- NOTES WITH MIND MAPS -

MATHEMATICS

(PERIMETER AND AREA)

7TH

Perimeter and Area

1. Perimeter is the distance around a closed figure when we go around the figure once. So, perimeter = sum of lengths of all sides.

2. The measurement of the region enclosed by a plane figure is called the area of the figure.

3. Perimeter of a rectangle = 2 × (length + breadth)

4. Perimeter of a square = 4 × (side)

5. Area of rectangle = (length) × (breadth)

6. Area of a square = (side)^2

7. Area of parallelogram = base × height

8. Area of triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

9. The perimeter of a circle is called its circumference. The length of the thread that winds tightly around the circle exactly once gives the circumference of the circle.

10. Circumference $= 2\pi r = \pi d$, where r = radius and d = diameter. Here, π (pi) is a constant.

11. The ratio of the circumference of a circle and its diameter is always constant.

12. Area of a circle with radius r units is equal to πr^2 sq.units.

13. The region enclosed between two concentric circles of different radii is called the area of ring.

    Area of path formed $= (\pi R^2 - \pi r^2)$ sq units

    $$= \pi(R^2 - r^2) \text{ sq units}$$

    $$= \pi(R + r)(R - r) \text{ sq units}$$

14. Conversion of units:

    1 cm^2 = 100 mm^2

    1 m^2 = 10000 cm^2

    1 dm^2 = 100 cm^2

    1 km^2 = 1000000 m^2

    1 hectare = 10000 m^2

Perimeter

Perimeter is the total length or total distance covered along the boundary of a closed shape.
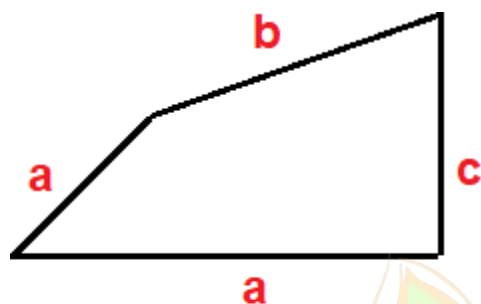
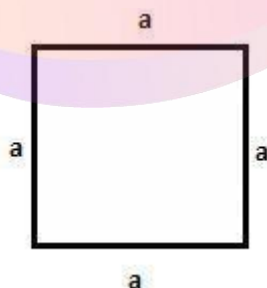$$p = a + b + c + d$$

The perimeter of a Quadrilateral

Area

The area is the total amount of surface enclosed by a closed figureS.
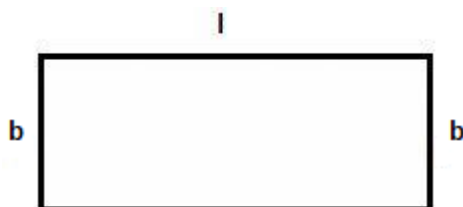
Areas of a closed figure

The perimeter of Square and Rectangle

Perimeter of a square = a + a + a + a = 4a, where a is the length of each side.

Square with side length 'a' units

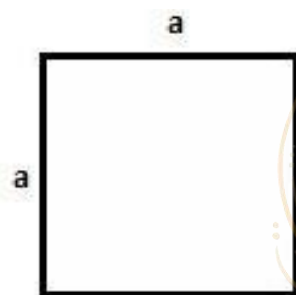Perimeter of a rectangle = l + l + b + b = 2(l + b), where l and b are length and breadth,

(2)

respectively.

Rectangle with length 'l' units and breadth 'b' units

Area of Square & Rectangle
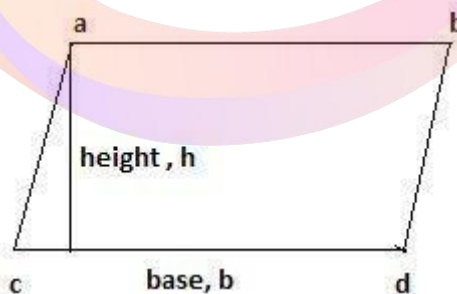
Area of square = $4a^2$

Here a is the length of each side

Square with the length of each side 'a' units

Area of rectangle = Length(l) × Breadth(b) = l × b

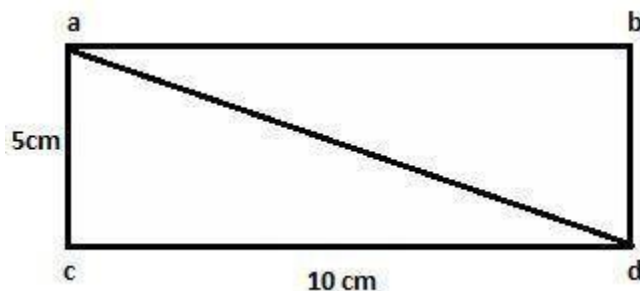Rectangle with length 'a' units and breadth 'b' units

Area of a Parallelogram

Area of parallelogram ABCD = (base × height)

Area of parallelogram ABCD = (b × h)

Triangle as Part of Rectangle

The rectangle can be considered as a combination of two congruent triangles.

Consider a rectangle ABCD, it is divided into 2 triangles ACD and ABD.S

Triangles as parts of Rectangle

Area of each triangle = 12 (Area of the rectangle).

= 12(length × breadth)

= 12(10cm × 5cm)

= 25cm^2

Area of a Triangle

Consider a parallelogram ABCD.

Draw a diagonal BD to divide the parallelogram into two congruent triangles.
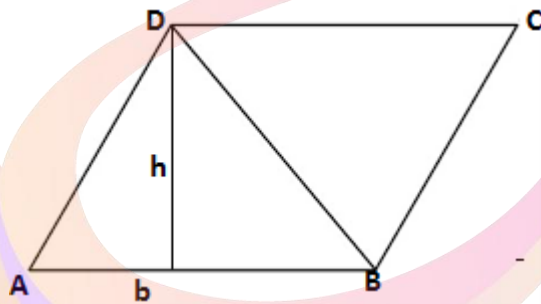
Area of Triangle = 1/2 (base × height)

Area of triangle ABD = 1/2 (Area of parallelogram ABCD)

Area of triangle ABD = 1/2 (b × h)

Conversion of Units

Kilometres, metres, centimetres, millimetres are units of length.
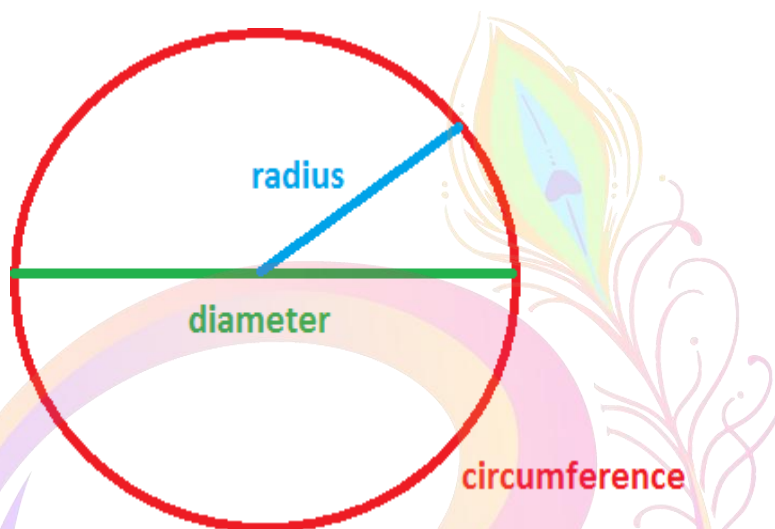
10 millimetres = 1 centimetre

100 centimetres = 1 metre

1000 metres = 1 kilometre

Life of Pi

Terms Related to Circle

- A circle is a simple closed curve which is not a polygon.

- A circle is a collection of points which are equidistant from a fixed point.

- The fixed point in the middle is called the centre.

- The fixed distance is known as radius.

- The perimeter of a circle is also called as the circumference of the circle.

Circumference of a Circle

The circumference of a circle (C) is the total path or total distance covered by the circle. It is also called a perimeter of the circle.

Circumference of a circle = $2 \times \pi \times r$,

where r is the radius of the circle.

Visualising Area of a Circle

Area of Circle

Area of a circle is the total region enclosed by the circle.

Area of a circle = $\pi \times r^2$, where r is the radius of the circle.

Circle Definition

A circle is a closed two-dimensional figure in which the set of all the points in the plane is equidistant from a given point called "centre". Every line that passes through the circle forms the line of reflection symmetry. Also, it has rotational symmetry around the centre for every angle. The circle formula in the plane is given as:

$(x-h)^2 + (y-k)^2 = r^2$

where (x, y) are the coordinate points

(h, k) is the coordinate of the centre of a circle

and r is the radius of a circle.

Circle Shaped Objects

There are many objects we have seen in the real world that are circular in shape. Some of the examples are:

- Ring
- CD/Disc
- Bangles
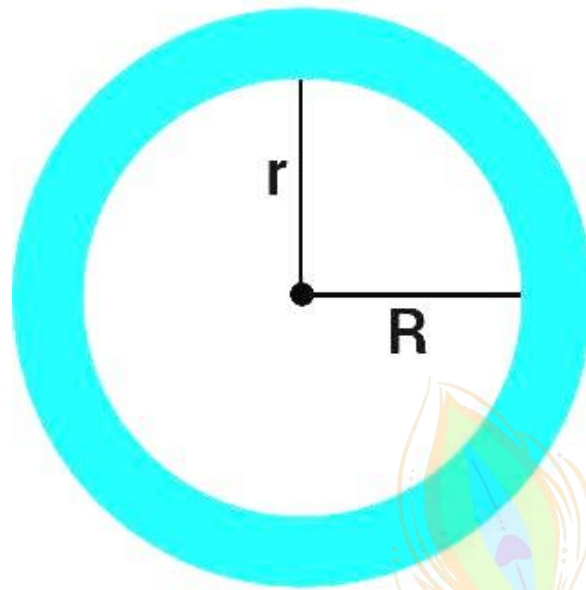- Coins
- Wheels
- Button
- Dartboard
- Hula hoop

We can observe many such examples in our day to day life.

Parts of Circle

A circle has different parts based on the positions and their properties. The different parts of a circle are explained below in detail.

Annulus-The region bounded by two concentric circles. It is basically a ring-shaped object. See the figure below.
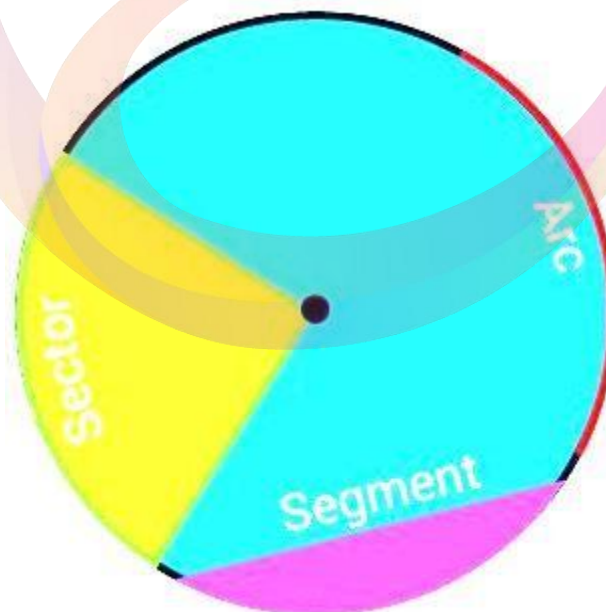
Annulus

Arc – It is basically the connected curve of a circle.

Sector – A region bounded by two radii and an arc.

Segment- A region bounded by a chord and an arc lying between the chord's endpoints. It is to be noted that segments do not contain the centre.

See the figure below explaining the arc, sector and segment of a circle.

Centre – It is the midpoint of a circle.

**Chord-** A line segment whose endpoints lie on the circle.

Diameter- A line segment having both the endpoints on the circle and is the largest chord of the circle.

Radius- A line segment connecting the centre of a circle to any point on the circle itself.

Secant- A straight line cutting the circle at two points. It is also called an extended chord.

Tangent- A coplanar straight line touching the circle at a single point.

See the figure below-representing the centre, chord, diameter, radius, secant and tangent of a circle.
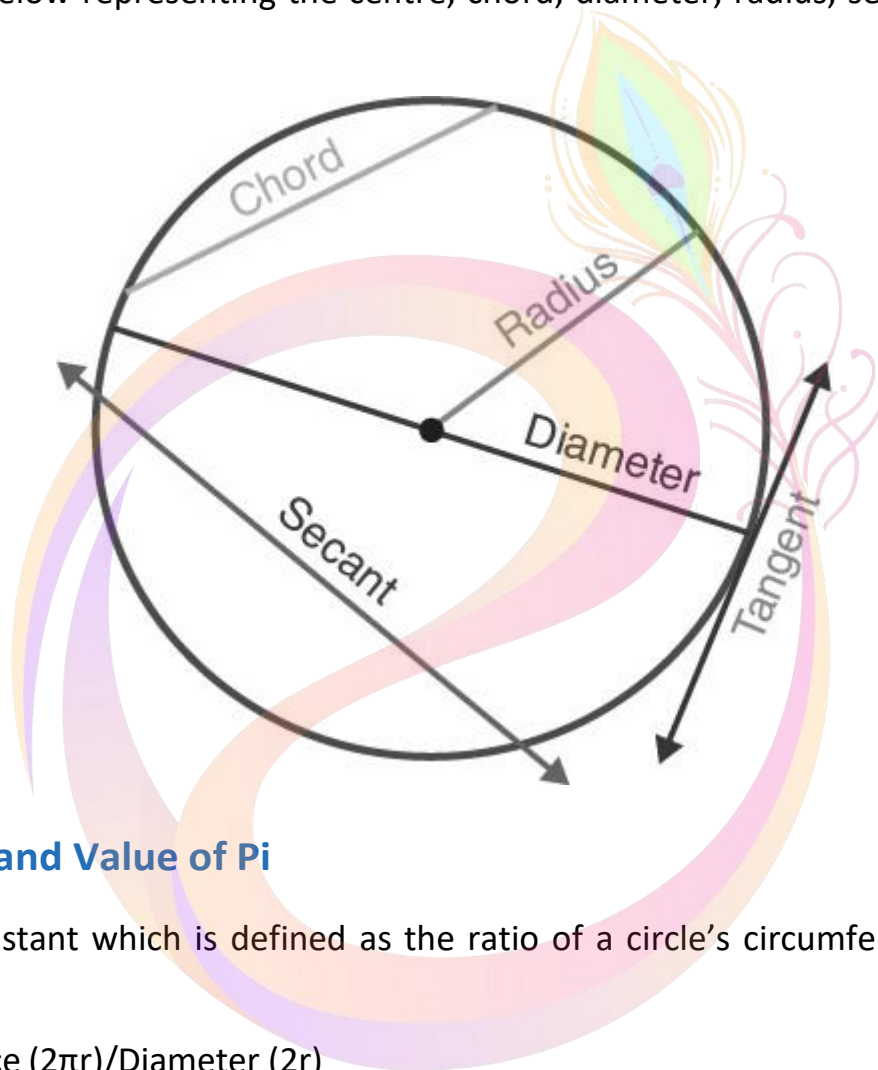
Introduction and Value of Pi

Pi (π) is the constant which is defined as the ratio of a circle's circumference (2πr) to its diameter(2r).

π= Circumference (2πr)/Diameter (2r)

The value of pi is approximately equal to 3.14159 or 22/7.

Problem Solving

Cost of Framing, Fencing

- Cost of framing or fencing a land is calculated by finding its perimeter.

- Example: A square-shaped land has length of its side 10m.

   Perimeter of the land = 4 × 10 = 40m

Cost of fencing 1m = Rs 10

Cost of fencing the land = 40 m × Rs 10 = Rs 400

Cost of Painting, Laminating

- Cost of painting a surface depends on the area of the surface.
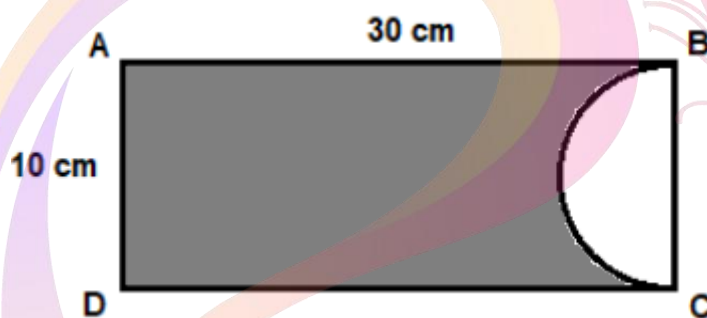
- Example: A wall has dimensions 5m×4m.

  Area of the wall = 5m × 4m = 20m^2

  Cost of painting 1m^2 of area is Rs 20.

  Cost of painting the wall = 20m^2 × Rs 20 = Rs 400

Area of Mixed Shapes

Find the area of the shaded portion using the given information.

Area of the shaded portion

Solution: Diameter of the semicircle = 10cm

Radius of semicircle = 5cm

Area of the shaded portion = Area of rectangle ABCD – Area of semicircle

Area of the shaded portion = (l × b) – (πr^2/2)

= 30×10 – (π × 5^2/2)

= 300 – (π × 25/2)

= (600 – 25π)/2

= (600 – 78.5)/2

= 260.7 cm^2