# 4 Basic Geometrical Ideas

## Learn and Remember

1. A point is a mark of position. It occupies a position and its location can be ascertained.
2. Line is straight and extends indefinitely in both direction.
3. Plane is a flat smooth surface which extends indefinitely in all directions.
4. An unlimited number of lines can be drawn through a given point.
5. Exactly one line passes through two different given points in a plane and it lies wholly in that plane.
6. Two lines in a plane either intersecting at exactly one point or are parallel.
7. Two planes either intersecting or parallel, and if they intersect, they intersect in a line.
8. Three or more points are collinear if all of them lie on the same line.
9. Three or more lines are concurrent if all of them pass through the same point which is called their point of concurrence.

## TEXTBOOK QUESTIONS SOLVED

### EXERCISE 4.1

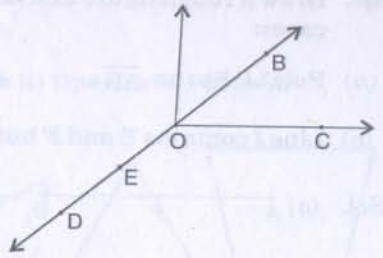
**Q1. Use the figure to name:**

**(a) five points**

**(b) a line**

**(c) four rays**

**(d) five line segments.**



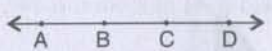

**Sol.** (a) Five points are : O, B, C, D, E

(b) A line : $\overline{DE}$ , $\overline{DB}$ , $\overline{OE}$ , $\overline{OB}$

(c) Four rays : $\overrightarrow{OD}$ , $\overrightarrow{OE}$ , $\overrightarrow{OC}$ , $\overrightarrow{OB}$

(d) Five line segments : $\overline{DE}$ , $\overline{OE}$ , $\overline{OC}$ , $\overline{OB}$ , $\overline{OD}$ .

**Q2. Name the line given in all possible (twelve) ways, choosing only two letters at a time from the four given.**




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

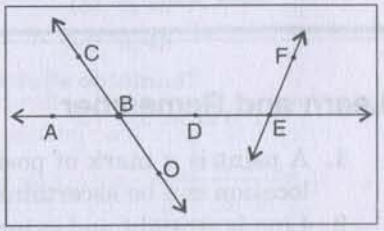
**Q3. Use the figure to name:**

**(a) Line containing point E.**

**(b) Line passing through A.**

**(c) Line on which O lies.**

**(d) Two pairs of intersecting lines.**




**Sol.** (a) A line containing E = $\overleftrightarrow{AE}$ or $\overleftrightarrow{FE}$

(b) A line passing through A = $\overleftrightarrow{AE}$ or $\overleftrightarrow{DE}$

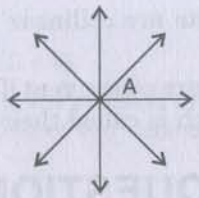
(c) A line on which O lies = $\overleftrightarrow{CO}$ or $\overleftrightarrow{OC}$

(d) Two pairs of intersecting lines are : $\overleftrightarrow{AD}$, $\overleftrightarrow{CO}$ and $\overleftrightarrow{AE}$, $\overleftrightarrow{EF}$.

**Q4. How many lines can pass through**

**(a) one given point?** **(b) two given points?**

**Sol.** (a) Infinite number of lines can pass through one given point.



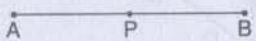

(b) Only one line can pass through two given points.


**Q5. Draw a rough figure and label suitably in each of the following cases:**

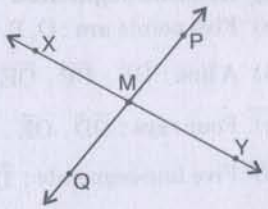
**(a) Point P lies on $\overleftrightarrow{AB}$.** **(b) $\overleftrightarrow{XY}$ and $\overleftrightarrow{PQ}$ intersect at M.**

**(c) Line *l* contains E and F but not D.** **(d) $\overleftrightarrow{OP}$ and $\overleftrightarrow{OQ}$ meet at O.**

**Sol.** (a)

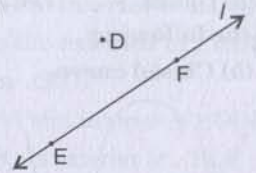



(b)

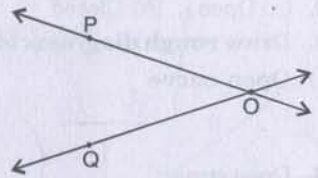





(c)




(d)




**Q6. Consider the following figure of line $\overleftrightarrow{MN}$. Say whether following statements are true or false in the context of the given figure.**

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

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

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

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

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

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

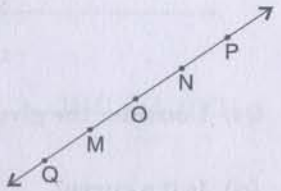
**(g) Ray $\overrightarrow{OP}$ is different from ray $\overrightarrow{OP}$.**

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

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

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

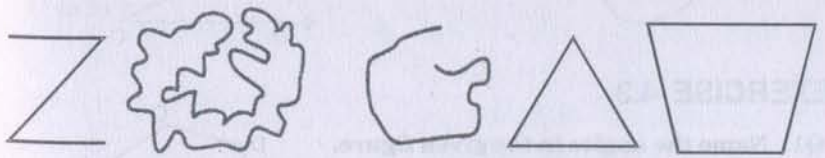
**(k) N is the initial point of $\overrightarrow{NP}$ and $\overrightarrow{NM}$.**




**Sol.** (a) True (b) True (c) True (d) False
(e) False (f) False (g) True (h) False
(i) False (j) False (k) True.

## EXERCISE 4.2

**Q1. Classify the following curves as (*i*) Open or (*ii*) Closed.**



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

**Sol.** (*a*) Open (*b*) Closed (*c*) Open (*d*) Closed (*e*) Closed.

**Q2. Draw rough diagrams to illustrate the following:**

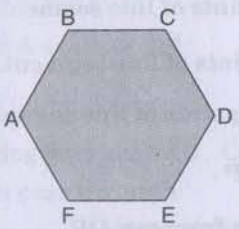
**(*a*) Open curve** **(*b*) Closed curve.**

**Sol.** Open curve :

Closed curve :

**Q3. Draw any polygon and shade its interior.**

**Sol.** Polygon ABCDEF.




**Q4. 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.

**Q5. Illustrate, if possible, each one of the following with a rough diagram:**

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

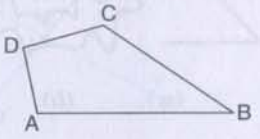
**(*b*) An open curve made up entirely of line segments.**

**(*c*) A polygon with two sides.**

**Sol.** (*a*) (*b*) (*c*) Can not be drawn.

## EXERCISE 4.3

**Q1. Name the angles in the given figure.**




**Sol.** ∠ABC, ∠CDA, ∠DAB, ∠DCB.

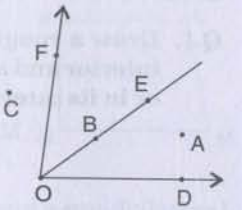


**Q2. In the given diagram, name the point(s)**

**(*a*) In the interior of ∠DOE**

**(*b*) In the exterior of ∠EOF**

**(*c*) On ∠EOF**




**Sol.** (*a*) Point interior of ∠DOE : A

(*b*) Points exterior of ∠EOF : C, A, D

(*c*) Points on ∠EOF : E, O, B, F.

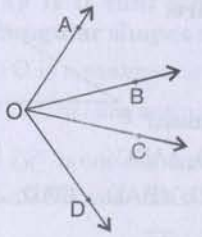
**Q3. Draw rough diagrams of two angles such that they have:**

**(*a*) One point in common.** **(*b*) Two points in common.**

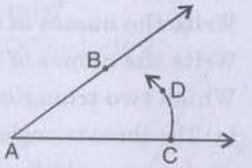
**(*c*) Three points in common.** **(*d*) Four points in common.**

**(*e*) One ray in common.**

**Sol.** (*a*)

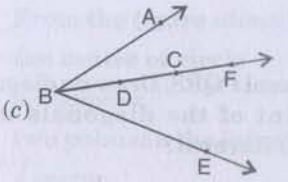



(*b*)

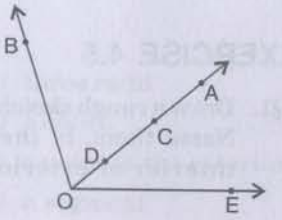



∠BAC and ∠DCA

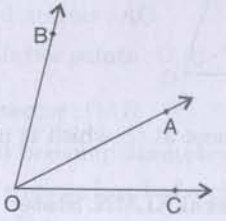
(*c*)




(*d*)



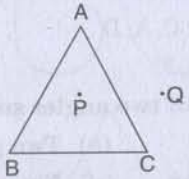

(*e*)



## EXERCISE 4.4

**Q.1. Draw a rough sketch of a triangle ABC. Mark a point P in its interior and a point Q in its exterior. Is the point A in its exterior or in its interior?**

**Sol.**



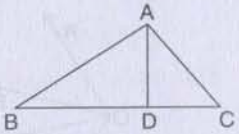

A is neither interior nor exterior of triangle, it is a vertex of D.

**Q.2. (*a*) Identify three triangles in the figure.**

**(*b*) Write the names of seven angles.**

**(*c*) Write the names of six line segments.**

**(*d*) Which two triangles have ∠B as common?**




**Sol.** (*a*) The three triangles are : ΔABC, ΔABD, ΔADC

(*b*) Angles are : ∠ADB, ∠ADC, ∠ABD, ∠ACD, ∠BAD, ∠CAD, ∠BAC

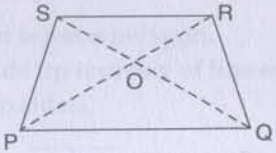
(*c*) Line segments : $\overline{AB}$, $\overline{AC}$, $\overline{AD}$, $\overline{BD}$, $\overline{DC}$, $\overline{BC}$.

(*d*) Triangle having common ∠B : ΔABC and ΔABD.

## EXERCISE 4.5

**Q1. Draw a rough sketch of a quadrilateral PQRS. Draw its diagonals. Name them. Is the meeting point of the diagonals in the interior or exterior of the quadrilateral?**

**Sol.**




Diagonal PR and Diagonal SQ. They meet at O, which is inside the quadrilateral.

**Q2. Draw a rough sketch of a quadrilateral KLMN. State:**

**(*a*) two pairs of opposite sides,**

**(*b*) two pairs of opposite angles,**

**(*c*) two pairs of adjacent sides,**

**(*d*) two pairs of adjacent angles.**



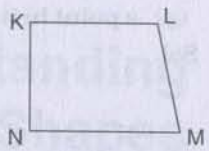
**Sol.**

(*a*) Pair of opposite sides : KL and MN, KN and LM

(*b*) Pair of opposite ∠s : ∠K and ∠M, ∠L and ∠N

(*c*) Pair of adjacent sides : KN and NM, KL and LM

(*d*) Pair of adjacent angles : ∠K and ∠N, ∠L and ∠M.




**Q3. Investigate:**

**Use strip and fasteners to make a triangle and a quadrilateral.**

**Try to push inward at any one vertex of the triangle. Do the same to the quadrilateral.**

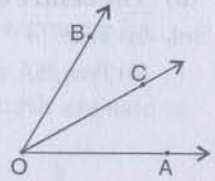
**Is the triangle distorted? Is the quadrilateral distorted? Is the triangle rigid?**

**Why is it that structures like electric towers make use of triangular shapes and not quadrilaterals?**

**Sol.** (*a*) O is a common to both the angles ∠AOC and ∠BOC

(*b*), (*c*), (*d*) are not possible.

(*e*) $\overline{OC}$ is one ray common to both angles ∠AOB and ∠BOC.




## EXERCISE 4.6

**Q1. From the figure identify:**

**(*a*) the centre of circle** **(*b*) three radii**

**(*c*) a diameter** **(*d*) a chord**

**(*e*) two points in the interior** **(*f*) a point in the exterior**

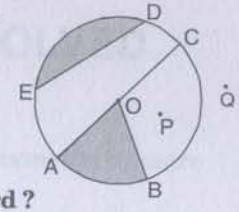
**(*g*) a sector** **(*h*) a segment**

**Sol.** (*a*) O is the centre (*b*) Radii : OA, OB, OC

(*c*) A diameter : AC (*d*) A chord : ED

(*e*) Interior points : O, P (*f*) Exterior point : Q

(*g*) A sector : OAB (*h*) A segment : $\overset{\frown}{ED}$




**Q2. (*a*) Is every diameter of a circle also a chord ?**

**(*b*) Is every chord of a circle also a diameter.**

**Sol.** (*a*) Yes (*b*) No.

**Q3. Draw any circle and mark**

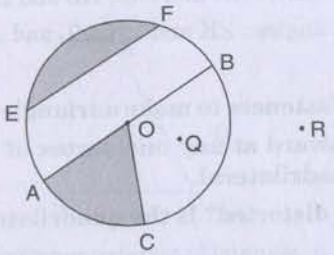
**(*a*) its centre** **(*b*) a radius**

**(*c*) a diameter** **(*d*) a sector**

**(e) a segment** **(f) a point in its interior**

**(g) a point in its exterior** **(h) an arc.**

**Sol.**




**Q4. Say true or false:**

**(a) Two diameters of a circle will necessarily intersect.**

**(b) The centre of a circle is always in its interior.**

**Sol.** (a) True.

(b) True.

□□