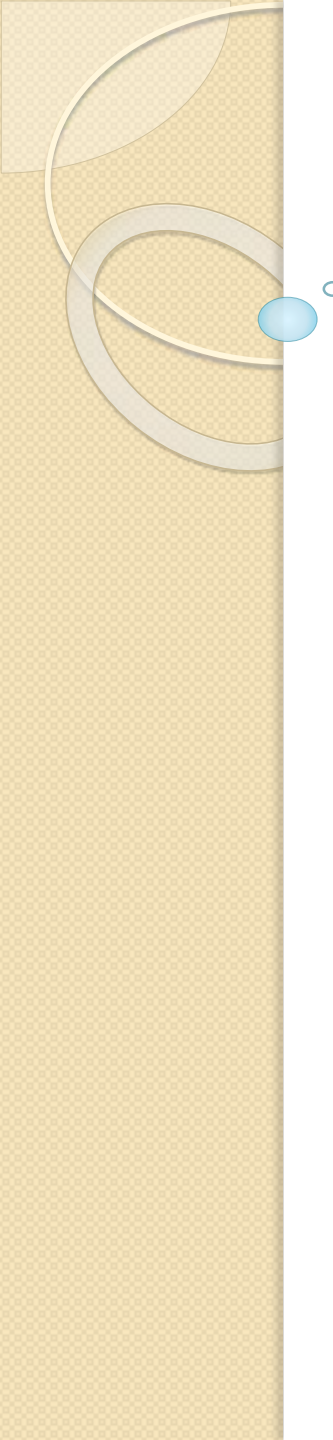




# **SUBJECT: MATHEMATICS**

## **CLASS VI**

**TOPIC : BASIC GEOMETRICAL IDEAS**

***Prepared By : Sasmita Senapaty***

# LEARNING OBJECTIVES

- **Identifying** point, line, line segments, ray, three regions of closed curve.
- **Giving examples** of point , line, line segment, ray and polygon from their environment.
- **Defining** closed curve, open curve, collinear points, non collinear points, polygon etc.
- **Differentiating** between closed and open curves, plane and curved surfaces, parallel and intersecting lines.
- **Stating** the properties of point and line.
- **Recognising** concurrent lines.
- **Enhancing** the understanding of the concepts of geometry and to improvise the skill of visualisation.

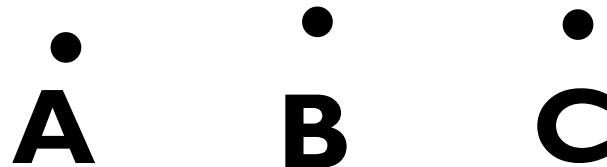
# INTRODUCTION

- The fundamental geometrical concepts depend on three basic concepts — **Point**, **Line** and **Plane**.
- The terms cannot be precisely defined. However, the meanings of these terms are explained through examples.
- Just as Maths deals with numbers, geometry deals with figures, points and lines.....

# • POINT

A point is usually represented by a small dot.

- It shows the location.
- It is named by one capital letter.



A B C are the points.



The tip of a  
compass



The sharpened  
end of a pencil



The pointed end of  
a needle.

***By a sharp tip of the pencil, mark a dot on the paper. Sharper the tip, thinner will be the dot.***

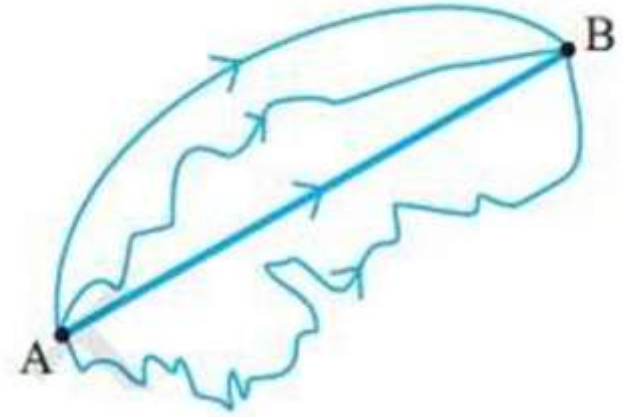
# LINE SEGMENT

- A line segment corresponds to the shortest distance between two points.
- The line segment joining points A and B is denoted by  $\overline{AB}$ .
- It has two end points.
- It has a definite length.



## EXAMPLES OF LINE SEGMENTS FROM DAILY LIFE :

- (a) Edges of ruler
- (b) Edges of window and door
- (c) Edges of books



***This shortest join of point A to B (including A and B) shown here is a line Segment AB***

# LINES

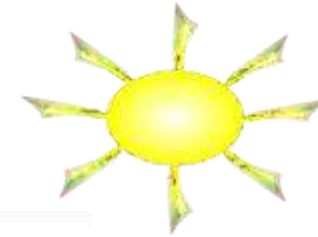
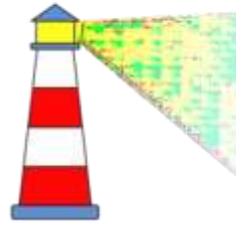
- A line is obtained when a line segment is extended on both directions indefinitely; it is denoted by line AB or sometimes by a single small letter like l.



# RAY

When a line segment is extended in one direction, ray is obtained. It starts at one point and goes endlessly in a direction. It is a portion of line.

Beam of light from a light house

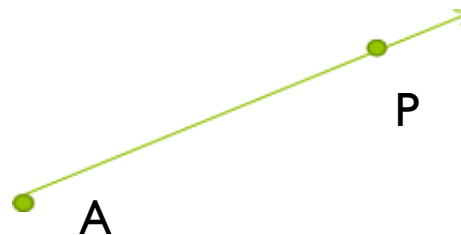


sun rays



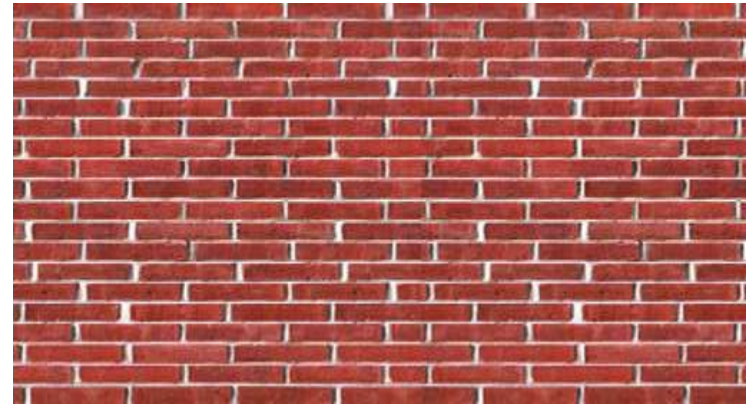
Ray of light from a torch

- Two points are shown on the ray. They are (a) A, the starting point (b) P, a point on the path of the ray.
- We denote it by  $\overrightarrow{AP}$ .



# PLANE SURFACES

- Plane is a flat surface which extends endlessly in all directions.
- **Examples:** Surface of green board, table top, surface of wall.



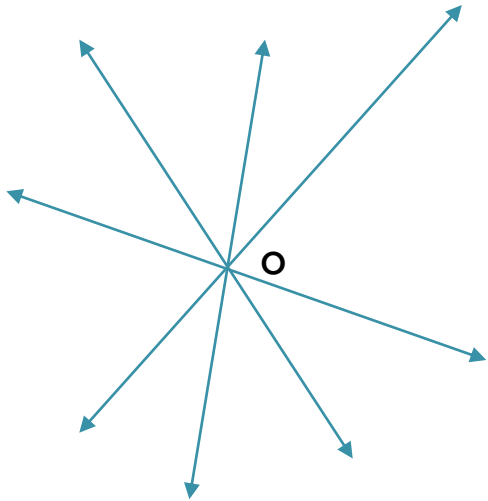
# **CURVED SURFACES**



**EXAMPLES: Surfaces of globe, football and orange etc.**

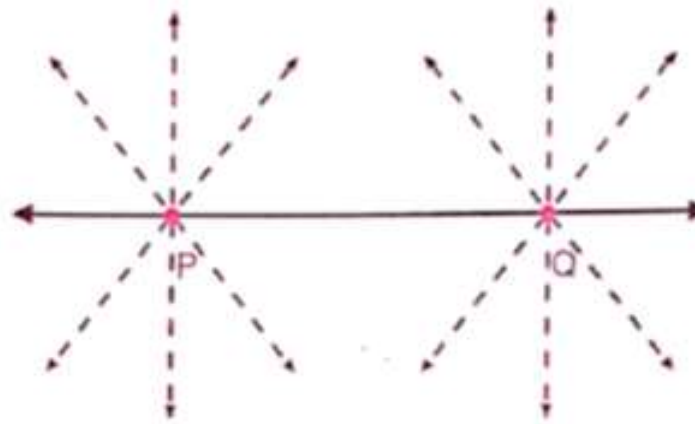
# PROPERTIES OF POINT AND LINE

- How many lines can be drawn through a point?



**PROPERTY 1:** An unlimited number of lines can be drawn passing through a given point in a plane.

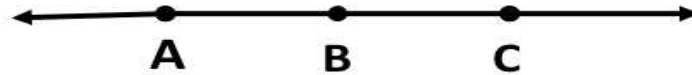
# How many lines can pass through two given points?



We can draw only one line passing through two given points.

**PROPERTY 2:** Only one line can be drawn passing through two given points in a plane.

**COLLINEAR POINTS**- Three or more points in a plane which lie on the same line are called collinear points.

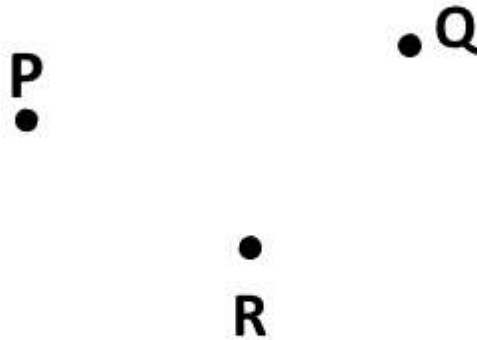


**A, B, and C are COLLINEAR POINTS**

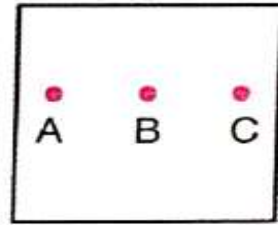
## Non collinear points:

Points that do not lie on the same line are called non collinear points.

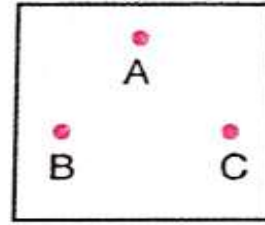
### COLLINEAR POINTS & NON-COLLINEAR POINTS



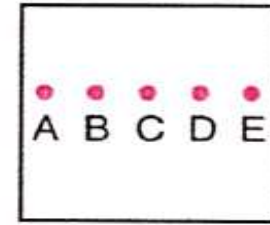
**P, Q, and R are NON-COLLINEAR POINTS**



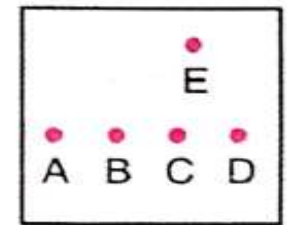
(a)



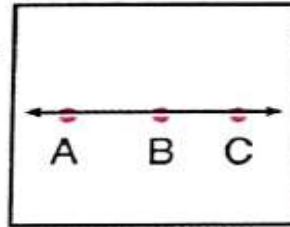
(b)



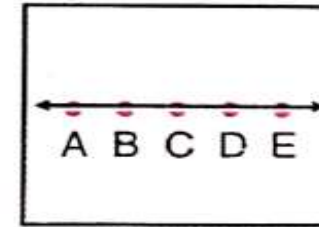
(c)



(d)



(a)



(c)

**(a) and (c) are examples of collinear points .  
(b) and (d) are examples of non collinear points.**

## EXAMPLES OF COLLINEAR POINTS AND NON COLLINEAR POINTS

### COLLINEAR POINTS:

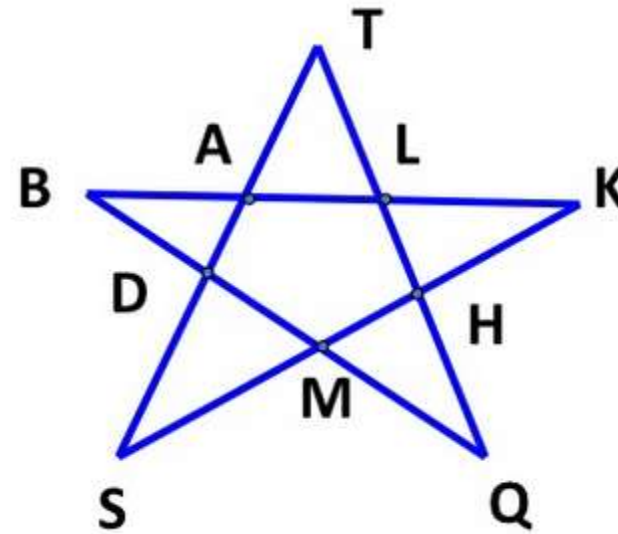
(T, A, D, S) (T, L, H, Q)

(B, A, L, K) (S, M, H, K)

### NON COLLINEAR POINTS

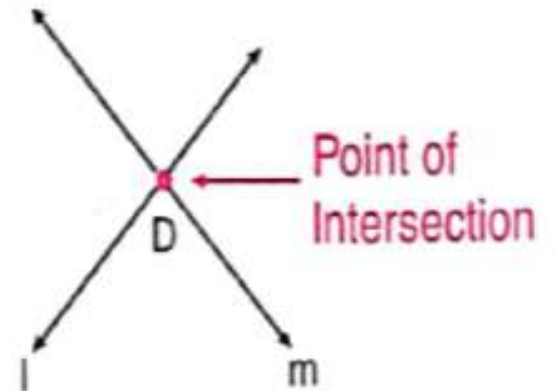
(T, L, M, A) (B, T, H, S)

(B, D, S, M) (B, D, L, H)



# INTERSECTING LINES

- Two distinct lines in a plane meeting at a point are called intersecting lines.
- The point where the lines meet is called the point of intersection.
- Two lines  $l$  and  $m$  meet at point  $D$ .

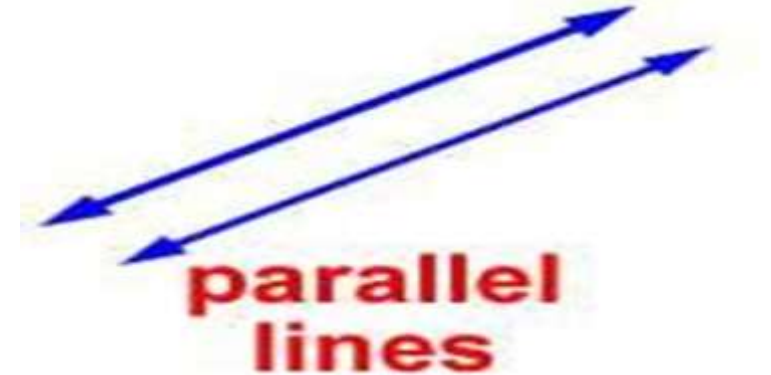


# PARALLEL LINES

- Two lines in a plane are said to be parallel if they do not meet anywhere.

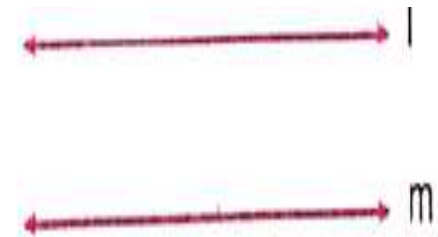
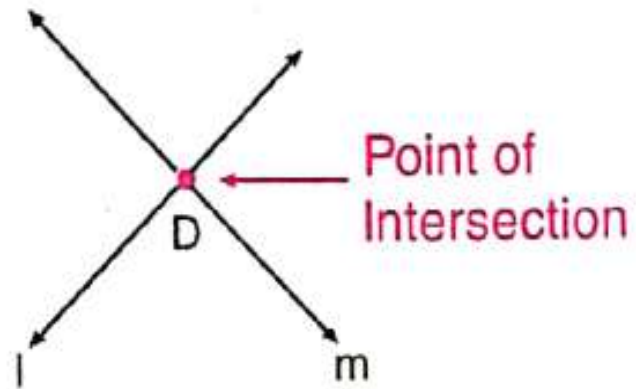


**Rail lines are parallel**



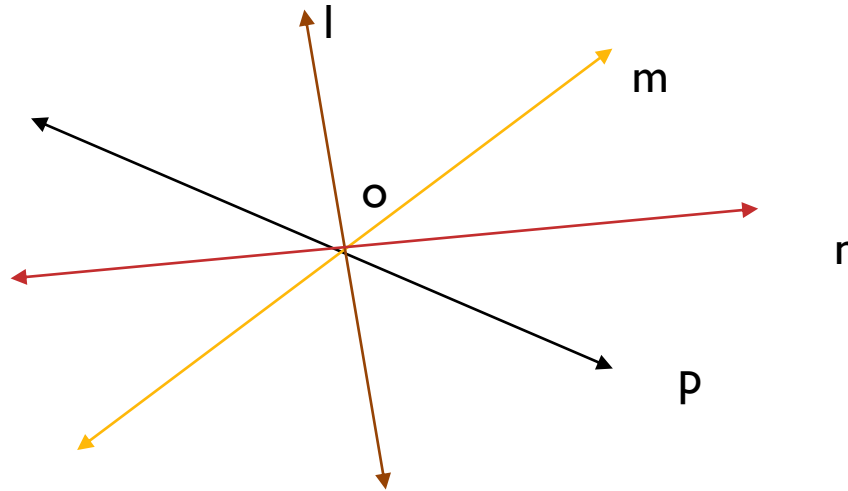
The opposite edges of ruler (scale)

**PROPERTY- 3 :** Two lines in a plane either intersect each other at one point or are parallel to each other



# CONCURRENT LINES

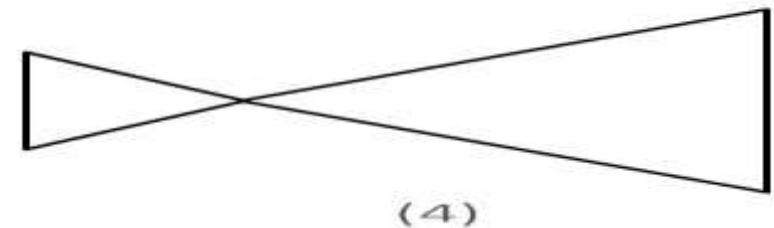
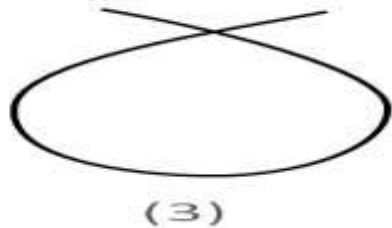
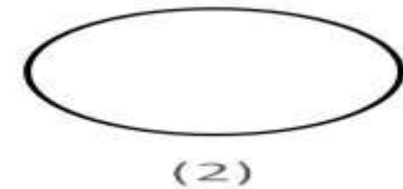
Three or more lines in a plane which pass through the same point are called concurrent lines.



- The point through which these lines pass is called point of concurrence.
- O is the point of concurrence in this figure.

# Curves

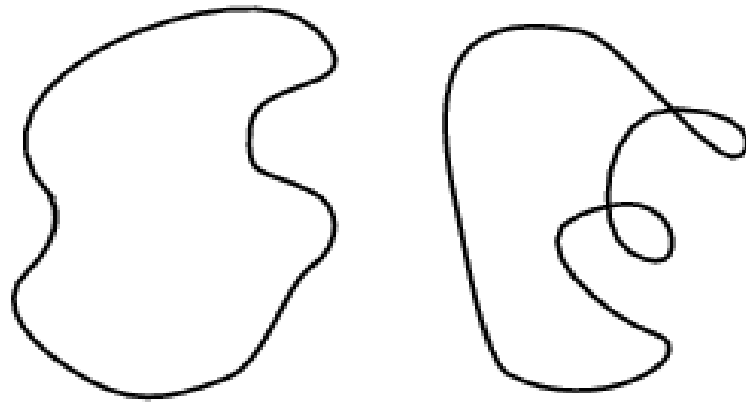
- The pictures that are results of doodling are called curves.
- We can draw the curves without lifting the pencil from the paper and without the use of a ruler.



- If a curve does not cross itself then it is called a simple curve. Fig. 1 & 2 are examples of simple curve.

# Open and Closed Curves

- Open Curves: The curves in which starting and ending points are not same.
- Closed Curves: The curves in which starting and ending points are same.



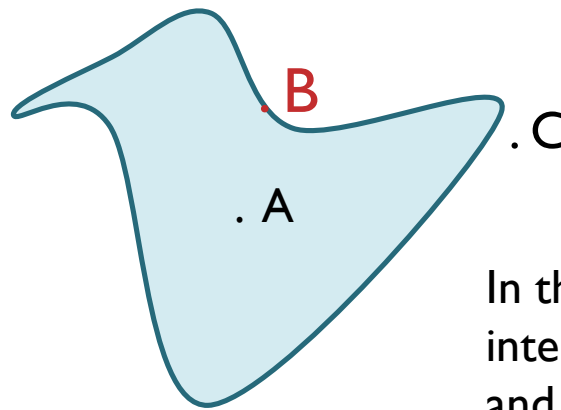
*closed curves*



*open curves*

# Parts of the closed curve

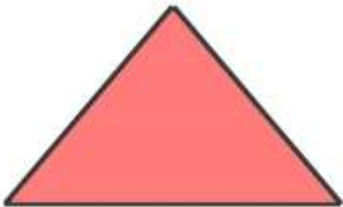
- There are three parts in a closed curve.
  - Interior of the curve
  - Boundary of the curve
  - Exterior of the curve
- The interior of a curve together with its boundary is called its region.



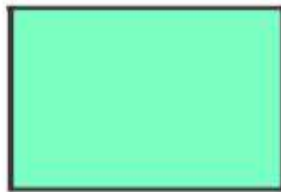
In the figure, A is in the interior, B is on the curve and C is in the exterior

# Polygons

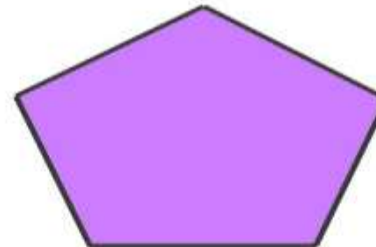
- A figure is a polygon if it is a simple closed figure made up entirely of line segments.



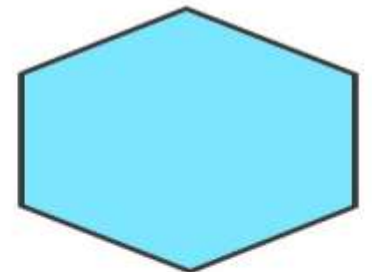
Triangle



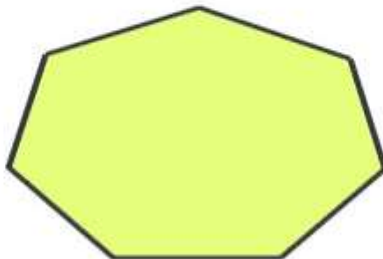
Quadrilateral



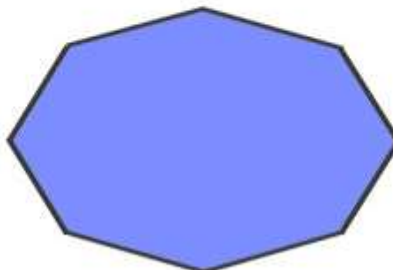
Pentagon



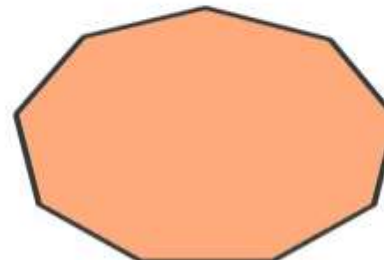
Hexagon



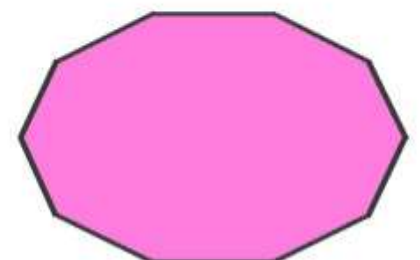
Heptagon



Octagon

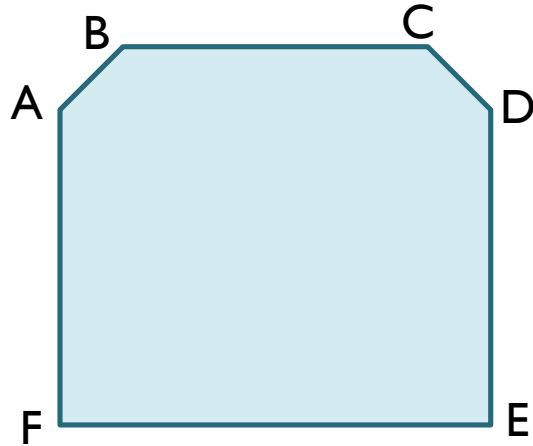


Nonagon



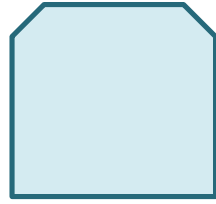
Decagon

# Polygon(Hexagon)



- The line segments forming a polygon are called its sides. The sides of the figure(Hexagon) are AB, BC, CD, DE, EF, FA.
- The meeting point of a pair of sides is called vertex. The vertices of the figure are points A,B,C,D,E,F.

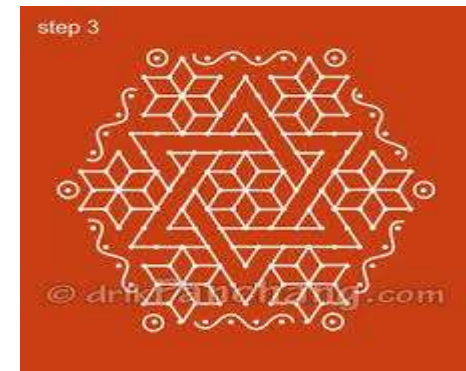
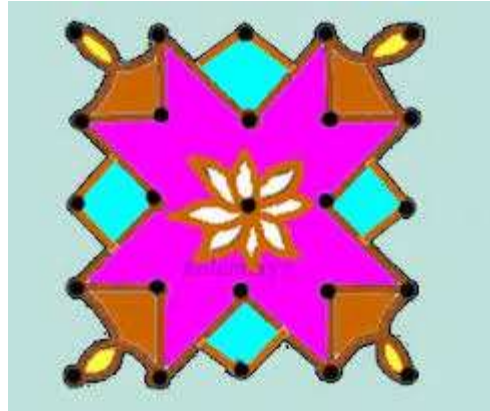
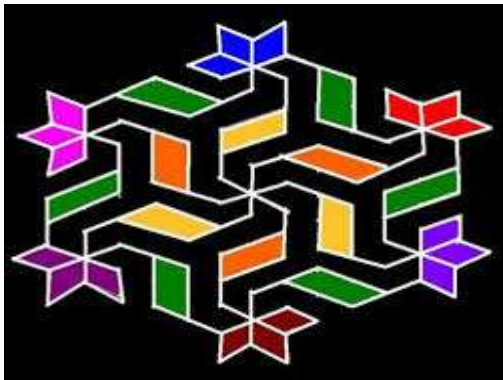
# Hexagon



- **Adjacent sides of the polygon**—Any two sides with common end point. Example: Sides AB and BC are adjacent sides with common end point as B.
- **Adjacent vertices of the polygon**—The end point of the same sides of a polygon. Example: Vertices E and F are adjacent whereas vertices A and C are not adjacent.
- **Diagonals of the polygon**—The join of the pair of vertices which are not adjacent. Example: Diagonals of the hexagon are  $\overline{AC}$ ,  $\overline{AD}$ ,  $\overline{AE}$ ,  $\overline{BD}$ ,  $\overline{BE}$ ,  $\overline{BF}$ ,  $\overline{DF}$ ,  $\overline{CE}$ ,  $\overline{CF}$ .

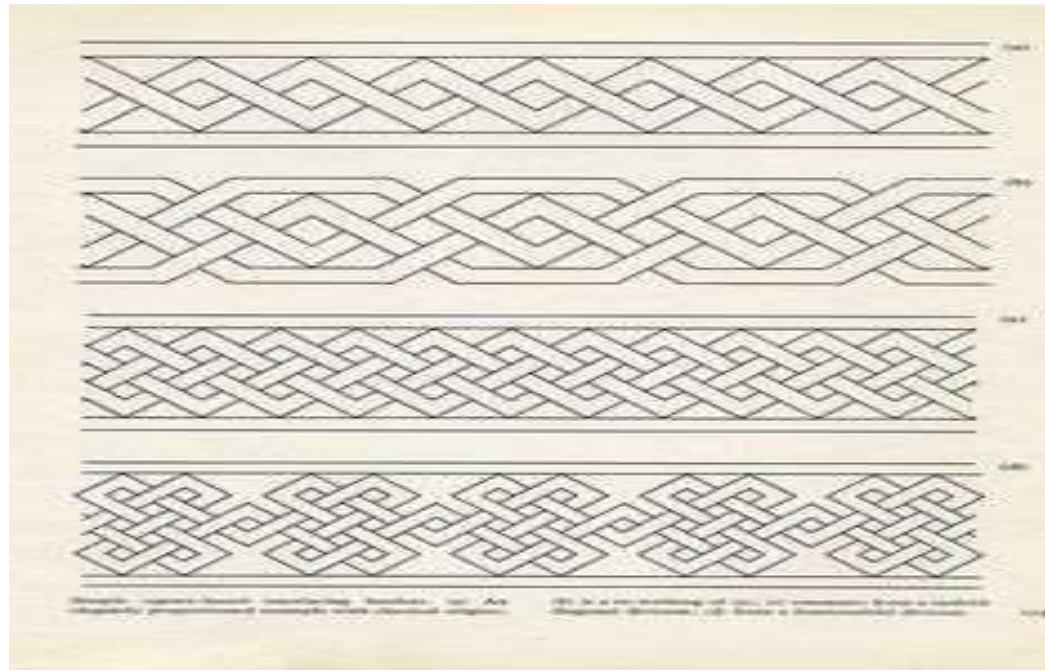
# ART INTEGRATION

## (Rangoli using dots and line segments)



# ACTIVITY

- **Drawing** a rangoli using dots and line segments.
- **Designing** a saree border using concept of parallel, intersecting lines, dots and line segments.



# LEARNING OUTCOMES

- **Students will be able to:**
  - **Identify** point, line, line segments, ray, three regions of closed curve.
  - **Give examples** of point, line, line segment, ray & polygon from their environment.
  - **Define** collinear points and non collinear points, polygon, closed and open curve.
  - **Differentiate** between plane and curved surfaces, closed and open curves, parallel and intersecting lines.
  - **State** the properties of point and line.
  - **Recognise** concurrent lines.
  - **Describe** geometrical ideas like point, line, line segment, ray, intersecting lines, parallel lines etc., with the help of examples in surroundings.
  - **Establish** the relation between line, line segment and ray.

# WORKSHEET(BASIC)

1. Mark a point on a sheet of paper and draw a line passing through it. How many lines can you draw through this point?
2. **One and only one line can be drawn passing through two given points. (T/F)**
3. **A page of a book is an example of a \_\_\_\_\_ surface.**
4. **The 'multiplication' sign represents \_\_\_\_\_ line segments.**
5. **Two lines in a plane always intersect in a plane. (T/ F)**
6. **Opposite sides of a blackboard represent parallel lines. (T/ F)**
7. **Four points are collinear if any three of them lie on the same line. (T/ F).**
8. **The minimum number of points of intersection of any three lines is one. (T/F)**
9. **Give three examples (each) from your environment.**
  - i. **Intersecting lines**
  - ii. **Parallel lines**
10. **How many lines can be drawn passing through two given points?**

# WORKSHEET(STANDARD)

1. What is the maximum and minimum number of points of intersection of three lines in a plane?

2. With the help of a figure, find the maximum and minimum number of points of intersection of four lines in a plane.

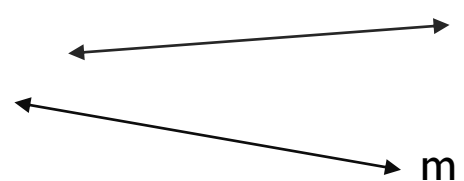
3. A, B, C are any three points in a plane. Join them in pairs. How many lines can you get if –

a) A, B, C are collinear?

b) A, B, C are non-collinear.

4. Lines p, q and r are concurrent. Also lines p, s and t are concurrent. Is it always true that the lines q, r and s will be concurrent? Is it always true for lines q, r and t ?

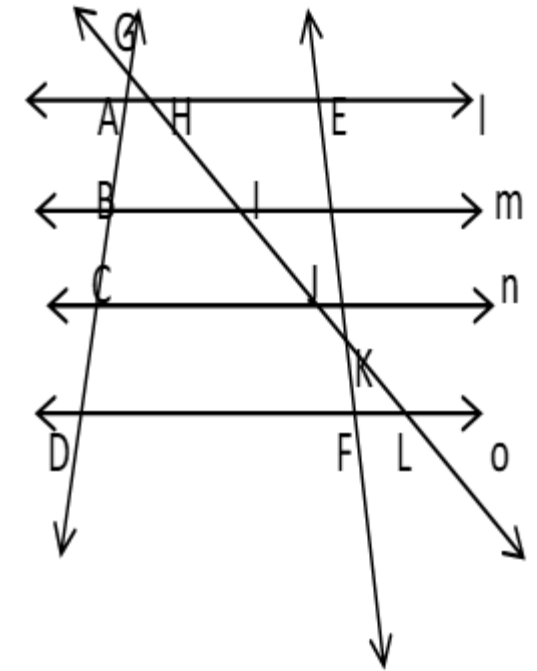
5. Are the following pairs of lines parallel? If not, why?



# WORKSHEET(ADVANCE)

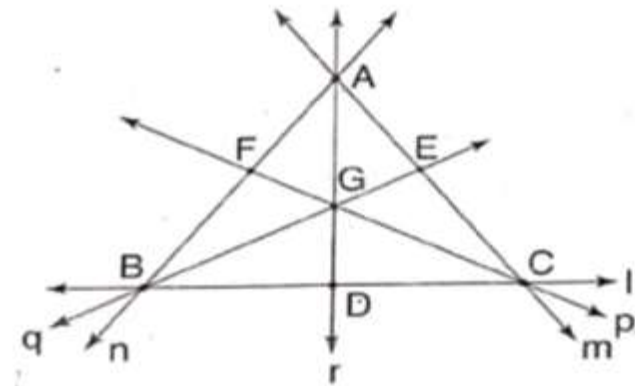
I. From the figure, answer the following

- a) All pairs of parallel lines
- b) All pairs of intersecting lines
- c) Lines whose point of intersection is D
- d) Lines whose point of intersection is J



**2. From the given figure name:-**

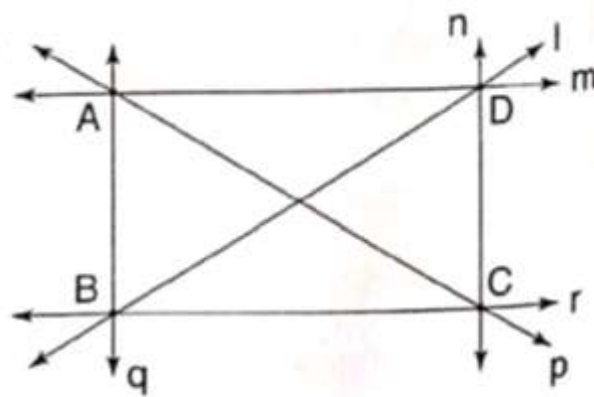
- a) Lines concurrent at point A.
- b) All the set of collinear points.
- c) Lines concurrent at point G.
- d) Point of intersection of 3 lines  $l, p, m$ .
- e) Two pairs of intersecting lines



3. From the given figure name:

a) Lines concurrent at D and B.

b) Point of concurrence of lines AD, AB, AC.



THANK YOU !!!