Mensuration I: Area and Perimeter

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INTRODUCTION

In this chapter, we shall be dealing with plane figures of various shapes by finding their sides, perimeters and areas.

Area:
The area of any figure is the amount of surface enclosed within its boundary lines. Area is always expressed in square units.

Units of Measuring Area

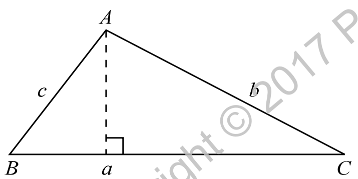
100 sq millimetres = 1 sq centimetre
100 sq centimetres = 1 sq decimetre
100 sq decimetres = 1 sq metre
100 sq metres = 1 sq decametre or arc
10,000 sq metres = 1 hectare
1,000,000 sq metres = 100 hectares
= 1 sq kilometre

Perimeter

The perimeter of a geometrical figure is the total length of the sides enclosing the figure.

SOME BASIC FACTS

1. Triangle



A *triangle* is a closed figure bounded by three sides. Here, ABC is a triangle.

The sides AB, BC and AC are denoted by c, a and b. respectivlely

Area of a Triangle (A)

(a) $A = \frac{1}{2}$ (base × height) $= \frac{1}{2}ah$

(b) $A = \sqrt{s(s-a)(s-b)(s-c)}$,

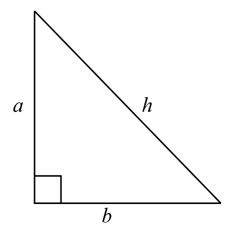
Where $s = \frac{1}{2}(a+b+c)$ or semi-perimeter of the triangle.

This formula is known as *Hero's formula*.

Perimeter $(P) = a + b + c = 2s$.

2. Right Angled Triangle

A triangle having one of its angles equal to 90° is called a *right-angled triangle*. The side opposite to the right angle is called the *hypotenuse*.



In a right angled triangle,

(Hypotenuse)^2 = Sum of the squares of sides

i.e., $h^2 = a^2 + b^2$.

Area (A) $= \frac{1}{2}$(product of the sides containing the right angle)

i.e., $A = \frac{1}{2}ab$.

Illustration 1: What is the area of a triangle having sides 3 m, 4 m and 5 m?

Solution: Let $a = 3$ m, $b = 4$ m, $c = 5$ m.

Then, $s = \dfrac{a+b+c}{2} = \dfrac{3+4+5}{2} = 6$ m.

$$\therefore \quad \text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{6(6-3)(6-4)(6-5)}$$
$$= \sqrt{6\times 3\times 2\times 1} = \sqrt{36} = 6 \text{ m}^2$$

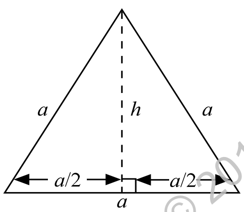
Illustration 2: Find the area of a triangle whose base is 4.6 m and height is 67 cm.

Solution: Area of the triangle $= \dfrac{1}{2}(\text{base} \times \text{height})$

$$= \frac{1}{2}(4.6 \times 100 \times 67)$$
$$= 15410 \text{ cm}^2$$

3. Equilateral Triangle

A triangle whose all sides are equal is called an equilateral triangle.



Area (A) of an equilateral triangle

$$= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4}a^2$$

Permeter (P) of an equilateral triangle

$$= 3 \times (\text{side}) = 3a$$

Altitude (h) of an equilateral triangle

$$= \frac{\sqrt{3}}{2} \times (\text{side}) = \frac{\sqrt{3}}{2}a.$$

In an equilateral triangle

$$\angle A = \angle B = \angle C = 60°.$$

Area (A) of an equilateral triangle

$$= \frac{(\text{altitude})^2}{\sqrt{3}} = \frac{h^2}{\sqrt{3}}.$$

Illustration 3: Find the area of an equilateral triangle each of whose sides measures 6 cm.

Solution: Area of the equilateral triangle

$$= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4} \times 36 = 9\sqrt{3} \text{ cm}^2.$$

Illustration 4: Length of the side of an equilateral triangle is $\dfrac{4}{\sqrt{3}}$ cm. Find its height.

Solution: Height of the equilateral triangle

$$= \frac{\sqrt{3}}{2} \times (\text{side})$$
$$= \frac{\sqrt{3}}{2} \times \frac{4}{\sqrt{3}} = 2 \text{ cm}.$$

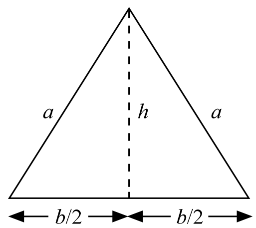
Illustration 5: Height of an equilateral triangle is $4\sqrt{3}$ cm. Find its area.

Solution: Area of the equilateral triangle

$$= \frac{(\text{altitude})^2}{\sqrt{3}} = \frac{4\sqrt{3}\times 4\sqrt{3}}{\sqrt{3}} = 16\sqrt{3} \text{ cm}^2.$$

4. Isosceles Triangle

A triangle whose two sides are equal is called an *isosceles triangle*.



Area (A) of an isosceles triangle

$$= \frac{b}{4}\sqrt{4a^2 - b^2}$$

Perimeter (P) of an isosceles triangle

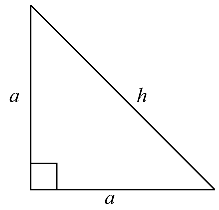
$$= (2a + b)$$

Height (h) of an isosceles triangle

$$= \frac{1}{2}\sqrt{4a^2 - b^2}.$$

5. Isosceles Right-angled Triangle

An *isosceles right-angled triangle* has two sides equal with equal sides making 90° to each other.



Hypotenuse $(h) = \sqrt{2a}$

Area $(A) = \frac{1}{2}a^2$

Perimeter $(P) = 2a + \sqrt{2a} = \sqrt{2}a(\sqrt{2}+1)$

$= h(\sqrt{2}+1)$.

If the perimeter of an isosceles triangle is P and the base is b, then the length of the equal sides is $\left(\frac{P-b}{2}\right)$.

If the perimeter of an isosceles triangle is P and the length of equal sides is a, then base is $(P-2a)$.

Illustration 6: An isosceles right-angled triangle has two equal sides of length 6 m each. Find its area.

Solution: Area = $\frac{1}{2}$ (equal side)^2 = $\frac{1}{2}$ $(6)^2$ = 18 m^2.

Illustration 7: The perimeter of an isosceles triangle is 80 cm. If the length of the equal sides is 15 cm, find the length of the base.

Solution: Length of the base = $P - 2a$

$= 80 - 2(15) = 50$ cm.

Illustration 8: The perimeter of an isosceles triangle is 42 cm. If the base is 16 cm, find the length of the equal sides.

Solution: The length of the equal sides = $\frac{P-b}{2}$.

$$= \frac{42-16}{2} = \frac{26}{2} = 13 \text{ cm}.$$

Illustration 9: If the base of an isosceles triangle is 10 cm and the length of the equal sides is 13 cm, find its area.

Solution: Area of the isosceles triangle

$$= \frac{b}{4}\sqrt{4a^2 - b^2}$$

$$= \frac{10}{4}\sqrt{4\times(13)^2-(10)^2}$$

$$= \frac{10}{4}\sqrt{676-100} = \frac{10}{4}\times 24 = 60 \text{ cm}^2.$$

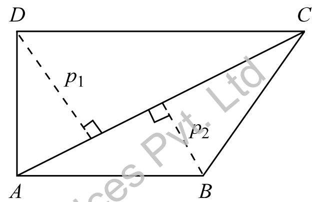
6. Quadrilateral

A closed figure bounded by four sides is called a *quadrilateral*.

It has four angles included in it.

The sum of these four angles is 360°.

i.e., $\angle A + \angle B + \angle C + \angle D = 360°$.



Area (A) of a quadrilateral

$= \frac{1}{2} \times$ one diagonal $\times$ (sum of the perpendiculars to it from opposite vertices)

$$= \frac{1}{2}d(p_1 + p_2)$$

Note:

If the lengths of four sides and one of its diagonals are known, then,

A = Area of ΔADC + Area of ΔABC.

The special cases of quadrilateral are parallelogram, rectangle, square, rhombus, trapezium, etc., which are discussed below separately.

7. Parallelogram

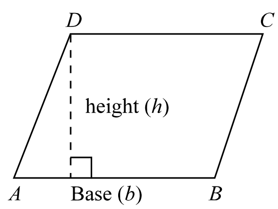
A quadrilateral in which opposite sides are equal and parallel is called a parallelogram.

The diagonals of a parallelogram bisect each other.

Area (A) of a parallelogram

= base $\times$ altitude corresponding to the base

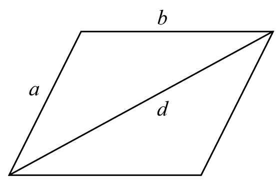
$= b \times h$



Area (A) of a parallelogram

$$= 2\sqrt{s(s-a)(s-b)(s-d)}$$

where a and b are adjacent sides, d is the length of the diagonal connecting the ends of the two sides and $s = \dfrac{a+b+d}{2}$.



In a parallelogram, the sum of the squares of the diagonals = 2 (the sum of the squares of the two adjacent sides),

i.e., $d_1^2 + d_2^2 = 2(a^2 + b^2)$.

Perimeter (P) of a parallelogram

$$= 2(a + b),$$

where a and b are adjacent sides of the parallelogram.

Illustration 10: One side of a parallelogram is 15 cm and the corresponding altitude is 5 cm. Find the area of the parallelogram.

Solution: Area of the parallelogram

$$= \text{base} \times \text{corresponding altitude}$$

$$= 15 \times 5 = 75 \text{ cm}^2.$$

Illustration 11: In a parallelogram, the lengths of the adjacent sides are 11 cm and 13 cm, respectively. If the length of one diagonal is 20 cm then, find the length of the other diagonal.

Solution: We have,

$$d_1^2 + d_2^2 = 2(a^2 + b^2)$$

$$\Rightarrow \quad (20)^2 + d_2^2 = 2(11^2 + 13^2)$$

$$\Rightarrow \quad d_2^2 = 2(121 + 169) - 400 = 180.$$

$$\therefore \quad d_2 = \sqrt{180} = 13.4 \text{ m (approx.)}$$

Illustration 12: Find the area of a quadrilateral of whose diagonal is 38 cm long and the lengths of perpendiculars from the other two vertices are 31 cm and 19 cm, respectively.

Solution: Area of the quadrilateral

$$= \frac{1}{2}\, d(p_1 + p_2)$$

$$= \frac{1}{2} \times 38 \times (31 + 19)$$

$$= 19 \times 50 = 950 \text{ cm}^2.$$

Illustration 13: Find the area of a parallelogram whose two adjacent sides are 130 m and 140 m and one of the diagonals is 150 m long.

Solution: Here, $a = 130$ m, $b = 140$ m and $d = 150$ m

$$\therefore \quad s = \frac{a+b+d}{2} = \frac{130+140+150}{2} = \frac{420}{2} = 210 \text{ m}$$

$\therefore$ Area of the parallelogram

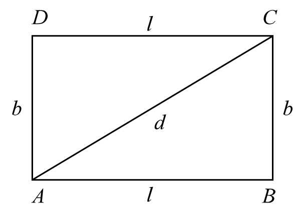
$$= 2\sqrt{s(s-a)(s-b)(s-a)}$$

$$= 2\sqrt{210(210-130)(210-140)(210-150)}$$

$$= 2\sqrt{210 \times 80 \times 70 \times 60} = 2 \times 8400 \text{ m}^2.$$

8. Rectangle

A *rectangle* is a quadrilateral with opposite sides equal and all the four angles equal to 90°.



The diagonals of a rectangle bisect each other and are equal.

(a) Area (A) of a rectangle = length × breadth

$$= l \times b$$

or,

Area of a rectangle = $(l \times \sqrt{d^2 - l^2})$,

if one side (l) and diagonal (d) are given.

or,

Area of a rectangle = $\left(\dfrac{p^2}{8} - \dfrac{d^2}{2}\right)$,

if perimeter (P) and diagonal (d) are given.

(b) Perimeter (P) of a rectangle

= 2(length + breadth)

= $2(l + b)$.

or,

Perimeter of a rectangle = $2(l + \sqrt{d^2 - l^2})$,

if one side (l) and diagonal (d) are given.

(c) Diagonal of a rectangle

$$= \sqrt{(\text{length})^2 + (\text{breadth})^2}$$

$$= \sqrt{l^2 + b^2}$$

(d) If area (A) and perimeter (P) of a rectangle are given, then,

$$\text{length of a rectangle} = \left(\sqrt{\frac{P^2}{16} - A} + \frac{P}{4}\right)$$

and,

$$\text{breadth of a rectangle} = \left(\frac{P}{4} - \sqrt{\frac{P^2}{16} - A}\right)$$

Illustration 14: Find the diagonal of a rectangle whose sides are 8 cm and 6 cm.

Solution: Diagonal of the rectangle

$$= \sqrt{l^2 + b^2}$$

$$= \sqrt{8^2 + 6^2} = \sqrt{64 + 36}$$

$$= 10 \text{ cm.}$$

Illustration 15: Find the perimeter of a rectangle of length 12 m and breadth 6 m.

Solution: Perimeter of the rectangle

$$= 2(l + b)$$

$$= 2(12 + 6) = 36 \text{ m.}$$

Illustration 16: Calculate the area of a rectangular field whose length is 12.5 cm and breadth is 8 cm.

Solution: Area of the rectangular field

$$= l \times b$$

$$= 12.5 \times 8 = 100 \text{ cm}^2.$$

Illustration 17: Calculate the area of a rectangular field whose one side is 16 cm and the diagonal is 20 cm.

Solution: Area of the rectangular field

$$= (l \times \sqrt{d^2 - l^2})$$

$$= (16 \times \sqrt{20^2 - 16^2})$$

$$= 16 \times 12 = 192 \text{ cm}^2.$$

Illustration 18: A rectangular carpet has an area of 120 m^2 and perimeter of 46 m. Find the length of its diagonal.

Solution: We have,

$$\text{Area of rectangle} = \left(\frac{P^2}{8} - \frac{d^2}{2}\right)$$

$$\Rightarrow \quad 120 = \frac{46^2}{8} - \frac{d^2}{2}$$

$$\Rightarrow \quad 46^2 - 4d^2 = 120 \times 8$$

$$\Rightarrow \quad 4d^2 = 2116 - 960 = 1156$$

$$\therefore \quad d = \sqrt{289} = 17 \text{ m.}$$

Illustration 19: The perimeter of a rectangle is 82 cm and its area is 400 m^2. Find the length and breadth of the rectangle.

Solution: Length of the rectangle

$$= \left(\sqrt{\frac{P^2}{16} - A} + \frac{P}{4}\right)$$

$$= \left(\sqrt{\frac{(82)^2}{16} - 400} + \frac{82}{4}\right)$$

$$= (4.5 + 20.5) = 25 \text{ m.}$$

Breadth of the rectangle

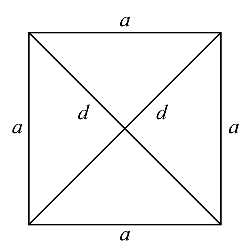
$$= \left(\frac{P}{4} - \sqrt{\frac{P^2}{16} - A}\right)$$

$$= \left(\frac{82}{4} - \sqrt{\frac{(82)^2}{16} - 400}\right)$$

$$= (20.5 - 4.5) = 16 \text{ m.}$$

9. Square

A square is a quadrilateral with all sides equal and all the four angles equal to 90°.



The diagonals of a square are equal and bisect each other at 90°.

(a) Area (A) of a square

$= a^2$, i.e., $(\text{side})^2$

$= \dfrac{d^2}{2}$, i.e., $\dfrac{(\text{diagonal})^2}{2}$

$= \dfrac{P^2}{16}$, i.e., $\dfrac{(\text{perimeter})^2}{16}$

(b) Perimeter (P) of a square

$= 4a$, i.e., $4 \times$ side

$= \sqrt{16 \times \text{area}}$

$= 2\sqrt{2}d$, i.e., $2\sqrt{2} \times$ diagonal

(c) Length (d) of the diagonal of a square

$= \sqrt{2}a$, i.e., $\sqrt{2} \times$ side

$= \sqrt{2 \times \text{area}}$

$= \dfrac{P}{2\sqrt{2}}$, i.e., $\dfrac{\text{Perimeter}}{2\sqrt{2}}$.

Illustration 20: If the area of a square field is 6050 m^2, find the length of its diagonal.

Solution: Length of the diagonal of the square field

$= \sqrt{2 \times \text{area}}$

$= \sqrt{2 \times 6050}$

$= \sqrt{12100}$, i.e., 110 m.

Illustration 21: Find the area of a square with perimeter 48 m.

Solution: Area of the square

$= \dfrac{(\text{Perimeter})^2}{16}$

$= \dfrac{(48)^2}{16} = \dfrac{48 \times 48}{16} = 3 \times 48 = 144$ m^2.

Illustration 22: Find the diagonal of a square field whose side is 6 m.

Solution: Length of the diagonal

$= \sqrt{2} \times$ side

$= 6\sqrt{2}$ m.

Illustration 23: In order to fence a square, Ramesh fixed 36 poles. If the distance between the two poles is 6 m, then find the area of the square so formed.

Solution: Perimeter of the square

$= 36 \times 6 = 216$ m.

$\therefore$ Area of the square $= \left(\dfrac{\text{Perimeter}}{4}\right)^2$

$= \dfrac{16\sqrt{2}}{2\sqrt{2}} = 54 \times 54$

$= 2916$ m^2.

Illustration 24: Perimeter of a square field is $16\sqrt{2}$ cm. Find the length of its diagonal.

Solution: We have,

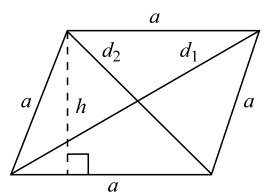
Perimeter of the square field $= 2\sqrt{2} \times$ diagonal

$\Rightarrow\ 16\sqrt{2} = 2\sqrt{2} \times$ diagonal

$\therefore$ Length of the diagonal $= \dfrac{16\sqrt{2}}{2\sqrt{2}} = 8$ cm.

10. Rhombus

A *rhombus* is a quadrilateral whose all sides are equal.



The diagonals of a rhombus bisect each other at 90°.

(a) Area (A) of a rhombus

$= a \times h$, i.e., base $\times$ height

$= \dfrac{1}{2}d_1 \times d_2$, i.e., $\dfrac{1}{2} \times$ product of its diagonals

$= d_1 \times \sqrt{a^2 - \left(\dfrac{d_1}{2}\right)^2}$,

since, $d_2^2 = 4\left[a^2 - \left(\dfrac{d_1}{2}\right)^2\right]$

$= d_1 \times \sqrt{\left(\dfrac{\text{Perimeter}}{4}\right)^2 - \left(\dfrac{d_1}{2}\right)^2}$,

since, $d_2^2 = 4\left[\left(\dfrac{\text{Perimeter}}{4}\right)^2 - \left(\dfrac{d_1}{2}\right)^2\right]$

(b) Perimeter (P) of a rhombus

$= 4a$, i.e., $4 \times$ side

$= 2\sqrt{d_1^2 + d_2^2}$,

where d_1 and d_2 are two diagonals.

(c) Side (a) of a rhombus

$= \frac{1}{2}\sqrt{d_1^2 + d_2^2}$.

Illustration 25: The area of a rhombus is 156 m^2. If one of its diagonals is 13 m^2 then, find the length of the other diagonal.

Solution: Area of rhombus $= \frac{1}{2}(d_1 \times d_2)$

$\Rightarrow \quad 156 = \frac{1}{2}(13 \times d_2)$

$\Rightarrow \quad d_2 = \frac{2 \times 156}{13} = 24$ m.

Illustration 26: Find the area of a rhombus whose one side is 13 cm and one diagonal is 24 cm.

Solution: Area of rhombus $= d_1 \times \sqrt{a^2 - \left(\frac{d_1}{2}\right)^2}$

$= 24 \times \sqrt{(13)^2 - \left(\frac{24}{2}\right)^2}$

$= 24 \times \sqrt{169 - 144}$

$= 24 \times 5$

$= 120$ cm^2.

Illustration 27: If the perimeter of a rhombus is 73 cm and one of its diagonals is 27.5 cm then, find the other diagonal and the area of the rhombus.

Solution: One side of rhombus $(a) = \frac{73}{4} = 18.25$ cm.

$\therefore$ Other diagonal $(d_2) = 2 \times \sqrt{a^2 - \left(\frac{d_1}{2}\right)^2}$

$= 2 \times \sqrt{(18.25)^2 - \left(\frac{27.5}{2}\right)^2}$

$= 24$ cm.

$\therefore$ Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 24 \times 27.5$

$= 330$ cm^2.

Illustration 28: In a rhombus, the lengths of two diagonals are 18 m and 24 m. Find its perimeter.

Solution: Perimeter of the rhombus

$= 2 \times \sqrt{d_1^2 + d_2^2}$

$= 2 \times \sqrt{(18)^2 + (24)^2}$

$= 2 \times \sqrt{324 + 576}$

$= 2 \times \sqrt{900} = 60$ m.

Illustration 29: Find the side of a rhombus, one of whose diagonals measure 4 m and the other 3 m.

Solution: Side of the rhombus

$= \frac{1}{2} \times \sqrt{d_1^2 + d_2^2}$

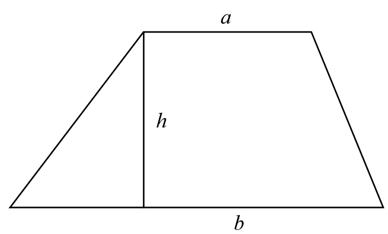
$= \frac{1}{2} \times \sqrt{(4)^2 + (3)^2}$

$= \frac{1}{2} \times 25$, i.e., 12.5 m.

11. Trapezium (Trapezoid)

A *trapezium* is a quadrilateral whose any two opposite sides are parallel.

Distance between the parallel sides of a trapezium is called its height.



(a) Area (A) of a trapezium

$= \frac{1}{2} \times$ (sum of the parallel sides) $\times$ perpendicular distance between the parallel sides

i.e., $\frac{1}{2} \times (a + b) \times h$.

$= \frac{a+b}{l}\sqrt{s(s-l)(s-c)(s-d)}$, where, $l = b - a$ if $b > a$

$= a - b$ if $a > b$

and, $s = \dfrac{c+d+l}{2}$

(b) Height (h) of the trapezium

$$= \frac{2}{l}\sqrt{s(s-l)(s-c)(s-d)}$$

$$= \left(\frac{2A}{a+b}\right)$$

Illustration 30: Find the area of a trapezium having parallel sides 65 m and 44 m and distance between them being 20 m.

Solution: Area of the trapezium

$$= \frac{1}{2} \times (a + b) \times h$$

$$= \frac{1}{2} \times (65 + 44) \times 20$$

$$= 1100 \text{ cm}^2.$$

Illustration 31: The parallel sides of a trapezium are 24 m and 52 m. If its other two sides are 26 m and 30 m, then what is the area of the trapezium?

Solution: Area of the trapezium

$$= \frac{a+b}{l}\sqrt{s(s-l)(s-c)(s-d)}.$$

Here, $a = 24$, $b = 52$, $c = 26$, $d = 30$, $l = b - a = 28$,

$$s = \frac{c+d+l}{2} = \frac{26+30+28}{2} = 42.$$

$\therefore$ Area of the trapezium

$$= \frac{24+52}{28}\sqrt{42(42-28)(42-26)(42-30)}$$

$$= \frac{76}{28}\times\sqrt{42\times14\times16\times12}$$

$$= \frac{76\times336}{28} = 912 \text{ m}^2.$$

Illustration 32: The two parallel sides of a trapezium of area 180 cm^2 measure 28 cm and 12 cm. What is the height of the trapezium?

Solution: Height of the trapezium

$$= \left(\frac{2A}{a+b}\right) = \left(\frac{2\times180}{28+12}\right) = \frac{360}{40} = 9 \text{ cm}.$$

12. Walls of a Room

Area of four walls of a room

= 2(length + breadth) × height

Illustration 33: Find the cost of painting the walls of a room of 6 m long, 5 m broad and 4 m high at ₹7.50 per m^2.

Solution: Area of 4 walls of the room

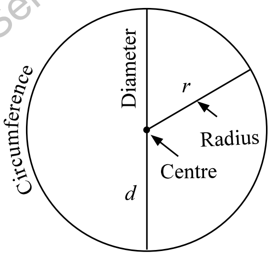
= 2(length + breadth) × height

= 2(6 + 5) × 4 = 88 m^2.

$\therefore$ Cost of painting = 88 × 7.50 = ₹660.

12. Circle

A *circle* is the path travelled by a point which moves in such a way that its distance from a fixed point remains constant.



The fixed point is known as *centre* and the fixed distance is called the *radius*.

(a) Circumference or perimeter of a circle

$= 2\pi r = \pi d$,

where r is radius and d is diameter of the circle

(b) Area of a circle

$= \pi r^2$, r is radius

$= \dfrac{\pi d^2}{4}$, d is diameter

$= \dfrac{c^2}{4\pi}$, c is circumference

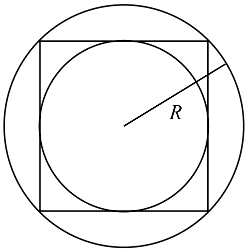
$= \dfrac{1}{2}$ × circumference × radius

(c) Radius of a circle $= \sqrt{\dfrac{\text{Area}}{\pi}}$

$$= \frac{\text{Perimeter or circumference}}{2\pi}$$

(d) Ratio of the areas of the two circles is

$$= \frac{\text{Area of circle circumscribing the square}}{\text{Area of circle inscribed in the square}} = \frac{2}{1}.$$



(e) Ratio of the area of the two squares is

$$= \frac{\text{Area of square circumscribing the circle}}{\text{Area of square inscribed in the circle}} = \frac{2}{1}.$$

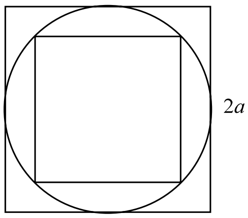


Illustration 34: What is the radius of a circular plot whose circumference is 176 m?

Solution: $r = \dfrac{\text{Circumference}}{2\pi}$

$$= \frac{176}{2\times\frac{22}{7}} = \frac{176\times 7}{2\times 22} = 28 \text{ m}.$$

Illustration 35: A circular plot covers an area of 154 m^2. How much wire is required for fencing the plot?

Solution: Area of the plot $= \pi r^2 = 154$

i.e., $r^2 = 154 \times \dfrac{7}{22} = 49$

$\therefore \quad r = 7$ m

$\therefore \quad$ Length of the wire $= 2\pi\, r = 2 \times \dfrac{22}{7}\times 7 = 44$ m.

Illustration 36: Find the length of a rope by which a buffalo must be tethered in order that she may be able to graze an area of 9856 m^2.

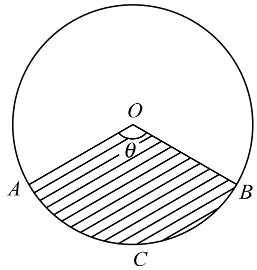
Solution: The required length of the rope

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

$$= \sqrt{\frac{9856\times 7}{22}} = \sqrt{3136} = 56 \text{ m}.$$

Sector

A *sector* is a figure enclosed by two radii and an arc lying between them.



For sector AOB,

Arc $AB = \dfrac{2\pi r\theta}{360}$,

where r = radius and $\angle AOB = \theta$

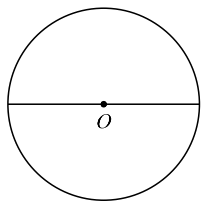
Area of the sector $ACBO$

$$= \frac{1}{2} \times (\text{arc } AB) \times \text{radius}$$

$$= \frac{\pi(\text{radius})^2\theta}{360}.$$

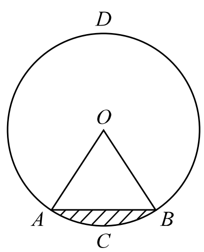
Semi-Circle

A *semi-circle* is a figure enclosed by a diameter and the part of the circumference cut off by it.



Segment

A *segment* of a circle is a figure enclosed by a chord and an arc which it cuts off.



Note:

Any chord of a circle which is not a diameter (such as AB), divides the circle into two segments, one is greater and the other is less than a semi-circle.

Area of segment ACB
= area of sector $ACBO$ – area of ΔOAB
and area of segment ADB
= area of circle – area of segment ACB

Illustration 37: If a piece of wire 20 cm long is bent into an arc of a circle subtending an angle of 60° at the centre, find the radius of the circle.

Solution: Length of the arc $= \dfrac{2\pi r\theta}{360}$

$$\Rightarrow \quad 20 = \frac{2\pi r \times 60}{360} \Rightarrow r = \frac{20\times 360}{60\times 2\times \pi} = \frac{60}{\pi}\text{ cm.}$$

Illustration 38: Find the area of sector of a circle whose radius is 14 cm and the angle at the centre is 60°.

Solution: Area of thesector $= \dfrac{\pi(\text{radius})^2\theta}{360}$

$$= \frac{22\times 14\times 14\times 60}{7\times 360}$$

$$= \frac{22\times 2\times 14}{6} = 102\frac{2}{3}\text{ cm}^2.$$

Illustration 39: Find the area of sector of a circle whose radius is 10 cm and the length of the arc is 13 cm.

Solution: Area of the sector $= \dfrac{1}{2}\times$ (length of arc) $\times$ radius

$$= \frac{1}{2}\times 13\times 10$$

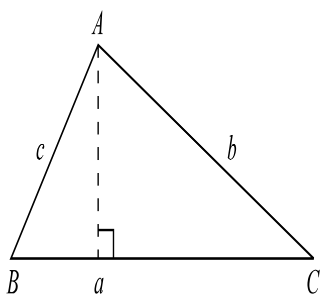
$$= 65\text{ cm}^2.$$

Polygon

A *polygon* is a plane figure enclosed by four or more straight lines.

Regular Polygon

If all the sides of a polygon are equal, it is called a *regular polygon.*



All the interior angles of a regular polygon are equal.
For a regular polygon:
Sum of exterior angles = 2π
Sum of interior angles = $(n - 2)\pi$

Number of diagonals in a polygon $= \dfrac{n(n-3)}{2}$

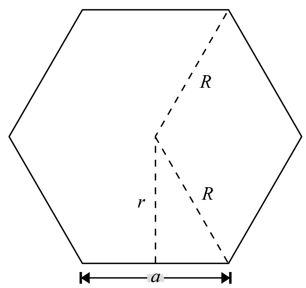
Perimeter $(P) = n \times a$,
where, n = number of sides
and, a = length of each side

Each interior angle $= \dfrac{n-2}{n}\times\pi$

Each exterior angle $= \dfrac{2\pi}{n}$

Area $= \dfrac{1}{2}\times P\times r = \dfrac{1}{2}\times n\times a\times r$,

where, r is radius of the circle drawn inside the polygon touching its sides.



$$= \frac{1}{2}\times n\times a\times\sqrt{R^2-\left(\frac{a}{2}\right)^2},$$

where, R is radius of the circle drawn outside the polygon touching its sides.

$$= \frac{na^2}{4}\cot\left(\frac{\pi}{n}\right).$$

Area of a regular hexagon $= \dfrac{3\sqrt{3}}{2}(\text{side})^2$

Area of a regular octagon $= 2(\sqrt{2}+1)\ (\text{side})^2$.

Illustration 40: Find the side of a regular hexagon whose area is $48\sqrt{3}$ cm^2.

Solution: Area of a regular hexagon

$$= \frac{3\sqrt{3}}{2} \times (\text{side})^2$$

$$\Rightarrow \quad 48\sqrt{3} = \frac{3\sqrt{3}}{2} \times (\text{side})^2$$

$$\Rightarrow \quad (\text{side})^2 = 32$$

$\therefore$ Side of the hexagon $= 4\sqrt{2}$ cm.

Illustration 41: Find the area of a regular octagon whose side measures $\sqrt{2}$ cm.

Solution: Area of regular octagon

$$= 2(\sqrt{2}+1)\times(\text{side})^2$$

$$= 2(\sqrt{2}+1)\times(\sqrt{2})^2$$

$$= 4(\sqrt{2}+1) \text{ cm}^2.$$

Illustration 42: Find the sum of interior angles of a regular polygon of 10 sides. Also, find the value of each interior angle.

Solution: Sum of interior angles $= (n - 2) \times \pi$

$$= (10 - 2) \times \pi$$

$$= 8\pi.$$

Also, value of each interior angle

$$= \left(\frac{n-2}{n}\right)\times \pi$$

$$= \left(\frac{10-2}{10}\right)\pi = \frac{4\pi}{5}.$$

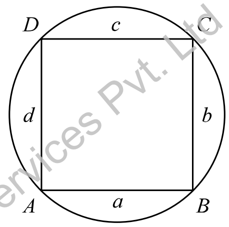
Illustration 43: Find the sum of all the exterior angles of a regular polygon of 12 sides. And, also find the value of each exterior angle.

Solution: Sum of exterior angles $= 2\pi$

Also, value of each exterior angle $= \frac{2\pi}{n} = \frac{2\pi}{12} = \frac{\pi}{6}$.

Cyclic Quadrilateral

A quadrilateral whose vertices lie on the circumference of the circle is called a *cyclic quadrilateral*.



For a cyclic quadrilateral

- Area $= \sqrt{s(s-a)(s-b)(s-c)(s-d)}$,

where,

$$s = \frac{a+b+c+d}{2}$$

- $\angle A + \angle B + \angle C + \angle D = 2\pi$
- $\angle A + \angle C = \angle B + \angle D = \pi$.

SOME USEFUL SHORTCUT METHODS

1. If the length and the breadth of a rectangle are increased by x% and y% respectively, then the area of the rectangle will increase by $\left(x+y+\frac{xy}{100}\right)$%

Explanation:

Area of the original rectangle is

$$A = l \times b.$$

Area of the new rectangle is

$$A' = l\left(\frac{100+x}{100}\right)\times b\left(\frac{100+y}{100}\right)$$

$$= lb\left(\frac{100+x}{100}\right)\left(\frac{100+y}{100}\right)$$

$$= A\left(\frac{100+x}{100}\right)\left(\frac{100+y}{100}\right)$$

$$\therefore \quad \frac{A'}{A} - 1 = \left(\frac{100+x}{100}\right)\left(\frac{100+y}{100}\right) - 1$$

or, $$\frac{A'-A}{A} = \frac{(100+x)(100+y)-(100)^2}{(100)^2}$$

or, $$\left(\frac{A'-A}{A}\right)\times 100$$

$$= \frac{(100)^2 + 100(x+y) + xy - (100)^2}{(100)}$$

$\therefore$ Percentage increase in area $= \frac{100(x+y)+xy}{100}$ %

or, $\left(x+y+\frac{xy}{100}\right)$%

Note:

If any of x or y decreases, we put negative sign.

Illustration 1: The length and the breadth of a rectangle are increased by 20% and 5%, respectively. Find the percentage increase in its area.

Solution: Percentage increase in the area of rectangle

$$= \left(x + y + \frac{xy}{100}\right)\%$$

$$= \left(20 + 5 + \frac{20 \times 5}{100}\right)\% = 20\%$$

> 2. If the length of a rectangle is increased by x%, then its breadth will have to be decreased by $\left(\frac{100x}{100+x}\right)$% in order to maintain the same area of rectangle.

Explanation:

Percentage increase in area of rectangle

$$= \left(x + y + \frac{xy}{100}\right)\%$$

or, $$0 = \left(x + y + \frac{xy}{100}\right)$$

or, $$-x = y\left(1 + \frac{x}{100}\right) \quad \text{or,} \quad y = -\left(\frac{100x}{100+x}\right)$$

–ve sign indicates decrease.

Therefore, breadth must be decreased by $\left(\frac{100x}{100+x}\right)$% in order to maintain the same area.

Illustration 2: The length of a rectangle is increased by 25%. By what per cent should its breadth be decreased so as to maintain the same area?

Solution: The breadth must be decreased by

$$= \left(\frac{100x}{100+x}\right)\% = \left(\frac{100 \times 25}{100+25}\right)\%, \text{ i.e., } 20\%$$

> 3. If each of the defining dimensions or sides of any two-dimensional figure (triangle, rectangle, square, circle, quadrilateral, pentagon, hexagon, etc.) is changed by x%, its area changes by $x\left(2 + \frac{x}{100}\right)$%

Illustration 3: If the radius of a circle is decreased by 10%, what is the percentage decrease in its area?

Solution: Here, $x = -10$ (–ve sign indicates decrease)

$\therefore$ Percentage change in area $= x\left(2 + \frac{x}{100}\right)\%$

$$= -10\left(2 - \frac{10}{100}\right)\%$$

$$= (-10)\left(\frac{19}{10}\right)\% = -19\%$$

$\therefore$ Area of the circle decreases by 19%

> 4. If all the sides of a quadrilateral are increased (or decreased) by x%, its diagonals also increase (or decrease) by x%.

Illustration 4: The length and the two diagonals of a rectangle are decreased by 5% each. What is the percentage decrease in its breadth?

Solution: Since the length and the two diagonals decreased by 5% each, the breadth also must decrease by 5%.

> 5. If each of the defining dimensions or sides of any two-dimensional figures are increased (or decreased) by x%, its perimeter also increases (or decreases) by x%

Illustration 5: If all the sides and diagonals of a square are increased by 8% each, then find the percentage increase in its perimeter.

Solution: The perimeter also increases by 8%

> 6. If the ratio of the areas of two squares be a:b, then the ratio of their sides, ratio of their perimeters and the ratio of their diagonals, each will be in the ratio $\sqrt{a} : \sqrt{b}$.

Illustration 6: Ratio of the areas of two squares is 16:9. Find the ratio of their diagonals.

Solution: The ratio of their diagonals

$$= \sqrt{a} : \sqrt{b}$$

$$= \sqrt{16} : \sqrt{9}, \text{ i.e., } 4:3.$$

> 7. If the diagonal of a square increases by x times, then the area of the square becomes x^2 times.

Illustration 7: The diagonal of a square is doubled. How many times will the area of the new square become?

Solution: The area of the new square will become x^2 times, i.e., $(2)^2 = 4$ times.

8. Standard Properties of Diagonals of Quadrilaterals

Quadrilateral	*Meet at right angles*	*Bisect each other*	*Equal to each other*	*Bisect angle at vertex*
Square	√	√	√	√
Rectangle	×	√	√	×
Parallelogram	×	√	×	×
Rhombus	√	√	×	√
Trapezium	×	×	may or may not be	×

9. Carpeting the Floor of a Room

If the length and the breadth of a room are l and b, respectively, and a carpet of width w is used to cover the floor, then the required length of the carpet

$$= \frac{l \times b}{w}.$$

Illustration 8: How many metres of a carpet of 12 cm wide will be required to cover the floor of a room which is 600 cm long and 420 cm broad? Also, calculate the amount required in carpeting the floor if the cost of carpet is ₹15 per metre.

Solution: Length of the carpet

$$= \frac{l \times b}{w}$$

$$= \frac{600 \times 420}{12}$$

= 21000 cm, i.e., 210 m.

The amount required for carpeting the floor

= 15 × 210 = ₹3150.

10. Number of Square Tiles Required for Flooring

If the length and the breadth of a room are l and b respectively, then the least number of square tiles required to cover the floor

$$= \frac{l \times b}{\text{H.C.F. } (l, b)}$$

Also, the size of the largest tile so that the tiles exactly fit

= H.C.F. (l, b).

Illustration 9: A hall of length 24 cm and breadth 20 m is to be paved with equal square tiles. What will be the size of the largest tile so that the tiles exactly fit and also find the number of tiles required.

Solution: Size of the largest possible square tile

= H.C.F. (l, b)

= H.C.F. (24, 20) = 4 m

Number of tiles required

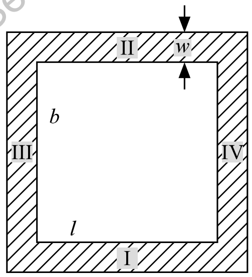
$$= \frac{l \times b}{\text{H.C.F. } (l, b)}$$

$$= \frac{24 \times 20}{4} = 120 \text{ tiles.}$$

11. Path around a Rectangular Space

(a) A rectangular garden l m long and b m broad is sorrounded by a path of w m wide. The area of the path is given by

$= 2w(l + b + 2w)$ m^2.



Explanation:

Area of part I = Area of part II

$= (l + 2w)w$ m^2

Area of part III = Area of part IV

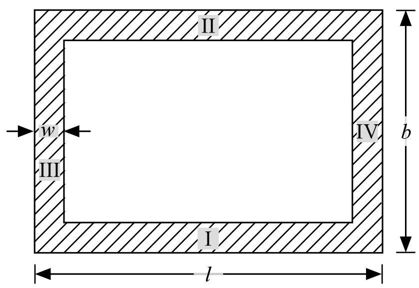
$= bw$ m^2.

∴ Total area of the path $= 2[(l + 2w)w + bw]$

$= 2w(l + b + 2w)$ m^2.

(b) A rectangular garden l m long and b m broad is sorrounded by a path of w m wide constructed inside it along its boundary. The area of the path is given by

$= 2w(l + b - 2w)$ m^2.



Explanation:

Area of part I = Area of part II
$= lw$ m^2

Area of part III = Area of part IV
$= (b - 2w)w$ m^2

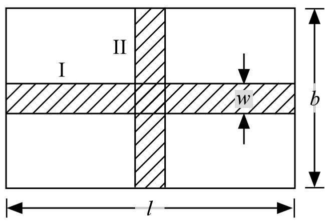
$\therefore$ Total area of the path
$= 2[lw + (b - 2w)w]$
$= 2w(l + b - 2w)$ m^2.

(c) A rectangular park is l m long and b m broad. Two paths inside the park of w m wide and they are perpendicular to each other. The area of the paths

$= w(l + b - w)$ m^2

Also, the area of the park minus the paths

$= (l - w)(b - w)$ m^2



Explanation:

Total area of the path

= Area of path I + Area of path II − Area of common central part

$= lw + bw - w^2$
$= w(l + b - w)$ m^2.

$\therefore$ Area of the park minus the paths
$= [lb - w(l + b - w)]$
$= lb - lw - w(b - w)$
$= l(b - w) - w(b - w)$
$= (l - w)(b - w)$ m^2.

Notes:

1. Clearly, from the figure, the area of the paths does not change on shifting their location as long as they are perpendicular to each other.
2. For a square park, take $l = b$ in all the results derived above.

Illustration 10: A rectangular park 18 m × 12 m, is sorrounded by a path of 4 m wide. Find the area of the path.

Solution: The area of the path
$= 2w(l + b + 2w)$
$= 2 \times 4(18 + 12 + 2 \times 4) = 304$ m^2.

Illustration 11: A park is square in shape with side 18 m. Find the area of the pavement of 3 m wide to be laid all around it on its inside.

Solution: Area of the pavement
$= 2w(l + b - 2w)$
$= 2 \times 3(18 + 18 - 2 \times 3)$ (Here, $l = b = 18$)
$= 180$ m^2.

Illustration 12: A playground measures 27 m × 13 m. From the centre of each side a path 2 m wide goes across to the centre of the opposite side. Calculate the area of the path and the cost of constructing it at ₹4 per m^2.

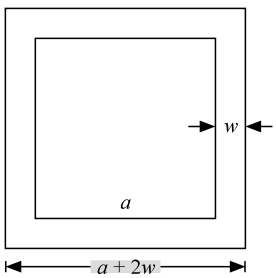
Solution: Area of the path
$= w(l + b - w) = 2(27 + 13 - 2)$
$= 76$ m^2.

$\therefore$ Cost $= 4 \times 76 =$ ₹304.

12. Square Room Surrounded by a Verandah

(a) A square room of side a is sorrounded by a verandah of width w on the outside of the square room. If the area of the verandah is A, then the area of the room is given by

$$\left(\frac{A - 4w^2}{4w}\right)^2.$$



Explanation:

Area of the room $= a^2$.

Area of the (room + verandah) $= (a + 2w)^2$.

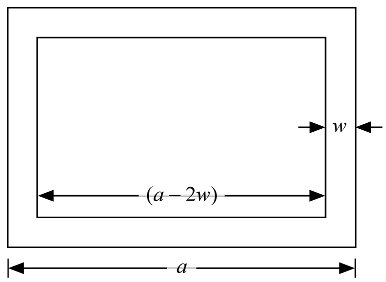
$\therefore$ Area (A) of the verandah $= (a + 2w)^2 - a^2$
$= (4aw + 4w^2)$

or, $a = \dfrac{A - 4w^2}{4w}$

$\therefore$ Area of the room $= a^2 = \left(\dfrac{A - 4w^2}{4w}\right)^2$.

(b) A square room of side a is surrounded by a verandah of width w on its inside. If the area of the verandah is A, then the area of the room is given by

$$\left(\frac{A+4w^2}{4w}\right)^2.$$



Explanation:

Area (A) of the verandah $= a^2 - (a - 2w)^2$

$= 4aw - 4w^2$

$= 4w(a - w)$

or, $a = \dfrac{A}{4\omega} + w = \dfrac{A+4w^2}{4w}$

$\therefore$ Area of the room $= a^2 = \left(\dfrac{A+4w^2}{4w}\right)^2.$

Illustration 13: A square field is surrounded by a path of 2 m wide on its outside. The area of the path is 72 m^2. What is the area of the field?

Solution: Area of the field

$$= \left(\frac{A-4w^2}{4w}\right)^2$$

$$= \left(\frac{72-4\times 2^2}{4\times 2}\right)^2 = 49 \text{ m}^2.$$

Illustration 14: A square room has a verandah of area 24 m^2 and width 1 m all around it on its inside. Find the area of the room.

Solution: Area of the room

$$= \left(\frac{A+4w^2}{4w}\right)^2$$

$$= \left(\frac{24\times 4\times 1^2}{4\times 1}\right)^2 = 49 \text{ m}^2.$$

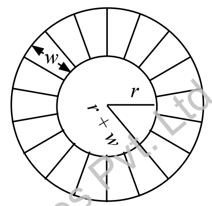
13. (a) A circular ground of radius r has a pathway of width w around it on its outside. The area of the circular pathway is given by $= \pi w(2r + w)$.

Explanation:

Area of the circular ground $= \pi r^2$

Area of the circular ground + pathway

$= \pi(r + w)^2 = \pi r^2 + 2\pi\, rw + \pi w^2.$



$\therefore$ Area of circular the pathway

$= (\pi r^2 + 2\pi\, rw + \pi w^2) - \pi r^2$

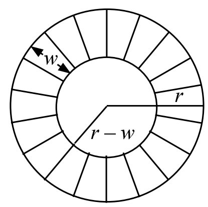
$= \pi w(2r + w).$

(b) A circular ground of radius r has a pathway of width w around it on its inside. The area of the circular pathway is given by

$= \pi w(2r - w).$

Explanation:

Area of circular the ground $= \pi r^2$



Area of the circular ground − pathway

$= \pi\,(r - w)^2$

$= \pi r^2 - 2\pi\, rw + \pi w^2$

$\therefore$ Area of the circular pathway

$= \pi r^2 - (\pi r^2 - 2\pi rw + \pi w^2)$

$= \pi w(2r - w).$

Illustration 15: A circular ground of radius 16 m has a path of width 2.8 m around it on its outside. Find the area of the path.

Solution: The area of the circular path

$= \pi\, w(2r + w)$

$= \dfrac{22}{7} \times 2.8 \times (2 \times 16 + 2.8)$

$= 8.8 \times (32 + 2.8) = 306.2$ m^2.

Illustration 16: A circular park of radius 22 m has a path of width 1.4 m around it on its inside. Find the area of the path.

Solution: The area of the circular path

$$= \pi\, w(2r - w)$$

$$= \frac{22}{7} \times 1.4 \times (2 \times 22 - 1.4)$$

$$= 4.4 \times (44 - 1.4) = 187.45 \text{ m}^2.$$

> 14. If the area of a square is a cm^2, then the area of the circle formed by the same perimeter is $\left(\frac{4a}{\pi}\right)$ cm^2.

Explanation:

Area of the square = a.

$\therefore$ Side of the square = $\sqrt{\text{Area}} = \sqrt{a}$.

$\therefore$ Perimeter of the square = $4\sqrt{a}$.

Given, Circumference of the circle = Perimeter of the square

$\Rightarrow$ $2\pi\, r = 4\sqrt{a}$

$\therefore$ Radius of the circle (r) = $\frac{4\sqrt{a}}{2\pi} = \frac{2\sqrt{a}}{\pi}$

$\therefore$ Area of the circle = $\pi r^2 = \pi\left(\frac{2\sqrt{a}}{\pi}\right)^2 = \frac{4a}{\pi}$ cm^2.

Illustration 17: If the area of a square is 33 cm^2, then find the area of the circle formed by the same perimeter.

Solution: Required area of the circle

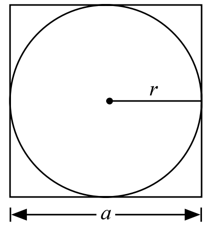
$$= \frac{4a}{\pi}$$

$$= \frac{4\times 33}{\pi} = \frac{4\times 33\times 7}{22} = 42 \text{ cm}^2.$$

> 15. The area of the largest circle that can be inscribed in a square of side a is $\frac{\pi a^2}{4}$.

Explanation

Clearly, from the figure, the diameter of the inscribed circle equals the side of the square i.e., $D = a$.



Area of the circle = $\frac{\pi D^2}{4}$

$\therefore$ Area of the inscribed circle = $\frac{\pi a^2}{4}$.

Illustration 18: Find the area of largest circle inscribed in a square of side 112 cm.

Solution: The area of the largest circle

$$= \frac{\pi a^2}{4}$$

$$= \frac{22\times 112\times 112}{7\times 4} = 9856 \text{ cm}^2.$$

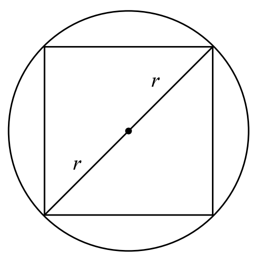
> 16. Area of a square inscribed in a circle of radius r is $2r^2$ and the side of the square is $\sqrt{2}\,r$.

Explanation:

Clearly, from the figure, diagonal of the inscribed square is equal to the diameter of the circle, i.e., $2r$.

$\therefore$ Area of square = (diagonal)^2

$$= \frac{1}{2}(2r)^2 = 2r^2.$$



Also, side of the square = $\sqrt{\text{Area}} = \sqrt{2r^2} = \sqrt{2}r$.

Illustration 19: Find the side of the square inscribed in a circle whose circumference is 308 cm.

Solution: Circumference of the circle ($2\pi r$) = 308

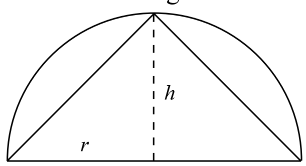
$\Rightarrow \quad r = \dfrac{308}{2\pi} = \dfrac{308\times 7}{2\times 22} = 49$ cm.

$\therefore$ Side of the inscribed square = $\sqrt{2}\,r = 49\sqrt{2}$ cm.

> 17. The area of the largest triangle inscribed in a semi-circle of radius r is r^2.

Explanation:

Clearly, from the figure, the largest triangle inscribed in a semi-circle is an isosceles triangle with diameter as its base and radius as its height.



Area of the triangle = $\dfrac{1}{2}$ × base × height

$= \dfrac{1}{2} \times 2r \times r = r^2.$

> 18. The number of revolutions made by a circular wheel of radius r in travelling a distance d is given by
>
> $= \left(\dfrac{d}{2\pi r}\right).$

Explanation:

Circumference of the wheel = $2\pi r$

In travelling a distance $2\pi r$, the wheel makes 1 revolution.

$\therefore$ In travelling a distance d, the wheel makes $\dfrac{22}{7}$ revolutions.

Illustration 20: The diameter of a wheel is 2 cm. If it rolls forward covering 10 revolutions, find the distance travelled by it.

Solution: Radius of the wheel = 1 cm.

The distance travelled by the wheel in 10 revolutions

$= 10 \times 2\pi r$

$= 10 \times 2 \times \dfrac{22}{7} \times 1 = 62.8$ cm.

Exercise-1

1. The area of a triangle whose sides are 15 m, 16 m and 17 m is:

(a) $24\sqrt{4}$ m^2 (b) $24\sqrt{3}$ m^2
(c) $24\sqrt{21}$ m^2 (d) None of these

2. The area of a right-angled triangle with base 6 m and hypotenuse 6.5 m is:

(a) 7.5 m^2 (b) 9.5 m^2
(c) 8.5 m^2 (d) None of these

3. The length of each side of a triangle is 12 cm. The height of the triangle is:

(a) $3\sqrt{2}$ m (b) $6\sqrt{3}$ m
(c) $6\sqrt{2}$ (d) None of these

4. The area of a triangular lawn is 1600 m^2. If one side is 64 m long and the other two sides are equal in length, the length of each equal side is:

(a) 60.37 m (b) 59.36 m
(c) 60.36 cm (d) None of these

5. Three sides of a triangular field are 20 m, 21 m and 29 m long, respectively. The area of the field is:

(a) 215 m^2 (b) 230 m^2
(c) 210 m^2 (d) None of these

6. The hypotenuse and the semi-perimeter of a right triangle are 20 cm and 24 cm, respectively. The other two sides of the triangle are:

(a) 16 cm, 12 cm
(b) 20 cm, 12 cm
(c) 20 cm, 16 cm
(d) None of these

7. The sides of a triangle are in the ratio 3:4:5. If its perimeter is 36 cm, then the area of the triangle is:

(a) 57 m^2 (b) 54 m^2
(c) 56.5 m^2 (d) None of these

8. For a triangle whose sides are 50 m, 78 m and 112 m, respectively, then the length of the perpendicular from the opposite angle on the side 112 m is:

(a) 45 m (b) 35 m
(c) 30 m (d) None of these

9. A ladder is resting with one end in contact with the top of a wall of height 12 m and the other end on the ground is at a distance 5 m from the wall. The length of the ladder is:

(a) 13 m (b) 17 m
(c) 16 m (d) None of these

10. A ladder is placed so as to reach a window 63 cm high. The ladder is then turned over to the opposite side of the street and is found to reach a point 56 cm high. If the ladder is 65 cm long, then the width of the street is:

(a) 59 cm (b) 39 cm
(c) 49 cm (d) None of these

11. If the area of a triangle with base x is equal to the area of a square with side x, then the altitude of the triangle is:

(a) $\frac{x}{2}$ (b) x
(c) $2x$ (d) $3x$

12. If the area of a triangle is 150 m^2 and the ratio of the base and the height is 3:4, then find its height.

(a) 25 m (b) 35 m
(c) 20 m (d) None of these

13. The base of a triangular field is three times its height. If the cost of cultivating the field at ₹36.72 per hectare is ₹495.72, then find its base and height.

(a) 950 m, 350 m (b) 800 m, 500 m
(c) 900 m, 300 m (d) None of these

14. If the sides of a triangle are doubled, its area:

(a) remains same (b) is doubled
(c) becomes 4 times (d) Can't say

15. Two sides of a triangular field are 85 m and 154 m, respectively, and its perimeter is 324 m. The cost of ploughing the field at the rate of ₹10 per m^2 is:

(a) ₹27720 (b) ₹37620
(c) ₹26750 (d) None of these

16. The area of an equilateral triangle, each of whose sides measures $2\sqrt{3}$ cm is:

(a) $5\sqrt{3}$ m^2 (b) $4\sqrt{3}$ m^2
(c) $3\sqrt{3}$ cm^2 (d) None of these

17. If the height of an equilateral triangle is $2\sqrt{3}$ cm, then the length of its side is:

(a) 4 cm (b) 6 cm
(c) 5 cm (d) None of these

18. If the perimeter of an equilateral triangle is 12 m, then find its area.

(a) $3\sqrt{4}$ m (b) $4\sqrt{3}$ m
(c) $5\sqrt{3}$ m (d) None of these

19. The height of an equilateral triangle whose perimeter is 24 cm, is:

(a) $4\sqrt{3}$ cm (b) $3\sqrt{4}$ cm
(c) $5\sqrt{3}$ cm (d) None of these

20. The perimeter of a right angled triangle is 90 cm and its hypotenuse is 39 cm. Find its other sides.

(a) 30 cm, 10 cm (b) 36 cm, 15 cm
(c) 48 cm, 20 cm (d) None of these

21. The perimeter of an isosceles triangle is 306 m and each of the equal sides is $\frac{5}{8}$ of the base. Find the area.

(a) 3648 cm (b) 3468 m^2
(c) 3846 cm (d) None of these

22. Find the area of an isosceles right-angled triangle whose hypotenuse is 8 cm.

(a) 32 m^2 (b) 24 cm^2
(c) 16 cm^2 (d) None of these

23. The perimeter of an isosceles triangle is equal to 14 cm; the lateral side and the base is in the ratio 5:4. The area of the triangle is:

(a) $3\sqrt{21}$ cm^2 (b) $2\sqrt{21}$ cm^2
(c) $4\sqrt{21}$ cm^2 (d) None of these

24. If all the sides of a triangle are increased by 200%, then the area of the triangle will increase by:

(a) 400% (b) 600%
(c) 800% (d) None of these

25. A plot of land is in the shape of a right-angled isosceles triangle. The length of the hypotenuse is $50\sqrt{2}$ m. The cost of fencing is ₹3 per metre. The total cost of fencing the plot will be:

(a) Less than ₹300
(b) Less than ₹500
(c) More than ₹500
(d) None of these

26. If the area of an equilateral triangle is equal to the area of an isosceles triangle whose base and equal sides are 16 cm and 10 cm respectively, then the side of the equilateral triangle is:

(a) 10.5 cm (b) 9.5 cm
(c) 12.5 cm (d) None of these

27. If the perimeter of a right-angled isosceles triangle is $4\sqrt{2} + 4$ m, then the hypotenuse is:

(a) 8 m (b) 6 m
(c) 4 m (d) None of these

28. The two adjacent sides of a parallelogram are 60 m and 40 m and one of the diagonals is 80 m long. The area of the parallelogram is:

(a) $600\sqrt{15}$ m^2 (b) $800\sqrt{25}$ m^2
(c) $700\sqrt{15}$ m^2 (d) None of these

29. One side of the parallelogram is 14 cm. Its distance from the opposite side is 16 cm. The area of the parallelogram is:

(a) 234 cm^2 (b) 324 cm^2
(c) 224 cm^2 (d) None of these

30. A field is in the shape of a parallelogram. Its adjacent sides and one diagonal are 65 m, 119 m and 156 m, respectively. Find the cost of gravelling it at the rate of ₹10 per m^2.

(a) ₹81400 (b) ₹71400
(c) ₹91400 (d) None of these

31. One side of a parallelogram is 10 m and the corresponding altitude is 7 m. The area of the parallelogram is:

(a) 70 m^2 (b) 60 m^2
(c) 80 m^2 (d) None of these

32. The adjacent sides of a parallelogram are 8 m and 5 m. The distance between the longer sides is 4 m. The distance between the shorter sides is:

(a) 4.6 m (b) 6.4 m
(c) 8.6 m (d) None of these

33. The area of a quadrilateral is 420 m^2 and the perpendiculars drawn to one diagonal from the opposite vertices are 18 m and 12 m. Then, the length of the diagonal is:

(a) 32 m (b) 24 m
(c) 28 m (d) None of these

34. The area of a parallelogram is 72 cm^2 and its altitude is twice the corresponding base. The length of the base is:

(a) 6 cm (b) 8 cm
(c) 4 cm (d) None of these

35. The area of a parallelogram is 240 cm^2 and its height is 12 cm. The base of the parallelogram is:

(a) 24 cm (b) 20 cm
(c) 28 cm (d) None of these

36. In a quadrilateral *ABCD*, the sides, *AB*, *BC*, *CD*, *DA* measure 20 m, 13 m, 17 m and 10 m, respectively and the diagonal *AC* is 21 m. The area of the quadrilateral is:

(a) 210 m^2 (b) 220 m^2
(c) 240 m^2 (d) None of these

37. If the two diagonals of a parallelogram are 72 cm and 30 cm respectively, then find its perimeter.

(a) 156 cm (b) 164 cm
(c) 172 cm (d) None of these

38. If the base of a parallelogram is $(x + 4)$, altitude to the base is $(x - 3)$ and the area is $(x^2 - 4)$, then the actual area is equal to:

(a) 64 sq units (b) 48 sq units
(c) 60 sq units (d) None of these

39. In a parallelogram, the lengths of adjacent sides are 12 cm and 14 cm, respectively. If the length of one diagonal is 16 cm, then find the length of the other diagonal.

(a) 24.8 cm (b) 20.6 cm
(c) 22.4 cm (d) None of these

40. Find the perimeter of a circular plot which occupies an area of 154 m^2.

(a) 54 m (b) 44 m
(c) 22 m (d) 11 m

41. The perimeter of a circle is equal to that of a square. Compare their areas.

(a) 14:11 (b) 25:12
(c) 24:7 (d) 22:7

42. The length of a rectangle is thrice its breadth and its perimeter is 96 m. The area of the rectangle is:

(a) 288 m^2 (b) 442 m^2
(c) 438 m^2 (d) 432 m^2

43. A cow is tied by a rope at the corner of a rectangular field. If the length of the rope is 14 m, then the area of the field which the cow could graze is:

(a) 77 m^2 (b) 308 m^2
(c) 23 m^2 (d) 154 m^2

44. The wheel of a scooter has diameter 70 cm. How many revolutions per minute must the wheel make so that the speed of the scooter is kept 66 Km/h?

(a) 400 (b) 600
(c) 500 (d) 800

45. 2 small circular parks of diameters 16 m, 12 m are to be replaced by a bigger circular park. What would be the radius of this new park, if the new park occupies same space as the two small parks?

(a) 10 (b) 15
(c) 20 (d) 25

46. A rectangular park is 65 m long and 50 m wide. 2 cross paths each 2 m wide are to be constructed parallel to the sides. If these paths pass through the centre of the rectangle and cost of construction is ₹17.25 per m^2, then find the total cost involved in the construction.

(a) ₹2265.59 (b) ₹1772.45
(c) ₹3898.50 (d) ₹8452.32

47. The area of a trapezium is 2500 m^2. One of its parallel sides is 75 m. If the distance between the two parallel sides is 40 m, then find the length of the other parallel side.

(a) 20 m (b) 30 m
(c) 40 m (d) 50 m

48. The length of a rectangle exceeds its breadth by 3 cm. If the numerical values of the area and the perimeter of the rectangle are equal, then the breadth is:

(a) 1 cm (b) 2 cm
(c) 3 cm (d) 3.5 cm

49. If the ratio of the areas of two squares is 9:1, then the ratio of their perimeters is:

(a) 9:1 (b) 3:4
(c) 3:1 (d) 1:3

50. A square field with side 30 m is surrounded by a path of uniform width. If the area of the path is 256 m^2, then its width is:

(a) 16 m (b) 14 m
(c) 4 m (d) 2 m

51. A rope by which a calf is tied is increased from 12 m to 23 m. How much additional grassy ground shall it graze?

(a) 1120 m^2 (b) 1250 m^2
(c) 1210 m^2 (d) 1200 m^2

52. Four circular cardboard pieces, each of radius 7 cm are placed in such a way that each piece touches two other pieces. The area of the space enclosed by the four pieces is:

(a) 21 cm^2 (b) 42 cm^2
(c) 84 cm^2 (d) 168 cm^2

53. The length and breadth of a rectangular field are in the ratio 5:3. If the cost of cultivating the field at 25 paise per square metre is ₹6000, then find the dimensions of the field:

(a) 250 m, 100 m (b) 50 m 30 m
(c) 200 m, 120 m (d) Cannot be determined

54. The cost of carpeting a room 5 m wide with carpet at ₹3.50 per m^2 is ₹105. The length of the room is:

(a) 3.5 m (b) 5 m
(c) 6 m (d) 6.5 m

55. The length of a rectangular field is twice its breadth. If the rent of the field at ₹3500 per hectare is ₹28000, then find the cost of surrounding it with fence at ₹5 per metre.

(a) ₹6000 (b) ₹7000
(c) ₹6500 (d) ₹8000

56. The area of a rectangular field is 27000 m^2. The ratio of its length and breadth is 6:5. The length and breadth of the field are respectively:

(a) 180 m, 150 m
(b) 200 m, 150 m
(c) 180 m, 120 m
(d) 150 m, 100 m

57. The area of a sector of a circle of radius 5 cm, formed by an arc of length 3.5 cms, is:

(a) 35 cm^2 (b) 17.5 cm^2
(c) 8.75 cm^2 (d) 55 cm^2

58. The length of a plot is double its width. If a square piece of land of area 150 m^2 occupies $\frac{1}{3}$ area of the plot, then what is the length of the plot?

(a) 15 m (b) 7.5 m
(c) 30 m (d) 10 m

59. A wire is in the form of a semi-circle of 7 cm radius. The length of the wire will be:

(a) 25 cm (b) 36 cm
(c) 5 cm (d) 69 cm

60. A circular road runs round a circular ground. If the difference between the circumferences of the outer circle and the inner circle is 66 m, the width of the road is:

(a) 21 m (b) 10.5 m
(c) 7 m (d) 5.25 m

61. If the area of a square is 50 sq units, then the area of the circle drawn on its diagonal is:

(a) 25 π sq units (b) 50 π sq units
(c) 100 π sq units (d) None of these

62. A rectangular sheet of cardboard is of 4 cm × 2 cm. If a circle of greatest possible area is cut from it, then the area of remaining portion is:

(a) $(2 - \pi)$ cm^2 (b) $(4 - \pi)$ cm^2
(c) $(8 - \pi)$ cm^2 (d) $(16 - \pi)$ cm^2

63. What is the radius of a circle, to the nearest cm, whose area is equal to the sum of the areas of the three circles of radii 22 cm, 19 cm and 8 cm, respectively?

(a) 17 cm (b) 30 cm
(c) 29 cm (d) 19 cm

64. The length of a rectangle is increased by 33.33%. By what per cent should the width be decreased to maintain the same area?

(a) 25% (b) 33.33%
(c) 22.5% (d) None of these

65. If the area of a square is equal to the area of a rectangle 6.4 m long and 2.5 m wide, then each side of the square measures:
(a) 8 m (b) 5.4 m
(c) 3.8 m (d) 4 m

66. The diameters of two concentric circles are 8 cm and 10 cm. The area of the region between them is:
(a) π cm^2 (b) 3π cm^2
(c) 6π cm^2 (d) 9π cm^2

67. The length of a rectangular room is 4 m. If it can be partitioned into two equal square rooms, what is the length of the partition in metres?
(a) 1 (b) 2
(c) 4 (d) Data inadequate

68. A rectangular carpet has an area of 120 m^2 and a perimeter of 46 m. The length of its diagonal is:
(a) 15 m (b) 16 m
(c) 17 m (d) 20 m

69. The side of a square is 22 m. What is the radius of the circle whose circumference is equal to the perimeter of the square?
(a) 28 m (b) 3.5 m
(c) 14 m (d) 7 m

70. A piece of wire 132 cm long is bent successively in the shapes of an equilateral triangle, a square, a regular hexagon, and a circle. Then, which has the largest surface area?
(a) Equilateral triangle
(b) Square
(c) Circle
(d) Regular hexagon

71. If the radius of one circle is twelve times the radius of another, how many times does the area of the greater contain the area of the smaller?
(a) 12 (b) 72
(c) 144 (d) 96

72. If the circumference of a circle is equal to the perimeter of a square, what is the ratio of the area of the circle to the area of the square?
(a) 22:7 (b) 14:11
(c) 11:7 (d) 4:1

73. The length of a rectangular plot of land is three times as much as its breadth. A playground measuring 1200 ft^2 occupies $\frac{1}{4}$ of the total area of the plot. What is the length of the plot in feet?
(a) 40 (b) 360
(c) 120 (d) Data inadequate

74. There are two squares s_1 and s_2. The ratio of their areas is 4:25. If the side of s_1 is 6 cm, what is the side of s_2?
(a) 20 cm (b) 15 cm
(c) 5 cm (d) 12 cm

75. The radius of the wheel of a vehicle is 70 cm. The wheel makes 10 revolutions in 5 seconds. The speed of the vehicle is:
(a) 29.46 Km/h (b) 31.68 Km/h
(c) 36.25 Km/h (d) 32.72 Km/h

76. A rectangular carpet has an area of 60 m^2. Its diagonal and longer side together equal 5 times the shorter side. The length of the carpet is:
(a) 5 m (b) 13 m
(c) 14.5 m (d) 12 m

77. A playground has the shape of a rectangle with two semi-circles on its smaller sides as diameters, added outside. If the sides of the rectangle are 36 m and 24.5 m, then the area of the playground is: $\left(\text{use } \pi = \frac{22}{7}\right)$
(a) 2259.529 m^2 (b) 1353.625 m^2
(c) 1139.523 m^2 (d) None of these

78. A man runs around a circle of 50 m radius at a speed of 12 Km/h. Find the time taken by him for going around it ten times:
(a) 10 minutes (b) 12.5 minutes
(c) 15.7 minutes (d) None of these

79. A room 5 m $\times$ 8 m is to be carpeted leaving a margin of 10 cm from each wall. If the cost of the carpet is ₹18 per m^2, then the cost of carpeting the room will be:
(a) ₹702.60 (b) ₹691.80
(c) ₹682.46 (d) ₹673.92

80. The area of a big rectangle is equal to the area of a small rectangle. If the length of the big rectangle is equal to the length of the small rectangle and the width of big rectangle is 2 m, what is the width of a small rectangle?
(a) $\frac{1}{3}$ m (b) 1 m
(c) 2 m (d) Cannot be determined
(e) None of these

81. If the radius of a circle is reduced by 40%, then its circumference is reduced by:
(a) 60% (b) 40%
(c) 35% (d) 45%

82. A figure consists of a square of side 'a' m with semi-circles drawn on the outside of the square. The area (in m^2) of the figure so formed will be:

(a) a^2 (b) $a^2 + 2\pi a^2$
(c) $4\pi a^2$ (d) $a^2 + \frac{\pi a^2}{2}$

83. The area of a square field is 6050 m^2. How much time it will take to reach from one of its corner to the opposite corner at the rate of 10 m in every 30 seconds?

(a) $5\frac{1}{2}$ minutes (b) 11 minutes
(c) 22 minutes (d) 110 minutes

84. If a regular hexagon is inscribed in a circle of radius r, then its perimeter is:

(a) $3r$ (b) $6r$
(c) $9r$ (d) $12r$

85. 2 poles 15 m and 30 m high stand upright in a playground. If their feet be 36 m apart, find the distance between their tops.

(a) 36 m (b) 39 m
(c) 15 m (d) None of these

86. The length of a rectangular hall is $\frac{4}{3}$ of its width. If the area of the hall is 300 m^2, what is the difference between the length and the breadth?

(a) 15 m (b) 20 m
(c) 3 m (d) 5 m
(e) 6 m

87. Each side of an equilateral triangle is increased by 1.5%. The percentage increase in its area is:

(a) 1.5% (b) 3%
(c) 4.5% (d) 5.7%

88. A rope, by which a horse is tied, is increased from 12 to 23 m. How much additional ground will it be able to graze?

(a) 1315 m^2 (b) 765 m^2
(c) 1210 m^2 (d) 1012 m^2

89. If a diagonal of a square is doubled, how does the area of the square change?

(a) Becomes 4-fold
(b) Becomes 3-fold
(c) Becomes 2-fold
(d) None of these

90. If the sides of a rectangle are increased by 20%, the percentage increase in its perimeter is:

(a) 80 (b) 40
(c) 20 (d) None of these

91. A circle road runs around a circular garden. If the difference between the circumference of the outer circle and the inner circle is 44 m, then find the width of the road.

(a) 4 m (b) 7 m
(c) 3.5 m (d) 7.5 m

92. The length of a rectangular field is double its width. Inside the field there is a square-shaped pond 8 m long. If the area of the pond is $\frac{1}{8}$ of the area of the field, what is the length of the field?

(a) 32 m (b) 64 m
(c) 16 m (d) 20 m
(e) None of these

93. A circular disc of area 0.49π m^2 rolls down a length of 1.76 Km. The number of revolutions it makes is:

(a) 300 (b) 400
(c) 600 (d) 4000

94. If area of a triangle whose base is 6 cm is equal to the area of a circle of radius 6 cm, then find the height of this triangle:

(a) 10 cm (b) 22 cm
(c) 12 cm (d) 18 cm

95. The length of a ladder exactly equals the height of a wall. If the ladder is placed on a 2-feet tall stool placed 10 feet away from the wall, its tip just touches the top of the wall. The height of the wall in feet is:

(a) 15 (b) 26
(c) 28 (d) 32

96. If the diagonal of a square is doubled to make another square, the area of the new square will:

(a) Become 4-fold
(b) Become 2-fold
(c) Become 6-fold
(d) Become 8-fold

97. The area of a circle is 154 cm^2. The length of an arc of the circle which subtends an angle of 45° at the centre is:

(a) 11 cm (b) 5.5 cm
(c) 7 cm (d) None of these

98. A lawn is in the form of a triangle having its base and height in the ratio 2:3. The area of the lawn is $\frac{1}{12}$ hectare. Find the base and height of the lawn.

(a) 55 m, 34 m (b) 50 m, $33\frac{1}{3}$ m
(c) 50 m, 35 m (d) Data inadequate

99. A rectangular farm has to be fenced on one long side, one short side and the diagonal. If the cost of fencing is ₹10 per m, the area of the farm is 1200 m^2 and the short side is 30 m long, how much would the job cost?

(a) ₹700 (b) ₹1200
(c) ₹1400 (d) ₹1500

100. The diameter of a circle is 105 cm less than the circumference. What is the diameter of circle?

(a) 44 cm (b) 46 cm
(c) 48 cm (d) 49 cm

101. A garden is 24 m long and 14 m wide. There is a path 1 m wide outside the garden along its sides. If the path is to be constructed with square marble tiles 20 cm × 20 cm, then find the number of tiles required to cover the path:

(a) 1800 (b) 200
(c) 2000 (d) 2150

102. If the length of the diagonal of a rhombus is 80% of the length of the other diagonal, the area of the rhombus is how many times the square of the length of the longer diagonal?

(a) $\frac{4}{5}$ (b) $\frac{2}{5}$
(c) $\frac{3}{4}$ (d) $\frac{1}{4}$

103. *ABCD* is a trapezium in which $AB \parallel CD$ and $AB = 2CD$. If its diagonals intersect each other at *O*, the ratio of the area of triangle *AOB* and *COD* is:

(a) 1:2 (b) 2:1
(c) 1:4 (d) 4:1

104. The ratio of the corresponding sides of two similar triangles is 3:4. The ratio of their areas is:

(a) 4:3 (b) 3:4
(c) 9:16 (d) $\sqrt{3}:2$

105. The area of the circle inscribed in an equilateral triangle of side 24 cm is:

(a) 24 π cm^2 (b) 36 π cm^2
(c) 48 π cm^2 (d) 18 π cm^2

106. The radius of wheel is 1.4 decimetre. How many times does it revolve during a journey of 0.66 Km?

(a) 375 (b) 750
(c) 1500 (d) 3000

Exercise-2
(Based on Memory)

1. The ratio of the length to breadth of a rectangular plot is 8:5. If the breadth is 60 m less than the length, what is the perimeter of the rectangular plot?

(a) 260 m (b) 1600 m
(c) 500 m (d) Cannot be determined
(e) None of these

[Bank of Maharashtra PO, 2008]

2. The ratio of the length and the breadth of a rectangular plot is 6:5 respectively; if the breadth of the plot is 34 metre less than the length, what is the perimeter of the rectangular plot?

(a) 374 m (b) 408 m
(c) 814 m (d) 748 m
(e) None of these

[SBI PO, 2008]

3. The ratio of the length and the breadth of a rectangle is 4:3 and the area of the rectangle is 1728 cm^2. What is the ratio of the breadth and the area of the rectangle?

(a) 1:38 (b) 1:24
(c) 1:42 (d) 1:34
(e) None of these

[Allahabad Bank SO, 2007]

4. A 50 cm wide path is to be made around a circular garden having diameter of 8 m. Approximately, what is the area of the path in m^2?

(a) 13 (b) 8
(c) 18 (d) 22
(e) 20

[PNB Management Trainee, 2007]

5. What will be the area of a circle with circumference equal to 88 cm?

(a) 154 cm^2
(b) 44 cm^2
(c) 616 cm^2
(d) Cannot be determined
(e) None of these

[Allahabad Bank PO, 2007]

6. The circumference of a circular plot is 396 m. What is the area of the circular plot?

(a) 9856 m^2 (b) 18634 m^2
(c) 12474 m^2 (d) 9446 m^2
(e) None of these

[LIC ADO, 2007]

7. A triangle's perimeter is 25 cm. Which of the following may be true or is a possibility?

(A) The sides are 7 cm, 7 cm and 11 cm.
(B) It is an equilateral triangle.
(C) The value of the sides can be in integer only.

(a) Only A (b) Only A and B
(c) Only C (d) Only B and C
(e) Only B

[IOB PO, 2006]

8. The area of a rectangle is 12 m^2 and its length is 3 times its breadth. What is the perimeter of the rectangle?

(a) 18 m (b) 24 m
(c) 14 m (d) Cannot be determined
(e) None of these

[IOB PO, 2006]

9. The magnitude of the area of a circle is 7 times that of its circumference. What is the circumference (in units) of the circle?

(a) 616 (b) 132
(c) 88 (d) Cannot be determined
(e) None of these

[Central Bank of India PO, 2006]

10. Perimeter of a rectangular field is 160 m and the difference between its adjacent sides is 48 m. The side of a square field, having the same area as that of the rectangle, is:

(a) 32 metres (b) 8 metres
(c) 4 metres (d) 16 metres

[SSC (GL) Prel, 2005]

11. The ratio of the area of a square to that of the square drawn on its diagonal is:

(a) 1:1 (b) 1:2
(c) 1:3 (d) 1:4

[SSC (GL) Prel, 2005]

12. If the length and breadth of a rectanlge are in the ratio 3:2 and its perimeter is 20 cm, then the area of the rectangle (in cm^2) is:

(a) 24 (b) 48
(c) 72 (d) 96

[SSC (GL) Prel, 2005]

13. The areas of a square and a rectangle are equal. The length of the rectangle is greater than the length of the side of the square by 5 cm and the breadth is less than the length of the side of the square by 3 cm. The perimeter of the rectangle is:

(a) 17 cm (b) 26 cm
(c) 30 cm (d) 34 cm

[SSC (GL) Prel, 2005]

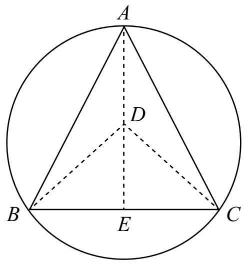
14. The area of a square of each side 8 cm is equal to the area of a rectangle. Which of the following statements about the rectangle is/are correct?

(1) The length of the rectangle is 16 times of the breadth.
(2) The length of the rectangle is 32 times of the breadth.
(3) The breadth of the rectangle is $\frac{1}{6}$ of the length.
(4) The breadth of the rectangle is $\frac{1}{9}$ of the length.

(a) Only (1) and (2) (b) Only (3) and (4)
(c) Either (1) or (2) (d) Either (3) or (4)
(e) None of these

[SBI PO, 2005]

15. In the given figure *ABC* is an equilateral triangle which is inscribed in a circle of radius *r*. Which one of the following is the area of the triangle?



(a) $(r-DE)^{1/2}(r+DE)^2$
(b) $(r-DE)^2(r+DE)^2$
(c) $(r-DE)^{1/2}(r+DE)^{3/2}$
(d) $(r+DE)^{1/2}(r-DE)^{3/2}$

[SBI PO, 2005]

16. The radius of a circle is 20% more than the height of a right angled triangle. The base of the right angled triangle is 36 cm. If the area of the right angled triangle is equal to the area of the circle, then what is the approximate area of the circle?

(a) 72 cm^2 (b) 144 cm^2
(c) 216 cm^2 (d) 128 cm^2
(e) Cannot be determined

[SBI PO, 2005]

17. In two triangles, the ratio of the areas is 4:3 and that of their heights is 3:4. Find the ratio of their bases.

(a) 16:9 (b) 9:16
(c) 9:12 (d) 16:12

[SSC (GL) Prel. Examination, 2002]

18. The diagonals of a rhombus are 24 cm and 10 cm. The perimeter of the rhombus (in cm) is:

(a) 68 (b) 65
(c) 54 (d) 52

[SSC (GL) Prel. Examination, 2002]

19. Find the length of the longest rod that can be placed in a hall of 10 m length, 6 m breadth and 4 m height.

(a) $2\sqrt{38}$ m (b) $4\sqrt{38}$ m
(c) $2\sqrt{19}$ m (d) 19 m

[SSC (GL) Prel. Examination, 2002]

20. If a wire is bent into the shape of a square, the area of the square is 81 cm^2. When the wire is bent into a semi-circular shape, the area of the semi-circle $\left(\text{taking } \pi = \frac{22}{7}\right)$ is:

(a) 154 cm^2 (b) 77 cm^2
(c) 44 cm^2 (d) 22 cm^2

[SSC (GL) Prel. Examination, 2002]

21. The perimeters of two squares are 24 cm and 32 cm. The perimeter (in cm) of a third square which is equal in area to the sum of the areas of the first and second squares is:

(a) 45 (b) 40
(c) 32 (d) 48

[SSC (GL) Prel. Examination, 2002]

22. The length of a rectangular garden is 12 m and its breadth is 5 m. Find the length of the diagonal of a square garden having the same area as that of the rectangular garden.

(a) $2\sqrt{30}$ m (b) $\sqrt{13}$ m
(c) 13 m (d) $8\sqrt{15}$ m

[SSC (GL) Prel. Examination, 2002]

23. The base of a triangle is 15 cm and height is 12 cm. The height of another triangle of double the area having base 20 cm is:

(a) 9 cm (b) 18 cm
(c) 8 cm (d) 12.5 cm

[SSC (GL) Prel. Examination, 2002]

24. The diagonals of a rhombus are 32 cm and 24 cm, respectively. The perimeter of the rhombus is:

(a) 80 cm (b) 72 cm
(c) 68 cm (d) 86 cm

[SSC (GL) Prel. Examination, 2002]

25. A wire when bent in the form of a square encloses an area of 484 cm^2. What will be the enclosed area, when the same wire is bent into the form of a circle? $\left(\text{take } \pi = \frac{22}{7}\right)$

(a) 462 cm^2 (b) 539 cm^2
(c) 616 cm^2 (d) 693 cm^2

[SSC (GL) Prel. Examination, 2002]

26. The perimeter of a square is 48 cm. The area of a rectangle is 4 cm^2 less than the area of the square. If the length of the rectangle is 14 cm, then its perimeter is:

(a) 24 cm (b) 48 cm
(c) 50 cm (d) 54 cm

[SSC (GL) Prel. Examination, 2002]

27. The side and one of the diagonals of a rhombus are 13 cm and 24 cm, respectively. The area of the rhombus (in cm^2) is:

(a) 156 (b) 240
(c) 120 (d) 130

[SSC (GL) Prel. Examination, 2002]

28. A circular wire of radius 21 cm is cut and bent in the form of a rectangle whose sides are in the ratio of 6:5. Assuming $\pi = \frac{22}{7}$, the area enclosed by the rectangle is:

(a) 540 cm^2 (b) 1080 cm^2
(c) 2160 cm^2 (d) 4320 cm^2

[SSC (GL) Prel. Examination, 2002]

29. The area (in m^2) of the square which has the same perimeter as of a rectangle whose length is 48 m and is 3 times its breadth, is:

(a) 1000 (b) 1024
(c) 1600 (d) 1042

[SSC (GL) Prel. Examination, 2002]

30. The area of an equilateral triangle is $400\sqrt{3}$ m^2. Its perimeter is:

(a) 120 m (b) 150 m
(c) 90 m (d) 135 m

[SSC (GL) Prel. Examination, 2003]

31. A took 15 seconds to cross a rectangular field diagonally walking at the rate of 52 m/min and B took the same time to cross the same field along its sides walking at the rate of 68 m/min. The area of the field is:

(a) 30 m^2 (b) 40 m^2
(c) 50 m^2 (d) 60 m^2

[SSC (GL) Prel. Examination, 2003]

32. Diameter of a wheel is 3 m. The wheel revolves 28 times in a minute. To cover 5,280 Km distance, the wheel will take $\left(\text{take } \pi = \frac{22}{7}\right)$:

(a) 10 minute (b) 20 minute
(c) 30 minute (d) 40 minute

[SSC (GL) Prel. Examination, 2003]

33. The sides of a triangle are 3 cm, 4 cm and 5 cm. The area (in cm^2) of the triangle formed by joining the mid-points of this triangle is:

(a) 6 (b) 3
(c) $\frac{3}{2}$ (d) $\frac{3}{4}$

[SSC (GL) Prel. Examination, 2003]

34. From a point in the interior of an equilateral triangle the perpendicular distance of the sides are $\sqrt{3}$ cm, 2 $\sqrt{3}$ cm respectively and 5 $\sqrt{3}$ cm. The perimeter (in cm) of the triangle is:

(a) 64 (b) 32
(c) 48 (d) 24

[SSC (GL) Prel. Examination, 2003]

35. Find the diameter of a wheel that makes 113 revolutions to go 2 Km 26 decametres $\left(\text{take } \pi = \frac{22}{7}\right)$.

(a) $4\frac{4}{13}$ m (b) $6\frac{4}{11}$ m
(c) $12\frac{4}{11}$ m (d) $12\frac{8}{11}$ m

[SSC (GL) Prel. Examination, 2003]

36. The difference of the areas of two squares drawn on 2 line segments of different lengths is 32 cm^2. Find the length of the greater line segment, if one is longer than the other by 2 cm.

(a) 7 cm (b) 9 cm
(c) 11 cm (d) 16 cm

[SSC (GL) Prel. Examination, 2003]

37. The perimeters of two squares are 40 cm and 32 cm. The perimeter of a third square whose area is, equal to the difference of the areas of the first two squares is:

(a) 24 cm (b) 42 cm
(c) 40 cm (d) 20 cm

[SSC (GL) Prel. Examination, 2003]

38. The perimeter of a rhombus is 40 cm. If the length of one of its diagonals be 12 cm, the length of the other diagonal is:

(a) 14 cm (b) 15 cm
(c) 16 cm (d) 12 cm

[SSC (GL) Prel. Examination, 2003]

39. Three circles of radius 3.5 cm each are placed in such a way that each touches the other. The area of the portion enclosed by the circles is:

(a) 1.975 cm^2 (b) 1.967 cm^2
(c) 19.67 cm^2 (d) 21.21 cm^2

[SSC (GL) Prel. Examination, 2003]

40. Four equal-sized maximum circular plates are cut off from a square paper sheet of area 784 cm^2. The circumference of each plate is:

(a) 22 cm (b) 44 cm
(c) 66 cm (d) 88 cm

[SSC (GL) Prel. Examination, 2003]

41. The area of a right-angled triangle is $\frac{2}{3}$ of the area of a rectangle. The base of the triangle is 80 per cent of the breadth of the rectangle. If the perimeter of the rectangle is 200 cm, what is the height of the triangle?

(a) 20 cm (b) 30 cm
(c) 15 cm (d) Data inadequate
(e) None of these

[BSRB Chennai PO, 2000]

42. When the length of a rectangular plot is increased by 4 times, its perimeter becomes 480 metres and area 12800 m^2. What was its original length (in m)?

(a) 160 (b) 40
(c) 20 (d) Cannot be determined

[BSRB Bhopal PO, 2000]

43. Four sheets of 50 cm × 5 cm are to be arranged in such a manner that a square could be formed. What will be the area of inner part of the square so formed?

(a) 2000 cm^2 (b) 1600 cm^2
(c) 1800 cm^2 (d) 2500 cm^2
(e) None of these

[BSRB Bangalore PO, 2000]

44. In order to fence a square Manish fixed 48 poles. If the distance between 2 poles is 5 m, then what will be the area of the square so formed?

(a) Cannot be determined
(b) 3025 cm^2
(c) 2500 cm^2
(d) 3025 cm^2
(e) None of these

[BSRB Bangalore PO, 2000]

45. What will be the area of semicircle of 14 m diameter?

(a) 154 m^2 (b) 77 m^2
(c) 308 m^2 (d) 22 m^2
(e) None of these

[NABARD Asst. Manager Examination, 2002]

46. The area of a rectangular field is 460 m^2. If the length is 15 per cent more than the breadth, what is the breadth of the rectangular field?

(a) 15 m (b) 26 m
(c) 34.5 m (d) Cannot be determined
(e) None of these

[Canara Bank PO, 2003]

47. The breadth of a rectangular hall is $\frac{2}{3}$ of its length. If the area of the hall is 2400 m^2, what is the length in m?

(a) 120 (b) 80
(c) 60 (d) 40
(e) None of these

[IBPS JR Executive Examination, 2002]

48. The front wheels of a wagon are 2π feet in circumference and the back wheels are 3π feet in circumference. When the front wheels have made 10 more revolutions than the back wheels, how many feet has the wagon travelled?

(a) 30 π (b) 90 π
(c) 60 π (d) 150 π

49. If the area of a circle is 9π, then which of the following is (are) true?

I. The radius is 3
II. The diameter is 6
III. The circumference is 6π

(a) I only (b) I and II only
(c) I, II and III (d) III only

50. The circle with center *O* has a radius of 4 (See figure in the solution). If the area of the shaded region is 14π, then what is the value of *x*?

(a) 90 (b) 60
(c) 55 (d) 45

51. If the radius of a circle is increased by 8%, then the area of the circle is increased by:

(a) 16.64% (b) 12.36%
(c) 6% (d) 3.6%

52. The perimeter of a square is equal to twice the perimeter of a rectangle of length 8 cm and breadth 7 cm. What is the circumference of a semicircle whose diameter is equal to the side of the square? (Rounded off to the two decimal place)

(a) 38.57 cm (b) 23.57 cm
(c) 42.46 cm (d) 47.47 cm

[Punjab and Sindh Bank PO, 2010]

53. The area of a square is 1024 cm^2. What is the ratio between the length and the breadth of a rectangle whose length is twice the side of the square and breadth is 12 cm less than the side of the square?

(a) 5:18 (b) 16:7
(c) 14:5 (d) None of these

[CBI (PO), 2010]

54. The length of a rectangular floor is twice its breadth. If ₹256 is required to paint the floor at the rate of ₹2 per m^2, then what would be the length of floor?

(a) 16 m (b) 8 m
(c) 21 m (d) 32 m

[Corporation Bank PO, 2009]

55. A number when subtracted by $\frac{1}{7}$ of itself gives the same value as the sum of all the angle of a triangle. What is the number?

(a) 224 (b) 210
(c) 140 (d) 350

[Corporation Bank PO, 2009]

56. What would be the cost of laying a carpet on a floor which has its length and breadth in the respective ratio of 32:21 and where its perimeter is 212 feet, if the cost per square foot of laying the carpet is ₹2.5?

(a) ₹6720 (b) ₹5420
(c) ₹7390 (d) Cannot be determined

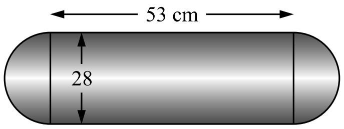
[Rajasthan Grameen Bank PO, 2011]

57. The circumference of 2 circles is 83 m and 220 m, respectively. What is the difference between the area of the larger circle and the smaller circle?

(a) 3422 m^2 (b) 3242 m^2
(c) 3244 m^2 (d) None of these

[Corporation Bank PO, 2011]

58. What is the area of the following figure?



(a) 2504 cm^2 (b) 1940 cm^2
(c) 2100 cm^2 (d) Cannot be determined

59. The length of a rectangle is twice the diameter of a circle. The circumference of the circle is equal to the area of a square of side 22 cm. What is the breadth of the rectangle if its perimeter is 668 cm?

(a) 24 cm (b) 26 cm
(c) 52 cm (d) Cannot be determined

[Union Bank of India PO, 2011]

60. Cost of fencing a circular plot at the rate of ₹15 per m is ₹3300. What will be the cost of flooring that plot at the rate of ₹100 per m^2?

(a) ₹385000 (b) ₹220000
(c) ₹350000 (d) Cannot be determined

[United Bank of India PO, 2009]

61. An order was placed for supply of carpet of breadth 3 m, the length of carpet was 1.44 times of breadth. Subsequently the breadth and length were increased by 25% and 40%, respectively. At the rate of ₹45 per m^2, what would be the increase in the cost of the carpet?

(a) ₹1002.6 (b) ₹398.8
(c) ₹437.4 (d) ₹583.2

[IOB PO, 2009]

62. The area of a square is 196 cm^2. whose side is half the radius of a circle. The circumference of the circle is equal to breadth of a rectangle, if perimeter of the rectangle is 712 cm. What is the length of the rectangle?

(a) 196 cm^2 (b) 186 cm^2
(c) 180 cm^2 (d) 190 cm^2

[OBC PO, 2010]

63. *ABCD* is a trapezium with *AD* and *BC* parallel sides. *E* is a point on *BC*. The ratio of the area of *ABCD* to that of *AED* is:

(a) $\dfrac{\overline{AD}}{\overline{BC}}$ (b) $\dfrac{\overline{BE}}{\overline{EC}}$

(c) $\dfrac{\overline{AD}+\overline{BE}}{\overline{AD}+\overline{CE}}$ (d) $\dfrac{\overline{AD}+\overline{BC}}{AD}$

[SSC, 2014]

64. In an equilateral triangle of side 24 cm, a circle is inscribed touching its sides. The area of the remaining portion of the triangle is $\left(\sqrt{3}=1.732\right)$:

(a) 98.55 cm^2 (b) 100 cm^2
(c) 101 cm^2 (d) 95 cm^2

[SSC, 2014]

65. Perimeter of a rhombus is 2*p* units and sum of length of diagonals is *m* units, then area of the rhombus is:

(a) $\frac{1}{4}m^2p$ sq units

(b) $\frac{1}{4}mp^2$ sq units

(c) $\frac{1}{4}(m^2-p^2)$ sq units

(d) $\frac{1}{4}(p^2-m^2)$ sq units

[SSC, 2014]

66. Two sides of a plot measuring 32 *m* and 24 *m* and the angle between them is a perfect right angle. The other two sides measure 25 *m* each and the other three angles are not right angles. The area of the plot in m^2 is:

(a) 768 (b) 534
(c) 696.5 (d) 684

[SSC, 2014]

67. A is the centre of circle whose radius is 8 and B is the centre of a circle whose diameter is 8. If these two circles touch externally, then the area of the circle with diameter AB is:

(a) 36 π (b) 64 π
(c) 144 π (d) 256 π

[SSC, 2014]

68. A lawn is in the form of a rectangle having its breadth and length in the ratio 3:4. The area of the lawn is $\frac{1}{12}$ hectare. The breadth of the lawn is:

(a) 25 metres (b) 50 metres
(c) 75 metres (d) 100 metres

[SSC, 2013]

69. The area of a rectangle is thrice that of a square. The length of the rectangle is 20 cm and the breadth of the rectangle is $\frac{3}{2}$ times that of the side of the square. The side of the square (in cm) is:

(a) 10 (b) 20
(c) 30 (d) 60

[SSC, 2013]

70. The diagonals of a rhombus are 12 cm and 16 cm. The length of one side is:

(a) 8 cm (b) 6 cm
(c) 10 cm (d) 12 cm

[SSC, 2013]

71. The diameter of a circular wheel is 7 m. How many revolutions will it make in travelling 22 Km?

(a) 100 (b) 400
(c) 500 (d) 1000

[SSC, 2013]

72. The area of an equilateral triangle is $9\sqrt{3}$ m^2. The length (in m) of the median is:

(a) $2\sqrt{3}$ (b) $3\sqrt{3}$
(c) $3\sqrt{2}$ (d) $2\sqrt{2}$

[SSC, 2013]

73. How many tiles, each 4 decimetres square, will be required to cover the floor of a room 8 m long and 6 m broad?

(a) 200 (b) 260
(c) 280 (d) 300

[SSC, 2013]

74. The area of the circumcircle of an equilateral triangle is 3π cm^2. The perimeter of the triangle is:

(a) $3\sqrt{3}$ cm (b) 9 cm
(c) 18 cm (d) 3 cm

[SSC Assistant Grade III, 2013]

75. In ΔABC, $\angle A = 90°$ and $AD \perp BC$ where D lies on BC. If $BC = 8$ cm, $AC = 6$ cm, then $\Delta ABC:\Delta ACD$ is:

(a) 4:3 (b) 25:16
(c) 16:9 (d) 25:9

[SSC Assistant Grade III, 2013]

76. The sides of a triangle are in the ratio $\frac{1}{4}:\frac{1}{6}:\frac{1}{8}$ and its perimeter is 91 cm. The difference of the length of the longest side and that of the shortest side is:

(a) 19 (b) 20
(c) 28 (d) 21

[SSC Assistant Grade III, 2013]

77. The perimeter of an isosceles right-angled triangle is $2p$ cm. Its area is:

(a) $(3+2\sqrt{2})p$ cm^2

(b) $(3-2\sqrt{2})p^2$ cm^2

(c) $(2-\sqrt{2})p$ cm^2

(d) $(2+\sqrt{2})p^2$ cm^2

[SSC Assistant Grade III, 2013]

78. The ratio between the areas of two circles is 4:7. What will be the ratio of their radii?

(a) $2:\sqrt{7}$ (b) 4:7
(c) 16:49 (d) $4:\sqrt{7}$

[SSC Assistant Grade III, 2013]

79. The perimeter of a non-square rhombus is 20 cm. One of its diagonals is 8 cm. The area of the rhombus is:

(a) 28 cm^2 (b) 20 cm^2
(c) 22 cm^2 (d) 24 cm^2

[SSC Assistant Grade III, 2013]

80. The sides of a triangle are 50 cm, 78 cm and 112 cm. The smallest altitude is:

(a) 20 cm (b) 30 cm
(c) 40 cm (d) 50 cm

[SSC Assistant Grade III, 2012]

81. In a triangle ABC, $AB + BC = 12$ cm, $BC + CA = 14$ cm and $CA + AB = 18$ cm. Find the radius of the circle (in cm) which has the same perimeter as the triangle.

(a) $\frac{5}{2}$ (b) $\frac{7}{2}$

(c) $\frac{9}{2}$ (d) $\frac{11}{2}$

[SSC, 2012]

82. A playground is in the shape of a rectangle. A sum of ₹1,000 was spent to make the ground usable at the rate of 25 paisa per m^2. The breadth of the ground is 50 m. If the length of the ground is increased by 20 m, what will be the expenditure in rupees at the same rate per m^2?

(a) 1,250 (b) 1,000
(c) 1,500 (d) 2,250

[SSC, 2012]

83. The lengths of three medians of a triangle are 9 cm, 12 cm and 15 cm. The area (in cm^2) of the triangle is:

(a) 24 (b) 72
(c) 48 (d) 144

[SSC, 2012]

84. A circle and a rectangle have the same perimeter. The sides of the rectangle are 18 cm and 26 cm. The area of the circle is $\left[\text{Take } \pi = \frac{22}{7}\right]$

(a) 125 cm^2 (b) 230 cm^2
(c) 550 cm^2 (d) 616 cm^2

[SSC, 2012]

85. The area of a circle is increased by 22 cm^2 when its radius is increased by 1 cm. The original radius of the circle is:

(a) 3 cm (b) 5 cm
(c) 7 cm (d) 9 cm

[SSC, 2012]

86. The sum of all interior angles of a regular polygon is twice the sum of all its exterior angles. The number of sides of the polygon is:

(a) 10 (b) 8
(c) 12 (d) 6

[SSC, 2012]

87. If the diagonals of a rhombus are 8 and 6, then the square of its size is:

(a) 25 (b) 55
(c) 64 (d) 36

[SSC, 2012]

88. The area of the square inscribed in a circle of radius 8 cm is:

(a) 256 cm^2 (b) 250 cm^2
(c) 128 cm^2 (d) 125 cm^2

[SSC, 2012]

89. A square is of area 200 m^2. A new square is formed in such a way that the length of its diagonal is $\sqrt{2}$ times of the diagonal of the given square. Then the area of the new square formed is:

(a) $200\sqrt{2}$ m^2 (b) $400\sqrt{2}$ m^2
(c) 400 m^2 (d) 800 m^2

[SSC, 2011]

90. The sides of a right-angled triangle forming right angle are in the ratio 5:12. If the area of the triangle is 270 cm^2, then the length of the hypotenuse is:

(a) 39 cm (b) 42 cm
(c) 45 cm (d) 51 cm

[SSC, 2010]

91. If the measures of a diagonal and the area of a rectangle are 25 cm and 168 cm^2 respectively, what is the length of the rectangle?

(a) 31 cm (b) 24 cm
(c) 17 cm (d) 27 cm

[SSC, 2010]

92. A General, while arranging his men, who were 6000 in number, in the form of a square, found that there were 71 men leftover. How many were arranged in each row?

(a) 73 (b) 77
(c) 87 (d) 93

[SSC, 2010]

93. If the length of a rectangle is increased by 10% and its breadth is decreased by 10%, then its area:

(a) decreases by 1%
(b) increases by 1%
(c) decreases by 2%
(d) remains unchanged

[SSC, 2010]

94. If the length of a rectangle is increased in the ratio 6:7 and its breadth is diminished in the ratio 5:4 then its area will be diminished in the ratio:

(a) 17:16 (b) 15:14
(c) 9:8 (d) 8:7

[SSC, 2010]

95. 3 horses are tethered at 3 corners of a triangular plot of land having sides 20 m, 30 m and 40 m each with a rope of length 7 m. The area (in m^2) of the region of this plot, which can be grazed by the horses, is:

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(a) $\frac{77}{3}$ (b) 75
(c) 77 (d) 80

[SSC, 2010]

96. A wire, when bent in the form of a square, encloses a region of area 121 cm^2. If the same wire is bent into the form of a circle, then the area of the circle is:

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(a) 150 cm^2 (b) 152 cm^2
(c) 154 cm^2 (d) 159 cm^2

[SSC, 2010]

97. The ratio of the area of a sector of a circle to the area of the circle is 1:4. If the area of the circle is 154 cm^2, the perimeter of the sector is:

(a) 20 cm (b) 25 cm
(c) 36 cm (d) 40 cm

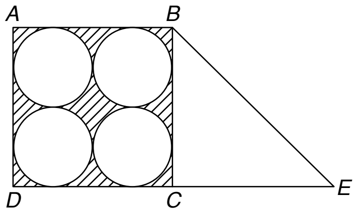
[SSC, 2010]

98. The sum of the areas of the 10 squares, the lengths of whose sides are 20 cm, 21 cm, ..., 29 cm respectively is:

(a) 6085 cm^2 (b) 8555 cm^2
(c) 2470 cm^2 (d) 11025 cm^2

[SSC, 2010]

Directions (Q. 99–100): Study the following diagram to answer the questions.



99. If the diameter of each circle is 14 cm and $DC = CE$, the area of ΔBDE is:

(a) 784 cm^2 (b) 748 cm^2
(c) 874 cm^2 (d) 441 cm^2
(e) None of these

[IBPS PO/MT, 2013]

100. The area of the shaded region of square *ABCD* is:

(a) 186 cm^2 (b) 168 cm^2
(c) 188 cm^2 (d) 441 cm^2
(e) None of these

[IBPS PO/MT, 2013]

101. The area of a square is 1444 square metres. The breadth of a rectangle is $\frac{1}{4}$ the side of the square and the length of the rectangle is thrice its breadth. What is the difference between the area of the square and the area of the rectangle?

(a) 1152.38 m^2 (b) 1169.33 m^2
(c) 1181.21 m^2 (d) 1173.25 m^2
(e) None of these

[IBPS PO/MT, 2012]

102. If the length of a rectangular field is increased by 20% and the breadth is reduced by 20%, the area of the rectangle will be 192 m^2. What is the area of the original rectangle?

(a) 184 m^2 (b) 196 m^2
(c) 204 m^2 (d) 225 m^2
(e) None of these

[SBI Associates Banks PO, 2011]

103. Inside a square plot, a circular garden is developed which exactly fits in the square plot and the diameter of the garden is equal to the side of the square plot which is 28 m. What is the area of the space left out in the square plot after developing the garden?

(a) 98 m^2 (b) 146 m^2
(c) 84 m^2 (d) 168 m^2
(e) None of these

[SBI Associates Banks PO, 2011]

104. What is the cost of flooring a rectangular hall?

Statements:

I. The length of the rectangle is 6 meters.
II. The breadth of the rectangle is 2/3 of its length.
III. The cost of flooring the area of 100 cm^2 is ₹45.

(a) Only I and III
(b) Only II and III
(c) All I, II and III
(d) Question cannot be answered even with data in all three statements.
(e) None of these

[SBI Associates Banks PO, 2011]

105. The length of a rectangle is 3/5 of the side of a square. The radius of a circle is equal to side of the square. The circumference of the circle is 132 cm. What is the area of the rectangle if the breadth of the rectangle is 8 cm?

(a) 112.4 cm^2 (b) 104.2 cm^2
(c) 100.8 cm^2 (d) Cannot be determined
(e) None of these

[IOB PO, 2011]

106. The smallest side of a right-angled triangle is 8 cm less than the side of a square of perimeter 56 cm. The second largest side of the right-angled triangle is 4 cm less than the length of the rectangle of area 96 cm^2 and breadth 8 cm. What is the largest side of the right-angled triangle?

(a) 20 cm (b) 12 cm
(c) 10 cm (d) 15 cm
(e) None of these

[IOB PO, 2011]

107. The sum of the circumference of a circle and the perimeter of a square is equal to 272 cm. The diameter of the circleis 56 cm. What is the sum of the areas of the circle and the square?

(a) 2464 cm^2 (b) 2644 cm^2
(c) 3040 cm^2 (d) Cannot be determined
(e) None of these

[Allahabad Bank PO, 2011]

108. The largest and the second largest angles of a triangle are in the ratio of 4: 3. The smallest angle is half the largest angle. What is the difference between the smallest and the largest angles of the triangle?

(a) 30° (b) 60°
(c) 40° (d) 20°
(e) None of these

[Allahabad Bank PO, 2011]

109. The ratio of the 3 angles of a quadrilateral is 13:9:5. The value of the 4 angle of the quadrilateral is 36°. What is the difference between the largest and the second smallest angles of the quadrilateral?

(a) 104° (b) 108°
(c) 72° (d) 96°
(e) None of these

[Allahabad Bank PO, 2011]

110. The circumference of two circles is 88 metres and 220 metres respectively. What is the difference between the area of the larger circle and that of the smaller circle?

(a) 3422 m^2
(b) 3242 m^2
(c) 3244 m^2
(d) 3424 m^2
(e) None of these

[Corporation Bank PO, 2011]

111. The angles of a quadrilateral are in the ratio of 2:4:7:5. The smallest angle of the quadrilateral is equal to the smallest angle of a triangle. One of the angles of the triangle is twice the smallest angle of the triangle. What is the second largest angle of the triangle?

(a) 80° (b) 60°
(c) 120° (d) Cannot be determined
(e) None of these

[Central Bank of India PO, 2010]

112 The area of a square is 1024 cm^2. What is the ratio of the length to the breadth of a rectangle whose length is twice the side of the square and breadth is 12 cm less than the side of this square?

(a) 5:18 (b) 16:7
(c) 14:5 (d) 32:5
(e) None of these

[Central Bank of India PO, 2010]

113. The perimeter of a square is equal to twice the perimeter of a rectangle whose dimensions are: length 8 cm and breadth 7 cm. What is the circumference of a semicircle whose diameter is equal to the side of the square?

(Rounded off of the decimal place)

(a) 38.57 cm
(b) 23.57 cm
(c) 42.46 cm
(d) 47.47 cm
(e) None of these

[Punjab and Sind Bank PO, 2010]

114. The circumferences of two circles are 132 metres and 176 metres respectively. What is the difference between the area of the larger circle and that of the smaller circle?

(a) 1048 m^2
(b) 1076 m^2
(c) 1078 m^2
(d) 1090 m^2
(e) None of these

[Indian Bank PO, 2010]

115. If the perimeter of a square is equal to the radius of a circle whose area is 39424 cm^2, what is the area of the square?

(a) 1225 cm^{2v}
(b) 441 cm^2
(c) 784 cm^2
(d) Cannot be determined
(e) None of these

[IDBI Bank PO, 2009]

116. What would be the cost of building a fence around a square plot with area equal to 361 sq.ft., if the price per foot of building the fence is ₹62?

(a) ₹4026 (b) ₹4712
(c) ₹3948 (d) Cannot be determined
(e) None of these

[OBC PO, 2009]

117. The length of a rectangular floor is twice its breadth. If ₹256 is required to paint the floor at the rate of ₹2 per square metre, then what would be the length of floor?

(a) 16 metres (b) 8 metres
(c) 12 metres (d) 32 metres
(e) 20 metres

[Corporation Bank PO, 2009]

118. What is the area of a given right-angled triangle?

I. The length of the hypotenuse is 5 cm.
II. The perimeter of the triangle is four times that of itsbase.
III. Oneof the angles of the triangle is 60°.

(a) Only II (b) Only III
(c) Either II or III (d) Both I and III
(e) Question cannot be answered even with the information in all three statements

[IBPS PO/MT, 2013]

ANSWER KEYS

Exercise–1

1. (c)	**2.** (a)	**3.** (b)	**4.** (b)	**5.** (c)	**6.** (a)	**7.** (b)	**8.** (c)	**9.** (a)	**10.** (c)	**11.** (c)	**12.** (c)	**13.** (c)
14. (c)	**15.** (a)	**16.** (c)	**17.** (c)	**18.** (b)	**19.** (a)	**20.** (b)	**21.** (b)	**22.** (c)	**23.** (b)	**24.** (c)	**25.** (c)	**26.** (a)
27. (c)	**28.** (a)	**29.** (c)	**30.** (b)	**31.** (a)	**32.** (b)	**33.** (c)	**34.** (a)	**35.** (b)	**36.** (a)	**37.** (a)	**38.** (c)	**39.** (b)
40. (b)	**41.** (a)	**42.** (d)	**43.** (d)	**44.** (c)	**45.** (a)	**46.** (c)	**47.** (d)	**48.** (c)	**49.** (c)	**50.** (d)	**51.** (c)	**52.** (b)
53. (c)	**54.** (c)	**55.** (a)	**56.** (a)	**57.** (c)	**58.** (c)	**59.** (b)	**60.** (b)	**61.** (a)	**62.** (c)	**63.** (b)	**64.** (a)	**65.** (d)
66. (d)	**67.** (b)	**68.** (c)	**69.** (c)	**70.** (c)	**71.** (c)	**72.** (b)	**73.** (c)	**74.** (b)	**75.** (b)	**76.** (d)	**77.** (b)	**78.** (c)
79. (d)	**80.** (a)	**81.** (b)	**82.** (d)	**83.** (a)	**84.** (b)	**85.** (b)	**86.** (d)	**87.** (a)	**88.** (c)	**89.** (a)	**90.** (c)	**91.** (b)
92. (a)	**93.** (b)	**94.** (c)	**95.** (b)	**96.** (a)	**97.** (b)	**98.** (b)	**99.** (b)	**100.** (d)	**101.** (c)	**102.** (b)	**103.** (d)	**104.** (c)
105. (c)	**106.** (b)											

Exercise–2

1. (e)	**2.** (d)	**3.** (e)	**4.** (a)	**5.** (c)	**6.** (c)	**7.** (b)	**8.** (e)	**9.** (c)	**10.** (a)	**11.** (b)	**12.** (a)	**13.** (c)
14. (c)	**15.** (c)	**16.** (a)	**17.** (a)	**18.** (d)	**19.** (a)	**20.** (b)	**21.** (b)	**22.** (a)	**23.** (b)	**24.** (a)	**25.** (c)	**26.** (b)
27. (c)	**28.** (b)	**29.** (b)	**30.** (a)	**31.** (d)	**32.** (b)	**33.** (c)	**34.** (c)	**35.** (b)	**36.** (b)	**37.** (a)	**38.** (c)	**39.** (b)
40. (b)	**41.** (d)	**42.** (b)	**43.** (e)	**44.** (e)	**45.** (b)	**46.** (e)	**47.** (c)	**48.** (c)	**49.** (c)	**50.** (d)	**51.** (a)	**52.** (a)
53. (d)	**54.** (a)	**55.** (b)	**56.** (a)	**57.** (d)	**58.** (c)	**59.** (b)	**60.** (a)	**61.** (c)	**62.** (c)	**63.** (d)	**64.** (a)	**65.** (c)
66. (d)	**67.** (a)	**68.** (a)	**69.** (a)	**70.** (c)	**71.** (d)	**72.** (b)	**73.** (d)	**74.** (d)	**75.** (c)	**76.** (d)	**77.** (b)	**78.** (a)
79. (d)	**80.** (b)	**81.** (b)	**82.** (a)	**83.** (b)	**84.** (d)	**85.** (a)	**86.** (d)	**87.** (a)	**88.** (c)	**89.** (c)	**90.** (a)	**91.** (b)
92. (b)	**93.** (a)	**94.** (b)	**95.** (c)	**96.** (c)	**97.** (b)	**98.** (a)	**99.** (a)	**100.** (b)	**101.** (d)	**102.** (e)	**103.** (d)	**104.** (c)
105. (c)	**106.** (c)	**107.** (c)	**108.** (c)	**109.** (d)	**110.** (e)	**111.** (b)	**112.** (e)	**113.** (a)	**114.** (c)	**115.** (c)	**116.** (b)	**117.** (a)
118. (d)												

EXPLANATORY ANSWERS

Exercise-1

1. **(c)** Let, $a = 15$ m, $b = 16$ m, $c = 17$ m.

Then, $s = \dfrac{a+b+c}{2} = \dfrac{15+16+17}{2} = 24$ m.

$\therefore$ Area $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{24(24-15)(24-16)(24-17)}$

$= \sqrt{24 \times 9 \times 8 \times 7}$

$= \sqrt{12096} = 24\sqrt{21}$ m^2.

2. **(a)** Height of the triangle $= \sqrt{(6.5)^2 - 6^2}$

$= \sqrt{42.25 - 36}$

$= \sqrt{6.25} = 2.5$ m

$\therefore$ Area $= \dfrac{1}{2}$(base $\times$ height)

$= \dfrac{1}{2} \times 6 \times 2.5 = 7.5$ m^2.

3. **(b)** Each side = 12 cm

Then, $s = \dfrac{12+12+12}{2} = 18$.

Area $= \sqrt{18(18-12)(18-12)(18-12)}$

$= \sqrt{18 \times 6 \times 6 \times 6} = \dfrac{1}{2} \times 12 \times$ height

or, height $= \dfrac{36\sqrt{3}}{6} = 6\sqrt{3}$ cm.

4. **(b)** Let, the length of equal sides be x.

Then, $s = \frac{x + x + 64}{2} = x + 32.$

Area = 1600 m^2.

$= \sqrt{(x+32)(x+32-x)(x+32-x)(x+32-64)}$

$= \sqrt{(x+32) \times 32 \times 32 \times (x-32)}$

or, $1600 = 32\sqrt{x^2 - 32^2}$

$\Rightarrow \sqrt{x^2 - 32^2} = 50$

or, $x^2 = 32^2 + 50^2 = 1024 + 2500 = 3524.$

$\therefore$ $x = 59.36$ m.

5. **(c)** Here, $s = \frac{20 + 21 + 29}{2} = \frac{70}{2} = 35$ m.

$\therefore$ Area $= \sqrt{35(35-20)(25-21)(35-29)}$

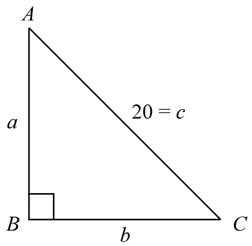
$= \sqrt{35 \times 15 \times 14 \times 6}$

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

$= 5 \times 7 \times 3 \times 2 = 210$ m^2.

6. **(a)** We have, $a + b + 20 = 2 \times 24$

$\therefore$ $a + b = 28$ …(1)



By Pythagores Theorem, $a^2 + b^2 = 400$

$\because$ $(a + b)^2 = 28^2$

$\Rightarrow$ $ab = \frac{28^2 - (a^2 + b^2)}{2} = \frac{28^2 - 400}{2} = 192$

$\therefore$ $a - b = \sqrt{(a+b)^2 - 4ab}$

$= \sqrt{784 - 4 \times 192} = 4$ …(2)

Solving (1) and (2), we get

$a = 16$ cm and $b = 12$ cm.

7. **(b)** The sides of the triangle are

$a = \frac{3}{12} \times 36 = 9$ cm, $b = \frac{4}{12} \times 36 = 12$ cm

$c = \frac{5}{12} \times 36 = 15$ cm

$s = \frac{a+b+c}{2} = \frac{36}{2} = 18$ cm

$\therefore$ Area $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{18(18-9)(18-12)(18-15)}$

$= \sqrt{18 \times 9 \times 6 \times 3}$

$= \sqrt{9^2 \times 2^2 \times 3^2} = 9 \times 2 \times 3 = 54$ cm^2.

8. **(c)** We have, $2s = 50 + 78 + 112 = 240$

$\therefore$ $s = 120.$

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

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

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

$= 2^4 \times 5 \times 3 \times 7 = 1680$ m^2

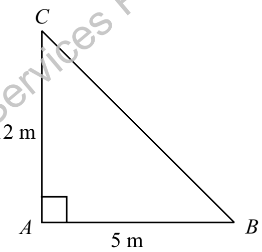
$\therefore$ $\frac{1}{2} \times 112 \times h = 1680,$

where h is the length of perpendicular

$\therefore$ $h = \frac{1680 \times 2}{112} = 30$ m.

9. **(a)** Let, BC be the ladder.

Then, $BC = \sqrt{12^2 + 5^2} = 13$ m.

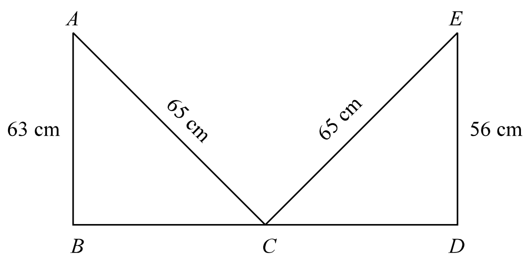


10. **(c)** $BC = \sqrt{(65)^2 - (63)^2} = 16$

$CD = \sqrt{(65)^2 - (56)^2} = 33.$

$\therefore$ Width of the street

$= 16 + 33 = 49$ cm.



11. **(c)** Given: $\frac{1}{2} \times x \times h = x^2$

$\therefore$ $h = 2x.$

12. **(c)** Let, the base be $3x$.

Then, the height is $4x$.

Given: $\frac{1}{2} \times 3x \times 4x = 150 \Rightarrow x = 5.$

$\therefore$ Base $= 3 \times 5 = 15$ m and height $= 4 \times 5 = 20$ m.

13. **(c)** Area of field $= \frac{495.72}{36.72} \times 10000$

$= 135000$ m^2

Let, the height be x.

Then, base = $3x$.

We have, $\frac{1}{2} \times x \times 3x = 135000$

$\Rightarrow$ $x^2 = 90000$ or $x = 300$.

$\therefore$ Height = 300 m and base = $3 \times 300 = 900$ m.

14. (c) Let, the original sides be a, b, c, then

$s = \frac{1}{2}(a + b + c)$

and area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

For the new triangle, the sides are $2a$, $2b$, $2c$.

Then, $S = \frac{1}{2}(2a + 2b + 2c) = a + b + c = 2s$.

$\therefore$ Area of new triangle

$$= \sqrt{S(S-2a)(S-2b)(S-2c)}$$
$$= \sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$$
$$= \sqrt{16s(s-a)(s-b)(s-c)}$$
$$= 4\sqrt{s(s-a)(s-b)(s-c)}$$

= 4 × (area of original triangle).

15. (a) The third side of the triangle

= 324 − (85 + 154) = 85 m.

Also, $s = \frac{a+b+c}{2} = \frac{324}{2} = 162$.

$\therefore$ Area of the triangle

$$= \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{162(162-85)(162-85)(162-154)}$$
$$= \sqrt{162 \times 77 \times 77 \times 8} = 2772 \text{ m}^2.$$

$\therefore$ The cost of ploughing the field

= 2772 × 10 = ₹27720.

16. (c) The area of the equilateral triangle

$$= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4} \times (2\sqrt{3})^2$$

$= 3\sqrt{3}$ cm^2.

17. (a) Height of the equilateral triangle = $\frac{\sqrt{3}}{2} \times$ (side)

$\Rightarrow$ $2\sqrt{3} = \frac{\sqrt{3}}{2} \times$ (side)

$\therefore$ Side of the equilateral triangle = 4 cm.

18. (b) 3 × (side) = 12 $\Rightarrow$ side = 4 m.

$\therefore$ Area of equilateral triangle = $\frac{\sqrt{3}}{4}$ (side)^2

$$= \frac{\sqrt{3}}{4} \times 16 = 4\sqrt{3} \text{ m}.$$

19. (a) 3 × (side) = 24 $\Rightarrow$ side = 8 cm.

$\therefore$ Height of the equilateral triangle

$$= \frac{\sqrt{3}}{2} \times (\text{side}) = \frac{\sqrt{3}}{2} \times 8 = 4\sqrt{3} \text{ cm}.$$

20. (b) Let, x and $(51 - x)$ be the other two sides of the triangle

Then, $x^2 + (51 - x)^2 = 39^2$

$\Rightarrow$ $x^2 + 2601 - 102x + x^2 = 1521$

$\Rightarrow$ $x = \frac{51 \pm \sqrt{441}}{2} = \frac{51 \pm 21}{2} = 36, 15$.

$\therefore$ The other two sides are 36 cm and 15 cm.

21. (b) Given: $a = \frac{5}{8}b$.

Now, perimeter of isosceles triangle = $2a + b$

$\Rightarrow$ $306 = 2 \times \frac{5}{8}b + b$ or, $b = 136$.

$\therefore$ $a = \frac{5}{8}b = \frac{5}{8} \times 136 = 85$.

$\therefore$ Area of isosceles triangle = $\frac{b}{4}\sqrt{4a^2 - b^2}$

$$= \frac{136}{4}\sqrt{4 \times (85)^2 - (136)^2}$$
$$= 34 \times 102 = 3468 \text{ m}^2.$$

22. (c) We have, hypotenuse = $\sqrt{2}\,a = 8 \Rightarrow a = 8/\sqrt{2}$.

$\therefore$ Area of isosceles triangle = $\frac{1}{2}a^2$

$$= \frac{1}{2} \times \frac{64}{2} = 16 \text{ cm}^2.$$

23. (b) Let, the lateral side = $5x$ and the base = $4x$.

Then, $5x + 5x + 4x = 14 \Rightarrow x = 1$.

$\therefore$ The sides of the triangle are 5 cm, 5 cm and 4 cm.

$\therefore$ Area of the isosceles triangle

$$= \frac{b}{4}\sqrt{4a^2 - b^2}$$
$$= \frac{4}{4}\sqrt{4(5)^2 - (4)^2} = \sqrt{84} = 2\sqrt{21} \text{ cm}^2.$$

24. (c) Area = $\sqrt{s(s-a)(s-b)(s-c)} = A$

where $s = \frac{a+b+c}{2}$ and a, b, c are sides of the triangle.

When the sides are increased by 200%, the sides become $3a$, $3b$ and $3c$.

$$s_1 = \frac{3a+3b+3c}{2} = 3\frac{(a+b+c)}{2} = 3s.$$

$A_1 = \sqrt{s_1(s_1-3a)(s_1-3b)(s_1-3c)}$

$= \sqrt{3s.3(s-a).3(s-b).3(s-c)}$

$= 9\sqrt{s(s-a)(s-b)(s-c)} = 9A.$

$\therefore$ Increase in area = $9A - A = 8A$ or, 800%

25. (c) Let, the length of each of equal sides of the triangle be x m.

Then, $x^2 + x^2 = (50\sqrt{2})^2 = 5000.$

$\Rightarrow$ $2x^2 = 5000 \Rightarrow x = 50.$

$\therefore$ Perimeter of the triangle = $50 + 50 + 50\sqrt{2}$

$= 100 + 50 \times 1.4146 = 170.73$ m.

$\therefore$ Cost of fencing = ₹(170.73 × 3) = ₹512.19.

26. (a) Area of isosceles triangle = $\frac{b}{4}\sqrt{4a^2-b^2}$

$= \frac{16}{4}\sqrt{4\times(10)^2-(16)^2} = 4 \times 12 = 48$ cm^2

Given: Area of equilateral triangle = 48.

$\Rightarrow$ $\frac{\sqrt{3}}{4}(\text{side})^2 = 48$

$\Rightarrow$ Side of equilateral triangle = 10.5 cm.

27. (c) Perimeter of a right-angled isosceles triangle

$= (\sqrt{2}+1) \times$ hypotenuse

$\Rightarrow$ $4\sqrt{2} + 4 = (\sqrt{2} + 1) \times$ hypotenuse

$\Rightarrow$ hypotenuse = 4 m.

28. (a) Here, $a = 60$, $b = 40$ and $d = 80$

$\therefore$ $s = \frac{a+b+d}{2} = \frac{60+40+80}{2} = 90.$

$\therefore$ Area of the parallelogram

$= 2\sqrt{s(s-a)(s-b)(s-d)}$

$= 2\sqrt{90(90-60)(90-40)(90-80)}$

$= 2\sqrt{90\times30\times50\times10}$

$= 600\sqrt{15}$ m^2.

29. (c) Area of the parallelogram
$= 16 \times 14 = 224$ cm^2.

30. (b) We have, $s = \frac{a+b+d}{2}$

$= \frac{65+119+156}{2} = 170.$

$\therefore$ Area of parallelogram

$= 2\sqrt{s(s-a)(s-b)(s-d)}$

$= 2\sqrt{170(170-65)(170-119)(170-156)}$

$= 2\sqrt{170\times51\times105\times14}$

$= 2 \times 3570 = 7140$ m^2.

$\therefore$ Cost of gravelling = 7140×10 = ₹71400.

31. (a) The area of the parallelogram

$= 10 \times 7 = 70$ m^2.

32. (b) Area of the parallelogram = $8 \times 4 = 32$ m^2.

Distance between the shorter sides = $\frac{32}{5} = 6.4$ m.

33. (c) Area of quadrilateral = $\frac{1}{2}d(p_1 + p_2)$

$\Rightarrow$ $420 = \frac{1}{2}\times d\times(18+12)$

$\Rightarrow$ $d = \frac{420\times2}{30} = 28$ m.

34. (a) Let, the base be x and altitude be $2x$.

Then, $x \times 2x = 72 \Rightarrow x^2 = 36 \Rightarrow x = 6.$

35. (b) Let, the base be x.

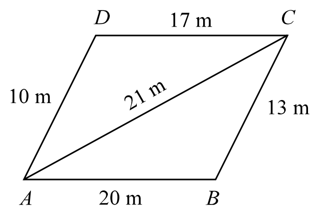
Area of the parallelogram = base × altitude

$\Rightarrow$ $240 = x \times 12$

$\therefore$ $x = \frac{240}{12} = 20$ cm.

36. (a) Area of quadrilateral $ABCD$

= Area of ΔADC + Area of ΔABC, where,



Area of ΔABC

$= \sqrt{s(s-AB)(s-BC)(s-d)}$

$\left(s = \frac{AB+BC+d}{2} = \frac{20+13+21}{2} = 27\right)$

$= \sqrt{27(27-20)(27-13)(27-21)}$

$= \sqrt{27\times7\times14\times6} = 126$ m^2.

Area of ΔADC

$= \sqrt{s(s-AD)(s-DC)(s-d)}$

$\left(s = \frac{AD+DC+d}{2} = \frac{10+17+21}{2} = 24\right)$

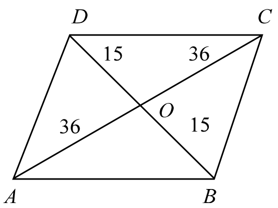
$= \sqrt{24(24-10)(24-17)(24-21)}$

$= \sqrt{24\times14\times7\times3} = 84$ m^2.

Here, the area of quadrilateral $ABCD$

$= 126 + 84 = 210$ m^2.

37. **(a)** Since $AC = 72$ and $BD = 30$



$\therefore \quad OB = OD = \dfrac{BD}{2} = \dfrac{30}{2} = 15$

and, $OA = OC = \dfrac{AC}{2} = \dfrac{72}{2} = 36$

$\therefore \quad AB = BC = CD = DA = \sqrt{36^2 + 15^2}$

$= \sqrt{1296 + 225}$

$= \sqrt{1521} = 39.$

$\therefore$ Perimeter of the parallelogram $= 4 \times 39$

$= 156$ cm.

38. **(c)** Area of the parallelogram

$=$ base $\times$ altitude

$\Rightarrow \quad (x^2 - 4) = (x + 4) \times (x - 3)$

$\Rightarrow \quad x^2 - 4 = x^2 + 4x - 3x - 12$

$\Rightarrow \quad x = 8.$

$\therefore$ Area of the parallelogram

$= x^2 - 4 = (8)^2 - 4 = 60$ sq units.

39. **(b)** We have,

$d_1^{\,2} + d_2^{\,2} = 2(a^2 + b^2)$

$\Rightarrow \quad (16)^2 + d_2^{\,2} = 2(12^2 + 14^2)$

$\Rightarrow \quad d_2^{\,2} = 2(144 + 196) - 256 = 424.$

$\therefore \quad d^2_{\,2} = \sqrt{424} = 20.6$ cm.

40. **(b)** $\pi r^2 = 154$ m^2

$\Rightarrow r^2 = \dfrac{7}{22} \times 154$ m$^2 = 49$ m^2

$\therefore \quad r = 7$ m

Perimeter $= 2 \times \dfrac{22}{7} \times 7$ m $= 44$ m.

41. **(a)** If x be the side of the square and r be the radius of the circle, then,

$4x = 2\pi r$

or, $\quad x = \dfrac{\pi r}{2}$

Now, $\pi r^2 :: x^2 = \pi r^2 : : \dfrac{\pi^2 r^2}{4}$ or, $4 : \pi$

$= 4 : : \dfrac{22}{7}$ or, 14:11.

42. **(d)** Let, the width of the rectangle be x m

Then length $= 3x$ m

Perimeter $= 2(x + 3x) = 96$

$\Rightarrow \quad 8x = 96$ or, $x = 12$

Area $= 12 \times 36 = 432$ m^2.

43. **(d)** As the cow is tied at the corner of a rectangular field, it will graze the area of the field enclosed between the two sides of the rectangle.

$= \dfrac{1}{4}(\pi \times 14 \times 14)$

$= \dfrac{1}{4} \times \dfrac{22}{7} \times 14 \times 14$

$= 154$ m^2.

44. **(c)** The distance covered by the wheel in one minute

$= \dfrac{66 \times 1000 \times 100}{60} = 110000$ cm

The distance covered by the wheel in one revolution

$=$ The circumference of the wheel

$= 2\pi r = 2 \times \dfrac{22}{7} \times \dfrac{70}{2} = 220$ cm

$\therefore$ Number of revolutions of the wheel

$= \dfrac{110000}{220} = 500.$

45. **(a)** $\pi(8)^2 + \pi(6)^2 = \pi r^2$

$\therefore \quad r^2 = 64 + 36$

$r = 10$

46. **(c)** Area of two paths $= 2 \times (65 + 50 - 2) = 226$ m^2

Cost of construction $= 226 \times 17.25$

$=$ ₹3898.50.

47. **(d)** $\dfrac{1}{2}(75 + x) \times 40 = 2500$

$\Rightarrow \quad 75 + x = 125$

$\Rightarrow \quad x = 50$

$\therefore$ The other parallel side $= 50$ m.

48. **(c)** Let, the breadth be x, then length $= x + 3$

Given: $2(x + x + 3) = x(x + 3)$

$\Rightarrow \quad 4x + 6 = x^2 + 3x$

$\Rightarrow \quad 4x + 6 = x^2 + 3x$

$\Rightarrow \quad x^2 - x - 6 = 0$

$\therefore \quad x = \dfrac{1 \pm \sqrt{1 + 24}}{2} = \dfrac{1 \pm 5}{2}$

$\therefore \quad x = 3, -2$

$\therefore$ Breadth $= 3$ cm.

49. **(c)** Let, x, y be the sides of squares

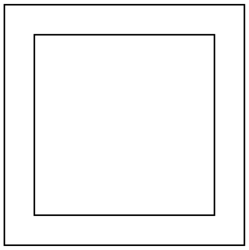
$\dfrac{x^2}{y^2} = \dfrac{9}{1} \Rightarrow \dfrac{x}{y} = \dfrac{3}{1}$

$\therefore$ The ratio of perimeters is $4x{:}4y$

i.e., $x{:}y = 3{:}1$.

50. **(d)** Let, x (in metres) be the width of the path

Side of outer square = $30 + 2x$



$\therefore$ Area of path = $(30 + 2x)^2 - 30^2$

$\therefore$ $(30 + 2x)^2 - 30^2 = 256$

$\Rightarrow$ $4x^2 + 12x - 256 = 0$

$\Rightarrow$ $x^2 + 30x - 64 = 0$

$\Rightarrow$ $(x - 2)(x + 32) = 0$

$\therefore$ $x = 2$ $\quad (\because x < 0)$

51. **(c)** Additional grassy ground grazed

$= \pi(23^2 - 12^2)$ m^2

$= \frac{22}{7} \times 35 \times 11$

$= 1210$ m^2.

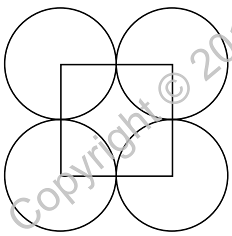
52. **(b)** Required area enclosed

$= 14 \times 14 - 4 \times$ (area of a quadrant)

$= \left[196 - 4 \times \frac{22}{7} \times 7 \times 7 \times \frac{90}{360}\right]$ cm^2

$= (196 - 154)$ cm^2

$= 42$ cm^2.



53. **(c)** Area = $\frac{6000 \times 100}{25} = 24000$ m^2

Let, the length be $5x$ and breadth be $3x$

$\therefore$ $5x \times 3x = 24000$

$\therefore$ $x = \sqrt{1600} = 40$

$\therefore$ Length $= 5 \times 40 = 200$ m, breadth $= 3 \times 40$ $= 120$ m.

54. **(c)** Area of the carpet = $\frac{105}{3.50} = 30$ m^2

Area of the room = 30 m^2

Width = 5 m

$\therefore$ Length = $\frac{30}{5} = 6$ m.

55. **(a)** Area of the rectangular field

$= \frac{28000}{3500} = 8$ hectares

$2x \times x = 80000$

$\therefore$ $x = \sqrt{40000} = 200$

$\therefore$ Breadth = 200 m

Length = 400 m

Perimeter = 2(400 + 200) = 1200 m

$\therefore$ Cost of fencing = 1200×5 = ₹6000.

56. **(a)** Let, the length and breadth be $6x$ and $5x$ m respectively. Then

$6x \times 5x = 27000$ or $30x^2 = 27000$

$\Rightarrow$ $x^2 = 900$ or $x = 30$

Hence, length of the field = 180 m and width = 150 m.

57. **(c)** Area of sector = $\left(\frac{1}{2} \times \text{arc length} \times \text{radius}\right)$ cm^2

$= \left(\frac{1}{2} \times 3.5 \times 5\right)$ cm^2

$= 8.75$ cm^2.

58. **(c)** Area of the plot = $150 \times 3 = 450$ m^2

If the length of the plot be x m then breadth

$= \frac{x}{2}$ m

$\therefore$ $x \times \frac{x}{2} = 450$

or, $x^2 = 900$

or, $x = 30$ m.

59. **(b)** Perimeter of circle = $2 \times \frac{22}{7} \times 7$

= 44 cm

Perimeter of half circle = 22 cm

The length of the wire = 22 + 14 = 36 cm.

60. **(b)** $2\pi R - 2\pi r = 66$

$2\pi(R - r) = 66$

$2 \times \frac{22}{7} \times (R - r) = 66$

or, $R - r = 66 \times \frac{7}{22} \times \frac{1}{2} = \frac{21}{2} = 10.5$ m.

61. **(a)** One side of the square = $\sqrt{50} = 5\sqrt{2}$

Length of diagonal = $5\sqrt{2} \times \sqrt{2} = 10$

Radius of circle = 5

$\therefore$ Area of the circle = 25π units.

62. **(c)** Area of remaining portion

= Area of rectangle − Area of circle

$= 4 \times 2 - \pi \times (1)^2 = (8 - \pi)$ cm^2.

63. **(b)** $r = \sqrt{22^2 + 19^2 + 8^2}$ cm

$= \sqrt{484 + 361 + 64}$ cm

$= \sqrt{909}$ cm = 30 cm

64. **(a)** Area of rectangle = $l \times b$

Let, the new width be b_1

Then, $l \times b = \frac{4}{3} l \times b_1$

$\therefore \quad b_1 = \frac{3}{4} b = 0.75b$

Thus, there should be a reduction of 25% in the width.

65. **(d)** Area of rectangle = 6.4 × 2.5 = 16 m^2

According to question:

Area of square = Area of the rectangle

$\therefore$ Area of square = 16 m^2

$\therefore$ Side of the square = 4 m.

66. **(d)** $\pi \times 5 \times 5 - \pi \times 4 \times 4$

$= 25\pi - 16\pi = 9\pi$ cm^2.

67. **(b)** The length of the room = 4 m

Since it can be partitioned into two equal square rooms, the two equal parts can only be of 2 m each.

68. **(c)** Let length = a m and breadth = b m

Then, $2(a + b) = 46$

or, $a + b = 23$ and $ab = 120$

$\therefore$ Diagonal $= \sqrt{a^2 + b^2} = \sqrt{(a+b)^2 - 2ab}$

$= \sqrt{(23)^2 - 2\times 120} = \sqrt{289} = 17$ m.

69. **(c)** Perimeter of the square = 4 × 22 m = 88 m

$2\pi r = 88$ m

$\Rightarrow \quad r = 88 \times \frac{7}{22\times 2}$ m = 14 m.

70. **(c)** Area of an equilateral $\Delta = \frac{\sqrt{3}}{4} a^2$

[$3a = 132 \therefore a = 44$]

$= \frac{\sqrt{3}}{4} \times 44 \times 44$

= 838.312 m^2.

Area of square = $a^2 = 33 \times 33$

$= 1089 \text{ m}^2 \left[a = \frac{132}{4} = 33\right]$

Area of regular hexagon

$= \frac{3\sqrt{3}a^2}{2} = \frac{3\sqrt{3}\times 22\times 22}{2} . \left[a = \frac{132}{6} = 22\right]$

Area of circle = πr^2

$= \frac{22}{7}\times 21\times 21 \quad \left[r = \frac{132}{2\pi} = 21\right]$

$\therefore$ Circle has largest surface area.

71. **(c)** Let, r be the radius of smaller circle

Radius of larger circle = $12r$

$\frac{\text{Area of larger circle}}{\text{Area of smaller circle}} = \frac{\pi(12r)^2}{\pi r^2} = \frac{144}{1}$

$\therefore$ Area of large circle contains the area of smaller circle 144 times.

72. **(b)** If a be the side of the square and r be the radius of the circle, then,

$2\pi r = 4a$

or, $r = \frac{4a}{2\pi} = \frac{2a}{\pi}$

$\therefore$ Area of the circle = πr^2 and,

area of the square = a^2

$\therefore$ Area of the circle:Area of the square

$= \pi r^2 : a^2$

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

$= \frac{4}{\pi} = \frac{4\times 7}{22} = 14:11.$

73. **(c)** Let, the length and breadth of the plot be $3x$ and x feet, respectively.

Total area of the plot = 4 × 1200 = 4800 ft^2.

$\therefore \quad x \times 3x = 4800 \Rightarrow x = 40$ ft

$\therefore$ Length = 3 × 40 = 120 ft.

74. **(b)** Ratio of the areas = 4:25

Ratio of the sides = 2:5

If the side of s_1 is 2 cm, then side of s_2 is 5 cm.

If the side of s_1 is 6 cm, the side of s_2 is $\frac{5}{2} \times 6 = 15$ cm.

75. **(b)** Circumference $= \left(2\times\frac{22}{7}\times 70\right)$ cm = 440 cm

Distance travelled in 10 revolutions

= 4400 cm = 44 m

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}} = \left(\frac{44}{5}\right)$ m/s

$= \left(\frac{44}{5}\times\frac{18}{5}\right)$ Km/h = 31.68 Km/h.

76. **(d)** $lb = 60$ m^2

$d^2 = l^2 + b^2$

$d + l = 5b \Rightarrow d = 5b - l$

$\therefore \quad d^2 = 25b^2 + l^2 - 10bl$

$\Rightarrow \quad l^2 + b^2 = 25b^2 + l^2 - 10bl$

$\Rightarrow \quad l^2 + b^2 = 25b^2 + l^2 - 10 \times 60$

$\Rightarrow \quad 24b^2 = 600 \quad$ or, $\quad b = 5$

$\therefore \quad l = 60 \div 5 = 12$ m.

77. (b)

78. (c) Distance = 2 × 3.14 × 50 × 10

= 3140 m

12 Km/h = $\frac{10}{3}$ m/s

Time = $\frac{3140}{10/3}$ = 942 second

= $\frac{942}{60}$ minutes

= 15.7 minutes.

79. (d) Length of the area to be carpeted = 8 − 0.2

= 7.8 m

Width = 5 − 0.2 = 4.8 m

∴ Area to be carpeted = 7.8 × 4.8 m^2

Total cost = 18 × 7.8 × 4.8 = ₹673.92.

80. (a) Let, the length of the big rectangle be x m

∴ Area of the big rectangle = $x \times 2 = 2x$ m^2

∴ Area of the small rectangle = $\frac{1}{6} \times 2x = \frac{x}{3}$ m^2

∴ Breadth of the small rectangle = $\frac{x}{3} \div x = \frac{1}{3}$ m.

81. (b) Let, original radius = r

Reduced radius = $r - 0.4r = 0.6r$

∴ Percentage reduction in circumference

= $\frac{2\pi r - 2\pi(0.6)r}{2\pi r} \times 100 = 40\%$

82. (d) Required area = (Area of a square of side a)

+ 4 $\left(\text{Area of semi-circle of radius } \frac{a}{2}\right)$

$= a^2 + 4 \times \frac{1}{2}\pi \times \left(\frac{1}{2}a\right)^2$

$= a^2 + \frac{\pi a^2}{2}$.

83. (a) $(\text{Diagonal})^2 = 2 \times 6050\ m^2 = 12100\ m^2$

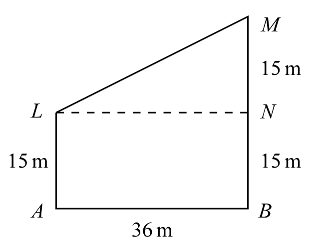
Diagonal = 110 m

Time taken = $\frac{110}{10} \times \frac{1}{2}$ minutes = $5\frac{1}{2}$ minutes.

84. (b) Length of each side of hexagon = r

∴ Its perimeter = $6r$.

85. (b) Let, AL, BM be poles with tops at L and M, respectively.



LA = 15 m, MB = 30 m

AB = 36 m.

Let, LN be parallel to the ground

$LN = AB$ = 36 m

and, MN = 30 − 15 = 15 m

∴ $LM = \sqrt{36^2 + 15^2} = \sqrt{1296 + 225}$ = 39 m.

86. (d) Let, the breadth be x m

∴ Length = $\frac{4x}{3}$ m

∴ $\frac{4x}{3} \times x = 300$

or, $x^2 = 300 \times \frac{3}{4} = 225$

$x = \sqrt{225} = 15$ m

and, length = $\frac{4}{3} \times 15 = 20$ m

length − breadth = 20 − 15 m = 5 m.

87. (a) Let, the original length of each side = a

Then, area = $\frac{\sqrt{3}}{4}a^2 = A$

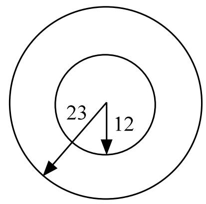
New area = $\frac{\sqrt{3}}{4}\left[\left(\frac{101.5}{100}a^2\right)\right]$

$= \frac{\sqrt{3}}{4}\left(\frac{20.3}{20}\right)a^2 = \frac{20.3}{20}A$

Increase in area = $\left(\frac{0.3}{20}A \times \frac{1}{A} \times 100\right)\%$

= 1.5%

88. (c) Shaded area of the two (in between) concentric circle of radius R and r is $\pi(R + r)(R - r)$



∴ Additional grassy area

= $\frac{22}{7} \times (23 + 12)(23 - 12)$ m^2

= $\frac{22}{7} \times 35 \times 11$ m^2

= 1210 m^2.

89. (a) Let, originally, diagonal = x

∴ Original area = $\frac{1}{2}x^2$

After increase, diagonal = $2x$

New area = $\frac{1}{2}(2x)^2$

$\therefore \frac{\text{Original area}}{\text{New area}} = \frac{1}{4}$

$\therefore$ New area = 4 (original area).

90. **(c)** If the length of the rectangle is L and its width is B, then its perimeter = $2(L + B)$

Increased length = $1.2L$,

Increased width = $1.2B$

Increase perimeter = $2(1.2L + 1.2B)$

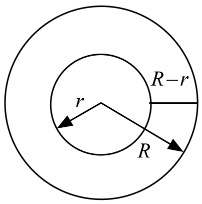
$= 2 \times 1.2(L + B)$

$= 2.4(L + B)$

Increase in perimeter = $0.4(L + B)$

Percentage increase = $\frac{0.4(L+B)}{2(L+B)} \times 100 = 20\%$

91. **(b)** $2\pi r - 2\pi r = 44$ m



$\therefore\ 2\pi(r - r) = 44$ m

or, $r - r = 44 \div 2\pi$

$= 44 \div \left(2 \times \frac{22}{7}\right) = 7$ m.

92. **(a)** Area of the square-shaped pond = 8×8

$= 64\ \text{m}^2$

$\therefore$ Area of the field = $8 \times 64 = 512\ \text{m}^2$

If the length of the field be x m.

Then, the breadth of the field = $\frac{x}{2}$ m

$\therefore\ x \times \frac{x}{2} = 512$

or, $x^2 = 2 \times 512$.

or, $x^2 = 1024$

or, $x = \sqrt{1024} = 32$ m.

93. **(b)** $\pi r^2 = 0.49\pi \Rightarrow r = 0.7$ m

Number of revolutions = $\frac{1.76 \times 1000}{2 \times \frac{22}{7} \times 0.7} = 400$.

94. **(c)** Radius of the circle = 6 cm

Area of the circle = 36 cm^2.

According to question:

Area of the triangle of base 6 cm

= Area of the circle of radius 6 cm

$\therefore\ \frac{1}{2} \times \text{base} \times \text{height} = 36$

$\Rightarrow \frac{1}{2} \times 6 \times \text{height} = 36$

$\Rightarrow$ Height of the triangle = $\frac{36 \times 2}{6} = 12$ cm.

95. **(b)** Let, the height of the wall be h metre when the ladder is placed at distance 10 m away from the wall on a stool of 2 m height, it will form a right triangle with sides 10 m, $(h - 2)$ m and taper side of length h m.

Hence, we have $h^2 = 10 + (h - 2)^2$

or, $h^2 - (h - 2)^2 = 100$

$\Rightarrow (h + h - 2) \times (h - h + 2) = 100$

or, $(2h - 2) \times 2 = 100$ or, $4h - 4 = 100$

$\Rightarrow 4h - 4 = 100$

$\Rightarrow 4h = 104$ or, $h = 26$ m

96. **(a)** Let, the side of the square = x cm

Diagonal of the square = $\sqrt{2}\,x$ cm

Area of the square = x^2 cm, i.e., $\frac{(\text{Diagonal})^2}{2}$

According to question:

Diagonal of the new square = $2 \times \sqrt{2}\,x$

$= 2\sqrt{2}\,x$ cm

$\therefore$ Area of the new square

$= \frac{(\text{Diagonal of the new square})^2}{2}$

$= \frac{(2\sqrt{2}x)^2}{2} = 4x^2\ \text{cm}^2$.

97. **(b)** Area of the circle = 154 cm^2

Let, its radius = r, then $154 = \frac{22}{7}r^2$

$\Rightarrow r^2 = \frac{154 \times 7}{22} = 49$ or, r = 7 cm

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

Length of arc = $\frac{44 \times 45}{360} = 5.5$ cm.

98. **(b)** Let, the base be $2x$ m and height $3x$ m.

Then, $\frac{1}{2}(2x \times 3x) = \frac{1}{12} \times 10000$

[$\because$ 1 hectare = 10000 m^2]

or, $x = \sqrt{\frac{10000 \times 2}{6 \times 12}} = \frac{100}{6} = \frac{50}{3}$

$\therefore$ Base = $2 \times \frac{50}{3} = 33\frac{1}{3}$ m

Height = $\frac{3 \times 50}{3} = 50$ m.

99. **(b)** Length of the longer side = $\frac{1200}{30} = 40$ m

and the length of the diagonal = $\sqrt{30^2 + 40^2} = 50$ m

$\therefore$ Length of the fence = 30 + 40 + 50 = 120 m

$\therefore$ The job cost = 120 × 10 = ₹1200.

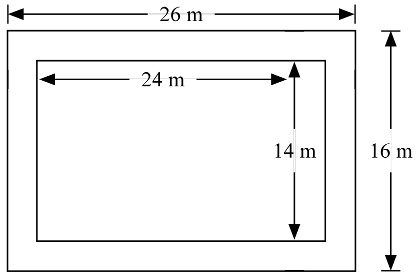
100. **(d)** $\pi d - d = 105 \Rightarrow (\pi - 1)d = 105$

$\Rightarrow \left(\frac{22}{7} - 1\right)d = 105$

$\therefore\ d = 105 \times \frac{7}{15} = 49$ cm.

101. **(c)** Area of garden = 24 × 14 = 336 m^2

Area of the (garden + path) = 26 × 16 = 416 m^2



$\therefore$ Area of the path = 416 − 336 = 80 m^2

Area of 1 tile = 20 × 20 = 400 cm^2 = 0.04 m^2

$\therefore$ Number of tiles required = $\frac{80}{0.04}$ = 2000.

102. **(b)** Let, one diagonal = x cm

Then, another diagonal

$= \left(\frac{80}{100}x\right)$ cm $= \left(\frac{4}{5}x\right)$ cm

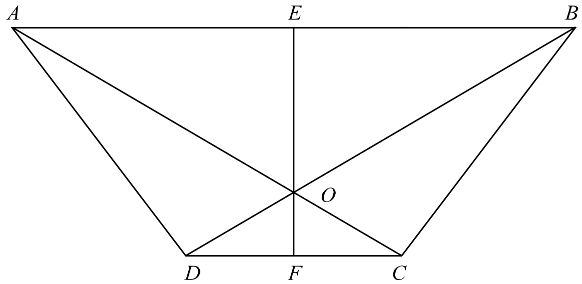
Area of rhombus = $\frac{1}{2}x \times \frac{4}{5}x = \frac{2}{5}x^2$

$= \frac{2}{5}$ × (square of longer diagonal).

103. **(d)** $\Delta OAB = \frac{1}{2} \times AB \times OE$

$= \frac{1}{2} \times 2CD \times OE$

$= CD \times OE$



$\Delta OCD = \frac{1}{2} \times CD \times OF$

$\therefore\ \frac{\Delta AOB}{\Delta COD} = \frac{CD \times OE}{\frac{1}{2} \times CD \times OF} = \frac{CD \times 2 \times OF}{\frac{1}{2} \times CD \times OF} = \frac{4}{1}$

= 4:1.

104. **(c)** Ratio of the areas of similar triangles

= Ratio of the squares of corresponding sides

$= \frac{(3x)^2}{4x^2} = \frac{9x^2}{16x^2} = \frac{9}{16}$ = 9:16.

105. **(c)** $\frac{1}{2} \times 24 \times h = \frac{\sqrt{3}}{4} \times 24 \times 24$

or, $h = 12\sqrt{3}$

$\therefore\ 3r = 12\sqrt{3} \Rightarrow r = 4\sqrt{3}$ cm

Area of the circle = $\pi \times (4\sqrt{3})^2\ cm^2 = 48\pi\ cm^2$.

106. (b) $r = 0.14$

Number of revolutions

$= \left(\frac{0.66 \times 1000}{2} \times \frac{7}{22} \times \frac{1}{0.14}\right) = 750.$

Exercise-2
(Based on Memory)

1. **(e)** Perimeter $= \frac{2(8+5)}{(8-5)} \times 60 = 520$ m

2. **(d)** Let, the length and breadth of the plot be $6x$ m and $5x$ m respectively.

$\therefore\ 6x - 5x = 34$

$\therefore\ x = 34$

Length = $6x$ = 204

Breadth = $5x$ = 170

$\therefore$ Perimeter of the plot

= 2(204 + 170) = 748 m

3. **(e)** $(4x)(3x) = 1728$

$\Rightarrow x^2 = 144 \qquad \therefore\ x = 12$

$\Rightarrow$ Length = 48; Breadth = 36

$\therefore$ Required ratio $= \frac{36}{36 \times 48} = 1:48$

4. **(a)** Area of path $= \pi[(4.5)^2 - 4^2]$

$= 3.14[8.5 \times 0.5] = 13.35\ cm^2$

5. **(c)** Radius $= \dfrac{88}{2\pi} = \dfrac{88 \times 7}{2 \times 22} = 14$ cm

Area $= = \dfrac{22}{7}(14)^2 = 616 \text{ cm}^2$

6. **(c)** $2\pi r = 396$ is $r = \dfrac{396 \times 7}{2 \times 22} = 63$

$\therefore$ Area $= \pi r^2 = \dfrac{22}{7} \times 63 \times 63 = 12474 \text{ m}^2$

8. **(e)** Let, the breadth of the rectangle is x metres. Then we have,

$x \times 3x = 12$

$\therefore$ $x = 2$ m [Breadth]

and, $3x = 6$ m [Length]

Thus the required perimeter

$= 2(6 + 2) = 16$ m

9. **(c)** We have, $\pi r^2 = 7 \times 2\pi r$

$\therefore$ $r = 14$

$\therefore$ Circumference $= 2\pi r = 2 \times \dfrac{22}{7} \times 14 = 88$

10. **(a)** Let, the length of the rectangular filed be x m.

$\therefore$ Width of the rectangular field

$= (x - 48)$ m

$2[x + (x - 48)] = 160$

$\Rightarrow$ $4x - 96 = 160$ $\Rightarrow x = 64$

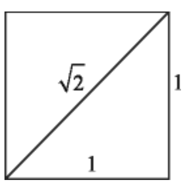
$\therefore$ Area of the rectangular field

$= 64 \times 16 = 1024 \text{ m}^2$

Area of the square field = Area of the rectangular field $= 1024 \text{ m}^2$

$\Rightarrow$ Side of the square field $= \sqrt{1024} = 32$ m

11. **(b)**



Required ratio $= (1)^2 : (\sqrt{2})^2 = 1 : 2$

12. **(a)** Perimeter $= 2(3x + 2x)$

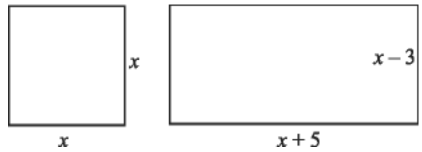
$= 10x = 20$ (Given)

$\Rightarrow$ $x = 2$

$\therefore$ Length = 6, Breadth = 4

$\Rightarrow$ Area of the rectangle = 24 cm^2

13. **(c)**



Given: $(x + 5)(x - 3) = x^2$

$\Rightarrow$ $x^2 + 2x - 15 = x^2 \Rightarrow x = \dfrac{15}{2}$

$\therefore$ Length of the rectangle $= \dfrac{15}{2} + 5 = \dfrac{25}{2}$

Breadth of the rectangle $= \dfrac{15}{2} - 5 = \dfrac{5}{2}$

$\therefore$ Perimeter of the rectangle

$= 2\left(\dfrac{25}{2} + \dfrac{5}{2}\right) = 30$ cm

14. **(c)** Area of the square $= 8 \times 8 = 64 \text{ cm}^2$

$\therefore$ Area of the rectangle = 64 cm^2

$\therefore$ $L \times B = 64 \text{ cm}^2$

$\therefore$ Length of the rectangle may be 16 times or 32 times of the breadth.

15. **(c)** Area of the $\Delta = \dfrac{1}{2} \times AE \times BC$

$= \dfrac{1}{2} \times 2 \times AE \times BE$ (Because BE $= \dfrac{1}{2}$ BC)

= AE × BE

$= (AD + DE) \times \sqrt{BD^2 - DE^2}$

$= (r + DE) \times \sqrt{(r^2 - DE^2)}$

$= (r + DE) \times (r - DE)^{1/2}(r + DE)^{1/2}$

$= (r + DE)^{3/2} \cdot (r - DE)^{1/2}$

16. **(a)** Let, the radius of the circle and the height of the right angled Δ be r and h respectively.

$\therefore$ $r = \dfrac{(100 + 20)}{100} h$

and, area of $\Delta = \dfrac{1}{2} \times h \times 36 = 18h$

$\therefore$ Area of the circle = $18h$

$\because$ $\pi r^2 = 18h$

$\Rightarrow$ $\dfrac{22}{7} r^2 = \dfrac{18 \times 100 \times r}{120}$

$\therefore$ $r = \dfrac{18 \times 100 \times 7}{120 \times 22} = 4.77$

$\therefore$ Area of the circle $= \dfrac{22}{7} r^2 = \dfrac{22}{7} \times 4.77 \times 4.77$

$= 72 \text{ cm}^2$ (App.)

17. (a) Let, the ratio of their bases is $x{:}y$

$\therefore\ \frac{x}{y}\times\frac{3}{4}=\frac{4}{3}$

or $\frac{x}{y}=\frac{4}{3}\times\frac{4}{3}=\frac{16}{9}$

Hence, required ratio = 16:9.

18. (d) One side of the rhombus

$=\sqrt{\left(\frac{24}{2}\right)^2+\left(\frac{10}{2}\right)^2}$ = 13 cm

Hence, perimeter = 13 × 4 = 52 cm.

19. (a) Length of the longest rod

$=\sqrt{10^2+6^2+4^2}=2\sqrt{38}$ m.

20. (b) Length of the wire = 4 × $\sqrt{81}$ = 36 m

Perimeter of semi-circle = 36 m

or, $\pi r + 2r = 36$

or, $r(\pi + 2) = 36$

or, $r=\frac{36}{\pi+2}=\frac{36}{\frac{22}{7}+2}$ = 7 m

Therefore, area of the semi-circle = $\frac{1}{2}\pi r^2$

$=\frac{1}{2}\times\frac{22}{7}$ × 7 × 7 = 77 cm^2.

21. (b) Required perimeter = $\sqrt{\left(\frac{24}{4}\right)^2+\left(\frac{32}{4}\right)^2}\times 4$

= 40.

22. (a) Length of the diagonal = $(\sqrt{12\times5})\times\sqrt{2}$

= $2\sqrt{30}$ m.

23. (b) Required height = $\frac{2\times15\times12}{20}$

= 18 cm.

24. (a) Perimeter of rhombus = 4 × $\sqrt{12^2+16^2}$

= 80 cm.

25. (c) Enclosed area = $\left(\frac{\sqrt{484}\times4}{2\pi}\right)^2\times\pi$

= 616 cm^2.

26. (b) Area of the square = 144 cm^2

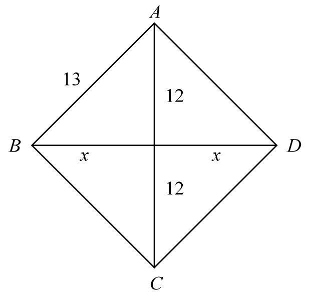
Area of the rectangle = 140 cm^2

Length of the rectangle = 14 cm

⇒ Width of the rectangle = 10 cm

∴ Perimeter of the rectangle = 48 cm.

27. (c) $x=\sqrt{13^2-12^2}$ = 5



∴ The diagonals of the rhombus are 10 and 24.

∴ Area of the rhombus = $\frac{1}{2}$ × 10 × 24

= 120 cm^2.

28. (b) Let, the sides of the rectangle be $6K$ and $5K$, respectively.

∴ $2[6K + 5K] = 2\times\frac{22}{7}\times 21 = 132 \Rightarrow K = 6$

∴ Area of the rectangle = $30K^2$ = 1080 cm^2.

29. (b) Breadth of the rectangle = $\frac{48}{3}$ = 16 m

Perimeter of the rectangle = $2(l + b)$ = 2 × 64 = 128 m

Side of the square = $\frac{48}{3}$ = 32

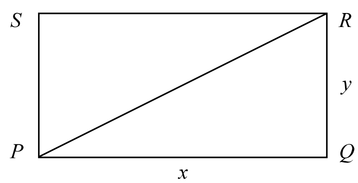
Area of the square = $(32)^2$ = 1024 m^2.

30. (a) Side of the equilateral triangle

$=\sqrt{\frac{4}{\sqrt{3}}\times400\sqrt{3}}=\sqrt{1600}$ = 40 m

Perimeter = 40 × 3 = 120 m.

31. (d) Length of PR = 52 × $\frac{15}{60}$ = 13 m



$PQ + RQ = 68\times\frac{15}{60}$ = 17 m

i.e., $x + y = 17$ and $x^2 + y^2 = 169$

Solving the above two, we get

$x = 12$ and $y = 5$

Area = 12 × 5 = 60 m^2.

32. (b) Circumference of wheel = $2\pi r$

$= 2\times\frac{22}{7}\times\frac{3}{2}=\frac{66}{7}$ m

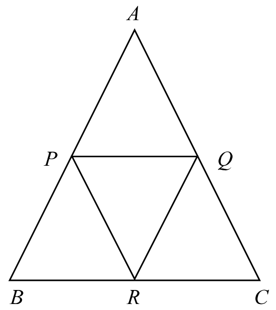
Wheel will take = $\frac{5280\times7}{28\times66}$ = 20 m.

33. **(c)** *ABC* is a triangle. *PQR* is the triangle which is formed with the mid-points of the ΔABC. First of all, find the area of the ΔABC

$$s = \frac{a+b+c}{2} = \frac{3+4+5}{2} = \frac{12}{2} = 6 \text{ cm}$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{6\times3\times2\times1} = 6 \text{ cm}^2$$

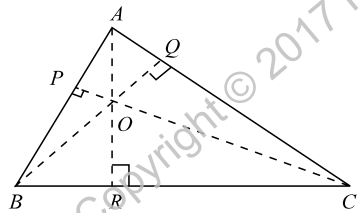


$\therefore$ $(\Delta PQR) = \frac{1}{4}$ of $(\Delta ABC) = \frac{1}{4} \times 6 = \frac{3}{2}$ cm^2.

34. **(c)** In ΔABC, O is the point from where three perpendicualar lines are drawn. And, also $OP = \sqrt{3}$ cm, $OQ = 2\sqrt{3}$ cm and $OR = 5\sqrt{3}$ cm

$$\text{Area of } \Delta AOB = \frac{1}{2} \times OP \times AB$$

$$\text{Area of } \Delta AOC = \frac{1}{2} \times OQ \times AC$$



$$\text{Area of } \Delta OBC = \frac{1}{2} \times OR \times BC$$

$$\frac{1}{2} \times \sqrt{3} \times x + \frac{1}{2} \times 2\sqrt{3} \times x + \frac{1}{2} \times 5\sqrt{3} \times x$$

$$= \frac{\sqrt{3}}{4} x^2$$

[x = Length of the side]

or, $\frac{\sqrt{3}+2\sqrt{3}+5\sqrt{3}}{2} = \frac{\sqrt{3}}{4} x$

or, $\frac{8\sqrt{3}}{2} = \frac{\sqrt{3}x}{4}$

or, $x = 16$ cm

$\therefore$ Perimeter of the triangle $= 3x = 3 \times 16 = 48$ cm.

35. **(b)** We know that 1 decametre = 10 m

$\therefore$ 2 Km + 26 decametre $= 2 \times 1000 + 26 \times 10$

$= 2260$ m

Also, 113 revolutions = 2260 m

$\therefore$ 1 revolution $= \frac{2260}{113} = 20$ m

$\therefore$ diameter of wheel $= \frac{20\times7}{22} = \frac{70}{11} = 6\frac{4}{11}$ m.

36. **(b)** Let, the side of one of the squares be x cm. Then, side of longer square $= (x + 2)$ cm

Now, $(x + 2)^2 - x^2 = 32$

or, $x^2 + 4x + 4 - x^2 = 32$

or, $4x = 28$

or, $x = 7$ cm

Length of the side of the longer square $= 7 + 2 = 9$ cm.

37. **(a)** Side of the two squares are $\frac{40}{4} = 10$ cm and $\frac{32}{4} = 8$ cm

Let, the side of the third square be 'x' cm

Then, $x^2 = 10^2 - 8^2 = 100 - 64 = 36$

or, $x = 6$ cm

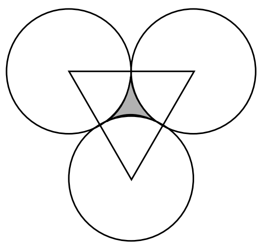
$\therefore$ Perimeter of the third square $= 6 \times 4 = 24$ cm.

38. **(c)** Side of the rhombus $= \frac{40}{4} = 10$ cm

Length of the other diagonal $= 2\sqrt{10^2 - 6^2}$

$= 2\sqrt{100-36} = 2 \times 8 = 16$ cm.

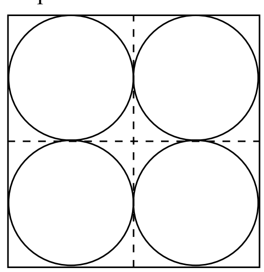
39. **(b)** Required Area $= \frac{1}{2} \times \frac{\sqrt{3}}{2} \times 7 \times 7 - \frac{22}{7} \times 3.5 \times \frac{3.5}{2}$



$= 3.5 \times 3.5\left(\sqrt{3} - \frac{11}{7}\right) = 12.25 \times 0.1605 = 1.967$ cm^2.

40. **(b)** Side of square $= \sqrt{784} = 28$ cm

Radius of each plate = 7 cm



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

41. **(d)** Let, the base and height of the triangle, and length and breadth of the rectangle be L and h and L_1 and b_1, respectively.

Then, $\frac{1}{2} \times L \times h = \frac{2}{3} \times L_1 \times b_1$ …(1)

$L = \frac{4}{5} b_1$ (2) and $L_1 + b_1 = 100$ …(3)

In the above we have three equations and four unknowns. Hence, the value of 'h' cannot be determined.

42. **(b)** Let the length and breadth of the rectangle be l and b, respectively.

Then, $2(4l + b) = 480$

$\therefore$ $4l + b = 240$ …(1)

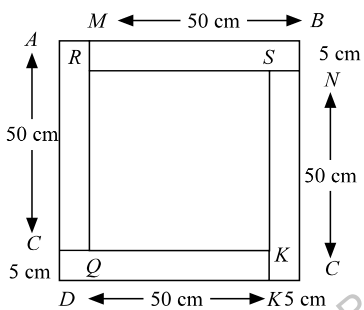
and, $4lb = 12800$

$\therefore$ $lb = 3200$ …(2)

Solving equations (1) and (2), we get

$l = 40$ m or, $l = 80$ m.

43. **(e)** The four sheets are $BMRN$, $AMQL$, $NSKC$ and DLPK.



$\therefore$ Side of the new square sheet $= 50 + 5 = 55$ cm and the side of the inner part of the square $= 55 - 10 = 45$ cm

Hence, area $= (45)^2 = 2025$ cm^2.

44. **(e)** Let, the side of the square be x m

$\therefore$ Perimeter of the square $= 48 \times 5 = 4x$

$\therefore$ $x = 60$ m

$\therefore$ Area $= (60)^2 = 3600$ m^2.

45. **(b)** Area of semi-circle $= \frac{1}{2}\pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77$ m^2.

46. **(e)** Let, the length of the rectangular field be 'x' m. Then, length of the field will be

$x + \frac{x \times 15}{100} = \frac{23x}{20}$

Now, $x \times \frac{23x}{20} = 460$

or, $23x^2 = 460 \times 20$

or, $x^2 = 20 \times 20$ or, $x = 20$ m.

47. **(c)** Let, the length of the rectangular hall be 'x' m, then the breadth of the rectangular hall $= \frac{2x}{3}$ m

Area $= \frac{2x}{3} \times x = \frac{2x^2}{3}$

or, $\frac{2x^2}{3} = 2400$ or, $x = 60$ m.

48. **(c)** Suppose the back wheel has made x revolutions.

$\therefore$ Front wheel has made $(10 + x)$ revolutions.

$\Rightarrow$ $3\pi x = 2\pi(10 + x)$

$\Rightarrow$ $\pi x = 2\pi \times 10 \Rightarrow x = 20$

$\therefore$ The wagon has travelled $3\pi x = 60\pi$.

49. **(c)** $\pi r2 = 9\pi$, where r is the radius of the circle

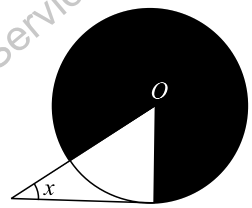
$\Rightarrow r = 3$, $2r$ = diameter $= 6$,

Circumference $= 2\pi r = 6\pi$.

50. **(d)** Area of the circle $= \pi r2 = 16\pi$ ($\because$ $r = 4$)

$\therefore$ 360° covers an area of 16π

1° covers an area of $\frac{16\pi}{360°} = 8$



$\left(\frac{\pi}{2} - x\right)°$ [unshaded region] covers an area of $8\left(\frac{\pi}{2} - x\right)$,

i.e., $4\pi - 8x$.

Area of the shaded region $= 14\pi$

$\therefore$ Area of the unshaded $= 2\pi$

$\therefore$ $4\pi - 8x = 2\pi \Rightarrow 8x = 2\pi \Rightarrow x = \frac{\pi}{4} = 45°$.

51. **(a)** Let, the area of the circle be $A = \pi r^2$, where r is the radius. If r is increased to r + 8% of r,

i.e., $\frac{27r}{25}$, therefore area becomes

$\pi \times \left(\frac{27}{25} r\right)^2 = \pi \times \frac{729}{625} r^2$

$\therefore$ Increase in area $= \frac{104}{625}\pi r^2$

$\Rightarrow$ Per cent increase in area

$= \frac{104}{625} \times 100 = 16.64$.

52. **(a)** Perimeter of square $= 2 \times 2\ (8 + 7) = 60$ cm

$4a = 60$ cm

$\therefore$ $a = 15$ cm

Diameter of circle $= 15$ cm

$\therefore$ Radius $= 7.5$ cm

Circumference of semicircle $= \pi r + 2r = \frac{22}{7} \times 7.5 + 2 \times 7.5$

$= 38.57$ cm

53. **(d)** Area of a square = a^2 = 1024

$\therefore \quad a = \sqrt{1024} = 32$ cm

Breadth of the rectangle = 12 cm less than the side of the square = 32 − 12 = 20 cm

Length of the rectangle = twice the side of the square = 2 × 32 = 64 cm

Ratio of the length and breadth = 64:20 = 16:5

54. **(a)** Rate of the painting = ₹2 per m^2

Area of the rectangular floor

$= \frac{256}{2} = 128$ m^2

Let, the breadth of rectangular floor is x m.

Length = $2x$ m

Area of the rectangular floor = $l \times b$

$128 = 2x \times x$

$128 = 2x^2$

$x^2 = \frac{128}{2} = 64$

$x = 8$ m

So, the length of the floor = $2x = 2 \times 8 = 16$ m

55. **(b)** Suppose the number is x.

$x - \frac{x}{7} = 180$

$\Rightarrow \quad \frac{7x - x}{7} = 180$

$\Rightarrow \quad \frac{6x}{7} = 180$

$\Rightarrow \quad x = \frac{180 \times 7}{6}$

$x = 210$

56. **(a)** Let, the length and breadth of a floor be $32x$ and $21x$, respectively.

Given perimeter of the floor = 212 feet

$2(32x + 21x) = 212$ feet

$\Rightarrow \quad 106x = 212$ feed

$\Rightarrow \quad x = \frac{212}{106} = 2$ feet

$\therefore$ Area of the floor = Length × Breadth

= (32 × 2) × (21 × 2)

= 64 × 42

= 2688 square feet

Hence, cost of laying carpet = 2688 × 2.5 = ₹6720

57. **(d)** $2\pi r = 88$

$\therefore \quad r = \frac{88 \times 7}{44} = 14$ m

$\therefore$ Area = πr^2

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

$2\pi r_1 = 220$

$r_1 = \frac{220 \times 7}{2 \times 22} = 35$ m

$\therefore$ Area = $\pi r_1^2 = \frac{22}{7} \times 35 \times 35 = 3850$ m^2

Difference = 3850 − 616 = 3234 m^2

58. **(c)** Area of the figure = $53 \times 28 + 2 \times \frac{1}{2} \times \frac{22}{7} \times 14 \times 14$

= 2100 cm^2

59. **(b)** $2(l + b) = 668$

$\therefore \quad l + b = 334$

$\therefore \quad l = (334 - b)$

Length of a rectangle = Twice the diameter of a circle

$334 - b = 2 \times d = 2 \times 2r = 4r$

$\therefore \quad r = \frac{334 - b}{4}$

Area of square = Circumference of circle

$(22)^2 = 2\pi r$

$484 = \frac{2 \times 22(334 - b)}{7 \times 4}$

$\therefore \quad 334 - b = \frac{484 \times 7 \times 4}{2 \times 22} = 308$

$\therefore \quad b = 334 - 308 = 26$ cm

60. **(a)** Circumference of circular plot

$= \frac{3300}{15} = 220$ m

$\therefore \quad 2\pi r = 220$

$r = \frac{220}{2\pi} = \frac{220 \times 7}{2 \times 22} = 35$ m

Area of the plot = πr^2

$= \frac{22}{7} \times 35 \times 35$

= 3850 m^2

Cost of flooring of one square metres plot = ₹100

Cost of flooring of 3850 m^2 plot = 3850 × 100

= ₹385000

61. **(c)** Breadth of carpet = 3 m

Length of carpet = 3 × 1.44 = 4.32 m

Original cost of carpet = 3 × 4.32 × 45 = ₹583.20

Cost of carpet after increasing of length and breadth

$= 3 \times \frac{125}{100} \times 4.32 \times \frac{140}{100} \times 45$

= 15 × 1.08 × 7 × 9 = ₹1020.60

$\therefore$ Increase (Difference)

= 1020.60 − 583.20 = ₹437.40

62. **(c)** Area of square $(a)^2 = 196$

$\therefore \quad a = \sqrt{196} = 14$ cm

Radius of a circle $= 14 \times 2 = 28$ cm

$\therefore$ Circumference $= \dfrac{22}{7} \times 2 \times 28 = 176$ cm

Now according to the question $b = 176$ cm

Also, $2(l + b) = 712$

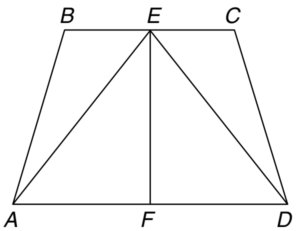
$2(l + 176) = 712$

$l + 176 = 356$

$\therefore \quad l = 356 - 176$

$\therefore \quad l = 180$ cm

63. (d)



EF is the perpendicular on side AD.

$\therefore$ Area of trapezium $= \dfrac{1}{2}(AD + BC) \times EF$

Area of $\Delta AED = \dfrac{1}{2} \times AD \times EF$

$\therefore$ Required ratio $= \dfrac{\frac{1}{2}(AD + BC) \times EF}{\frac{1}{2} \times AD \times EF} = \dfrac{AD + BC}{AD}$

64. **(a)** In-radius $= \dfrac{a}{2\sqrt{3}} = \dfrac{24}{2\sqrt{3}} = 4\sqrt{3}$ cm

Area of an equilateral triangle $= \dfrac{\sqrt{3}}{4} \times (\text{side})^2$

$= \dfrac{\sqrt{3}}{4} \times 24 \times 24$

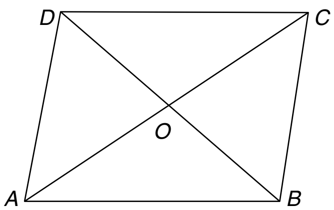
$= 144\sqrt{3}\ \text{cm}^2 = 144 \times 1.732 = 249.408\ \text{cm}^2$

Area of circle $= \pi r^2 = \dfrac{22}{7} \times 4\sqrt{3} \times 4\sqrt{3} = \dfrac{1056}{7}$

$= 150.86\ \text{cm}^2$

Area of the remaining part $= (249.408 - 150.86)\ \text{cm}^2$
$= 98.548\ \text{cm}^2 = 98.55\ \text{cm}^2$

65. **(c)**



Side of a rhombus $= \dfrac{2p}{4} = \dfrac{p}{4}$ units

Let $OA = OC = y$ units

$\therefore \quad AC = 2y$ units

Let $OB = OD = x$ units

$\therefore \quad BD = 2x$ units

From ΔOAB, $\angle AOB = 90°$

$AB^2 = OA^2 + OB^2$

$\Rightarrow \quad \dfrac{p^2}{4} = x^2 + y^2$

$\Rightarrow \quad p^2 = 4x^2 + 4y^2 \qquad \ldots(1)$

According to the question, $2x + 2y = m$.

On squaring both sides, we have, $4x^2 + 4y^2 + 8xy = m^2$

$\Rightarrow \quad p^2 + 8xy = m^2 \quad \Rightarrow \quad 8xy = m^2 - p^2$

$\Rightarrow \quad 4xy = \dfrac{1}{2}(m^2 - p^2)$

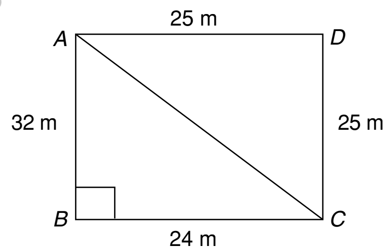
$\therefore$ Area of the rhombus $= \dfrac{1}{2} \times AC \times BD$

$= \dfrac{1}{2} \times 2x \times 2y = \dfrac{1}{2} \times 4xy$

$= \dfrac{1}{2} \times \dfrac{1}{2}(m^2 - p^2)$

$= \dfrac{1}{4}(m^2 - p^2)$ sq units

66. **(d)**



$AC = \sqrt{AB^2 + BC^2} = \sqrt{32^2 + 24^2}$

$= \sqrt{1024 + 576} = \sqrt{1600} = 40$ metres

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

$= \dfrac{1}{2} \times 24 \times 32 = 384\ \text{m}^2$

Semi-perimeter (s) of ΔADC

$= \dfrac{25 + 25 + 40}{2} = \dfrac{90}{2} = 45$ m

$\therefore$ Area of $\Delta ADC = \sqrt{s(s-a)(s-b)(s-c)}$

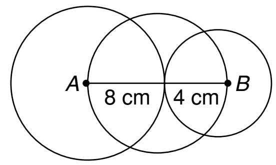
$= \sqrt{45(45-25)(45-25)(45-40)}$

$= \sqrt{45 \times 20 \times 20 \times 5} = (20 \times 15)$

$= 300\ \text{m}^2$

$\therefore$ Area of the plot $= (384 + 300) = 684\ \text{m}^2$

67. **(a)**



Diameter = AB (8 + 4) = 12 units

Radius $= \frac{12}{2} = 6$ units

$\therefore$ Area of circle = $\pi r^2 = \pi \times 6^2 = 36\pi$ sq. units

68. **(a)** $\frac{1}{12}$ hectare $= \frac{1}{12} \times 10000\ \text{m}^2$

$= \frac{2500}{3}\ \text{m}^2$

$\therefore\ 3x \times 4x = \frac{2500}{3}$

$\Rightarrow\ x^2 = \frac{2500}{3 \times 3 \times 4}\ \Rightarrow\ x = \frac{50}{6}$

$\Rightarrow$ Width $= 3x = \left(3 \times \frac{50}{6}\right) = 25$ m

69. **(a)** Let, the side of a square be x cm.

Now, according to the question,

Area of rectangle = 3 × area of square

$\Rightarrow\ 20 \times \frac{3}{2}x = 3 \times x^2$

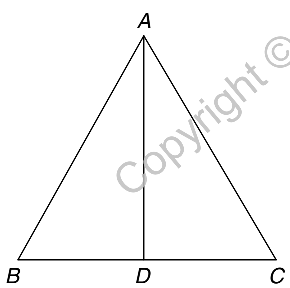
$\Rightarrow\ x = \frac{20 \times 3}{2 \times 3} = 10$ cm

70. **(c)** Side of the rhombus $= \sqrt{6^2 + 8^2} = 10$ cm

71. **(d)** Distance covered by the wheel in one revolution $= \pi d = \frac{22}{7} \times 7 = 22$ m

$\therefore$ Number of revolutions $= \frac{22 \times 1000}{22} = 1000$

72. (b)



$\frac{\sqrt{3}}{4} \times \text{side}^2 = 9\sqrt{3}$

$\Rightarrow\ \text{Side}^2 = 9 \times 4 = 36\ \Leftrightarrow\ \text{Side} = \sqrt{36} = 6$ m

$\therefore$ BD = 3 m

$AD = \sqrt{AB^2 - BD^2} = \sqrt{6^2 - 3^2}$

$= \sqrt{36 - 9} = \sqrt{27} = 3\sqrt{3}$ m

73. **(d)** Area of the floor = 8 × 6 = 48 m^2 = 4800 dm^2

Area of a square tile = 4 × 4 = 16 m^2

$\therefore$ Number of tiles $= \frac{4800}{16} = 300$

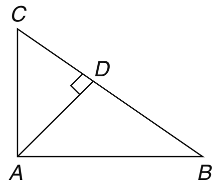
74. **(b)** Circum-radius $= \frac{\text{Side}}{\sqrt{3}}$

$\therefore$ Area of circumcircle $= \pi \times \frac{\text{Side}^2}{3} = 3\pi$

$\Rightarrow$ Side^2 = 9 $\Rightarrow$ Side = 3 cm

$\therefore$ Perimeter of the triangle = 3 × 3 = 9 cm

75. (c)



$\angle BAC = 90°$ and $\angle ADC = 90°$

BC = 8 cm and AC = 6 cm

$\therefore\ AB = \sqrt{8^2 - 6^2} = \sqrt{14 \times 2} = 2\sqrt{7}$ cm

$\therefore$ Area or $\Delta ABC = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times AB \times AC$

$\Leftrightarrow\ 8 \times AD = 2\sqrt{7} \times 6$

$\therefore\ AD = \frac{3\sqrt{7}}{2}$ cm

$CD = \sqrt{6^2 - \left(\frac{3\sqrt{7}}{2}\right)^2} = \sqrt{36 - \frac{63}{4}} = \sqrt{\frac{144 - 63}{4}}$

$= \sqrt{\frac{81}{4}} = \frac{9}{2}$ cm

$\therefore\ \frac{\Delta ABC}{\Delta ACD} = \frac{AB \times AC}{CD \times AD} = \frac{2\sqrt{7} \times 6}{\frac{9}{2} \times \frac{3\sqrt{7}}{2}} = \frac{2\sqrt{7} \times 6 \times 4}{9 \times 3 \times \sqrt{7}} = 16:9$

76. **(d)** Ratio of the sides of triangle $= \frac{1}{4}:\frac{1}{6}:\frac{1}{8}$

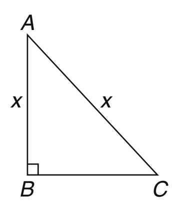
$= \frac{1}{4} \times 24 : \frac{1}{6} \times 24 : \frac{1}{8} \times 24 = 6:4:3$

[$\because$ LCM of 4, 6, 8 = 24]

$\therefore\ 6x + 4x + 3x = 91\ \Leftrightarrow\ 13x = 91\ \Leftrightarrow\ x = \frac{91}{13} = 7$

$\Rightarrow$ Required difference = $6x - 3x = 3x = 3 \times 7$ = 21 cm

77. **(b)**



$AB = BC = x$ cm, $AC = \sqrt{2x}$ cm

$\therefore\ 2x + \sqrt{2x} = 2p$

$\Rightarrow\ x(2 + \sqrt{2}) = 2p\ \Rightarrow\ x = \frac{2p}{2 + \sqrt{2}}$

$= \frac{2p}{2+\sqrt{2}} \times \frac{2-\sqrt{2}}{2-\sqrt{2}} = \frac{2p(2-\sqrt{2})}{4-2} = p(2-\sqrt{2})$

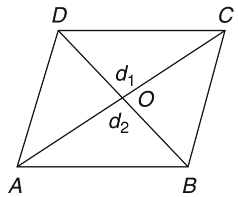
$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times AB \times BC$

$= \frac{1}{2}x^2 = \frac{1}{2}p^2(2-\sqrt{2})^2 = \frac{1}{2} \times p^2(4+2-4\sqrt{2})$

$= (3-2\sqrt{2})p^2 \text{ cm}^2$

78. (a) $\pi r_1^2 : \pi r_2^2 = 4:7 \Rightarrow r_1 : r_2 = \sqrt{4}:\sqrt{7} = 2:\sqrt{7}$

79. (d)



Side of the rhombus $= \frac{20}{4} = 5 \text{ cm}$ and OB = 4 cm

$\therefore QA = \sqrt{5^2 - 4^2} = \sqrt{9} = 3 \text{ cm}$

$\therefore AC = 6 \text{ cm}$

Area of the rhombus $= \frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 8 \times 6 =$ 24 cm^2

80. (b) Semi-perimeter of triangle(s) $= \frac{50+78+112}{2}$

$= \frac{240}{2} = 120 \text{ cm}$

$\therefore$ Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

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

$= \sqrt{120 \times 70 \times 42 \times 8} = 1680 \text{ cm}^2$

$\therefore$ The altitude will be smallest when the base is largest.

$\therefore \frac{1}{2} \times 112 \times h = 1680$

$\Rightarrow h = \left(\frac{1680 \times 2}{112}\right) = 30 \text{ cm}$

81. (b) $AB + BC = 12$
$BC + CA = 14$
$CA + AB = 18$
$\therefore$ $2(AB + BC + CA) = 12 + 14 + 18 = 44$
$\Rightarrow$ $AB + BC + CA = 22$
Now, according to the question,
$2\pi r = 22$

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

$\Rightarrow r = \frac{7}{2} \text{ cm}$

82. (a) Area of rectangular field $= \frac{1000}{\frac{1}{4}}$

= 4000 m^2

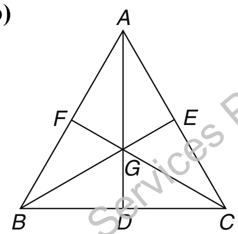
$\therefore$ Length $= \left(\frac{4000}{50}\right) = 80 \text{ m}$

New length of field = (80 + 20) = 100 m
Area = (100 × 50) = 5000 m^2

$\therefore$ Required expenditure

$= ₹\left(5000 \times \frac{1}{4}\right) = ₹1250$

83. (b)



$BG = \frac{2}{3} \times 12 = 8 \text{ cm}$

$GC = \frac{2}{3} \times 15 = 10 \text{ cm}$

$AG = \frac{2}{3} \times 9 = 6 \text{ cm}$

Let, AF be x cm
Now, $\Delta AGF = \Delta GBF$
$\because$ CF = 15 cm and CG = 10 cm
$\because$ GF = (15 − 10) = 5 cm
Now, from the Hero's formula for the area of triangle, we have

$\sqrt{\frac{6+5+x}{2}\left(\frac{6+5+x}{2}-6\right)\left(\frac{6+5+x}{2}-x\right)\left(\frac{6+5+x}{2}-5\right)}$

$= \sqrt{\frac{8+5+x}{2}\left(\frac{8+5+x}{2}-8\right)\left(\frac{8+5+x}{2}-x\right)\left(\frac{8+5+x}{2}-5\right)}$

$\Rightarrow \left(\frac{11+x}{2}\right)\left(\frac{x-1}{2}\right)\left(\frac{11-x}{2}\right)\left(\frac{x+1}{2}\right)$

$= \left(\frac{13+x}{2}\right)\left(\frac{x-3}{2}\right)\left(\frac{13-x}{2}\right)\left(\frac{x+3}{2}\right)$

$\Rightarrow$ $(11 + x)(11 - x)(x - 1)(x + 1)$
$= (13 + x)(13 - x)(x - 3)(x + 3)$
$\Rightarrow$ $(11^2 - x^2)(x^2 - 1) = (13^2 - x^2)(x^2 - 9)$
$\Rightarrow$ $121x^2 - x^4 - 121 + x^2 = 169x^2 - 169 \times 9 - x^4 + 9x^2$
$\Rightarrow$ $122x^2 - x^4 - 121 = 178x^2 - 1521 - x^4$
$\Rightarrow$ $56x^2 = 1400$

$\Rightarrow \quad x^2 = \dfrac{1400}{56} = 25$

$\Rightarrow \quad x = \sqrt{25} = 5$

$\therefore$ Side $AB = (2 \times 5) = 10$ cm

Now, area of the triangle AGB

$$= \sqrt{\frac{6+8+10}{2}\left(\frac{6+8+10}{2}-6\right)\left(\frac{6+8+10}{2}-8\right)\left(\frac{6+8+10}{2}-10\right)}$$

$= \sqrt{12(6)(4)(2)} = \sqrt{2\times2\times3\times2\times3\times2\times2\times2}$

$= 2 \times 2 \times 2 \times 3 = 24$ cm^2

$\therefore$ Area of the triangle $ABC = 3 \times AGB$

$=(3 \times 24) = 72$ cm^2

84. **(d)** $2\pi r = 2(18 + 26)$

$\Rightarrow \quad 2 \times \dfrac{22}{7} \times r = 44 \times 2$

$\Rightarrow \quad r = 14$ cm

$\therefore$ Area of circle $= \pi r^2$

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

85. **(a)** Let the original radius be r cm

Now, according to the question,

$\pi (r + 1)^2 - \pi r^2 = 22$

$\Rightarrow \quad \pi(r^2 + 2r + 1 - r^2) = 22$

$\Rightarrow \quad 2\pi r + \pi = 22$

$\Rightarrow \quad \dfrac{22}{7}(2r+1) = 22$

$\Rightarrow \quad 2r + 1 = 7$

$\Rightarrow \quad 2r = 6 \quad \Rightarrow \quad r = 3$ cm

86. **(d)** Sum of interior angles $= (2n - 4) \times 90°$

Sum of exterior angles $= 360°$

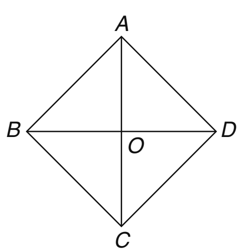
$\therefore \quad (2n - 4) \times 90° = 360° \times 2$

$\Rightarrow \quad 2n - 4 = 2 \times 360° \div 90 = 8$

$\Rightarrow \quad 2n - 4 = 8 \quad \Rightarrow \quad 2n = 12 \quad \Rightarrow \quad n = 6$

87. **(a)** $BO = 4$ units; $OC = 3$ units

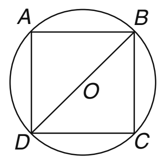
$\angle BOC = 90°$



$\therefore \quad BC = \sqrt{4^2 + 3^2} = 5$ units

$\Rightarrow BC^2 = 25$ sq. units

88. **(c)**



BD = Diagonal = 16 cm

Area of square $= \dfrac{1}{2} \times BD^2$

$= \dfrac{1}{2} \times 16 \times 16 = 128$ cm^2

Alternative Method:

Let, the side of the square be a cm.

$\therefore \quad a^2 + a^2 = 16 \times 16$

$\Rightarrow \quad 2a^2 = 16 \times 16$

$\Rightarrow \quad a^2 = \dfrac{16 \times 16}{2} = 128$

$\Rightarrow$ Area of the square = 128 cm^2

89. **(c)** Side of the first square $= \sqrt{\text{Area}}$

$= \sqrt{200} = 10\sqrt{2}$ m

Its diagonal $= \sqrt{2} \times$ side

$= 10\sqrt{2} \times \sqrt{2} = 20$ m

$\therefore$ Diagonal of new square $= \sqrt{2} \times 20 = 20\sqrt{2}$ m

$\therefore$ Its area $= \dfrac{1}{2} \times (\text{diagonal})^2$

$= \dfrac{1}{2} \times 20\sqrt{2} \times 20\sqrt{2} = 400$ m^2

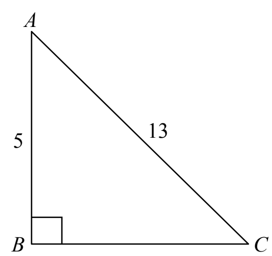
90. **(a)** Let, the perpendicular sides of right-angled triangle be $5x$ and $12x$

Now, according to the question, $\dfrac{1}{2} \times 5x \times 12x = 270$

$\Rightarrow \quad 30x^2 = 270$ cm^2

$\Rightarrow \quad x^2 = \dfrac{270}{30} = 9$

$\therefore \quad x = 3$



$\therefore$ The length of the hypotenuse

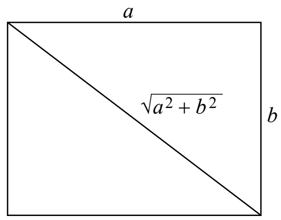
$= \sqrt{(5x)^2 + (12x)^2}$

$= \sqrt{(13x)^2} = 13x = 13 \times 3 = 39$ cm

91. (b) Let, the length and breadth of the rectangle be a and b respectively.

$a^2 + b^2 = 625 = (\text{diagonal})^2$

$ab = 168 \text{ cm}^2 = \text{area}$



$$\because \quad a+b=\sqrt{a^2+b^2+2ab}=\sqrt{625+2\times 168}$$

$$=\sqrt{625+336}=\sqrt{961}=31 \qquad \ldots(1)$$

$$\text{and, } a-b=\sqrt{a^2+b^2-2ab}$$

$$=\sqrt{625-336}=\sqrt{289}=17 \qquad \ldots(2)$$

Now, on solving equation. (1) and (2), we have

$$a=\frac{31+17}{2}=24 \text{ and,}$$

$$b=\frac{31-17}{2}=7$$

$\therefore$ Length of the rectangle = 24 cm

92. (b) Let, the number of men standing in each row be x.

Total number when standing in square form = x^2

Now, according to the question,

$x^2 + 71 = 6000$

$\Rightarrow \quad x^2 = 5929$

$\therefore \quad x = 77$

93. (a) Quicker Method:

$$\text{Required decrease} = \left(\frac{x^2}{100}\right)\% = \left(\frac{10^2}{100}\right)\% = 1\%$$

94. (b) Original area = 6 × 5 = 30

New, area = 7 × 4 = 28

$\therefore$ Required ratio = 30:28

= 15:14 (diminished)

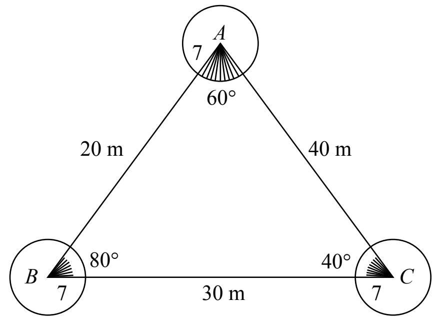
95. (c) Ratio of triangle's side = 2:3:4

$\therefore$ Ratio of angles = 2:3:4

$$\Rightarrow \angle C^\circ = \frac{2}{(2+3+4)}\times 180^\circ = 40^\circ$$

$$\Rightarrow \angle A^\circ = \frac{3}{(2+3+4)}\times 180^\circ = 60^\circ$$

$$\Rightarrow \angle B^\circ = \frac{4}{(2+3+4)}\times 180^\circ = 80^\circ$$



$\therefore$ Total area of the region of this plot, which can be grazed by the horses = Shaded area

$$=\frac{40^\circ}{360^\circ}\times \pi r^2+\frac{60^\circ}{360^\circ}\times \pi r^2+\frac{80^\circ}{360^\circ}\times \pi r^2$$

$$=\left(\frac{40^\circ+60^\circ+80^\circ}{360^\circ}\right)\pi r^2$$

$$=\frac{180^\circ}{360^\circ}\pi r^2=\frac{1}{2}\pi r^2=\frac{1}{2}\times\frac{22}{7}\times 7\times 7=77 \text{ m}^2$$

96. (c) Area of square = 121 cm^2

Side of square = 11 cm

Perimeter of square =(11 × 4) = 44 cm

$\therefore$ Perimeter of square = perimeter of circle

$\therefore$ $2\pi r$ = 44 cm

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

$\therefore$ Area of circle = πr^2

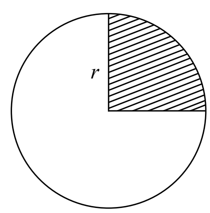
$$=\frac{22}{7}\times 7\times 7=154 \text{ cm}^2$$

97. (b)

$$\therefore \text{ Area of sector } =\frac{1}{4}\times 154 \text{ cm}^2$$

$\therefore$ Angle created by sector

$$=\frac{\text{Area of segment}}{\text{Area of circle}}\times 360^\circ=\frac{1}{4}\times 360^\circ=90^\circ$$



$\Rightarrow$ Again area of circle = 154 cm^2

$$\Rightarrow \text{Radius of circle}=\sqrt{\frac{154}{\pi}}=\sqrt{7^2}=7 \text{ cm.}$$

$$\therefore \text{ Perimeter of the sector } =\frac{90^\circ}{360^\circ}\times 2\pi r+2r$$

$= \frac{1}{4} \times 2\pi r + 2r = \frac{1}{4} \times 2 \times \frac{22}{7} \times 7 + 2 \times 7$

= (11 + 14) cm = 25 cm

98. **(a)** Required sum $=20^2 + \cdots + 29^2$

$= (1^2 + \cdots + 29^2) - (1^2 + \cdots + 19^2)$

$= \frac{29(29+1)(2\times 29+1)}{6} - \frac{19(19+1)(2\times 19+1)}{6}$

$= \frac{29\times 30\times 59}{6} - \frac{19\times 20\times 39}{6}$

$=8555 - 2470 = 6085$ cm^2

99. (a) In ΔBDE

DC = 28 cm (because diameter of each circle is 14 cm)

Now, $DE = DC + CE = 28 + 28 = 56$ cm

And BC = 28 cm

Again, area of ΔBDE

$= \frac{1}{2} \times DE \times BC = \frac{1}{2} \times 56 \times 28 = 784 \text{ m}^2$

100. **(b)** Area of the square = 28 × 28 = 784 cm^2

Area of the four circles = $4pr^2$

$= 4 \times \frac{22}{7} \times 7 \times 7 = 28 \times 22 = 616 \text{ m}^2$

∴ Area of the shaded parts = 784 − 616 = 168 cm^2

101. **(d)** Area of the square = 1444

Let, the side of the square be a.

So, $a^2 = 1444$

∴ $a = \sqrt{1444} = 38$ m

Breadth of rectangle $= \frac{1}{4} \times 38 = 9.5$ m

Length = 3 × 9.5 = 28.5 m

Area of rectangle = 28.5 × 9.5 = 270.75 m^2

∴ Difference = 1444 – 270.75 = 1173.25 m^2

102. **(e)** Let the length and breadth of the original rectangle be L m and B m, respectively.

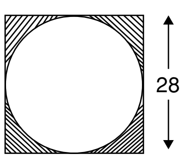
After increasing the length by 20% and decreasing the breadth by 20%, area is 192.

$(1.2L) \times (0.8B) = 192$

or, 0.96 LB = 192

or LB = 200

103. **(d)**



We have to calculate the area of the shaded region which is equal to

Area of square – Area of the circle.

Required answer $= (28)2 - \frac{22}{7} \times 14 \times 14$

$= 784 - 616 = 168 \text{ m}^2$

104. **(c)** Using statements I and II we can find the area of the rectangle and using statement III we can find the cost.

105. (c) Let, the side of the square be a.

∴ Length of the rectangle $= \frac{3a}{5}$

Radius of the circle = a

Circumference of the circle = $2\pi a$ = 132

⇒ $a = \frac{132}{2\pi} = 21$

Now, area of the rectangle = length × breadth

$= \frac{3}{5} \times 21 \times 8 = 100.8 \text{ cm}^2$

106. **(c)** Side of the square $= \frac{56}{4} = 14$ cm

∴ smallest side of the triangle = 14 – 8 = 6 cm

Length of the rectangle $= \frac{96}{8} = 12$ cm

Second largest side of the triangle = 112 – 4 = 8 cm

∴ Largest side of the triangle $= \sqrt{6^2 + 8^2}$

$= \sqrt{36+64} = \sqrt{100} = 10$ cm

107. **(c)** Circumference of the circle = p×diameter

$= \frac{22}{7} \times 56 = 176$ cm

∴ Perimeter of the square = 272 − 176 = 96 cm

∴ Side of the square $= \left(\frac{96}{4}\right) = 24$ cm

∴ Area of the square = 24 × 24 = 576 cm^2

∴ Area of the circle $= \pi r^2 = \frac{22}{7} \times 28 \times 28 = 2464 \text{ cm}^2$

∴ Required sum = 576 + 264 = 3040 cm^2

108. **(c)** The smallest angle of the triangle is half of the largest angle.

∴ Ratio of the three angle = 4:3:2

∴ $4x + 3x + 2x = 180$

∴ $9x = 180$

∴ $x = 20$

∴ Required difference = $4x - 2x = 2x = 2 \times 20 = 40°$

109. (d) Let, the three angles of the quadrilateral be $13x°$, $19x°$ and $5x°$, respectively.

Now, according to the question,

$13x + 9x + 5x = 360 - 36 = 324$

$\Rightarrow \quad 27x = 324$

$\therefore \quad x = \frac{324}{27} = 12$

$\therefore$ Required difference $= 13x - 5x = 8x = 8 \times 12 = 96°$

110. (e) $2\pi r = 88$ (smaller circle)

$\therefore \quad r = 14$ m

$2\pi R = 220$ m (larger circle)

$\therefore \quad R = 35$ m

Difference between their areas

$= \pi(R^2 - r^2) = \frac{22}{7}(35^2 - 14^2)$

$= \frac{22}{7} \times 49 \times 21 = 22 \times 7 \times 21 = 3234 \text{ m}^2.$

111. (b) $(2x + 4x + 7x + 5x) = 18x = 360°$

$\Rightarrow \quad x = 20°$

$\therefore$ Smallest angle of the quadrilateral $= 2x = 2 \times 20 = 40°$

So the smallest angle of the triangle = 40°

Remaining two angles of the triangle are

40 × 2 = 80° and 180 – (80 + 40)

= 180 – 120 = 60°

112. (e) Side of the square

$= \sqrt{1,024} \text{ cm}^2 = 32$ cm

Length of the rectangle = 32 × 2 cm

Breadth of the rectangle = 32 – 12 = 20 cm

Required ratio = 64:20 = 16:5

113. (a) Perimeter of the rectangle = 2(8 + 7) = 30 cm

Perimeter of the square = 2 × 30 = 60 cm

$\therefore$ Side of the square $= \frac{1}{4} \times 60 = 15$ cm

Circumference of the required semi-circle

$= \pi r + 2r = \frac{22}{7} \times \frac{15}{2} + 2 \times \frac{15}{2} = 38.57$ cm.

114. (c) $r_1 = \frac{132 \times 7}{2 \times 22} = 21$ m

$r_2 = \frac{176 \times 7}{2 \times 22} = 28$ m

Required difference $= \pi\{(28)^2 - (21)^2\}$

$= \frac{22}{7} \times 49 \times 7 = 1078 \text{ m}^2$

115. (c) Radius of the circle = r

$r = \frac{\sqrt{39424 \times 7}}{22} = \sqrt{12544} = 112$ cm

Also, 4 × side = 112 implies that

side = 28 cm

Area of the square = (side)^2 = (28)^2 = 784 cm^2

116. (b) Required cost

$= 4 \times \sqrt{361} \times 62 = 4 \times 19 \times 62 = ₹4712$

117. (a) Let the breadth be x.

Then, length = $2x$.

$\therefore \quad 2x^2 = \frac{256}{2} \Rightarrow x^2 = 64;$

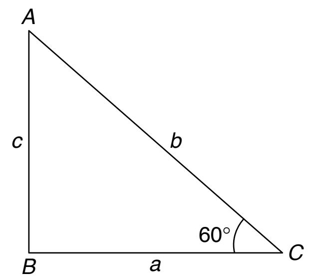
118. (d)

From I. AC = 5cm

From II. Perimeter = 4 × base

From III. One of the angles of the triangle, say $\angle C$, be 60°.

FromI and III. $\cos 60° = \frac{BC}{AC}$



or, $BC = AC \times \cos 60° = \frac{5}{2}$

$a = \frac{5}{2}, b = 5 (\because AC = b)$

Now, area of the triangle $ABC = \frac{1}{2} ab \sin\theta$

$= \frac{1}{2} \times \frac{5}{2} \times 5 \times \sin 60°$

$= \frac{5}{4} \times \frac{\sqrt{3}}{2} = \frac{25}{8}\sqrt{3} \text{ cm}^2$

Hence, statement I and III are sufficient to answer the question.