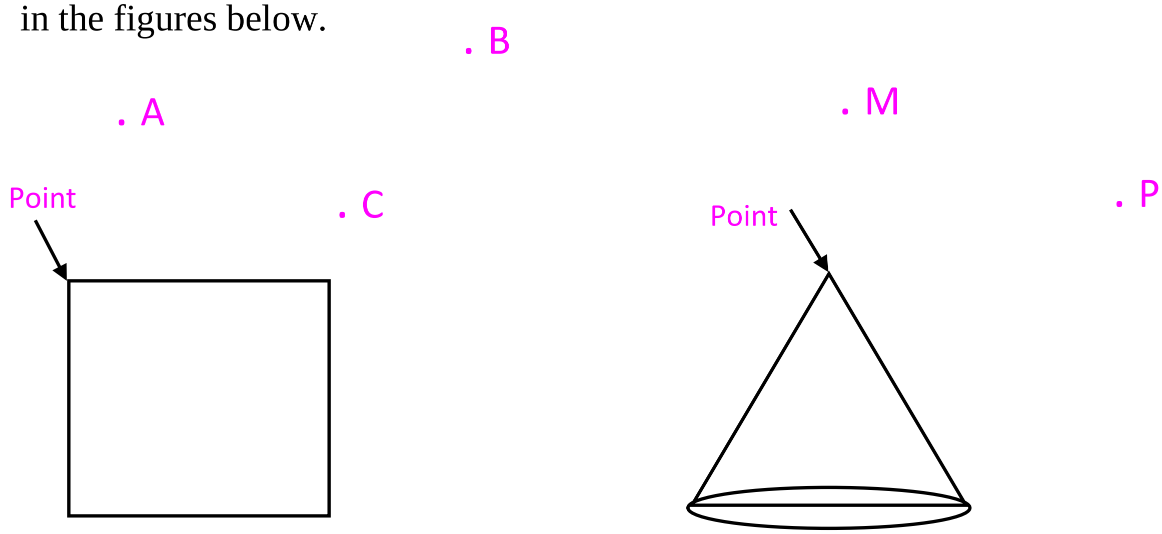
Class: VI **Date: 10.6.2020**

- The term '*Geometry*' is the English equivalent of the Greek word '*Geometron*'. '*Geo'* means Earth and '*metron*' means Measurement.
- The geometry began when man felt the need to measure the lands while buying and selling.
- Various shapes and figures with which we deal in geometry are called geometrical figures.
- There are three basic terms, namely Point, Line and Plane which form the building blocks of geometry just as numbers, alphabets and the four fundamental operation of addition, subtraction, multiplication and division are the basic elements of algebra.

- ***Point:*** A *point* depicts a location. A *point* depicts the exact position of an object. It does not have any size. A point has no length, breadth or height.

  A small dot marked by a pencil on a plane sheet of paper or a tiny prick made by a fine pin on a paper. The corners of a square, the tip of an ice cone etc. are examples of a point.

  A point is marked by a single capital letter of the English alphabet such as A, B, M, O, P, etc. and is read as point A, point B, point M, point P etc. as shown in the figures below.



- ***Plane:*** In geometry, a *plane* refers to any flat and smooth surface. It has length and width but no height.

  A plane is never ending flat surface which extends indefinitely in all directions. It therefore has only two dimensions – length and width, both infinitely long.

  A plane extends indefinitely in all directions, so we cannot draw a plane only a portion of it is drawn and is usually represented by a rectangle or a parallelogram. Three non-collinear points determine a plane.
  Collinear points are points which lie on the same line.

- ***Line Segment:*** A line segment corresponds to the shortest distance between two points. A line segment joining points A and B is denoted by $\overline{AB}$ or $\overline{BA}$. The points A and B are called the end points of the line segment. A line segment has a definite length. It has no width.

For example: The edge of a box, the edge of a post card, the edge of a blackboard, the edge of a table in the class room etc. are all exmples of line segment.

Activity:1

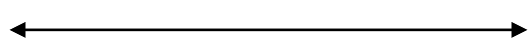
Take a square or rectangular piece of paper. First fold it and then unfold it. We can see a fold. This gives the idea of a line segment.

Activity:2

Take a thin thread. Hold its two ends and stretch it. The ends hled by hands are the points of the line segment which is shown by the thread.

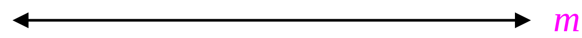
- ***Line:*** The word *'line'* usually refers to a 'straight line'. A line has no width. It is absolutely straight and can extend indefinitely in both directions. A line does not have length as it extends indefinitely in both the directions. We can also say that two points determine a line.

  Since it ends indefinitely in both the directions, only a portion of a line is drawn and arrow heads are marked at its two ends indicating that it extends indefinitely in both the directions as shown in the figure below.

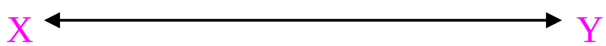


Naming a line: *A line can be named in two ways:*

1) *By putting a small letter of English alphabet by the side of it. For example in the figure below, the line is named as 'm' and is read as line 'm'.*



2) We can also mark two points X and Y on it and is named as XY and read as line XY as shown in the figure below.



Indefinite lines can be drawn through a given point.

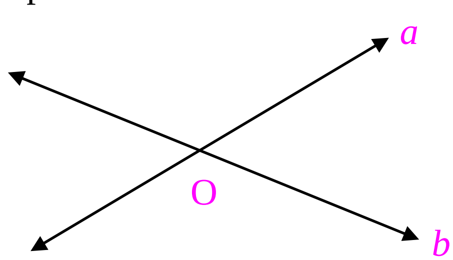
One and only one line can be drawn through two given points

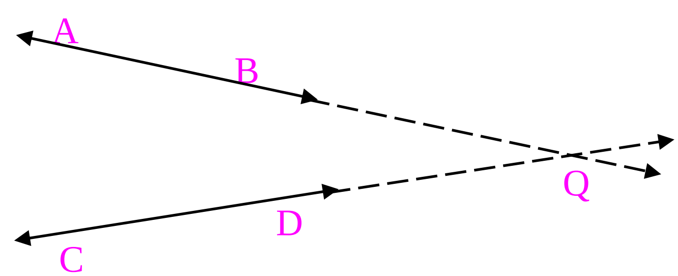
- ***Intersecting Lines and Parallel Lines:*** *When we draw two lines in a plane, then there are two possibilities :*
  1) The two lines intersect each other
  2) The two lines don't intersect each other.

The lines which intersect are called *intersecting lines* and the point where they intersect is called the point of intersection. For example: the letter X of English alphabet, Cross-roads, two adjacent edges of your textbook etc. are all examples of intersecting lines.

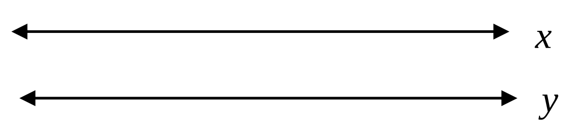
In figure (1), lines '*a*' and '*b*' are intersecting each other at point O. Point O is the point of intersection.

In figure (2), lines '*AB*' and '*CD*' are intersecting each other at point Q. Point Q is the point of intersection.

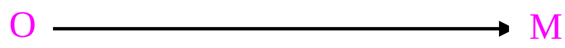




In figure 3, lines '*x*' and '*y*' do not intersect and they have no point in common. Such lines are called as *parallel lines*. For example, two opposite edges of a ruler, rail lines, cross –bars on the window grill etc. are examples of parallel lines.

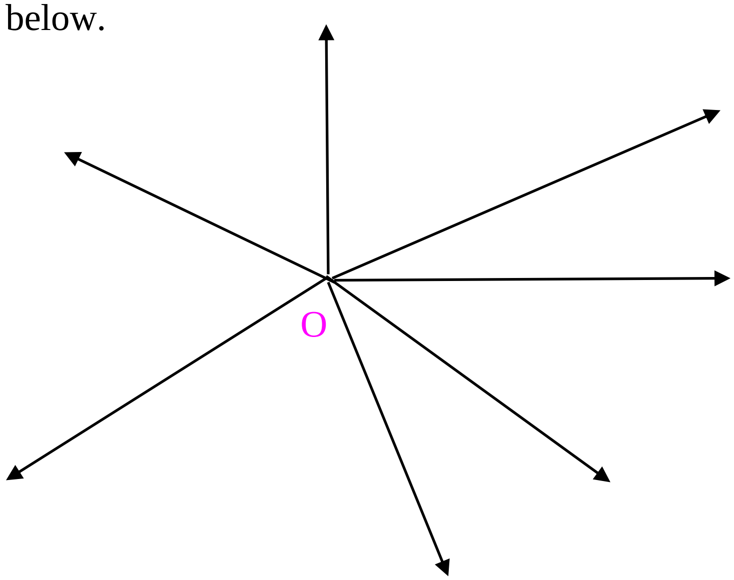


- ***Ray:*** The part of line that extends indefinitely in one direction from a fixed point say 'O' is called a *Ray*. The point 'O' is called the initial point or the end point of the ray. The figure below is ray OM.



A ray has only one end point and can be extended indefinitely in one direction only. A ray is portion of a line.

We can draw unlimited number of lines from a point. Similarly, we can draw unlimited number of rays with a given point as the initial point as shown in the figure below.



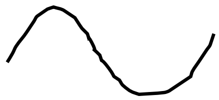
We know that there is no difference between line AB and line BA. Also, line segment AB is same as the line segment BA. But ray OA and ray AO are different rays. Ray OA extends indefinitely in the direction of O to A, while ray AO extends indefinitely in the direction from A to O. Actually, ray OA and ray AO are called opposite rays.

- ***Curves***: A figure which is obtained by moving the tip of a pencil on the paper without lifting it aimlessly from one point to the other are called *curves*. Even picture obtained by doodling on a piece of paper are *curves*. We understand that curves are not straight.

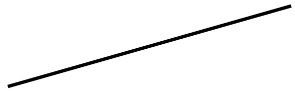
Open Curve: A curve which does not cut itself is called an *open curve*.

Closed Curve: A curve which cuts itself is called a *closed curve.*

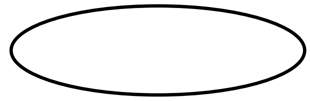
The following figures are all curves.



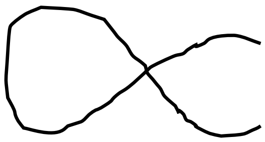
(i)



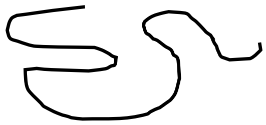
(ii



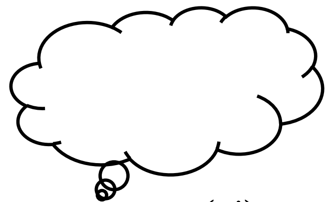
(iii



(iv)



(v)



(vi)

Among these curves, (i), (ii) and (v) are open curves and (iii), (iv) and (vi) are closed curves.

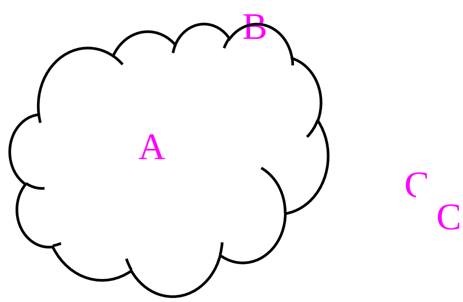
- ***Position of a point in a figure***: In a closed curve, there are three parts:
  - (i) interior (inside) of the curve
  - (ii) exterior (outside) of the curve
  - (iii) boundary ('on') of the curve

The interior of the curve together with its boundary is called the *region of the curve*. In the adjacent figure,

point A is in the interior of the curve,

point B is on the curve and

C is in the exterior of the curve.



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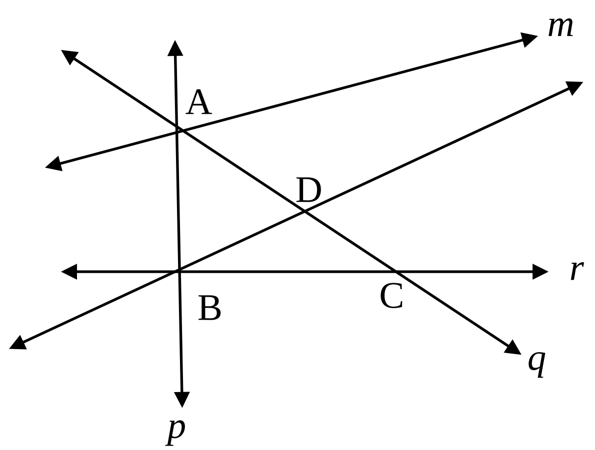
Example 1: From the figure given below, write

(a) lines intersecting at A

(b) lines intersecting at B

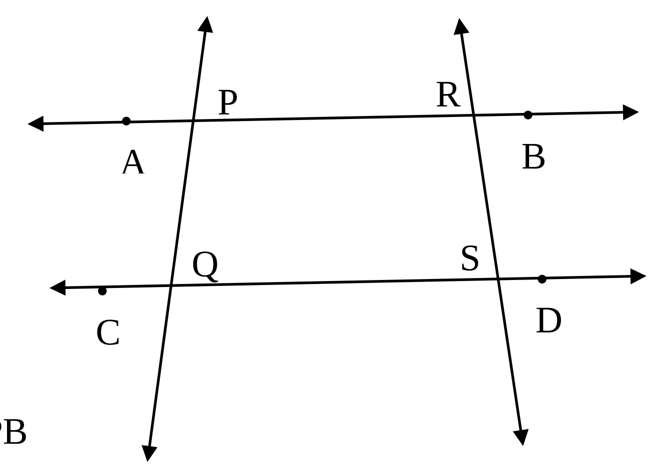


Answer 1:
(a) Lines *p*, *q* and *m* intersect at A.

(b) Lines *r*, *p* and *l* intersect at A.

Example 2: From the adjacent figure, name

(a) five line segments
(b) five rays
(c) non-intersecting lines.



Answer 2:

(a) Five line segments are:
PR, QS, PQ, RS and CQ

(b) Five rays are: PA, QC, SD, RB and PB

(c) (AB, CD), (PR, QS)

Example 3: Draw a rough diagram to show:

(a) a closed curve and (b) an open curve

- ***Assignment:***
  1) Attempt exercise 4.1 of the textbook.
  2) Complete the worksheet given along with this module.

Worksheet – 1(Chapter 4)

Question 1: Match the statements of Column A and Column B correctly.

	Column A		**Column B**
i)	Line is completely known	a)	may be intersecting or parallel
ii)	Two lines in a plane	b)	if they lie on the same plane.
iii)	Three non-collinear points	c)	can pass through a point
iv)	A plane extends	d)	determine a plane
v)	Indefinite number of lines	e)	if two points are given
vi)	Points are collinear	f)	indefinitely in all directions

Question 2: How many lines pass through (i) one point (ii) two points?

Question 3: Give two examples each of (i) intersecting lines (ii) parallel lines (iii) line segments from your environment.

Question 4: ***Write (T) for a true statement and (F) for a false statement***.

a) Point has a size because we can see it as a thick dot on a paper.
b) Two different lines can be drawn passing through two given points.
c) Through a given point, only one line can be drawn.
d) A page of a book is a physical example of plane.
e) An inkpot has both plane and curved surfaces.
f) Two lines in a plane can only be parallel.
g) The maximum number of points of intersection of three lines is three.
h) A line has two end points and a line segment has no end points.

Question 5: Look at the figure below. Name all the rays with initial point as A.