CHAPTER 4

VI-MATHEMATICS-NCERT

4 BASIC GEOMETRICAL IDEAS(Notes)

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1. The term 'Geometry' is the English equivalent of the Greek word 'Geometron'. 'Geo' means Earth and 'metron' means Measurement

2. **Point**: A point determines a location. It is usually denoted by a capital letter A, B, C, ...

Try These

1. With a sharp tip of the pencil, mark four points on a paper and name them by the letters A,C,P,H. Try to name these points in different ways. One such way could be this.

Sol:

A• •C

P• •H

2. A star in the sky also gives us an idea of a point. Identify at least five such situations in your daily life.

Sol: (i) The tip of a pencil.

(ii) The tip of a pen

(iii) The pointed end of the tooth pic

(iv) The sharp tip of compass.

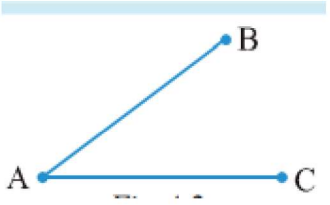
(v) A small bindi.

A Line Segment: This shortest join of point A to B (including A and B) is a line segment. It is denoted by $\overline{AB}$ or $\overline{BA}$

The points A and B are called the end points of the segment.

Try These

3. Name the line segments in the figure 4.2. Is A, the end point of each line segment?



Sol: $\overline{AB}$ and $\overline{AC}$

A Line : Aline segment extended both directions without any end point we get a line .

The line AB written as $\overleftrightarrow{AB}$

Sometimes a line is denoted by a letter like ***l***, ***m***, ***n*** ...

Intersecting Lines: Two distinct lines meeting at a point are called intersecting lines.

If two lines have one common point, they are called intersecting lines.

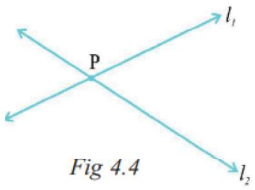
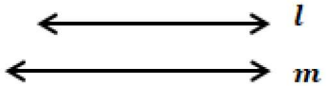


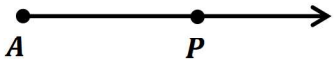
Fig 4.4

Parallel Lines: If two lines have no common points, they are called parallel lines.



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

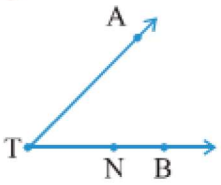
Ray: A ray is a portion of a line. It starts at one point (called starting point or initial point) and goes endlessly in a direction.



Ray AP is denote by $\overrightarrow{AP}$

Try These

1. **Name the rays given in this picture** (Fig 4.8)



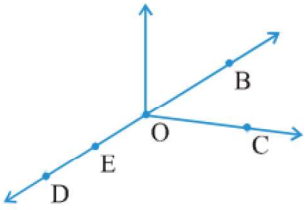
Sol: $\overrightarrow{TA}$, $\overrightarrow{TN}$ or $\overrightarrow{TB}$

4. **Is T a starting point of each of these rays?**

Sol: T starting point of the rays $\overrightarrow{TA}$, $\overrightarrow{TN}$ or $\overrightarrow{TB}$ But not $\overrightarrow{NB}$

EXERCISE 4.1

1. **Use the figure to name :**



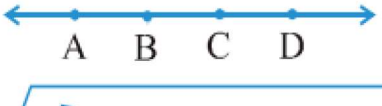
(a) **Five points** : B,C,D,E,O

(b) **A line** : $\overleftrightarrow{BD}$ or

(c) **Four rays** : $\overrightarrow{OC}, \overrightarrow{OB}, \overrightarrow{DB}, \overrightarrow{EB}$

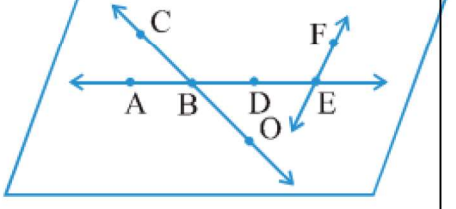
(d) **Five line segments**: $\overline{OB}, \overline{OC}, \overline{DE}, \overline{EO}, \overline{DB}$

5. **Name the line given in all possible (twelve) ways, choosing only two letters at a time from the four given.**



Sol: $\overleftrightarrow{AB}, \overleftrightarrow{AC}, \overleftrightarrow{AD}, \overleftrightarrow{BA}, \overleftrightarrow{BC}, \overleftrightarrow{BD}, \overleftrightarrow{CA}, \overleftrightarrow{CB}, \overleftrightarrow{CD}, \overleftrightarrow{DA}, \overleftrightarrow{DB}, \overleftrightarrow{DC}$.

2. **Use the figure to name :**



(a) **Line containing point E** : $\overleftrightarrow{AE}$ or $\overleftrightarrow{BE}$ or $\overleftrightarrow{DE}$ or $\overleftrightarrow{EF}$

(b) **Line passing through A**: $\overleftrightarrow{AB}, \overleftrightarrow{AD}, \overleftrightarrow{AE}, \overleftrightarrow{BD}, \overleftrightarrow{AE}, \overleftrightarrow{DE}$

(c) **Line on which O lies**: $\overleftrightarrow{OC}, \overleftrightarrow{OD}, \overleftrightarrow{CD}$

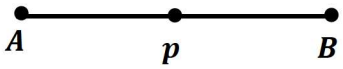
(d) **Two pairs of intersecting lines**: $\overleftrightarrow{OC}, \overleftrightarrow{AE}$; $\overleftrightarrow{OF}, \overleftrightarrow{AE}$

6. How many lines can pass through (a) one given point? (b) two given points?

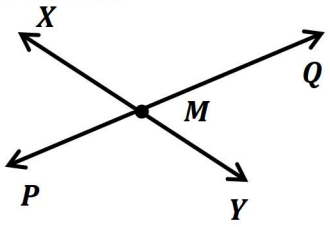
Sol: (a) Infinite lines (b) One line.

3. Draw a rough figure and label suitably in each of the following cases:

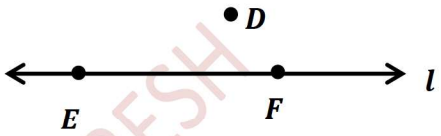
(a) **Point P lies on AB.**



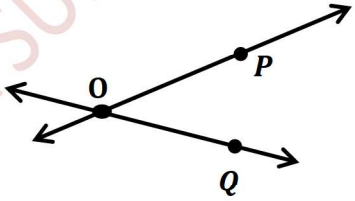
(b) **$\overleftrightarrow{XY}$ and $\overleftrightarrow{PQ}$ intersect at M.**



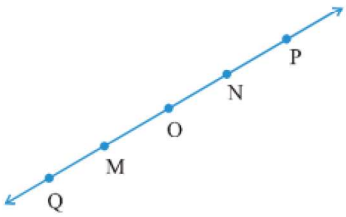
(c) **Line l contains E and F but not D.**



(d) **$\overleftrightarrow{OP}$ and $\overleftrightarrow{OQ}$ meet at O.**



7. Consider the following figure of line MN . Say whether following statements are true or false in context of the given figure.



(a) Q, M, O, N, P are points on the line $\overleftrightarrow{MN}$. **(True)**

(b) M, O, N are points on a line segment $\overline{MN}$. **(True)**

(c) M and N are end points of line segment $\overline{MN}$. **(True)**

(d) O and N are end points of line segment $\overline{OP}$. **(False)**

(e) M is one of the end points of line segment $\overline{QO}$. **(False)**

(f) M is point on ray $\overrightarrow{OP}$. **(False)**

(g) Ray $\overrightarrow{OP}$ is different from ray $\overrightarrow{QP}$. **(True)**

(h) Ray $\overrightarrow{OP}$ is same as ray $\overrightarrow{OM}$. **(False)**

(i) Ray $\overrightarrow{OM}$ is not opposite to ray $\overrightarrow{OP}$. **(False)**

(j) O is not an initial point of $\overrightarrow{OP}$. **(False)**

(k) N is the initial point of $\overrightarrow{NP}$ and $\overrightarrow{NM}$. **(True)**

Curves

Any drawing (straight or non-straight) done without lifting the pencil may be called **a curve**. In this sense, **a line is also a curve**.

(i) If a curve does not cross itself, then it is called a simple curve.

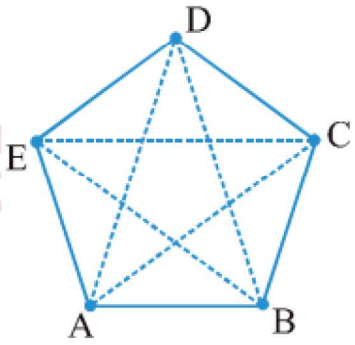
(ii) A simple curve is one that does not cross itself.

(iii) A curve is said to be closed if its ends are joined; otherwise it is said to be open

(iv) The interior of a curve together with its boundary is called its "region".

Polygons

A polygon is a simple closed curve made up of line segments.



(i) **The line segments forming a polygon are called its sides.**

$\overline{AB}, \overline{BC}, \overline{CD}, \overline{DE}, \overline{EA}$

(ii) **Any two sides with a common end point are called the adjacent sides.**

$\overline{AB}, \overline{BC}$; $\overline{BC}, \overline{CD}$; $\overline{CD}, \overline{DE}$; $\overline{DE}, \overline{EA}$; $\overline{EA}, \overline{AB}$.

(iii) **The meeting point of a pair of sides is called a vertex.**

A, B, C, D, E.

(iv) **The end points of the same side are adjacent vertices.**

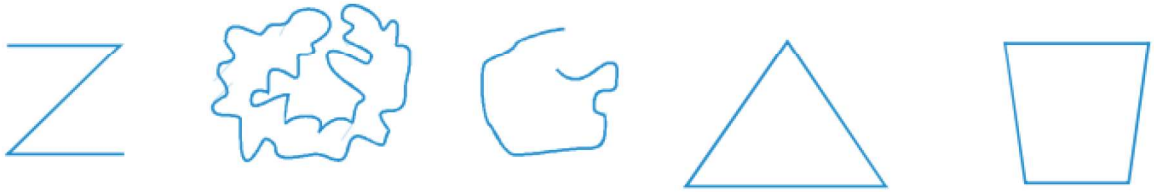
A, B; B, C; C, D; D, E; E, A .

(v) **The join of any two non-adjacent vertices is a diagonal.**

$\overline{AC}, \overline{AD}, \overline{BD}, \overline{BE}$

EXERCISE 4.2

1. **Classify the following curves as (i) Open or (ii) Closed.**



(a) (b) (c) (d) (e)

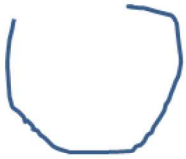
Sol: (a) , (c) are Open curves.

(b),(d) and (e) are closed curves.

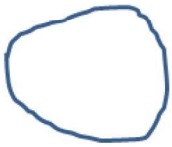
8. Draw rough diagrams to illustrate the following :

9. (a) Open curve (b) Closed curve.

Sol:



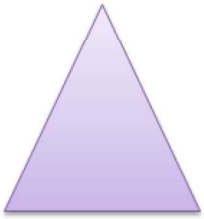
Open curve



Closed curve

10. Draw any polygon and shade its interior.

Sol:



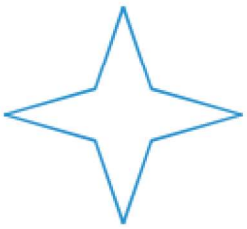
Triangle

Rectangle

Square

11. Consider the given figure and answer the questions :

(a) Is it a curve? (b) Is it closed?



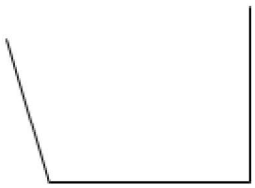
Sol: (a) Yes, it is a curve. (b) Yes, it is closed.

12. Illustrate, if possible, each one of the following with a rough diagram:

(a) A closed curve that is not a polygon.

Closed curve

(b) An open curve made up entirely of line segments.



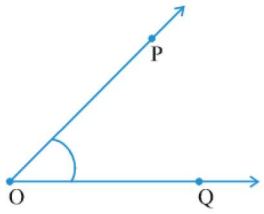
(c) A polygon with two sides.

Sol: Not possible.

Angles

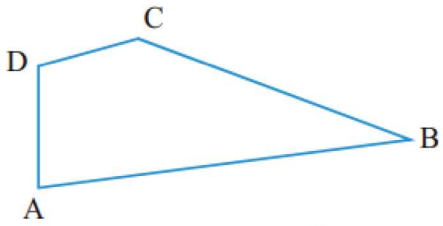
1. An angle is made up of two rays starting from a common starting/initial point.

2. The two rays forming the angle are called the arms or sides of the angle.
3. The common initial point is the vertex of the angle.
4. Two rays **$\overrightarrow{OP}$ and $\overrightarrow{OQ}$ make ∠POQ**(or also called **∠QOP).** O is vertex.
5. An angle leads to three divisions of a region: On the angle, the interior of the angle and the exterior of the angle.



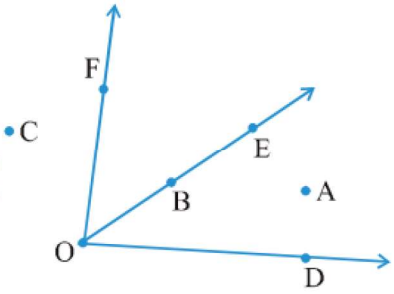
EXERCISE 4.3

13. Name the angles in the given figure



Sol: ∠ABC, ∠BCD, ∠CDA, ∠DAB

14. In the given diagram, name the point(s)



(a) In the interior of ∠DOE

Sol: A

(b) In the exterior of ∠EOF

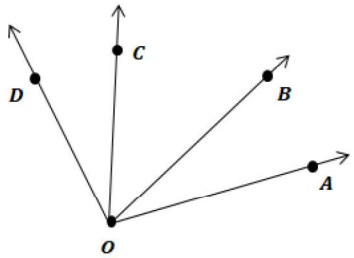
Sol: A,D,C

(c) On ∠EOF

Sol: E,B,O,F

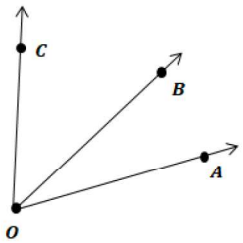
1. **Draw rough diagrams of two angles such that they have.**

(a) One point in common.



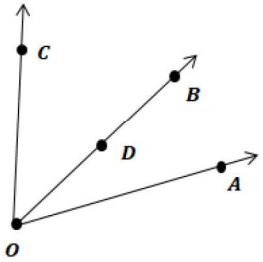
∠AOB and ∠COD have one common point O

(b) Two points in common.



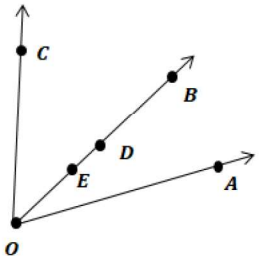
∠AOB and ∠COD have two common points O, B

(c) Three points in common.



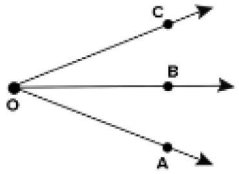
∠AOB and ∠COD have three common points O, B, *D*

(d) Four points in common.



∠AOB and ∠COD have four common points O, B, D, E

(e) One ray in common.



∠AOB and ∠COD have one ray $\overrightarrow{OB}$ in common.

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