimeter of a rectangular field = 151 m

Breadth = 32 m

Length = $\frac{Perimeter}{2}$ − Breadth

= $\frac{151}{2}$ − 32

= $\frac{87}{2}$

= 43.5 m

and area = l × b = 43.5 × 32 m^2 = 1392 m^2

Question 5.
The area of a rectangular plot is 340 m² and its breadth is 17 m. Find the cost of surrounding the plot with a fence at ₹ 5.70 per meter.
Solution:

Area of plot = 340 m^2

and breadth (b) = 17 m

Length = $\frac{A}{b}$ = $\frac{340}{17}$ = 20 m

Perimeter = 2(l + b) = 2(20 + 17) = 2 × 37 = 74 m

Rate of fencing around it = ₹ 5.70 per m

Total cost = ₹5.70 × 74 = ₹ 421.80

Question 6.
The area of a square park is the same as that of a rectangular park. If the side of the square park is 60 m and the length of the rectangular park is 90 m, find the breadth of the rectangular park.

Solution:

Side of a square park = 60 m

Area = $(\text{Side})^2 = 60 \times 60 = 3600\ m^2$

Area of rectangular park = $3600\ m^2$

and length (l) = 90 m

$$\therefore \text{ Breadth} = \frac{\text{Area}}{\text{Length}} = \frac{3600}{90} = 40\ m$$

Question 7.

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 in the shape of a square, what will be the measure of each side? Also, find which shape encloses more area and by how much?

Solution:

A wire in shape of a rectangle whose length (l) = 40 m

and breadth (b) = 22 m

Perimeter (Length) of wire = 2(l + b) = 2(40 + 22) cm = 2 × 62 cm = 124 cm

Perimeter of square wire = 124 cm

Then side = $\frac{Perimeter}{4} = \frac{124}{4}$ = 31 m

Now area of rectangle = l × b = 40 × 22 = $880\ cm^2$

and area of square = $(\text{Side})^2 = (31)^2\ cm^2 = 961\ cm^2$

Difference in area = 961 − 880 = $81\ cm^2$

Area of $81\ cm^2$ is more of square shaped wire.

Question 8.

A door of breadth 1 m and height 2 m 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 whitewashing the wall, if the rate of whitewashing the wall is ₹ 20 per m^2.

Solution:

Breadth of door = 1 m and height = 2 m

Area of door = l × b = 1 × 2 = $2\ m^2$

Length of wall = 4.5 m and height = 3.6 m

Area = $4.5 \times 3.6\ m^2 = 16.2\ m^2$

Area of wall excluding area of door = $16.2 - 2 = 14.2\ m^2$

Rate of white washing = ₹ 20 per m^2

Total cost = 14.2 × 20 = ₹ 284

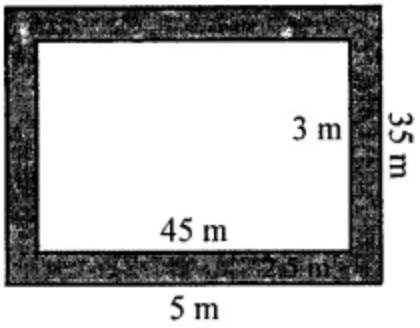
Question 9.
A rectangular park is 45 m long and 30 m wide. A path 2.5 m wide is constructed outside the park. Find the area of the path.
Solution:

Length of a rectangular park (l) = 45 m

and breadth (b) = 30 m

Width of path outside the park = 2.5 m

Outer length (L) = 45 + 2 × 2.5 m = 45 + 5 = 50 m



and width (B) = 30 + 2 × 2.5 = 30 + 5 = 35 m

Area of park = L × B − l × b

= 50 × 35 − 45 × 30 m^2

= 1750 − 1350

= 400 m^2

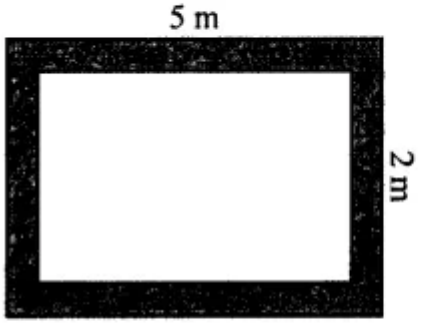
Question 10.
A carpet of size 5 m × 2 m has 25 cm wide red border. The inner part of the carpet is blue in colour. Find the area of the blue portion. What is the ratio of the areas of red portion to blue portion?

Solution:

Length of blue carpet (l) = 5 m

Breadth (b) = 2 m

Width of red border = 25 cm



Inner length = $5 - \frac{2 \times 25}{100}$ = 5 − 0.5 = 4.5 m

and breadth = 2 − 0.5 = 1.5 m

Now area of carpet = 4.5 × 1.5 m^2 = 6.75 m^2

and area of border = 5 × 2 − 6.75 m^2 = 10 − 6.75 = 3.25 m^2

Now ratio between border and carpet (blue part) = 3.25 : 6.75 = 13 : 27

Question 11.

A verandah of width 2.25 m is constructed all along outside a room which is 5.5 m long and 4 m wide. Find:

(i) the area of the verandah.

(ii) the cost of cementing the floor of the verandah at the rate of ₹ 200 per m2.

Solution:

Width of a verandah = 2.25 m

Length of room (i) = 5.5 m

and breadth (b) = 4.0 m

Outer length (L) = 5.5 + 2 × 2.25 m = 5.5 + 4.5 = 10 m

and outer breadth = 4 + 4.5 = 8.5 m

(i) Area of verandah = Outer area − Inner area

= 10 × 8.5 − 5.5 × 4 m^2

= 85 − 22 m^2

= 63 m^2

(ii) Rate of cementing the floor of verandah = ₹ 200 per m^2

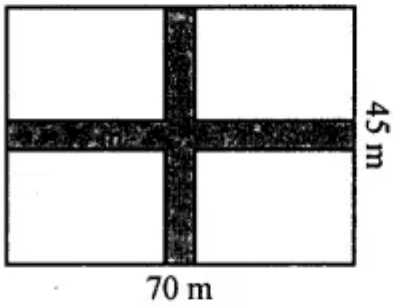
Total cost = ₹ 63 × 200 = ₹ 12600

Question 12.
Two crossroads, each of width 5 m, run at right angles through the centre of a rectangular park of length 70 m and breadth 45 m and parallel to its sides. Find the area of the roads. Also, find the cost of constructing the roads at the rate of ₹ 105 per m2.
Solution:

Length of rectangular park (l) = 70 m

and breadth (ft) = 45 m

Width of each road = 5 m



(i) Area of roads = $70 \times 5 + 45 \times 5 - (5)^2$ m^2

= 350 + 225 − 25 = 550 m^2

(ii) Rate of constructing the roads = ₹105 per m^2

Total cost = ₹ 105 × 550 = ₹ 57750

Question 13.
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 ₹ 250 per metre.
Solution:

Length of rectangular room (l) = 10 m

and breadth (b) = 7.5 m

Area of floor of the room = l × b = 10 × 7.5 = 75 m^2

Width of carpet = 1.25 m

$$\therefore \text{ Length of carpet} = \frac{\text{Area}}{\text{Width}} = \frac{75}{1.25}$$

$$= \frac{75 \times 100}{125} = 60 \text{ m}$$

Cost of 1 m carpet = ₹ 250

Total cost = ₹ 250 × 60 = ₹ 15000

Question 14.
Find the cost of flooring a room 6.5 m by 5 m with square tiles of side 25 cm at the rate of ₹ 9.40 per tile.
Solution:

Length of floor of a room (l) = 6.5 m

and breadth (b) = 5 m

Area = $6.5 \times 5\ m^2 = 32.5\ m^2$

$$\text{Side of square tile} = 25\ \text{cm} = \frac{25}{100} = \frac{1}{4}\ \text{m}$$

$$\therefore\ \text{Area of one tile} = \left(\frac{1}{4}\right)^2 m^2 = \frac{1}{16} m^2$$

$$\text{Number of tiles required} = \frac{\text{Area of floor}}{\text{Area of one tile}}$$

$$= \frac{32.5}{\frac{1}{16}} = 32.5 \times \frac{16}{1} = 520$$

Cost of tile at the rate of ₹ 9.40 per tile = ₹ 9.40 × 520 = ₹ 4888

Question 15.
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 ₹ 27.
Solution:

Side of square room = 4.8 m

Area = $(4.8)^2\ m^2 = 23.04\ m^2$

Perimeter of one tile = 1.2 m

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

Area of one tile = $(0.3)^2 = 0.09\ m^2$

$$\therefore\ \text{Number of tiles} = \frac{\text{Area of floor}}{\text{Area of one tile}}$$

$$\therefore \text{ Number of tiles} = \frac{\text{Area of floor}}{\text{Area of one tile}}$$

$$= \frac{23.04}{0.09} = \frac{2304}{9} = 256$$

Cost of one tile = ₹ 27

Total cost = 256 × ₹ 27 = ₹ 6912

Question 16.

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.

(ii) the cost of leveling the plot at the rate of ₹ 7.6 per m^2.

Solution:

Breadth of a plot = 50 m

Cost of fencing around it = ₹ 4680

Rate of fencing = ₹ 18 per m

Perimeter = $\frac{4680}{18}$ = 260 m

Length = $\frac{Perimeter}{2}$ − Breadth

= $\frac{260}{2}$ − 50

= 130 − 50

= 80 m

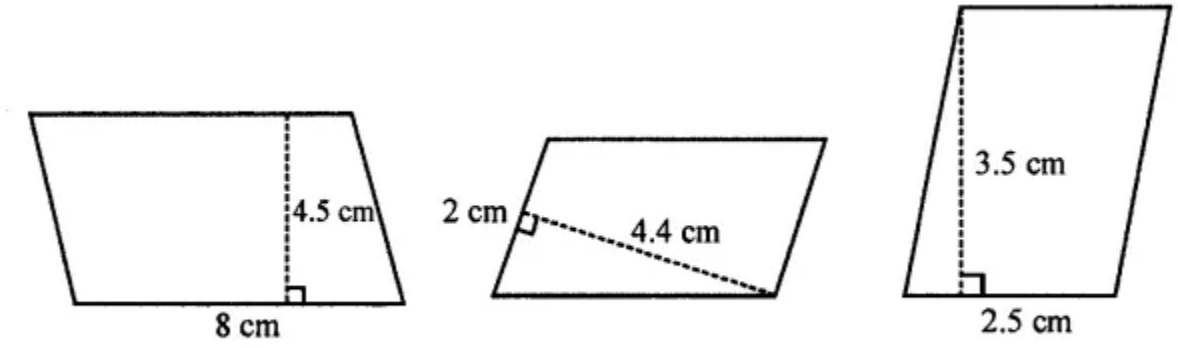
(ii) Now area of plot = l × b = 80 × 50 m^2 = 4000 m^2

Rate of leveling the plot = ₹ 7.6 per m^2

Total cost = ₹ 4000 × ₹ 7.6 = ₹ 30400

Exercise 16.2

Question 1.
Find the area of each of the following parallelogram:



(*i*) (*ii*) (*iii*)

Solution:

(i) Base of the parallelogram (b) = 8 cm and height (h) = 4.5 cm

Area = b × h = 8 × 4.5 = 36 cm^2

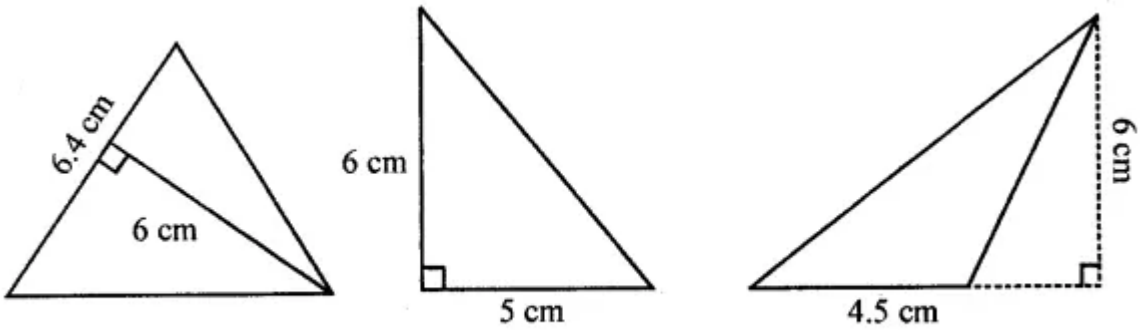
(ii) Base of the parallelogram (b) = 2 cm and height (h) = 4.4 cm

Area = b × h = 2 × 4.4 = 8.8 cm^2

(iii) Base of the parallelogram (b) = 2.5 cm and height (h) = 3.5 cm

Area = b × h = 2.5 × 3.5 = 8.75 cm^2

Question 2.
Find the area of each of the following triangles:



(*i*) (*ii*) (*iii*)

Solution:

(i) Base of the triangle (b) = 6.4 cm and height (b) = 6 cm

Area = $\frac{1}{2} \times b \times h$

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

= 19.2 cm^2

(ii) Base of triangle (b) = 5 cm and height (h) = 6 cm

Area = $\frac{1}{2} \times b \times h$

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

(iii) Base of the triangle (b) = 4.5 cm and altitude (h) = 6 cm

Area = $\frac{1}{2} \times b \times h$

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

= 13.5 cm^2

Question 3.
Find the missing values:

	Base	Height	Area of parallelogram
(*i*)	7.5 cm	5.6 cm	....
(*ii*)	20 cm	....	246 cm^2
(*iii*)	....	15 cm	154.5 cm^2
(*iv*)	....	8.4 cm	48.72 cm^2

Solution:

Area of ||gm = b × h

	Base	Height	Area of parallelogram
(*i*)	7.5 cm	5.6 cm	42 cm^2
(*ii*)	20 cm	12.3 cm	246 cm^2
(*iii*)	10.3 cm	15 cm	154.5 cm^2
(*iv*)	5.8 cm	8.4 cm	48.72 cm^2

(*i*) Area = $b \times h = 7.5 \times 5.6 = 42$ cm^2

(*ii*) $\frac{\text{Area}}{\text{Base}} = \text{Height} = h = \frac{246}{20} = 12.3 \text{ cm}$

(*iii*) $\text{Base} = \frac{\text{Area}}{\text{Height}} = \frac{154.5}{15} = 10.3 \text{ cm}$

(*iv*) $\text{Base} = \frac{\text{Area}}{\text{Height}} = \frac{48.72}{8.4} = 5.8 \text{ cm}$

Question 4.
Find the missing values:

	Base	Height	Area of triangle
(*i*)	23.2 m	16.7 m	....
(*ii*)	15 cm	....	87 cm^2
(*iii*)	22 mm	....	170.5 mm^2
(*iv*)	....	31.4 cm	1256 cm^2

Solution:

	Base	Height	Area of triangle
(*i*)	23.2 m	16.7 m	193.72 m^2
(*ii*)	15 cm	11.6 cm	87 cm^2
(*iii*)	22 mm	15.5 mm	170.5 mm^2
(*iv*)	80 cm	31.4 cm	1256 cm^2

$$\text{Area of } \Delta = \frac{1}{2} b \times h$$

(*i*) $A = \frac{1}{2} b \times h = \frac{1}{2} \times 23.2 \times 16.7 \text{ m}^2$

$= 11.6 \times 16.7 = 193.72$

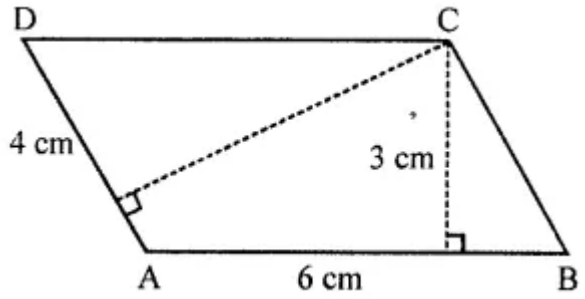
(*ii*) $\text{Height } (h) = \frac{\text{Area} \times 2}{B} = \frac{87 \times 2}{15} = 11.6 \text{ cm}$

(*iii*) Height $(h) = \dfrac{\text{Area} \times 2}{\text{B}}$

$= \dfrac{170.5 \times 2}{22} = 15.5$ mm

(*iv*) Base $= \dfrac{\text{Area} \times 2}{h} = \dfrac{12.56 \times 2}{31.4} = 80$ cm

Question 5.
In the given 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
(ii) the height corresponding to the base AD.

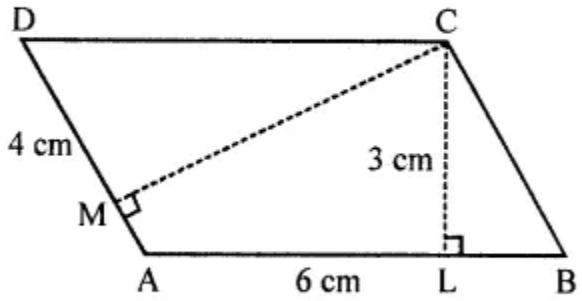


Solution:

In ||gm ABCD,

Base AB (b) = 6 cm

Altitude (h) = 3 cm



(i) Area = b × h = 6 × 3 = 18 cm^2

In second case,

(ii) Base = 4 cm

Area= 18 cm^2

Altitude (to AD) = $\frac{Area}{Base}$

= $\frac{18}{4}$ cm

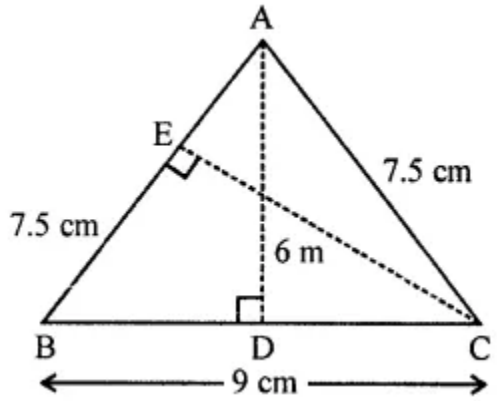
= 4.5 cm

Question 6.

In the given figure, ABC is an isosceles triangle with AB = AC = 7.5 cm and BC = 9 cm. If the height AD from A to BC is 6 cm, find:

(i) the area of ΔABC

(ii) the height CE from C to AB.



Solution:

In an isosceles ΔABC

AB = AC = 7.5 cm, BC = 9 cm

Height AD to BC = 6 cm

(i) Area of ΔABC = $\frac{1}{2}$ × Base × Height

= $\frac{1}{2}$ × BC × AD

= $\frac{1}{2}$ × 9 × 6 = 27 cm^2

(ii) Area of ΔABC = 27 cm^2

Base AB = 7.5 cm

$$\therefore \text{ Height CE} = \frac{\text{Area} \times 2}{\text{Base}} = \frac{27 \times 2}{7.5} \text{ cm}$$

$$= 7.2 \text{ cm}$$

Question 7.

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

Solution:

Base of a right angled triangle = 8 cm

and hypotenuse = 17 cm

Height^2 = (Hypotenuse)^2 – (Base)^2 = $17^2 - 8^2 = 289 - 64 = 225 = (15)^2$

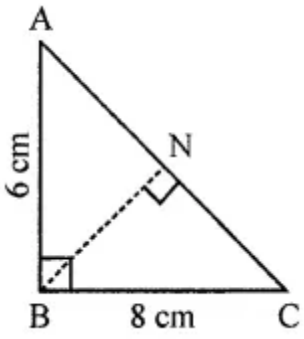
Height = 15 cm

Now are of $\Delta = \frac{1}{2} \times$ Base × Height

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

Question 8.

In the given 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.



Solution:

In the given figure,

In ΔABC,

Base BC = 8 cm

and height AB = 6 cm

Area = $\frac{1}{2} \times$ Base × Height

$= \frac{1}{2} \times 8 \times 6$

$= 24\ cm^2$

Now, BN ⊥ AC

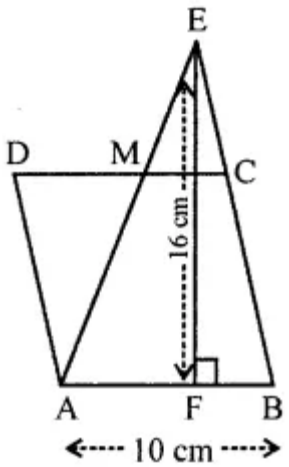
$AC^2 = AB^2 + BC^2 = 6^2 + 8^2 = 36 + 64 = 100 = (10)^2$

AC = 10 cm

$$\text{Height BN} = \frac{\text{Area} \times 2}{\text{Base}} = \frac{24 \times 2}{10}$$

$$= \frac{48}{10} = 4.8 \text{ cm}$$

Question 9.
In the given figure, the 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 mid-point of side DC?



Solution:

In the given figure, M is mid-point of DC

Area of ΔABE = Area of ||gm ABCD

Now base of ΔABC = 10 cm and height = 16 cm

Area = $\frac{1}{2}$ × Base × Height

= $\frac{1}{2}$ × 10 × 16 = 80 cm^2

Now area of ||gm = Area of Δ = 80 cm^2

Base = 10 cm

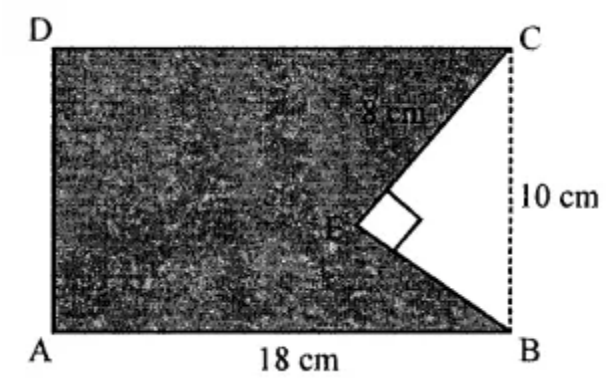
Length of altitude = $\frac{Area}{Base}$ = $\frac{80}{10}$ = 8 cm

and Area of ΔAMD = $\frac{1}{2}$ × Base MD × Altitude

= $\frac{1}{2} \times \frac{10}{2} \times \frac{16}{2}$

= 20 cm^2

Question 10.
In the given figure, ABCD is a rectangle of size 18 cm by 10 cm. In ABEC, ∠E = 90° and EC = 8 cm. Find the area of the shaded region.



Solution:

In the figure,

ABCD is a rectangle in which

Base (b) = 18 cm

Height (h) = 10 cm

A ΔDEC is cut in which

∠E = 90°, EC = 8 cm

Now area of rectangle = l × b = 18 × 10 = 180 cm^2

In ΔEBC,

BC = 10 cm, EC = 8 cm

$EB^2 = BC^2 - EC^2$ (Pythagoras Theorem)

$= 10^2 - 8^2 = 100 - 64 = 36 = (6)^2$

EB = 6 cm

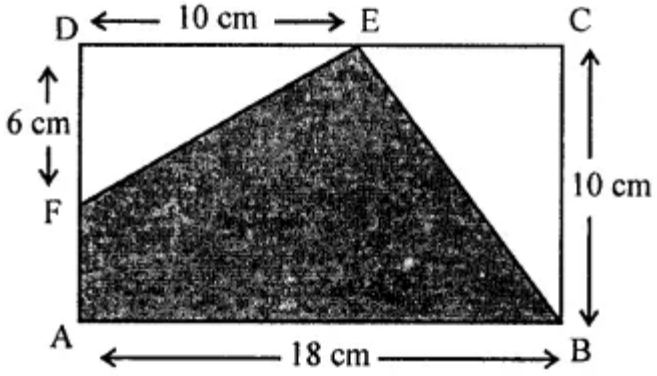
Now area of right ΔEBC = $\frac{1}{2}$ × EB × EC

= $\frac{1}{2}$ × 6 × 8 = 24 cm^2

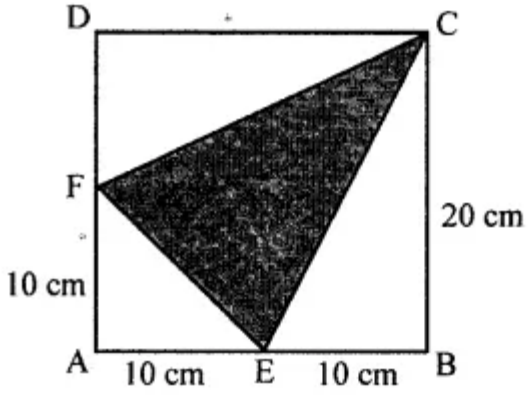
Area of shaded portion = 180 − 24 = 156 cm^2

Question 11.

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



(*i*)



(*ii*)

Solution:

(i) ABCD is a rectangle in which

Length (l) = 18 cm

Breadth (b) = 10 cm

Area of rectangle = l × b = 18 × 10 = 180 cm^2

DE = 10 cm

EC = 18 − 10 = 8 cm

Now area of ΔBCE = $\frac{1}{2}$ × BC × EC

= $\frac{1}{2}$ × 10 × 8

= 40 cm^2

and area of ΔFDE = $\frac{1}{2}$ × DC × DF

$= \frac{1}{2} \times 10 \times 6 = 30 \text{ cm}^2$

Area of shaded portion = Area of rectangle – Area of ΔBCE – Area of ΔFDE

$= 180 - (40 + 30)$

$= 180 - 70$

$= 110 \text{ cm}^2$

(ii) In the given figure,

ABCD is a square whose each side = 20 cm

E and F are mid-points of AB and AD respectively

EC and FC are joined

Area of square ABCD = $(\text{Side})^2 = (20)^2 = 400 \text{ cm}^2$

Area of $\Delta EBC = \frac{1}{2} \times EB \times BC$

$= \frac{1}{2} \times 10 \times 20 = 100 \text{ cm}^2$

Area of $\Delta FDC = \frac{1}{2} \times FD \times DC$

$= \frac{1}{2} \times 10 \times 20 = 100 \text{ cm}^2$

Area of $\Delta AEF = \frac{1}{2} \times 10 \times 10 = 50 \text{ cm}^2$

Area of shaded portion = $400 - (100 + 100 + 50) \text{ cm}^2 = 400 - 250 = 150 \text{ cm}^2$

Exercise 16.3

Take $\pi = 227$, unless stated otherwise.

Question 1.

Find the circumference of the circles with the following radius:

(i) 7 cm

(ii) 21 cm

(iii) 28 mm

(iv) 3.5 cm

Solution:

(i) Radius of the circle (r) = 7 cm

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

(ii) Radius of the circle (r) = 21 cm

Circumference = $2\pi r = 2 \times \frac{22}{7} \times 21 = 132$ cm

(iii) Radius of the circle (r) = 28 mm

Circumference = $2\pi r = 2 \times \frac{22}{7} \times 28$ mm = 176 mm

(iv) Radius of the circle (r) = 3.5 cm

Circumference = $2\pi r = 2 \times \frac{22}{7} \times 3.5$ cm = 22 cm

Question 2.

Find the area of the circles, given that:

(i) radius = 14 mm

(ii) diameter = 49 m

(iii) diameter = 9.8 m

(iv) radius = 5 cm

Solution:

(i) Radius (r) = 14 mm

$$\therefore \text{ Area} = \pi r^2 = \frac{22}{7} \times 14 \times 14 = 616 \text{ cm}^2$$

(*ii*) Diameter = 49 m

$$\therefore \text{ Radius} = \frac{49}{2} \text{ m}$$

$$\text{and area} = \pi r^2 = \frac{22}{7} \times \frac{49}{2} \times \frac{49}{2}$$

$$= 3773 \text{ m}^2$$

(*ii*) Diameter = 9.8 m

$\therefore$ Radius = $\frac{9.8}{2}$ = 4.9 m

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

(*iv*) Radius = 5 cm

$\therefore$ Area = $\pi r^2 = \frac{22}{7} \times 5 \times 5\ cm^2$

$= \frac{550}{7} = 78\frac{4}{7}\ cm^2$

Question 3.
Find the circumference and area of a circle of radius 20 cm. (use π = 3.14)
Solution:

Radius of a circle (r) = 20 cm

Circumference = $2\pi r = 2 \times 3.14 \times 20$ cm = 125.60 = 125.6 cm

and area = $\pi r^2 = 3.14 \times 20 \times 20\ cm^2 = 1256\ cm^2$

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

Length of minute hand (r) = 1.4 m

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

Distance covered = 8.8 m

Question 5.
A gardener wants to fence a circular garden of diameter 21 m. Find the length of the rope he needs to purchase if he makes 2 rounds of the fence. Also find the cost of the rope, if it costs ₹ 4 per metre.

Solution:

Diameter of a circular garden = 21 m

Circumference = $\pi d = \frac{22}{7} \times 21 = 66$ m

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

Rate of rope = ₹ 4 per metre

Total cost = 132×4 = ₹ 528

Question 6.

If the circumference of a circle exceeds its diameter by 30 cm, find the radius of the circle.

Solution:

Let fadius of a circle = r

Then diameter = 2r

and circumference = $2\pi r$

According to the condition,

$2\pi r - 2r = 30$

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

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

$$\Rightarrow r \times \frac{44 - 14}{7} = 30 \Rightarrow r = \frac{30}{7} = 30$$

$$\therefore r = \frac{30 \times 7}{30} = 7$$

$\therefore$ **Radius = 7 cm**

Question 7.

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

Solution:

Circumference of a circle = 44 cm

Circumference of circles = 2πr

$$\text{Radius} = \frac{\text{Diameter}}{2}$$

$d = 2r$

$\therefore$ Circumference $= 2\pi r = \pi d$

$$\therefore d = \frac{\text{Circumference}}{\pi}$$

$$\therefore \text{Diameter } (d) = \frac{44}{\pi} = \frac{44}{22} \times 7 = 14 \text{ cm}$$

Question 8.

The circumference of a circle is 31.4 cm. Find the radius and the area of the circle. (Take π = 3.14)

Solution:

Circumference of a circle = 31.4 cm

Circumference = 2πr

$$\therefore \text{Radius} = \frac{\text{Circumference}}{2\pi} = \frac{31.4}{2 \times 3.14}$$

$$= \frac{314 \times 100}{10 \times 2 \times 314} = 5 \text{ cm}$$

and area = $\pi r^2 = 3.14 \times 5 \times 5 = 78.5 \text{ cm}^2$

Question 9.

Find the radius and the circumference of a circle whose area is 144π cm².

Solution:

Area of a circle = 144π cm^2

Area = πr^2

$$r = \sqrt{\frac{\text{Area}}{\pi}}$$

$$\therefore \text{ Radius} = \sqrt{\frac{\text{Area}}{\pi}} = \sqrt{\frac{144\pi}{\pi}}$$

$$= \sqrt{144} = 12 \text{ cm}$$

and circumferene = $2\pi r = 2 \times \pi \times 12 = 24\pi$ cm

Question 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?
Solution:

Total distance covered = 88 km = 88 km × 1000 m = 88000 m

Diameter of a wheel (d) = 56 cm

Circumference = $2\pi r = \pi d = \frac{22}{7} \times 56 = 176$ cm

Number of rotation of the wheel

$$= \frac{\text{Distance}}{\text{Circumference}}$$

$$= \frac{88000 \times 100}{176} = 50000$$

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

Solution:

Side of a square cardboard = 21 cm

A circle of the maximum area is cut out from is

Diameter of circle = 21 cm

$$\therefore \text{ Radius } (r) = \frac{21}{2} \text{ cm}$$

$$\therefore \text{ Area} = \pi r^2 = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \text{ cm}^2$$

$$= \frac{693}{2} \text{ cm}^2 = 346.5 \text{ cm}^2$$

Total area of the cardboard = 21×21 cm^2 = 441 cm^2

Area of remaining cardboard = $441 - 346.5 = 94.5$ cm^2

Question 12.

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

Solution:

Side of equilateral triangular shaped wire = 44 cm

Perimeter = 4.4×3 cm = 13.2 cm

After rebenting it into a circular shape the circumference = 13.2 cm

Radius = $\frac{Circumference}{2\pi}$

$$= \frac{13.2 \times 7}{2 \times 22} = 2.1 \text{ cm}$$

and area $= \pi r^2$

$$= \frac{22}{7} \times 2.1 \times 2.1 \text{ cm}^2$$

$$= 13.86 \text{ cm}^2$$

Question 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.

Solution:

Side of square shaped wire = 27.5 cm

Perimeter = 27.5 × 4 = 110 cm

Now after rebenting it into a circle the circumference = 110 cm

$$\therefore \text{ Radius} = \frac{\text{Circumference}}{2\pi}$$

$$= \frac{110 \times 7}{2 \times 27} = \frac{35}{2} \text{ cm}$$

$$\therefore \text{ Area of circle} = \pi r^2 = \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \text{ cm}^2$$

$$= \frac{1925}{2} \text{ cm}^2 = 962.5 \text{ cm}^2$$

Question 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 the circle, find the radius and the area of the circle so formed.

Solution:

Length of rectangular wire (l) = 18.7 cm

and breadth (b) = 14.3 cm

Perimeter = 2(l + b) = 2(18.7 + 14.3) cm = 2 × 33 = 66 cm

After rebenting it into a circle circumference = 66 cm

$$\therefore \text{ Radius} = \frac{\text{Circumference}}{2\pi} = \frac{66 \times 7}{2 \times 22}$$

$$= \frac{21}{2} \text{ cm} = 10.5 \text{ cm}$$

$$\text{and area} = \pi r^2 = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \text{ cm}^2$$

$$= \frac{693}{2} = 346.5 \text{ cm}^2$$

Question 15.

The diameter of a circular park is 84 m. On its outside, there a 3.5 m wide road. Find the

cost of constructing the road at ₹ 240 per m^2.
Solution:

Diameter of a circular park = 84 m

Width of road made out side of it = 3.5 m

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

and outer radius (R) = 42 + 3.5 = 45.5 m

Area of road = $\pi(R^2 - r^2)$

$$= \frac{22}{7}(45.5^2 - 42.0^2)$$

$$= \frac{22}{7} \times 87.5 \times 3.5 \text{ m}^2$$

$$= 962.5 \text{ m}^2$$

Rate of constructing the road = ₹ 240 per m^2

Total cost = ₹ 962.5 × 240 = ₹ 231000

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

Solution:

The outer circumference of circular path = 44 m

$$\therefore \text{ Outer radius} = \frac{\text{Circumference}}{2\pi}$$

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

Width of path = 2 m

$\therefore$ Inner radius = 7 – 2 = 5 m

$$\therefore \text{ Inner circumference} = 2 \times \frac{22}{7} \times 5$$

$$= \frac{220}{7} \text{ m} = 31\frac{3}{7} \text{ m}$$

and area of path = $\pi(R^2 - r^2)$

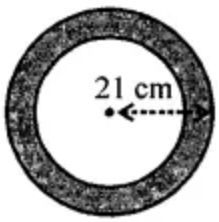
$$= \frac{22}{7}(7^2 - 5^2) \text{ m}^2$$

$$= \frac{22}{7} \times 12 \times 2 = \frac{528}{7} \text{ m}^2$$

$$= 7.5\frac{3}{7} \text{ m}^2$$

Question 17.

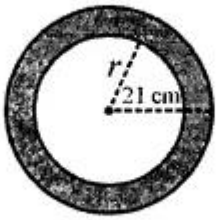
In the given figure, the area enclosed between the concentric circles is 770 cm^2. If the radius of the outer circle is 21 cm, calculate the radius of the inner circle.



Solution:

Area enclosed by two concentric circles = 770 cm^2

Radius of outer circle (R) = 21 cm



Let r be the radius of inner circle

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

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

$$\Rightarrow 21^2 - r^2 = \frac{770 \times 7}{22} = 245$$

$$441 - r^2 = 245$$

$$\Rightarrow r^2 = 441 - 245 = 196 = (14)^2$$

$$\therefore r = 14$$

Inner radius = 14 cm

Question 18.

From a circular card sheet of radius 14 cm, two circles of radius 3.5 cm and a rectangle of length 3 cm and breadth 1 cm are removed (as shown in the given figure). Find the area of the remaining sheet.

Solution:

Radius of circular card sheet (R) = 14 cm

Radius of smaller circles = 3.5 cm

and length of rectangle = 3 cm

Breadth = 1 cm

Now area of bigger circular sheet = πR^2

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

Area of 2 smaller circles = $2 \times \pi r^2$

$= 2 \times \frac{22}{7} \times 3.5 \times 3.5\ cm = 77\ cm^2$

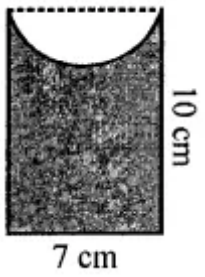
and area of rectangle = $3 \times 1 = 3\ cm$

Area of shaded portion = $616 - (77 + 3)\ cm^2 = 616 - 80 = 536\ cm^2$

Question 19.

Calculate the length of the boundary and the area of the shaded region in the following diagrams. All measurements are in centimetres.

(i) The unshaded part is a semicircle.



(ii) Four semicircles on a square.

Solution:

(i) Length of rectangle = 10 cm

Breadth = 7 cm

Area = l × b = 10 × 7 = 70 cm^2

Radius of semicircle on one side = $\frac{7}{2}$ cm

$$\therefore \text{Area} = \frac{1}{2}\pi r^2 = \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$$

$$= \frac{77}{4} \text{cm}^2 = 19.25 \text{ cm}^2$$

$\therefore$ Area of shaded portion = 70 – 19.25

$= 50.75 \text{ cm}^2$

$$\text{Length of boundary} = 10 \times 2 + 7 + \frac{22}{7} \times \frac{7}{2}$$

$= 20 + 7 + 11 = 38$ cm

(*ii*) Side of inner square = $\frac{28}{2} = 14$ cm

Area = $(\text{Side})^2 = 14 \times 14 = 196 \text{ cm}^2$

Radius of each semicircles = $\frac{14}{2} = 7$ cm

$\therefore$ Area $= 4 \times \frac{1}{2}\pi r^2$

$= 2 \times \frac{22}{7} \times 7 \times 7 \text{ cm}^2$

$= 308 \text{ cm}^2$

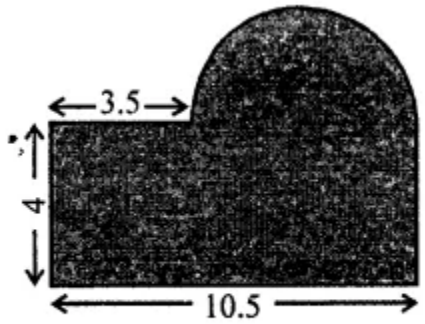
Area of shaded region $= 196 + 308 \text{ cm}^2$

$= 504 \text{ cm}^2$

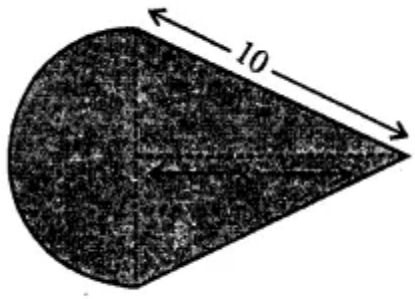
Length of boundary $= 4 \times \pi r = 4 \times \frac{22}{7} \times 7$

$= 88$ cm

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



(*i*)



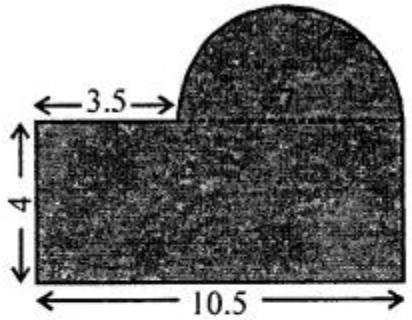
(*ii*)

Solution:

(i) Length of rectangular part = 10.5 cm

and breadth = 4 cm

Diameter of semicircle = 7 cm



$\therefore$ Radius $(r) = \frac{7}{2}$ cm

Now, perimeter $= 4 \times 2 + 10.5 + 3.5 + \pi r$

$$= 8 + 14 + \frac{22}{7} \times \frac{7}{2}$$

$$= 8 + 14 + 11 = 33 \text{ cm}$$

Area = Area of rectangle + Area of semicircle

$$= 10.5 \times 4 + \frac{1}{2}\pi r^2$$

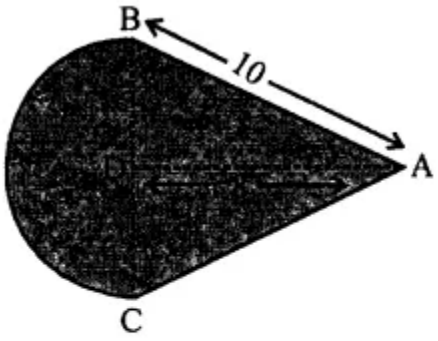
$$= 42 + \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \text{cm}^2$$

$$= 42 + \frac{77}{4} = 42 + 19.25 = 61.25 \text{ cm}^2$$

(*ii*) In isosceles triangle, each of equal side

$= 10$ cm

Perpendicular AD = 8 cm



$\therefore$ In right $\angle ABD$

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

$10^2 = 8^2 + BD^2$ (Pythagoras Theorem)

$100 = 64 + BD^2$

$\Rightarrow BD^2 = 100 - 64 = 36 = (6)^2$

$\therefore$ BD = 6 cm $\Rightarrow$ BC = $2 \times 6 = 12$ cm

$\therefore$ Radius of the semicircle = 6 cm

$$\text{Perimeter} = \pi r + 10 \times 2 = \frac{22}{7} + 6 + 20$$

$$= \frac{132}{7} + 20 = 18\frac{6}{7} + 20 = 38\frac{6}{7}\text{ cm}$$

Area of shaded region

= Area of ΔABC + Area of semicircle

$$= \frac{1}{2} \times 8 \times 12 + \frac{1}{2}\pi r^2$$

$$= 40 + \frac{1}{2} \times \frac{22}{7} \times 6 \times 6 \text{ cm}^2$$

$$= 48 + \frac{396}{7} = 48 + 56\frac{4}{7} = 104\frac{4}{7}\text{ cm}^2$$

Objective Type Questions

Question 1.
Fill in the blanks:
(i) The perimeter of a regular polygon = ... × length of a side.
(ii) The unit of measurement of the area is .....
(iii) The perimeter of a rhombus is = 4 × .....
(iv) An area of 1 km^2 = ... hectare
(v) If the perimeter of a parallelogram is 40 cm and the length of one side is 12 cm, then the length of the adjacent side is .....
(vi) To find the cost of polishing a table-top, we need to find the ..... of the table-top.
(vii) The ratio of circumference to the diameter of a circle is .....
(viii) If the area of a triangular piece of cardboard is 90 cm^2, then the length of the altitude corresponding to 20 cm long base is ..... cm.
Solution:

(i) The perimeter of a regular polygon = Number of sides × length of a side.

(ii) The unit of measurement of the area is a square unit.

(iii) The perimeter of a rhombus is = 4 × length of side.

(iv) An area of 1 km^2 = 1000 hectare

(v) If the perimeter of a parallelogram is 40 cm and the length of one side is 12 cm, then the length of the adjacent side is 8 cm.

(vi) To find the cost of polishing a table-top, we need to find the area of the table-top.

(vii) The ratio of circumference to the diameter of a circle is π.

(viii) If the area of a triangular piece of cardboard is 90 cm^2, then the length of the altitude corresponding to 20 cm long base is 9 cm.

Question 2.
State whether the following statements are true (T) or false (F):
(i) A diagonal of a rectangle divides it into two right-angled triangles of equal areas.
(ii) A diagonal of a parallelogram divides it into two triangles of equal areas.
(iii) If the perimeter of two parallelograms is equal, then their areas are also equal.
(iv) All parallelogram having equal areas have the same perimeters.
(v) The area of a circle of diameter d is πd^2.
(vi) Area of a parallelogram = product of lengths of its two adjacent sides.

Solution:

(i) A diagonal of a rectangle divides it into two right-angled triangles of equal areas. (True)

(ii) A diagonal of a parallelogram divides it into two triangles of equal areas. (True)

(iii) If the perimeter of two parallelograms is equal, then their areas are also equal. (False)

(iv) All parallelogram having equal areas have the same perimeters. (False)

(v) The area of a circle of diameter d is πd^2. (False)

Correct:

Area of circle = πr^2 (r is a radius of the circle).

(vi) Area of a parallelogram = product of lengths of its two adjacent sides. (False)

Correct:

Area = Base × Corresponding altitude.

Multiple Choice Questions

Choose the correct answer from the given four options (3 to 14):

Question 3.

If the perimeter of a square is 24 cm, then its area is

(a) 16 cm^2

(b) 24 cm^2

(c) 36 cm^2

(d) 36 m^2

Solution:

Perimeter of a square = 24 cm

Side = $\frac{24}{4}$ = 6 cm

Area = $(Side)^2 = 6 \times 6 = 36\ cm^2$ (c)

Question 4.

If the area of a parallelogram is 54 cm^2 and the length of one side is 7.5 cm, then the corresponding height is

(a) 7.2 cm

(b) 14.4 cm

(c) 3.6 cm
(d) 13.5 cm
Solution:
Area of a ||gm = 54 cm^2
Length of one side = 7.5 cm

$$\text{Corresponding height} = \frac{\text{Area}}{\text{Side}} = \frac{54}{7.5}$$

$$= \frac{54 \times 10}{75} = \frac{36}{5} = 7.2 \text{ cm} \qquad \text{(a)}$$

Question 5.
If the base of a triangle is doubled and its height is halved, then the area of the resulting triangle
(a) decreases
(b) increases
(c) doubles
(d) remains the same
Solution:
If the base is doubled and height is halved,
then the area of the resulting triangle remains the same. (d)

Question 6.
If the height of a parallelogram is doubled and base tripled, then its area becomes
(a) 2 times
(b) 3 times
(c) 6 times
(d) 12 times
Solution:
If the height of a ||gm is doubled and base tripled
then the area becomes 2 × 3 = 6 times (c)

Question 7.
The circumference of the circle with diameter 28 cm is
(a) 44 cm
(b) 88 cm
(c) 176 cm
(d) 616 cm

Solution:

The circumference of a circle with diameter 28 cm is = $28 \times \pi = 28 \times \frac{22}{7} = 88$ cm (b)

Question 8.
The ratio of circumference to the area of a circle of radius r units is
(a) 2 : r
(b) r : 2
(c) 1 : r
(d) π : r
Solution:

The ratio of circumference to the area of a circle of radius r units is $2\pi r : \pi r^2 = 2 : r$ (a)

Question 9.
If the area of a circle is numerically equal to its circumference, then the radius of the circle is
(a) 1 unit
(b) 2 units
(c) 3 units
(d) 4 units
Solution:

Area of a circle is numerically equal to its circumference the radius of the circle $\pi r^2 = 2\pi r \Rightarrow r = 2$ units (b)

Question 10.
The area of a circle of diameter d is
(a) $2\pi d^2$
(b) πd^2
(c) $\pi d_2 2$
(d) $\pi d_2 4$
Solution:

The area of a circle of diameter d is $\pi r^2 = \pi \left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$ (d)

Question 11.
If the ratio of the radii of two circles is 2 then the ratio of their circumferences is

(a) 2 : 3
(b) 3 : 2
(c) 4 : 9
(d) 9 : 4
Solution:

Let radii be 2x and 3x

Then ratio between their

Circumferences = $2\pi r_1 : 2\pi r_2$

$= 2\pi(2x) : 2\pi(3x)$

$= 2x : 3x$

= 2 : 3 (a)

Question 12.
If the ratio of the radii of two circles is 3 : 5, then the ratio of their areas is
(a) 3 : 5
(b) 5 : 3
(c) 25 : 9
(d) 9 : 25
Solution:

The ratio of radii of two circles is 3 : 5

Let radii of two circles be 3x, and 5x

Then ratio between then areas be

$\pi(3x)^2 : \pi(5x)^2 = 97\pi x^2 : 25\pi x^2$

= 9 : 25 (d)

Question 13.
The perimeter of a semicircle (including its diameter) of radius 7 cm is
(a) 22 cm
(b) 29 cm
(c) 36 cm
(d) 44 cm
Solution:

The perimeter of a semicircle

(including diameter) of radius 7 cm

$$= \frac{1}{2} \times 2\pi r + 2r = \pi r + 2r$$

$$= r(\pi + 2) = 7\left(\frac{22}{7} + 2\right)$$

$$= 7 \times \frac{22+14}{7} = 36 \text{ cm}$$

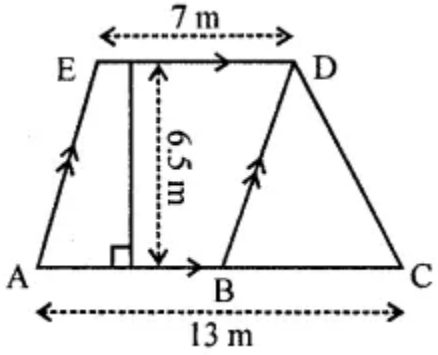
Question 14.
Area of a rectangle and the area of a circle are equal. If the dimensions of the rectangle are 14 cm × 11 cm, then the radius of the circle is
(a) 21 cm
(b) 14 cm
(c) 10.5 cm
(d) 7 cm
Solution:
Area of a rectangle = Area of a circle
Dimensions of the rectangle are 14 cm × 11 cm
Area of circle = 14 × 11 = 154 cm^2

$$\text{Then radius} = \sqrt{\frac{\text{Area}}{\pi}} = \sqrt{\frac{154 \times 7}{22}} \text{ cm}$$

$$= \sqrt{7 \times 7} = 7 \text{ cm}$$ (d)

Higher Order Thinking Skills (HOTS)

Question 1.
In the given figure, ABDE is a parallelogram, find the area of the trapezium ACDE.



Solution:

In the given figure,

ABDE is a parallelogram and ACDE is a trapezium

whose bases are 13 m and height = 6.5 m

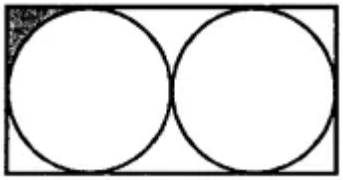
Area = $\frac{1}{2}$ (Sum of parallel sides) × Height

= $\frac{1}{2}$ (13 + 7) × 6.5 m^2

= $\frac{1}{2}$ × 20 × 6.5 = 65 m^2

Question 2.

In the given figure, the length of the rectangle is 28 cm. Find the area of the shaded region.



Solution:

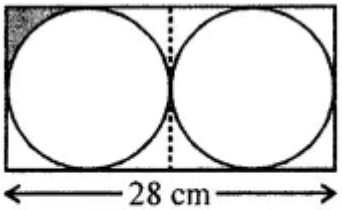
In the given figure,

Length of rectangle = 28 cm

Then diameter of each circle = $\frac{28}{2}$ = 14 cm

and radius = $\frac{14}{2}$ = 7 cm

Breadth of rectangle = 14 cm



There are 8 corners like the shaded are

∴ Area of shaded region

$$= \frac{1}{8}(\text{Area of rectangle} - \text{Area of two circle})$$

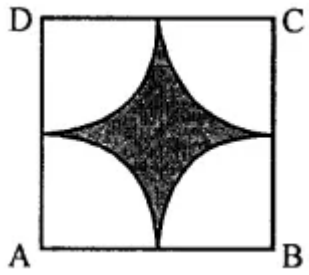
$$= \frac{1}{8}(28 \times 14 - 2 \times \pi r^2)$$

$$= \frac{1}{8}\left(392 - \frac{2 \times 22}{7} \times 7 \times 7\right)$$

$$= \frac{1}{8}(392 - 308)\ \text{cm}^2$$

$$= \frac{1}{8} \times 84 = 10.5\ \text{cm}^2$$

Question 3.
In the given figure, ABCD is a square of side 14 cm. A, B, C, and D are centers of circular arcs of equal radius. Find the perimeter and the area of the shaded region.



Solution:

In the given figure, ABCD is a square of side 14 cm

Area of square = $(\text{Side})^2 = (14)^2 = 196\ \text{cm}^2$

Now radius of each quadrant = $\frac{14}{2} = 7$ cm

Area of 4 quadrants = $7 \times \frac{1}{4} \times \pi r^2$

$= \frac{22}{7} \times 7 \times 7 = 154\ \text{cm}^2$

Area of shaded portion = Area of square − Area of 4 quadrant

$= 196 - 154 = 42\ \text{cm}^2$

and perimeter = $4 \times \frac{1}{4} \times 2\pi r$

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

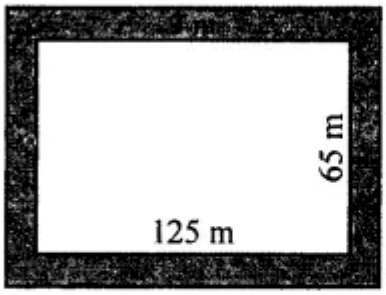
Check Your Progress

Question 1.
A 3 m wide path runs outside and around a rectangular park of length 125 m and breadth 65 m. Find the area of the path.
Solution:

Length of rectangular park (l) = 125 m

and breadth (b) = 65 m

Width of path around it = 3 m



Outer length (L) = 125 + 2 × 3 = 125 + 6 = 131 m

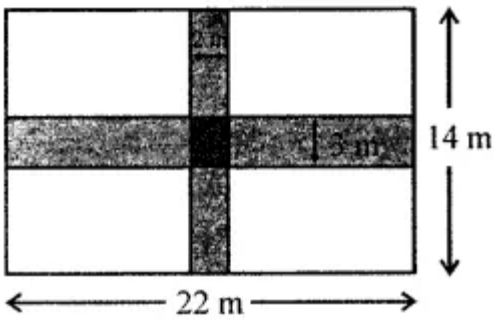
and breadth = 65 + 2 × 3 = 65 + 6 = 71 m

Area of path = L × B − l × b

= 131 × 71 − 125 × 65

= 9301 − 8125 = 1176 m^2

Question 2.
In the given figure, all adjacent line segments are at right angles. Find:
(i) the area of the shaded region
(ii) the area of the unshaded region.



Solution:

In the given figure,

Length (l) = 22 m

and breadth (b) = 14 m

Width of length wire region = 3 m

and breadth wire = 2 m

Area of shaded portion = $22 \times 3 + 14 \times 2 - 3 \times 2\ m^2$

$= 66 + 28 - 6$

$= 88\ m^2$

Total area = $l \times b = 22 \times 14 = 308\ m^2$

Area of unshaded region = $308 - 88 = 220\ m^2$

Question 3.

Find the area of a triangle whose:

(i) base = 2 m, height = 1.5 m

(ii) base = 3.4 m and height = 90 cm

Solution:

(i) Base of a triangle (b) = 2 m

Height (h) = 1.5 m

Area = $\frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 2 \times 1.5 = 1.5\ m^2$

(ii) Base of the triangle (b) = 3.4 m

and height (h) = 90 cm = $\frac{90}{100} = \frac{9}{10}$ m

Area = $\frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 3.4 \times \frac{9}{10}$

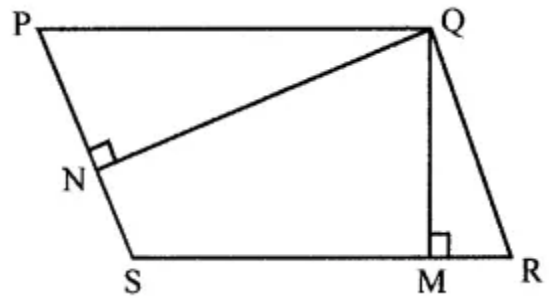
$= \frac{30.6}{20} = 1.53\ m^2$

Question 4.

In the given figure, PQRS is a parallelogram. QM is the height from Q to SR and QN is the height from Q to PS. If SR = 12 cm, PS = 8 cm and QM = 7.6 cm, find:

(i) the area of the parallelogram PQRS

(ii) the length of QN.



Solution:

In the given figure,

PQRS is a parallelogram in which QM ⊥ SR and QN ⊥ PQ

SR = 12 cm, PS = 8 cm, QM = 7.6 cm

(i) Area of ||gm ABCD = b × h

= SR × QM

= 12 × 7.6 cm^2

= 91.2 cm^2

Base PS = 8 cm

Area of ||gm = 91.2 cm^2

Heigh QN = $\frac{Area}{Base}$ = $\frac{91.2}{8}$ = 11.4 cm

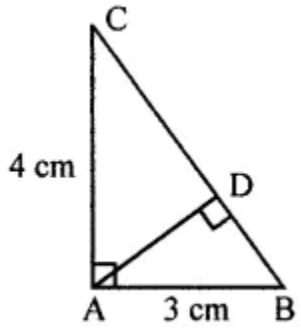
Question 5.

From the given figure, find

(i) the area of ΔABC

(ii) length of BC

(iii) the length of altitude from A to BC.



Solution:

In the given figure,

ABC is a right angled triangle in which

AB = 3 cm , AC = 4 cm

AD ⊥ BC

(i) Area $\Delta ABC = \frac{1}{2} \times$ Base × Height

$= \frac{1}{2} \times 3 \times 4 = 6\ cm^2$

(ii) $BC^2 = AB^2 + AC^2$ (Pythagoras Theorem)

$= 3^2 + 4^2 = 9 + 16 = 25 = (5)^2$

BC = 5 cm

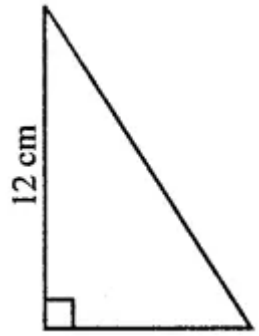
(iii) Now length of altitude AD

$$= \frac{\text{Area} \times 2}{\text{Base}} = \frac{6 \times 2}{5}$$

$$= \frac{12}{5}\ \text{cm} = 2.4\ \text{cm}$$

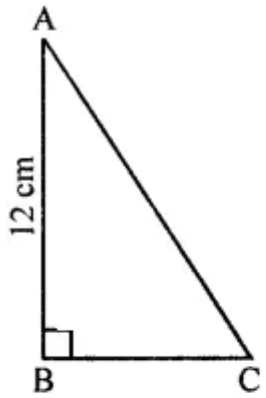
Question 6.

In the given figure, the area of the right-angled triangle is 54 cm^2. If one of its legs is 12 cm long, find its perimeter.



Solution:

In the given figure,



Area of right-angled triangle = 54 cm^2

Length of one leg AB = 12 cm

$$\therefore \text{ Second leg } BC = \frac{\text{Area} \times 2}{AB}$$

$$= \frac{54 \times 2}{12} = 9 \text{ cm}$$

Now $AC^2 = AB^2 + BC^2$ (Pythagoras Theorem)

$= 12^2 + 9^2 = 144 + 81 = 225 = (15)^2$

AC = 15 cm

Now perimeter = AB + BC + AC = 12 + 9 + 15 = 36 cm

Question 7.

If the area of a circle is 78.5 cm^2, find its circumference. (Take $\pi = 3.14$)

Solution:

Area of a circle = 78.5 cm^2

$$\therefore \text{ Radius } (r) = \sqrt{\frac{\text{Area}}{\pi}} = \sqrt{\frac{78.5}{3.14}}$$

$$= \sqrt{25} = 5 \text{ cm}$$

Circumference = $2\pi r = 2 \times 3.14 \times 5 = 31.4$ cm

Question 8.

Find the circumference of the circle whose area is 16 times the area of the circle with

diameter 7 cm.
Solution:

Diameter of first circle = 7 cm

Radius (r) = $\frac{7}{2}$ cm

and Area = $\pi r^2 = \pi \times \frac{7}{2} \times \frac{7}{2} = \frac{49}{4}\pi \text{ cm}^2$

Now area of second circle

$= \frac{49}{4}\pi \times 16 = 196\pi \text{ cm}^2$

$\text{Radius} = \sqrt{\frac{\text{Area}}{\pi}} = \sqrt{\frac{196\pi}{\pi}}$

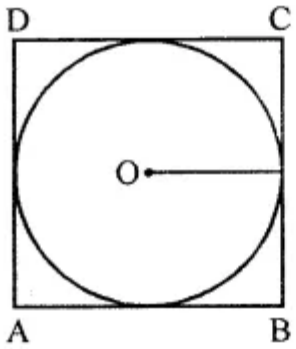
$= \sqrt{196} = 14 \text{ cm}$

$\therefore \text{ Circumference} = 2\pi r = 2 \times \frac{22}{7} \times 14$

$= 88 \text{ cm}$

Question 9.
From square cardboard, a circle of the biggest area was cut out. If the area of the circle is 154 cm^2, calculate the original area of the cardboard.
Solution:

From square cardboard, the biggest circle is cut out



Area of circle = 154 cm^2

$$\text{Radius } (r) = \sqrt{\frac{\text{Area}}{\pi}} = \sqrt{\frac{154 \times 7}{22}} \text{ cm}$$

$$\sqrt{49} = 7 \text{ cm}$$

Side of square = diameter of the circle = $2 \times 7 = 14$ cm

Area of square cardboard = $(\text{Side})^2 = (14)^2 = 196 \text{ cm}^2$

Question 10.

A road 3.5 m wide surrounds a circular park whose circumference is 88 m. Find the cost of paving the road at the rate of ₹ 60 per square meter.

Solution:

Circumference of a circular park = 88 m

$$\therefore \text{ Radius} = \frac{\text{Circumference}}{2\pi}$$

$$= \frac{88 \times 7}{2 \times 22} = 14 \text{ m}$$

Width of road surounded it = 3.5 m

Outer radius (R) = 14 + 3.5 = 17.5 m

Area of road = $\pi R^2 - \pi r^2 = \pi(R^2 - r^2)$

$= \frac{1}{2} \times (17.5^2 - 14^2)$

$= \frac{1}{2} \times 31.5 \times 3.5$

$= 346.5 \text{ m}^2$

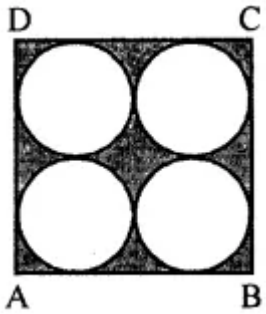
Cost of paving the road = ₹ 60 per m^2

Total cost = ₹ 60×346.5 = ₹ 20790

Question 11.

In the given figure, ABCD is a square of side 14 cm. Find the area of the shaded region.

Take $\pi = 227$



Solution:

In the given figure, ABCD is a square whose side is 14 cm.

Area of square = $(\text{Side})^2 = (14)^2\ \text{cm}^2 = 14 \times 14 = 196\ \text{cm}^2$

Radius of each circle in it = $\frac{7}{2}$ cm

Area of 4 circles = $4 \times \pi r^2$

$= 4 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

$= 154\ \text{cm}^2$

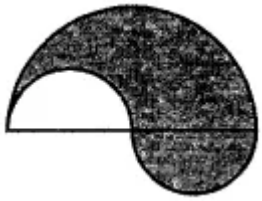
Area of shaded portion $= 196 - 154 = 42\ \text{cm}^2$

Question 12.

The boundary of a shaded region in the given figure consists of three semicircles, the smaller being equal. If the diameter of the larger one is 28 cm, find

(i) the length of the boundary

(ii) the area of the shaded region.



Solution:

In the given figure,

There are a bigger semicircle and two small semicircles

Diameter of bigger semicircle = 28 cm

Radius (R) = $\frac{28}{2}$ = 14 cm

and radius of each of smaller semicircles = $\frac{14}{2}$ = 7 cm

Now the area of shaded portion

= Area of bigger semicircle + Area of one smaller on semicircle

– Area of another smaller semicircle

Both small semicircles have the same area

$$= \frac{1}{2}\pi R^2 + \frac{1}{2}\pi r^2 - \frac{1}{2}\pi r^2 = \frac{1}{2}\pi R^2$$

$\because (r = r_1)$

$$= \frac{1}{2} \times \frac{22}{7} \times 14 \times 14 \text{ cm}^2 = 308 \text{ cm}^2$$