MATHEMATICS

Class-VII

Topic-13

MENSURATION

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CHAPTER 13

MENSURATION

TERMINOLOGIES

Area, Perimeter, Rectilinear Figure, Triangle, Rectangle, Square, Parallelogram, Rhombus, Quadrilateral, Trapezium, Circle, Circumference, Radius, Diameter.

INTRODUCTION

Mensuration is a branch of mathematics that deals with the measurement of areas and volumes of various geometrical figures. Figures such as triangle, rectangle, square, trapezium or in higher classes cubes, cuboids, cylinders, cones and spheres are covered under mensuration. It also deals with the development of formulas to measure their areas and volumes.

13.1 AREA AND PERIMETER OF RECTILINEAR FIGURES

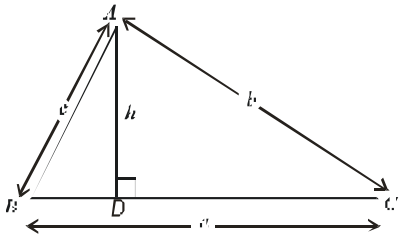
Rectilinear figure: A figure made up of some line segments is called a rectilinear figure and these line segments are called its sides.

Closed figure: A rectilinear figure having no free ends is called a closed figure. A square,a rectangle, a triangle, a parallelogram etc. are all closed figure.

Perimeter : The measurement of the boundary of a plane figure is known as its perimeter.

Area : The magnitude of measurement of a plane region enclosed by a simple closed figure is called its areas.

(a) Triangle



(i) Scalene triangle :

Perimeter = a + b + c

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

(ii) Isosceles triangle :

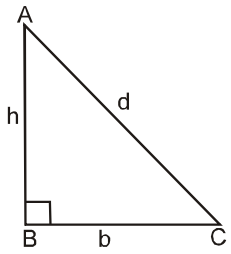
Area = $\frac{1}{2} \times \text{base} \times \sqrt{(\text{equal side})^2 - \frac{1}{4}(\text{base})^2}$

(iii) Right-angled triangle :

For an right-angled triangle, let b be the base, h be the perpendicular and d be the hypotenuse. Then :

(A) Perimeter = b + h + d

(B) Area = $\frac{1}{2}$ (Base × Height) = $\frac{1}{2}$bh



(C) Hypotenuse, d = $\sqrt{b^2+h^2}$ [Pythagoras theorem]

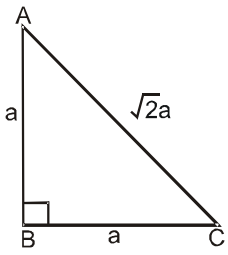
(iv) Isosceles right-angled triangle :

For an isosceles right-angled triangle, let a be the equal sides, then

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

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

(C) Area = $\frac{1}{2}$(Base × Height) = $\frac{1}{2}$ (a × a) = $\frac{1}{2}$a².



(v) Equilateral triangle :

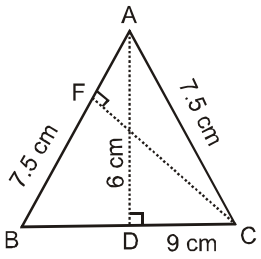
Area = $\frac{\sqrt{3}}{4}$(side)², Perimeter = 3(side).

Illustration 13.1

Triangle ABC is isosceles with AB = AC = 7.5 cm and BC = 9 cm. The height from A to BC i.e., AD is 6 cm. Find the area of ΔABC. What will be the height from C to AB ?

Sol. We have,

Area of ΔABC = $\frac{1}{2}$ × BC × AD = $\frac{1}{2}$ × 9 × 6 cm² = 27 cm²



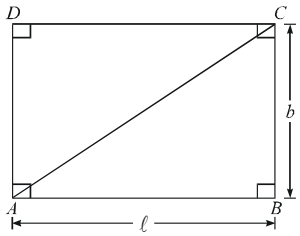
Let CF be the height from C to AB. Then,

Area of ΔABC = $\frac{1}{2}$ × AB × CF

$\Rightarrow$ 27 = $\frac{1}{2}$ × 7.5 × CF $\Rightarrow$ CF = $\frac{27\times 2}{7.5}$

$\Rightarrow$ CF = 7.2 cm

(b) Rectangle



Perimeter = 2 (ℓ + b)

Area = ℓ × b

Length of diagonal = $\sqrt{\ell^2+b^2}$.

Illustration 13.2

Find the area of rectangular plot one side of which is 48 m and its diagonal 50 m.

Sol. Let the other side be x metres. Since, ΔABC is a right triangle. Therefore,

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

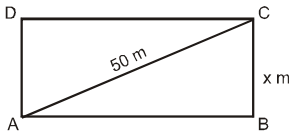
$\Rightarrow$ $50^2 = 48^2 + x^2$

$\Rightarrow$ $x^2 = (50)^2 - (48)^2$

$\Rightarrow$ $x^2 = (50 + 48)(50 - 48)$

$\Rightarrow$ $x^2 = 98 \times 2$

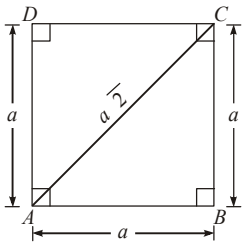
$\Rightarrow$ $x^2 = 14^2$ $\Rightarrow$ x = 14.



Thus, the other side of the rectangle is 14 cm.

$\therefore$ Area of the rectangle = $(48 \times 14)\ m^2 = 672\ m^2$.

(c) Square :



Perimeter = $4a$

Area = a^2

Length of diagonal = $a\sqrt{2}$.

Illustration 13.3

A grassy plot is 80 m × 60 m. Two cross paths each 4 m wide are constructed at right angles through the centre of the field, such that each path is parallel to one of the sides of rectangle. Find the total area used as path. Also, find the cost of gravelling them at Rs 5 per square metre.

Sol. Let ABCD and EFGH be the cross paths.

We have, AB = 80 m and BC = 4 m.

$\therefore$ Area of path ABCD = $(80 \times 4)\ m^2 = 320\ m^2$

Again, EF = 60 m and FG = 4 m

$\therefore$ Area of path EFGH = $(60 \times 4)\ m^2 = 240\ m^2$.

Clearly, area PQRS is common to both the paths.

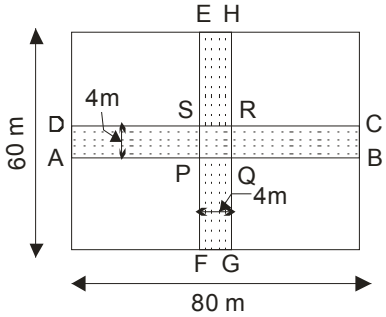
We have, Area PQRS = $(4 \times 4)\ m^2 = 16\ m^2$.

$\therefore$ Total area used as path = Area of path ABCD + Area of path EFGH – Area PQRS

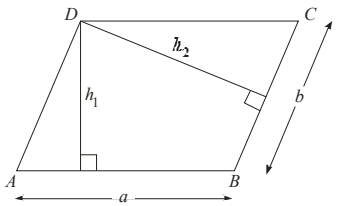
$= (320 + 240 - 16)\ m^2 = 544\ m^2$

Rate of gravelling the path = Rs 5 per square metre

$\therefore$ Total cost of gravelling the path = Rs (5 × 544) = Rs 2720



(d) Parallelogram



Perimeter = 2 (a + b)

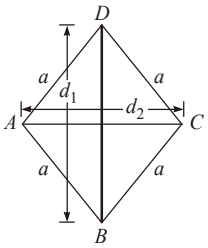
Area = $ah_1 = bh_2$

Illustration 13.4

The base of a parallelogram is thrice its height. If the area is 867 cm^2, find the base and height of the parallelogram.

Sol. Let the height of the parallelogram be x cm.
Then, base = 3x cm.
$\therefore$ Area of the parallelogram= $(x \times 3x)\ cm^2 = 3x^2\ cm^2$
But, area of the parallelogram is given as 867 cm^2.
$\therefore$ $3x^2 = 867$
$\Rightarrow$ $x^2 = 289$
$\Rightarrow$ $x^2 = 17^2$
$\Rightarrow$ $x = 17$ cm.
Thus, height = 17 cm and base = (3×17) cm = 51 cm.

(e) Rhombus



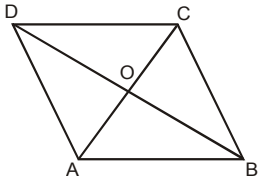
Perimeter = $4a = 2\sqrt{d_1^2 + d_2^2}$

Area = $\frac{1}{2} d_1 d_2$

Illustration 13.5

If the area of rhombus be 24 cm^2 and one of the its diagonals be 4 cm, find the perimeter of the rhombus.

Sol. Let ABCD be a rhombus such that its one diagonal AC = 4 cm. Suppose the diagonals AC and BD intersect at O.



Now, Area of rhombus ABCD = 24 cm^2
$\Rightarrow$ $\frac{1}{2} \times AC \times BD = 24$
$\Rightarrow$ $\frac{1}{2} \times 4 \times BD = 24$
$\Rightarrow$ $2 \times BD = 24$
$\Rightarrow$ BD = 12 cm.

Thus, we have AC = 4 cm and BD = 12 cm.
$\therefore$ OA = $\frac{1}{2}$AC = 2 cm and OB = $\frac{1}{2}$ BD = 6 cm.
Since the diagonals of a rhombus bisect each other at right angles. Therefore,
ΔAOB is a right triangle, right angled at O.
By pythagoras theorem, we have

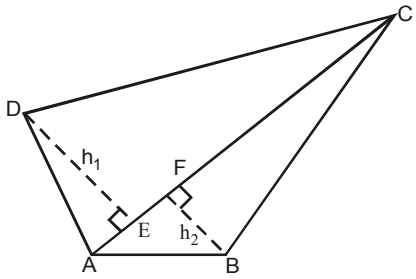
$AB^2 = OA^2 + OB^2$

$\Rightarrow$ $AB^2 = 2^2 + 6^2 = 40 = 4 \times 10 = 2^2 \times 10$

$\Rightarrow$ $AB = 2\sqrt{10}$ cm

Hence, perimeter of rhombus ABCD = $(4 \times 2\sqrt{10})$ cm = $8\sqrt{10}$ cm

(f) Quadrilateral



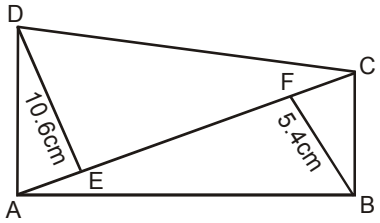
Let AC = d

Area = $\frac{1}{2}$d $(h_1 + h_2)$

Illustration 13.6

Find the area of the given quadrilateral ABCD, whose diagonal AC = 19.5 cm and the offsets on it are 5.4 cm and 10.6 cm.

Sol.



Diagonal AC = 19.5 cm

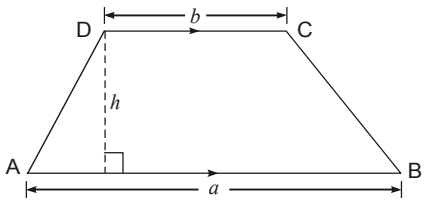
h_1 = 5.4 cm and h_2 = 10.6 cm

$\therefore$ Area of quad ABCD = $\frac{1}{2}$ (sum of offsets) $\times$ diagonal

= $\frac{1}{2}$ $(h_1 + h_2) \times d = (5.4 + 10.6) \times 19.5$ sq cm

= $\frac{1}{2} \times 16 \times 19.5$ sq cm = 156 sq cm.

(g) Trapezium



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

Illustration 13.7

The area of a trapezium is 384 cm^2. Its parallel sides are in the ratio 3 : 5 and the perpendicular distance between them is 12 cm. Find the length of each of the parallel sides.

Sol. Let one side be $b_1 = 3x$

$\therefore$ Other side will be $b_2 = 5x$

$$A = \frac{1}{2}h(b_1 + b_2) \quad \Rightarrow \quad 384 = \frac{1}{2} \times 12(3x + 5x)$$

$$\Rightarrow \quad \frac{384 \times 2}{12} = 8x \quad \Rightarrow \quad 8x = 64 \quad \Rightarrow \quad x = 8$$

So, one side will be 3x = 24 cm & other side 5x = 40 cm.

Ask yourself

1. The base of an isosceles triangle measures 80 cm and its area is 360 cm^2. Find the perimeter of the triangle.

2. The sides of an equilateral triangle are (2a – b) cm, (a + 3b) cm and (2a – 2b + 1) cm then find the perimeter of the triangle

3. Find the area of a rhombus, one side of which measures 20 cm and one diagonal is 24 cm

4. The perimeters of two squares are 748 cm and 336 cm. Find the perimeter of a square whose area is equal to the sum of the areas of these two squares.

5. The length of the parallel side of a trapezium is 12 cm and 8 cm. Its area is 100 cm^2. Find the distance between the parallel side.

Answers

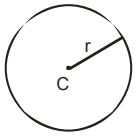
1. $20\left(\sqrt{97}+4\right)$ cm **2.** 21 cm **3.** 384 cm^2 **4.** 820 cm

5. 10 cm

13.2 AREA RELATED TO CIRCLE

(a) Circle

Circle is a path of a moving point, which moves in such a manner that its distance from a fixed point is always equal. The fixed point is called **centre** of the circle and the fixed distance is called **radius** of the circle.



Circle

Area of circle (A) = πr^2

Circumference (C) = $2\pi r$

Diameter (D) = 2r

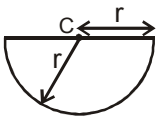
Results :

(i) Distance moved by a rotating wheel in one revolution is equal to the circumference of the wheel.

(ii) Number of revolutions completed by a rotating wheel in one minute

$$= \frac{\text{Distance moved in one minute}}{\text{Circumference}}.$$

(b) Semicircle



Semi-Circle

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

Area (A) = $\frac{\pi r^2}{2}$

Illustration 13.8

The areas of two circles are in the ratio 16 : 25. Find the ratio of their circumferences.

Sol. Let r_1 and r_2 be the radii of two circles and let their areas be A_1 and A_2 respectively. Then,

$A_1 = \pi r_1^2$, $A_2 = \pi r_2^2$

Now, $A_1 : A_2 = 16 : 25 \Rightarrow \pi r_1^2 : \pi r_2^2 = 16 : 25$

$\Rightarrow \frac{\pi r_1^2}{\pi r_2^2} = \frac{16}{25} \Rightarrow \frac{r_1^2}{r_2^2} = \frac{4^2}{5^2}$

$\Rightarrow \frac{r_1}{r_2} = \frac{4}{5}$ ..(i) [Taking square root of both sides]

Let C_1 and C_2 be the circumferences of two circles. Then,

$C_1 = 2\pi r_1$ and $C_2 = 2\pi r_2$.

$\frac{C_1}{C_2} = \frac{2\pi r_1}{2\pi r_2} = \frac{r_1}{r_2} = \frac{4}{5} \Rightarrow C_1 : C_2 = 4 : 5.$

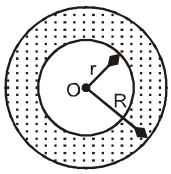
Hence, the circumferences of the two circles are in the ratio 4 : 5.

Illustration 13.9

A race track is in the form of a ring whose inner circumference is 352 m, and the outer circumference is 396 m. Find the width of the track.

Sol. Let the outer and inner radii of the ring be R meters and r metres respectively. Then,

$2\pi R = 396$ and $2\pi r = 352$



$\Rightarrow 2 \times \frac{22}{7} \times R = 396$ and $2 \times \frac{22}{7} \times r = 352$

$\Rightarrow R = 396 \times \frac{7}{22} \times \frac{1}{2}$ and $r = 352 \frac{7}{22} \times \frac{1}{2}$

$\Rightarrow$ R = 63 m and r = 56 m

Hence, width of the track

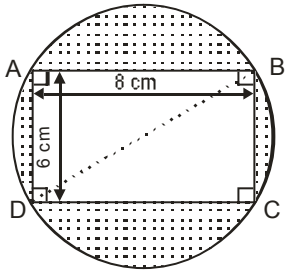
= (R – r) metres = (63 – 56) metres

= 7 metres.

Illustration 13.10

In figure, find the area of the shaded region. [Use $\pi = 3.14$]

Sol. Clearly,
Diameter of the circle = Diagonal BD of rectangle ABCD



$\therefore$ Diameter = BD = $\sqrt{BC^2 + CD^2} = \sqrt{6^2 + 8^2}$ cm = 10 cm
Let r be the radius of the circle. Then,
r = Radius of the circle = (10/2) cm = 5 cm
Area of rectangle ABCD = AB × BC
= (8 × 6) cm^2 = 48 cm^2
Area of the circle = $\pi r^2 = 3.14 \times (5)^2$ cm^2 = 78.50 cm^2
Hence, area of the shaded region
= Area of the circle – Area of rectangle ABCD
= (78.50 – 48) cm^2 = 30.50 cm^2.

Ask yourself

1. The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having its area equal to the sum of the areas of the two circles.

2. A thin wire is bent into the form of a circle of radius 7 cm. If a square is made out of this wire, the side of the square would be :

3. Find the cost of fencing a semi-circular garden of radius 14 m at Rs. 10 per metre.

4. The area of a quadrant of a circle is $\frac{77}{2}$ cm^2. find its radius.

5. A circle of radius 7 cm rotates inside and around the circumference of circumference of another circle. The smaller circle takes 10 rotations to complete the circumference of the bigger circle. Find the radius of the bigger circle.

Answers

1. 10 cm **2.** 11 cm **3.** Rs. 720 **4.** 7 cm

5. 70 cm

Add your knowledge

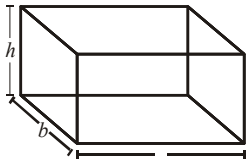
Till now we have studied 2-d figures, lets now throw some light on 3-D figures. Three dimensional figures have volume in addition to areas of surface from which these solid figures are formed.
Some of the main solid figures are given below **:**

CUBOID

There are six faces (rectangular), eight vertices and twelve edges in a cuboid.

Total Surface Area (T.S.A.) : The area of surface from which cuboid is formed.

(i) Total Surface Area (T.S.A.) = 2 [ℓ × b + b × h + h × ℓ] sq. units

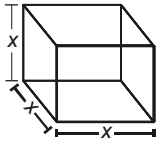


(ii) Volume of Cuboid = (Area of base) × height = (ℓ × b) × h cubic units

(iii) Length of diagonal = $\sqrt{\ell^2 + b^2 + h^2}$

CUBE

Cube has six faces. Each face is a square.



(i) T.S.A. = 2 [x . x + x . x + x . x] = 2 [$x^2 + x^2 + x^2$] = 2 ($3x^2$) = $6x^2$ sq. units

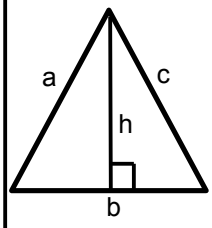
(iii) Volume = (Area of base) × Height = (x^2) × x = x^3 cubic units

(iii) Length of diagonal = x

Concept Map

PERIMETER AND AREA
(P) (A)

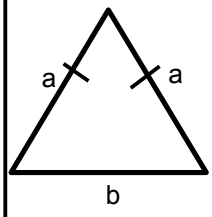
Scalene Δ



$A = \frac{1}{2}\,bh$

$P = a + b + c$

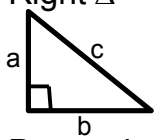
Isosceles Δ



$P = 2a + b$

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

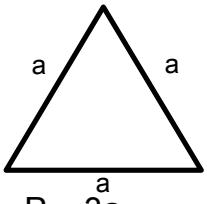
Right Δ



$P = a + b + c$

$A = \frac{1}{2}ab$

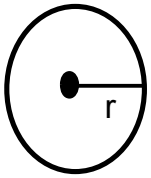
Equilateral Δ



$P = 3a$

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

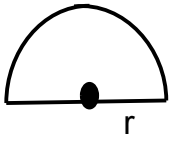
Circle



$P = 2\pi r$

$A = \pi r^2$

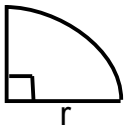
Semi – circle



$P = \pi r + 2r$

$A = \frac{\pi r^2}{2}$

Quarter Circle



$P = \frac{\pi r}{2} + 2r$

$A = \frac{\pi r^2}{4}$

Square

$P = 4(\text{side})$

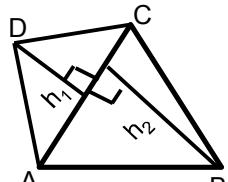
$A = \text{Side}^2$

Rectangle

$P = 2(l+b)$

$A = lb$

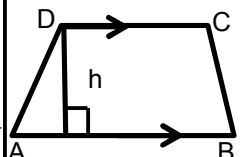
Quadrilateral



$P = AB + BC + CD + DA$

$A = \frac{1}{2}\,AC\,(h_1 + h_2)$

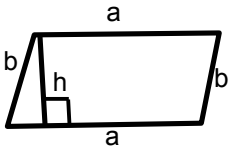
Trapezium



$P = AB + BC + CD + DA$

$A = \frac{1}{2}(AB + CD)h$

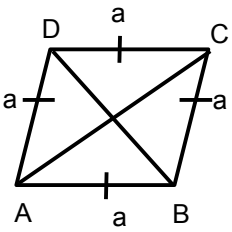
Parallelogram



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

$A = a \times h$

Rhombus



$AC = d_1$

$BD = d_2$

$P = 4a$

$A = \frac{1}{2}\,d_1 d_2$

Summary

The measurement of the boundary of a plane figure is known as its perimeter.

(A) Triangle:

(i) Scalene triangle :

Perimeter = a + b + c

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

(ii) Isosceles triangle :

Area = $\frac{1}{2}$ × base × $\sqrt{(\text{equal side})^2 - \frac{1}{4}(\text{base})^2}$

(iii) Right-angled triangle :

For an right-angled triangle, let b be the base, h be the perpendicular and d be the hypotenuse. Then :

(a) Perimeter = b + h + d

(b) Area = $\frac{1}{2}$ (Base × Height) = $\frac{1}{2}$ bh

(c) Hypotenuse, d = $\sqrt{b^2 + h^2}$ [Pythagoras theorem]

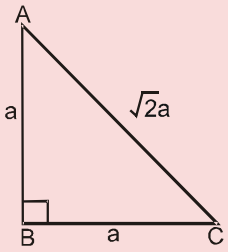
(iv) Isosceles right-angled triangle :

For an isosceles right-angled triangle, let a be the equal sides, then

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

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

(c) Area = $\frac{1}{2}$ (Base × Height) = $\frac{1}{2}$ (a × a) = $\frac{1}{2}$ a^2.



(v) Equilateral triangle :

Area = $\frac{\sqrt{3}}{4}$ (side)^2, **Perimeter** = 3(side).

(B) Rectangle :

Perimeter = 2 (ℓ + *b*) Area = ℓ × *b*

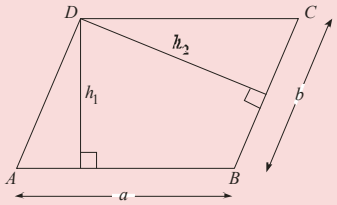
Length of diagonal = $\sqrt{\ell^2 + b^2}$.

(C) Square :

Perimeter = 4*a* Area = a^2

Length of diagonal = a$\sqrt{2}$

(D) Parallelogram :



Perimeter = 2 (a + b)

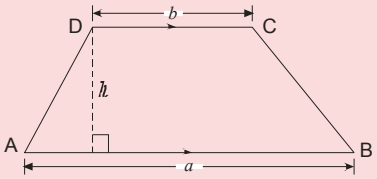
Area = ah_1 = bh_2

(E) Rhombus :

Perimeter = $4a = 2\sqrt{d_1^2 + d_2^2}$

Area = $\frac{1}{2} d_1 d_2$

(F) Trapezium :



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

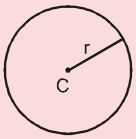
(G) Circle :

Circle is a path of a moving point, which moves in such a manner that its distance from a fixed point is always equal. The fixed point is called **centre** of the circle and the fixed distance is called **radius** of the circle.

Area of circle (A) = πr^2

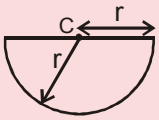
Circumference (C) = $2\pi r$

Diameter (D) = 2r



Circle

(H) Semicircle :



Semi-Circle

Perimeter = $\pi r + 2r = (\pi + 2) r$

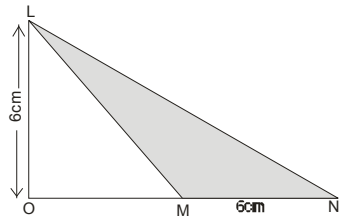
Area (A) = $\frac{\pi r^2}{2}$

EXERCISE 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

1. In the given figure, the area of triangle LMN is :



(A) 18 cm^2 (B) 12 cm^2 (C) 36 cm^2 (D) 40 cm^2

2. The sides of a triangle are 5 cm, 12 cm and 13 cm. Then its area is :

(A) 0.0024 m^2 (B) 0.0026 m^2 (C) 0.003 m^2 (D) 0.0015 m^2

3. Find the length of the hypotenuse of right isosceles triangle whose area is 961 cm^2.

(A) 31 cm (B) 62 cm (C) $31\sqrt{2}$ (D) $62\sqrt{2}$

4. The length and breadth of a rectangle are 23 cm and 11 cm respectively. The triangles formed by drawing the diagonal of the rectangle have the area of :

(A) 126.5 cm^2 (B) 253 cm^2 (C) 280 cm^2 (D) 300 cm^2

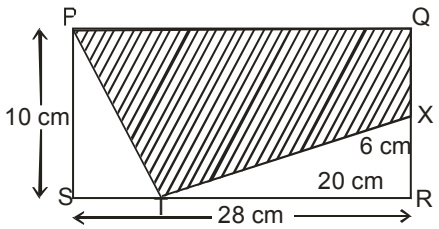
5. Two cross roads each 3 m wide, cut at right angles through the center of a rectangular park 72 m by 56 m, such that each is parallel to one of the sides of the rectangle. The area of the remaining portion of the park is :

(A) 4750 m^2 (B) 9280 m^2 (C) 3657 m^2 (D) 1292 m^2

6. Area of a rectangle is A. If its length is reduced by 10% and its breadth is increased by 10% then which of the following statements is true ?

(A) A remains unchanged (B) A is decreased by 1%
(C) A is decreased by 0.1% (D) A is increased by 0.1%

7. In the figure given below, PQRS is a rectangle. Find the area of the shaded portion in the given figure.



(A) 180 cm^2 (B) 100 cm^2 (C) 280 cm^2 (D) 140 cm^2

8. The area of a square is 225 sqm. Then, the perimeter of the square is :

(A) 50 m (B) 15 m (C) $15\sqrt{2}$ m (D) 60 m

9. If the length of a diagonal of a square is a + b, then the area of the square is :

(A) $(a + b)^2$ (B) $\frac{1}{2}(a-b)^2$ (C) $a^2 + b^2$ (D) $\frac{1}{2}(a+b)^2$

10. Each side of a square is 5 cm. The perimeter of the equilateral triangle formed on the diagonal of the square would be :

(A) 15 cm (B) 20 cm (C) $20\sqrt{2}$ cm (D) $15\sqrt{2}$ cm

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

12. The adjacent sides of a parallelogram are 10 m and 8 m . If the distance between the longer sides is 4 m, then find the distance between the shorter sides.

(A) 5m (B) 6m (C) 7m (D) 8m

13. The area of a rhombus is 54 cm^2. If its perimeter is 36 cm, then its altitude.

(A) 6 cm (B) 5 cm (C) 4 cm (D) 8 cm

14. The length of a side of rhombus is 5 meter and one of its diagonal is of length 8 meter. The other diagonal is of length :

(A) 5 cm (B) 8 cm (C) 7 cm (D) 6 cm

15. Diagonals of rhombus are 15 cm and 20 cm. Then its area and perimeter are :

(A) 150 cm^2, 50 cm (B) 120 cm^2, 50 cm
(C) 150 cm^2, 70 cm (D) 120 cm^2, 70 cm

16. The ratio of the length of the parallel sides of a trapezium is 4 : 1. The distance between them is 10 cm. If the area of the trapezium is 500 cm^2, find the length of the parallel sides.

(A) 20 cm, 40 cm (B) 20 cm, 80 cm (C) 30 cm, 60 cm (D) 10 cm, 20 cm

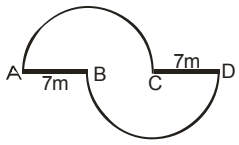
17. The area of a trapezium is 180 cm^2 and its height is 12 cm. If one of the parallel sides is double that of the other, then the length of two parallel sides in cm are :

(A) 20, 40 (B) 15, 30 (C) 10, 20 (D) 10, 10

18. The circumference of a circle exceeds the diameter by 16.8 cm. Then, the radius of the circle.

(A) 3.10 cm (B) 3.25 cm (C) 3.92 cm (D) 3.5 cm

19. If AB = BC = CD then find the perimeter of adjoining figure.

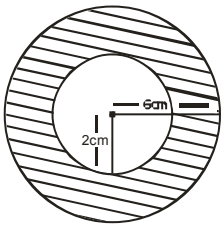


(A) 58 m (B) $\frac{44}{7}$ m (C) 142 m (D) none of these

20. The radius of a circle of area 616 cm^2 is :

(A) 16 cm (B) 12 cm (C) 14 cm (D) None of these

21. The area of the shaded region in the given figure is : (use $\pi = 3.14$)



(A) 12.56 cm^2 (B) 32 cm^2 (C) 100 cm^2 (D) 100.48 cm^2

22. The parallel sides of a trapezium are 24 cm and 20 cm. The distance between them is 7 cm. Find the radius of a circle whose area is equal to the area of the trapezium.
(A) 7 cm (B) 9 cm (C) 10 cm (D) none of these

FILL IN THE BLANKS

1. The perimeter of a Rectangle is 36 m. Its length is 10 m. Breadth is _____.

2. Length of diagonal of Rectangle is _____

3. If the ratio of area of two squares is 9:1, then the ratio of their perimeter is ____

4. Area of square having perimeter 20 cm is _____

5. Two diagonals of Rhombus are 6 cm and 12 cm . Then area is _____

6. Radius of circle is 7 cm .Then its area is _____

7. The difference between the circumfrence and radius of a circle is 37 cm. The area of the circle is_____

8. If area of a circle A_1 is 25 times the area of a circle A_2, then ratio of their circumference is _____

TRUE / FALSE

1. Area of Equilateral triangle is $\frac{\sqrt{3}}{2}$ × side

2. Diagonal of a square of side 2a is $2\sqrt{2}$ a.

3. Circumference of circle is πr^2.

4. $\frac{\text{Circumference}}{\text{diameter}} = \pi$

5. If ratio of radii of two circles is 3 : 4. Then ratio of their areas is 9 : 16

MATCH THE COLUMN

1.

Column–I		**Column–II**
(A) Area of circle	(p)	½ × b × h
(B) Circumference of a circle	(q)	$\pi\frac{d^2}{4}$
(C) Area of Triangle	(r)	4 × side
(D) Area of parallelogram	(s)	πd
(E) Perimeter of a square	(t)	b × h

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. Find the height of a triangle having an area of 72 cm^2 and base 16 cm.

2. If the area and length of a rectangular plot are 440 m^2 and 22 m respectively, then find its breadth?

3. A school room is 12 m long, 8 m wide, and 5 m high. Find the area of four walls.

4. Find the area of square if perimeter is 16cm.

5. Find the altitude of a parallelogram whose area is 2.25 m^2 and base is 25 dm.

6. The area of a rhombus is 36 cm^2. One of its diagonals is of length 12 cm. Find the length of other diagonal

7. Find the diameter of a circle whose circumfrence is 26.4 cm

8. The circumference of a compact disk with diameter of 5 inches is :

9. The difference between the circumference and radius of a circle is 37 cm. Then find the area of the circle.

SHORT ANSWER TYPE

10. Area of right angled triangle is 600 cm^2. If one of its sides containing the right angle is 40 cm then find the other two sides of the triangle.

11. In an isosceles triangle ABC, it is known that AC = AB = 2BC. If the perimeter of the triangle is 100, then find AC .

12. The perimeter of an isosceles triangle is 36 cm and its base is 3 cm less than each of the equal sides. Find (i) the length of each side of the triangle, (ii) the area of the triangle, and (iii) the height of the triangle.

13. The length of a rectangle is twice its breadth and one of its diagonal measures $3\sqrt{5}$ cm. Find the perimeter of rectangle.

14. Length of two sides of a parallelogram are in the ratio of 2 : 3. Find the sides of the parallelogram if its perimeter is 120 m.

15. The area of a rhombus is 36 cm^2. One of its diagonals is of length 12 cm.Find the other diagonal.

16. A wire is in the form of a square of side 18 m. It is bent in the form of rectangle, whose length and breadth are in the ratio of 3 : 1. What is the area of the rectangle ?

17. A cycle wheel makes 1400 revolutions. If the radius of the wheel is 2.5 m, then find the distance covered.

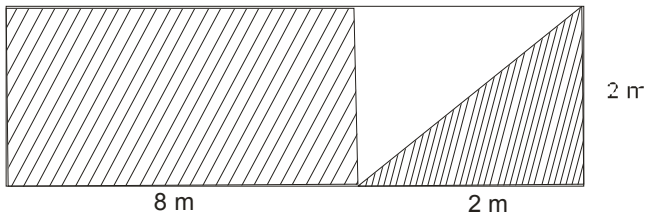
18. A circle is inscribed in a square whose each side is 28 cm. Find the area of the circular region.

19. The side of square garden is 150 m. A circular path of width 1.5 m is laid inside the garden touching all the sides. Find the cost of laying the path at 28 per m^2.

LONG ANSWER TYPE

20. Find the area in sq. cm of an isosceles triangle whose base is 16 cm and each of the equal sides is 9 cm.

21. The area of the shaded part in the figure given below is



22. A lawn is in the shape of a rectangle of length 80 m and width 40 m. Out side the lawn there is a footpath of uniform width 3 m. Find the area of the path.

23. The length and width of a rectangular field are 500 m and 400 m respectively; within it two roads of 10 metres width run parallel to both sides. Find the area covered by both the roads.

24. A rectangular sheet of cardboard is 9 cm by 6 cm. If greatest possible circle is cut off from the card board. Find the remaining area of the card board ?

25. The area of a square field is 900 m^2. Find its perimeter.

26. Find the area of a ring shaped region enclosed between two concentric circles of radii 20 cm and 15 cm.

27. How many times should a wheel of radius 1.4 m rotate to go around the perimeter of a rectangular field of length 120 m and breadth 100 m?

28. Area of the rectangle and the area of the circle are equal. If the dimensions of the rectangle are 14cm × 11 cm, then find the radius of the circle.

29. A circle of maximum possible area is cut out from a square sheet of area 'A'. Find the area of the circle.

EXERCISE 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

1. If the sides of a triangle are doubled, then its area :
(A) Remains the same (B) Becomes doubled
(C) Becomes three times (D) Becomes four times

2. Find the perimeter of triangle ABC. If $\angle A = 90^\circ$, AB = 8 cm and AC = 6 cm.
(A) 24 cm (B) 22 cm (C) 18 cm (D) 20 cm

3. The area of a right angled triangle is 20 cm^2 and one of the sides containing the right triangle is 4 cm. Then the altitude on the hypotenuse is :
(A) 8 cm (B) 10 cm (C) $\frac{10}{\sqrt{41}}$cm (D) $\frac{20}{\sqrt{29}}$cm

4. The ratio of length to the breadth of a rectangle is 4 : 3. If the perimeter of rectangle be 182 cm, then the difference between length and breadth is :
(A) 26 cm (B) 13 cm (C) 1 cm (D) 7 cm

5. The perimeter of a rectangle is 100 and its diagonal has length x. The area of this rectangle, is :
(A) $625 - x^2$ (B) $625 - \frac{x^2}{2}$ (C) $1250 - x^2$ (D) $1250 - \frac{x^2}{2}$

6. The area of a rhombus, one side of which measures 20 cm and one diagonal 24 cm is :
(A) 256 sq. cm (B) 384 sq. cm (C) 512 sq. cm (D) 480 sq. cm

7. The perimeter of a trapezium is 52 cm and its non-parallel sides are each equal to 10 cm and its altitude is 8 cm. Its area is :
(A) 128 cm^2 (B) 112 cm^2 (C) 118 cm^2 (D) 124 cm^2

8. A square ABCD is inscribed in a circle and AB = 4 cm, then radius of the circle is :
(A) 2 cm (B) $2\sqrt{2}$ m (C) 4 cm (D) $4\sqrt{2}$

9. A thin wire is bent into the form of a circle of radius 7 cm. If a square is made out of this wire, the side of the square would be :
(A) 7 cm (B) 14 cm (C) 11 cm (D) 22 cm

10. A lawn is the form of a square of side 30 m. A cow is tied with a rope of 10 m to a pole standing at one of its corner. The maximum area of the lawn grazed by this cow is :
(A) 300 m^2 (B) 150 m^2 (C) 78.5 m^2 (D) 450 m^2

11. Four horses are tethered at 4 corners of a square field of side 70 metres so that they just cannot reach one another. The area left ungrazed by the horses is :
(A) 1050 sq.m (B) 3850 sq.m (C) 950 sq.m (D) 1075 sq.m

12. If the diagonal and the area of a rectangle are 25 m and 168 m^2, what is the length of the rectangle ?
(A) 17 m (B) 31 m (C) 12 m (D) 24 m

SECTION -B (TECHIE STUFF)

13. How many cubes of surface area 96 square centimeters each can be made by melting a cube of surface area 384 square centimeters ?
(A) 2 (B) 4 (C) 6 (D) 8

14. The surface area of the three coterminous faces of a cuboid are 6, 15, 10 sq. cm respectively. Find the volume of the cuboid.
(A) 30 (B) 20 (C) 40 (D) 35

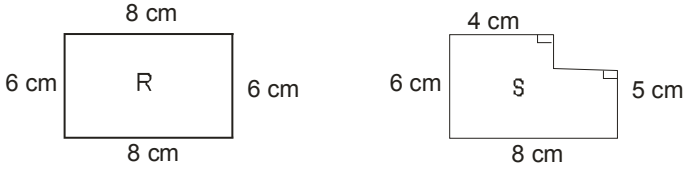
15. When two cube of side 12 cm are joined end to end to form a cuboid then the total surface area of cuboid is.
(A) 1740 cm^2 (B) 1640 cm^2 (C) 1540 cm^2 (D) 1440 cm^2

16. Find the volume of a cube whose surface area is 150 m^2.
(A) 140 cm^3 (B) 160 cm^3 (C) 150 cm^3 (D) 125 cm^3

EXERCISE 03

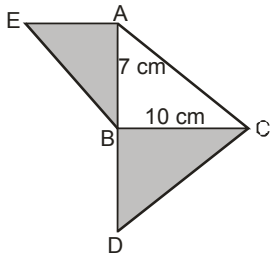
(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. Kalyan cut rectangle "R" from a sheet of paper. A smaller rectangle is then cut from the larger rectangle "R" to produce figure "S". In comparing "R" to "S" we have **[NSTSE 2009]**



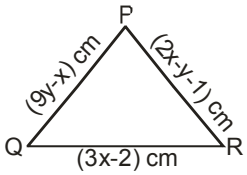
(A) the area and perimeter both decrease
(B) the area decreases and the perimeter increases
(C) the area and perimeter both increase
(D) the area decreases and the perimeter stays the same

2. In the figure given below, ABC is a right angle triangle where AB = 7 cm and BC = 10 cm. Given that AEB and BCD are right isosceles Δs. Area of the shaded region is
[NSTSE 2011



(A) 70 cm^2 (B) 35 cm^2 (C) 74.5 cm^2 (D) 75.5 cm^2

3. In the figure given below, **[NSTSE 2011]**



The perimeter, in cm, of the triangle is :

(A) 8y + 4x – 3 (B) 8y – 4x + 3 (C) 14x – 2y – 3 (D) 12xy – 3

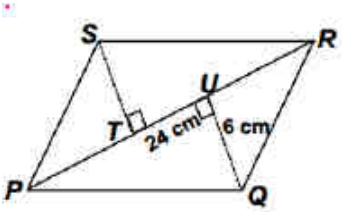
4. If the circumference of a circle is 704 cm, then its area is_____ **[IMO-2011]**

(A) 49324 m^2 (B) 39626 m^2 (C) 3672 cm^2 (D) 39424 cm^2

5. A rectangular field has length and breadth in the ratio of 16: 9. If its perimeter is 750 cm. What is its area? **[IMO-2011]**

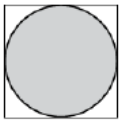
(A) 75000 cm^2 (B) 32400 cm^2 (C) 14400 cm^2 (D) 14000 cm^2

6. Find the area of parallelogram PQRS, if PR = 24 cm and QU = ST = 6 cm **[IMO-2012]**



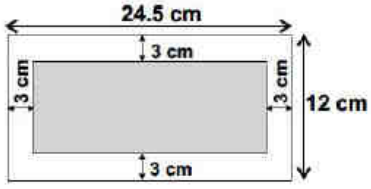
(A) 72 cm^2 (B) 100 cm^2 (C)150 cm^2 (D) 144 cm^2

7. Find the circumference of the circle that is within a square if the area of the square is 81 cm^2. (Take $\pi = \frac{22}{7}$) **[IMO-2012]**



(A) $7\frac{2}{7}$cm (B) $14\frac{2}{7}$cm (C) $28\frac{2}{7}$cm (D) $63\frac{9}{14}$cm

8. The length of a rectangular painting with border is 24.5 cm and its width is 12 cm. The width of the border is 3 cm. Find the area of the painting. **[IMO-2012]**

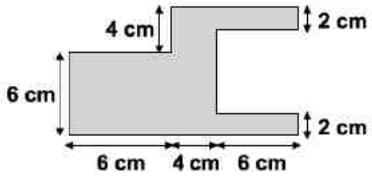


(A) 111 cm^2 (B) 100 cm^2 (C) 133 cm^2 (D) 294 cm^2

9. The side of a square plot is 80 m. A path of 4 m width along the sides of the square are constructed in the middle of the plot. Determine the area of the path. **[IMO-2012]**

(A) 1216 m^2 (B) 1200 m^2 (C) 1360 m^2 (D) 624 m^2

10. Find the area of the given figure (not drawn to scale). **[IMO-2012]**



(A) 200 cm^2 (B) 94 cm^2 (C) 84 cm^2 (D) 100 cm^2

11. The diameter of a scooter wheel is 56 cm. How much distance will it cover in 10 revolutions? **[IMO-2012]**

(A) 1660 cm (B) 1875 cm (C) 1560 cm (D) 1760 cm

12. The side of a square plot is 80 m. Two paths of 4 m width along the sides of the square are constructed in the middle of the plot. Determine the area of the path. **[IMO-2012]**

(A) 139 m^2 (B) 624 m^2 (C) 264 m^2 (D) 512 m^2

13. Which one of the following represents the largest area? **[NSTSE 2013]**

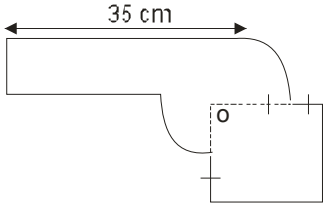
(A) $\frac{1}{4}$ of a circle of radius 3 cm

(B) a square of side 2 cm

(C) A rectangle of dimensions 3 cm by 1 cm

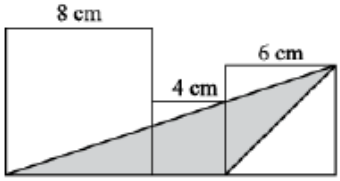
(D) A triangle of base 3 cm and vertical height 4 cm

14. In the given figure O is the center of the circle which has diameter of 14 cm. If the side of square is 14 cm long & arc interset at mid-point of the side of square. Find the perimeter of the figure. **[NSTSE 2013]**



(A) 98 cm (B) 125 cm (C) 134 cm (D) 148 cm

15. The figure is made up of 3 squares. What is the area of the shaded part of the figure? (figure not drawn to scale) **[IMO-2013]**



(A) 50 cm^2 (B) 24 cm^2 (C) 36 cm^2 (D) 48 cm^2

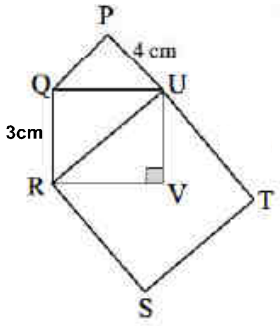
16. The circumference of the tyre of Radha's bicycle is 2.5 m. She took part in a bicycle race of 1 km. When she had covered 700 m, the tyre burst. If she had to finish the race. how many more times the wheel must go round? **[IMO-2013]**

(A) 24 (B) 120 (C) 125 (D) 30

17. A park 300 m by 210 m has a path 5 m wide all round it, the path being inside the park. Find the cost of constructing the path at Rs.100 per 10 m^2. **[IMO-2013]**

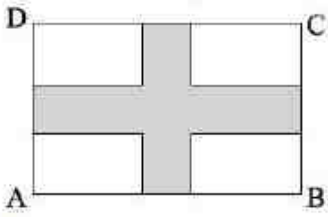
(A) Rs.500 (B) Rs.5000 (C) Rs.50000 (D) Rs.500000

18. In the given diagram. PQU is an equilateral triangle. QRVU is a rectangle and RSTU is a rhombus. Find the perimeter,in cm, of the whole diagram. **[IMO-2013]**



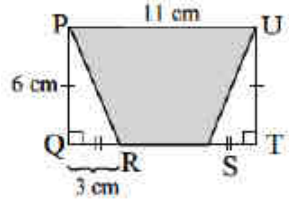
(A) 17 (B) 21 (C) 26 (D) 27

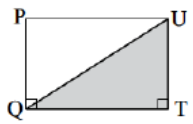
19. A rectangular grass plot 80 m × 60 m has two roads, each 10 in wide, running in the middle of it, one parallel to length and the other parallel to breadth. Find the cost of gravelling the roads at Rs.2 per m^2. **[IMO-2013]**

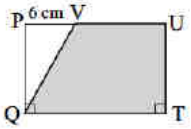


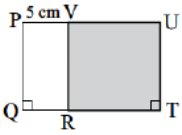
(A) Rs.2600 (B) Rs.2700 (C) Rs.2750 (D) Rs.2800

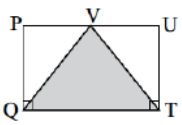
20. The diagram shows a rectangle. Which rectangle, A, B, C or D, has a shaded area which is the same as the shaded area in diagram? (The length and breadth of rectangle PQTU and each of the rectangles A, B, C and D are the same). **[IMO-2013]**



(A) 

(B) 

(C) 

(D) 

21. Mr. Sameer was trying to find a tablecloth for his rectangular dining table. He knew the area and perimeter of the tabletop. **[IMO-2013]**

Area = 36 square metres, Perimeter = 26 metres

Which of the following best represents the width and length of the tabletop?

(A) Width = 2 m, Length = 18 m (B) Width = 3 m, Length = 12 m

(C) Width = 6 m, Length = 6 m (D) Width = 4 m, Length = 9 m

22. In a triangle ABC, if AB + BC = 10cm, BC +CA = 12 cm, CA + AB = 16 cm, what is its perimeter? **[NSTSE 2014]**

(A) 19 cm (B) 17 cm (C) 38 cm (D) 30 cm

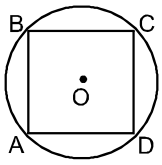
23. Jai made a 9 m by 3 m rectangular garden and rohit made a square garden of side 6 m . How much larger is the area of rohit 's garden than that of jai ? **[NSTSE 2014]**

(A) 6 (B) 9 (C) 16 (D) 12

24. A wire is bent in the form of a circle of radius 42 cm is again bent in the form of square . What is the ratio of the regions enclosed by the circle and the square ? **[NSTSE 2014]**

(A) 11 : 12 (B) 22 : 28 (C) 22 : 33 (D) 14 : 11

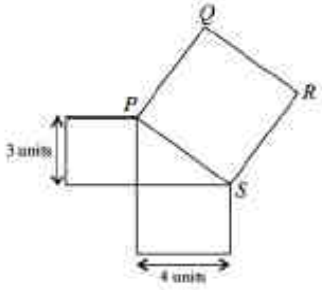
25. In the given figure a square of area 50 sq. units is inscribed in a circle with center O. **[NSTSE 2014]**



Which of the following is the cicumference of the circle ?

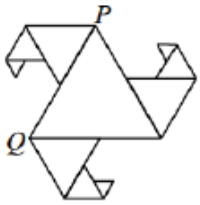
(A) 100 π units (B) 25 π units (C) 50 π units (D) 10 π units

26. Find the area of square PQRS. **[IMO-2014]**



(A) 19 sq. units (B) 36 sq. units (C) 16 sq. units (D) 25 sq. units

27. In the given figure all triangles are equilateral and PQ = 12 units. Other triangle have been formed by taking the mid-point of the sides. What is the perimeter of the figure? **[IMO-2014]**



(A) 62.3 units (B) 64.5 units (C) 65.8 units (D) 67.5 units

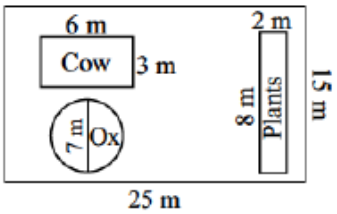
28. The lawn in front of Latika's house is 12 m × 8 m. whereas the lawn in front of Nisha's house is 15 m × 5 m. A bamboo fencing is built around both the lawns. How much fencing is required for both? **[IMO-2014]**

(A) 40 m (B) 80 m (C) 60 m (D) 90 m

29. A square, whose side is 4 metres has its corners cut away so as to form an octagon with all sides equal. Find the length of each side of the octagon (in metres). **[IMO-2014]**

(A) $\left(4\sqrt{2}-1\right)$ (B) $\frac{-2\sqrt{2}}{1+2\sqrt{2}}$ (C) $\frac{2\sqrt{2}}{\left(1+\sqrt{2}\right)}$ (D) None of these

30. People of a village take good care of plants, trees and animals. They marked some land for their pets (cow and ox) and plants. Find the ratio of the areas kept for animals and plants to the total area of the village. **[IMO-2014]**



(A) 75:21 (B) 125:39 (C) 29:150 (D) 29:121

ANSWER KEY

EXERCISE 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A	C	B	A	C	B	A	D	D	D	B	A	A	D	A
Ques.	16	17	18	19	20	21	22								
Ans.	B	C	C	A	C	D	A								

FILL IN THE BLANKS

1. 8cm **2.** $\sqrt{l^2+b^2}$ **3.** 3 : 1 **4.** 25 cm^2

5. 36 cm^2 **6.** 154 cm^2 **7.** 154 cm^2 **8.** 5 : 1.

TRUE / FALSE

1. False **2.** True **3.** False **4.** True **5.** True

MATCH THE COLUMN

1. (A) → q, (B) → s, (C) → p, (D) → t, (E) → r

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. 9 cm **2.** 20m. **3.** 200 sq meter **4.** 16 cm square

5. 9dm **6.** 6 cm **7.** 8.4 cm **8.** 15.71 inches

9. 154 cm square

SHORT ANSWER TYPE

10. 50 **11.** 40 **12.** **(i)** 13 cm, 13 cm, 10 cm **(ii)** 60 cm^2 **(iii)** 12 cm

13. 18 cm **14.** 36 m, 24 m **15.** 6 cm **16.** 243 m^2

17. 22 Km **18.** 616 cm^2 **19.** Rs. 19602

LONG ANSWER TYPE

20. $8\sqrt{17}$ cm² **21.** 18m² **22.** 756 m² **23.** 8900 m²

24. $9(6 - \pi)$ cm². **25.** 120m **26.** 550 cm² **27.** 50

28. 7 cm **29.** $\frac{A\pi}{4}$

EXERCISE 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	D	A	D	B	D	B	A	B	C	C	A	D

SECTION -B (TECHIE STUFF)

Ques.	13	14	15	16
Ans.	D	A	D	D

EXERCISE 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	D	C	A	D	B	D	C	A	A	D	D	B	A	C	C
Ques.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	B	C	C	A	B	D	A	B	D	D	D	D	B	D	C