Lesson - 3

Basic Geometrical Ideas

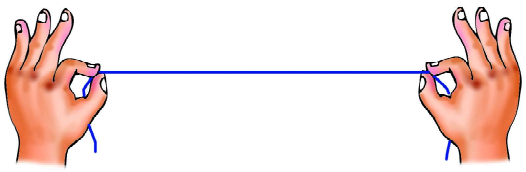
E3K3X7

Every time when we look around ourselves, we get to see objects of different shapes and sizes. When we look around the room, we can see the floor, the ceiling and four walls. We can also see the doors, windows, bed, chair, table etc. On our study table, we have books, note books, erasers, pencils, geometry box etc. In our geometry box ,we have divider, compass, protractor, set square, ruler etc. When we move out of the room, we can see the verandah, the stairs, the courtyard, the shrubs, herbs and flower plants surrounding the house. If we move further, we can see more houses, trees, fields, lakes, rivers, hills etc.

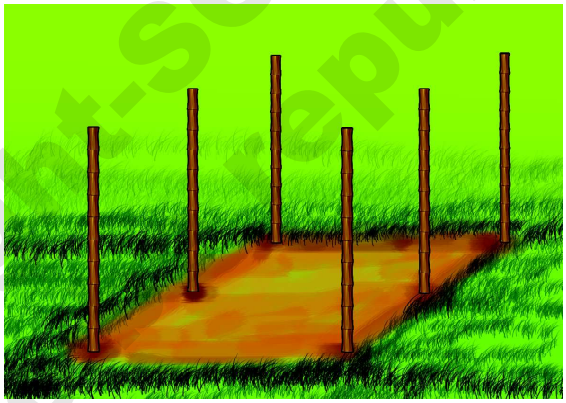
All these things differ in shape and size and most of the times, we can identify out the different shapes of these objects by their names itself like- round as the ball, straight as the ruler, sharp as the pencil, plane (uniform) as the courtyard, meandering like a river, up and down like the hills etc.

Have you ever noticed a carpenter using a thread to measure the edges or ups and downs(unevenness) of the slices of wood. He places it on the slab to ensure whether the measurements are accurate or not. If the slab is rough, the thread does not set properly. If the thread sets properly then it is understood that the slab is uniform (plane).

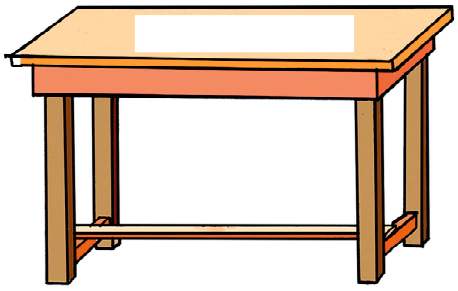
In other words, the thread stretched along the edges denote whether the slab is straight or not. On the other hand, the loosely kept thread denotes an irregular shape.



Also, before building a house, a mason determines a plane ground and lengthwise as well as breadthwise, four spots are marked where four sticks are placed and a thread is stretched to mark the boundary by tying it around the sticks.



Here the position of four sticks and the thread joining two sticks help us to understand the geometric concepts of point and line.



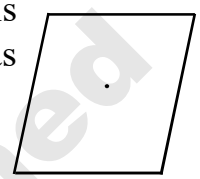
Similarly, the four edged plane on the table, a page of a book, a sheet of paper, each of these have four corners and edges. These also help to understand the concepts of point and line.

Point

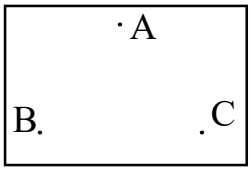
We have seen that the four sticks placed on the ground by a mason prior to building a house determine the foundation or base of the building. A carpenter marks the place by using a pointed pencil to find out the places on the slab where the nail is to be fixed. Similarly, to determine a certain position on paper we put a dot on the paper using the sharp edge of a pencil.

Here the small pores for placing the sticks, the marks on the slabs by pencils or the dots on the piece of paper, all represents some position. All these are the models of point. Actually, if the pencil is sharper, the dot will be smaller and if the dot is much smaller, the idea of the point will be more perfect.

The dot placed on the paper with the sharp end of the pencil is called a point, but this determines just a position. So, we use this as a model of a point.



To differentiate many points, every points is recognised by a letter namely A, B, C etc and then these points are read as point A, point B, point C etc.

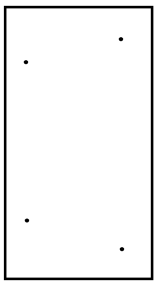


Do it yourself :

(i) How many points do you see in the adjacent picture ? Name the points using various letters and try to read them.

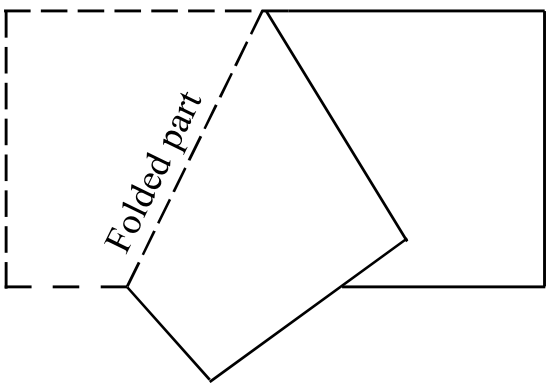
(ii) Place four more points on the paper and name them using various letters.

(iii) How many points, do you think, can fit into the picture?

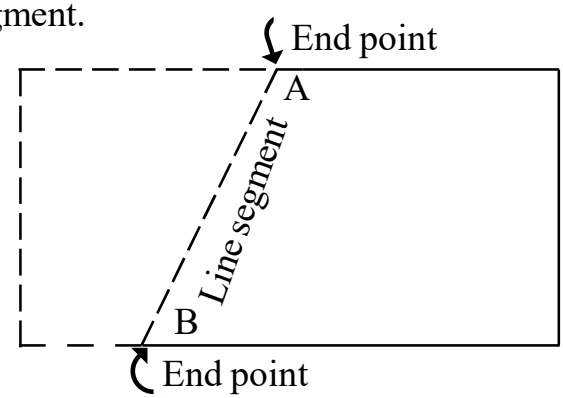


Line Segment

(i) Take a piece of paper, Now fold the paper by keeping a mark as shown in the picture below.



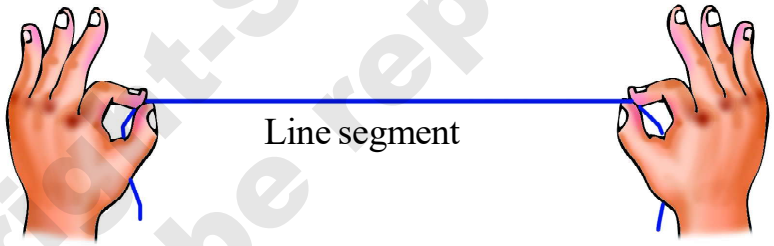
Open the fold and you can see the folded crease. The crease on the paper is an example of line segment.



The line segment is enclosed within two end points. The end points have been named as A and B.

(ii) Draw a line by joining two points A and B which can be done by using a scale and a sharp pointed pencil. The line within two points A and B is a line segment. The line enclosed within A and B determines the length of the line segment. That is, alongwith the two end points of the line segment, it also has a length.

(iii) Stretch a piece of thread as shown in the diagram. The part of the thread, between the fingers, can be considered as a line segment.

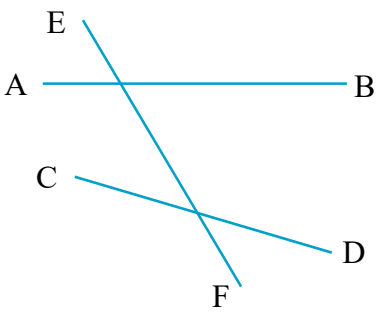


The four edges of your study table, the edges of the geometry box, the edge of the ruler etc are all examples of line segments. All these line segments are enclosed within two end points and are straight.

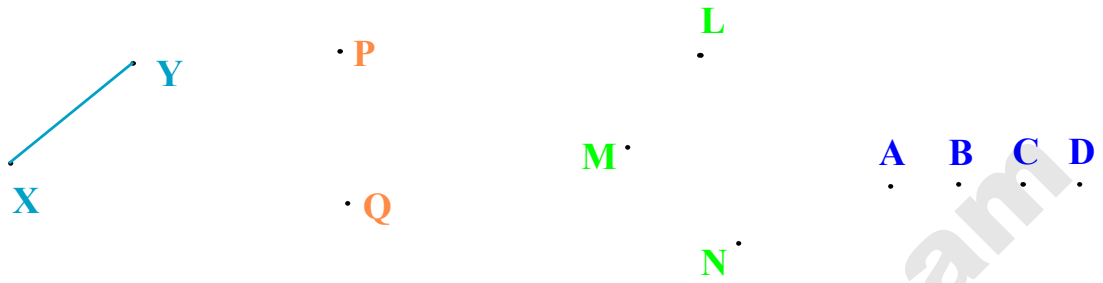
The line segment joining the end points A and B is written as $\overline{AB}$ or $\overline{BA}$ This means $\overline{AB}$ or $\overline{BA}$ denotes the same line segment.

Do it yourself :

(i) Name the line segments of the adjacent picture



(ii) Join each pair of points given below and draw the line segments. Name the line segments.



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

How many points make one line segment?

Take a line segment $\overline{AB}$.

If we take a point C in between the points A and B of the line segment $\overline{AB}$ then two line segments $\overline{AC}$ and $\overline{CB}$ can be obtained. Similarly, if we consider two points D and E on the line segment $\overline{AC}$, and $\overline{CB}$, then we get four line segments $\overline{AD}$, $\overline{DC}$, $\overline{CE}$ and $\overline{EB}$.

In this way, take various points on the line segment $\overline{AB}$ and create new line segments from it. This process can be repeated for indefinite number of times. So, we can say that the line segment $\overline{AB}$ contains an infinite number of points.

A Line

Take two points A and B and draw a line segment $\overline{AB}$.

Using a scale, keep expanding the line segment from the two end points A and B. The line segment can be extended to two edges of the page. If we imagine the page to be endless then we can imagine that the line segment $\overline{AB}$ can also be extended endlessly.

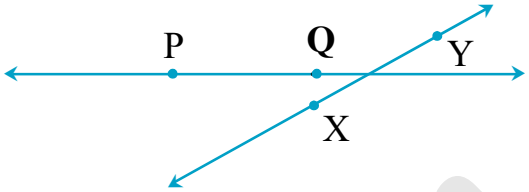
The extended line segment $\overline{AB}$ imagined to be endless, is called a line. Thus the line segment $\overline{AB}$ can be extended endlesslly to form a line.

Hence, every line segment is a part of a line.

The line segment $\overline{AB}$ and the line formed by extending two of its end points.

$\overline{PQ}$ line segment is the part of an endlessly extended line.

$\overline{XY}$ line segment is the part of an another endlessly extended line.

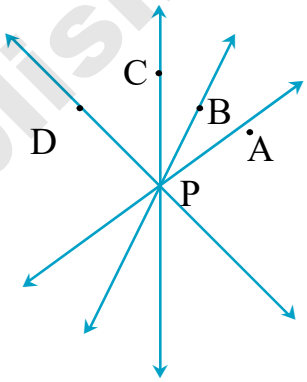


The line of which line segment $\overline{AB}$ is a part is written as $\overleftrightarrow{AB}$

As two end points A and B constitute two line segments $\overline{AB}$ and $\overline{BA}$, in the same way, these points can constitute lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{BA}$. Sometimes, l, m, n etc. are also used to symbolise a straight line.

Place a point P on a piece of paper. Place some other points A, B and C on the piece of the paper on different positions. Join all of them with P using a scale to form line segment. If we extend $\overrightarrow{PA}, \overrightarrow{PB}, \overrightarrow{PC}, \ldots$ line segments endlessly at both ends we get the lines $\overleftrightarrow{PA}, \overleftrightarrow{PB}, \overleftrightarrow{PC}, \ldots\ldots$

The lines $\overleftrightarrow{PA}, \overleftrightarrow{PB}, \overleftrightarrow{PC}, \ldots\ldots$etc passing through P are called Concurrent lines.



Concurrent lines

Do it yourself :

How many lines can be drawn through a single point?

(i) 1 line (ii) 2 lines (iii) 50 lines (iv) Infinite numbers of lines

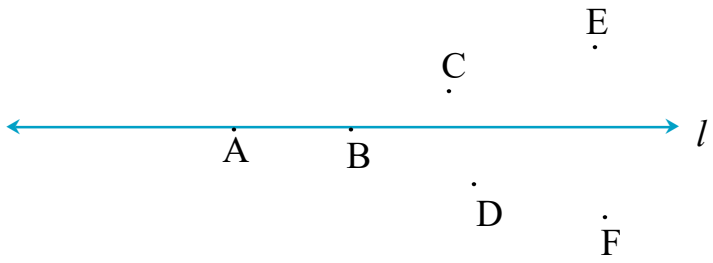
Take any line '*l*'.

Take points A, B, C, D etc on the line '*l*'. *Then* A, B, C, D... are called Collinear points.

Now, take any two points A and C from them. Using a scale join the points to draw a line segment. Extend the line segment infinitely at both the ends and get a line. The line will pass through the other points also. i.e. A and D.

Collinear points

Hence, in order to determine whether three or more points are collinear or not, we need to join two of them to form a line. If the points are collinear, the line will pass through the remaining points also. The line will not pass through the points if they are not collinear.



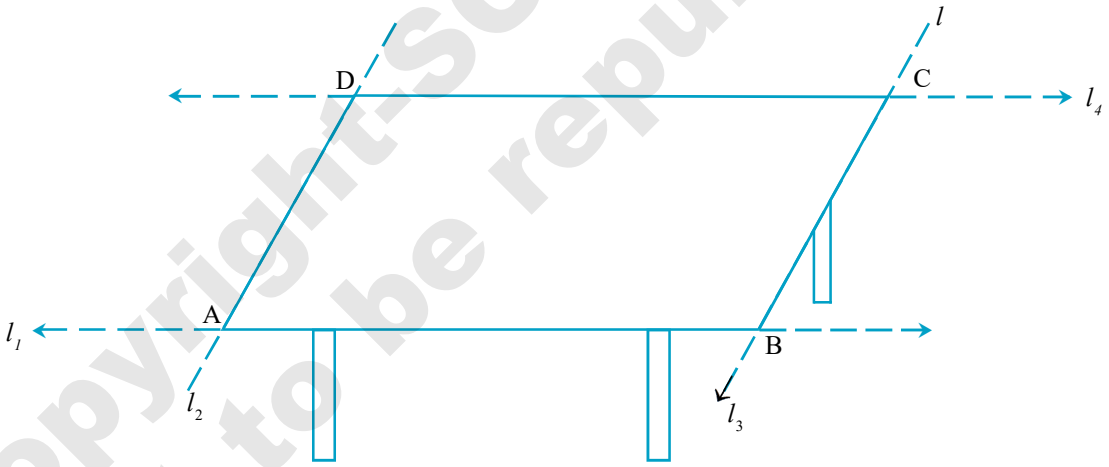
C, E, D, F points are not Collinear

Think and tell :

(a) The adjacent diagram contains two points A and B. Are they collinear?

(b) There are three points A, B, C in the adjacent diagam. Are they collinear?

Intersecting and Parallel lines



If we consider the four edges of a table to be line segments and if we extend them endlessly at their endpoints we will get four lines. Mark these lines as l_1, l_2, l_3 and l_4 respectively as shown in the diagram above. The lines l_1 and l_2 meet at point A. We can say that l_1 and l_2 intersect each other at point A. Can they cross at any point other than A? It is clear that they cannot cross at any point other than A.

The lines intersecting each other at a point are called intersecting lines.

Similarly from the above diagram we can say that,

l_1 and l_3 are two intersecting lines and they intersect at the point B.

l_3 and l_4 are two intersecting lines and they intresect at the point C.

l_2 and l_4 are two intersecting lines and they intersect at the point D.

For a pair of intersecting lines, the point where the pair of lines intersect each other is called the point of intersection.

On the other hand, look at the lines l_1 and l_4. If they are extended infinitely from the two end points they never meet each other. That is, we never get a point which is common to both l_1 and l_4. Such pair of lines are called parallel lines.

In the diagram l_2 and l_3 are another pair of parallel lines.

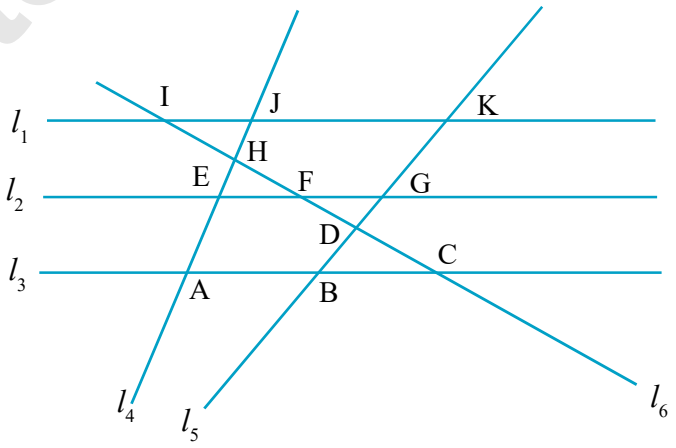
Hence, if a pair of lines intersect at a point, they are called intersecting lines and a pair of lines which, never intersect at a point are called parallel lines.

Do it yourself :

(i) If we extend two line segments forming the letter X from their end points then we get a pair of lines. Are the lines thus formed, parallel lines or intersecting lines?

(ii) Find out the intersecting lines and parallel lines formed by extending the line segment infinitely from the end points of the line segments forming the letter H.

(iii) Form a pair of two lines from the lines in the given diagram. Now make a list of parallel lines and intersecting lines. Also mention the point of intersection from the intersecting lines.

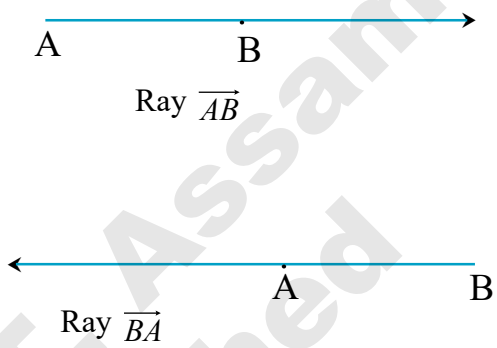


Ray

We are acquainted with a beam of light which spreads thoughout, and comes out as a ray of light from different sources such as candle, torch, electric bulb etc.

In geometry, a Ray is produced if a line segment $\overline{AB}$ goes endlessly in a direction.

In A line segment $\overline{AB}$, keeping the point A fixed, if we move towards B and extend the line endlessly, a Ray is formed. We write it as $\overrightarrow{AB}$. A is the endpoint of the ray $\overrightarrow{AB}$. Similarly, for the line segment AB keeping B fixed, if we move towards A and move in that direction endlessly, Ray $\overrightarrow{BA}$ is formed. B is the end point of the ray $\overrightarrow{BA}$.



Let us think : Are the rays $\overrightarrow{AB}$ and $\overrightarrow{BA}$ same?

Note, Ray $\overrightarrow{AB}$ means, it starts at A and moves in the direction of B. Ray $\overrightarrow{BA}$ means, it starts at B and moves in the direction of A.

So, the direction of $\overrightarrow{AB}$ is opposite to the direction of $\overrightarrow{BA}$. That means, the ray $\overrightarrow{AB}$ and $\overrightarrow{BA}$ are not same.

Let us think : Consider a ray $\overrightarrow{AB}$

Let C and D be the two points on the ray $\overrightarrow{AB}$. Are the rays $\overrightarrow{AC}$, $\overrightarrow{AB}$ and $\overrightarrow{AD}$ the same?

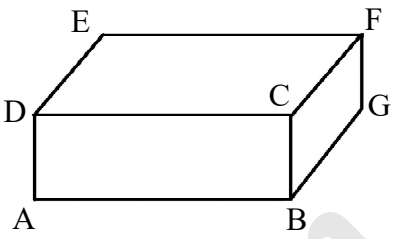
Actually, a ray can be identified by its starting point and a point on the path of the ray. Because a ray directs towards a particular direction only.

Here, also the rays $\overrightarrow{AC}$, $\overrightarrow{AB}$ and $\overrightarrow{AD}$ direct towards a particular path.

Let us know : For developing a primary concept we use the symbol $\overline{AB}$ for line segment, $\overleftrightarrow{AB}$ for line and $\overrightarrow{AB}$ for ray.

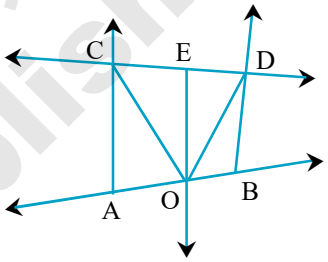
Do it yourself :

1. In the adjacent figure a model of a box is drawn with the help of point and line segment. Prepare a chart for all the points and line segments in the model.



2. Write the line segments formed by joining the points given on the adjacent side.

3. Find the points, line segments, lines and rays from the given diagram.



4. From the figure -A
   (i) Find out the lines passing through a single point.
   (ii) Find out the collinear points.

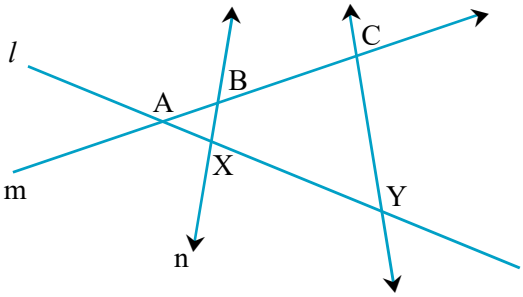


Fig -A

5. From the figure- B.
   (i) Name any five line segments.
   (ii) Name any two rays.
   (iii) Name two points which are not on the ray $\overrightarrow{BP}$.
   (iv) Name two points which are on the ray $\overrightarrow{CQ}$.
   (v) Name two points on the line segment $\overline{AD}$.

Fig - B

6. Answer the following-
   (i) How many lines can be drawn through a single point?

(ii) How many lines can be drawn through two distinct points?

7. Put (✓) for the correct answer and (×) for the wrong one.

(i) There are two end points in a line. (ii) Each ray is a part of a line.

(iii) A ray has only one end point. (iv) Line segment has a definite length.

(v) A Line segment has no end points.

Simple figures

Have you observed the doodles made on slate or a piece of paper by your younger brother and sister or some small boys or girls? Some drawing of that type are shown below.

(i) (ii) (iii) (iv) (v) (vi)

(vii) (viii) (ix) (x) (xi)

Among the pictures, (i), (ii), (iv), (v), (vii) and (viii) are the example of simple figure. The characteristics of those figures are that the lines have either two end points or they ended to a single point by which each of these figures are formed. They do not cross themselves between two end points. On the otherhand, in drawing some figure, the line crosses itself at least once between two end points (Fig-(iii), (vi), (ix). Also the figure (xi), (xi) cannot be drawn completely without lifting the pencil in between the lines. These figures are not included in the simple figure. Here we will discuss on simple figure.

So, the figure will represent the simple figures only, if they are not mentioned.

Closed and open figures

In figures, (i), (ii), (iv), (v), (vii) and (viii), some have two seperate end points and some have the same end points. But for (i), (ii), (vii) and (viii) two end points of each of them are separate. These simple figures are called open figures.

On the other hand, in figures (iv) and (v) the two end points are same. That is, a line starting from a point, makes a complete turn and ends at the same point. These simple figures are called closed figure.

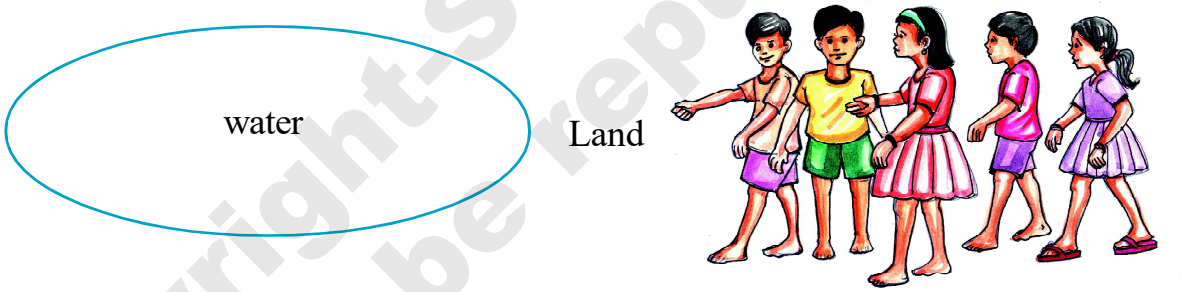
Do it yourself :

Classify the following figures 'simple figure' and 'not simple figure'. Mention which of them are closed and which are open.

A B C D E F G H

A B C D E F G H

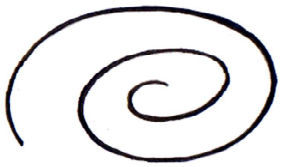
Have you ever played the game '*land water*' during your school events?



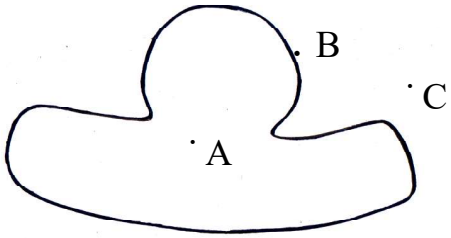
Draw a ring on the ground using lime or flour. When the judge will say 'water' the students will have to jump inside the ring and when the judge will say 'land' the students will have to be outside the ring.

Here, the ring is a closed figure, which divides the land into three parts- inside the ring, on the ring and out side (the land) the ring.

Similarly, if we draw any closed figure on a piece of paper, it divides the surface of the paper into three parts- inside, on and out side the figure. Open figures do not have inside outside.



An open figure does not have inside-outside



A closed figure divides the paper into three parts. Here A, B, C represent the three parts.

Do it yourself :

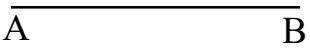
Is the adjacent diagram open or closed? If it is closed, then colour its interior portion.

Curves

Have you ever taken a piece of paper and just doodled? The pictures that are results of your doodling are called curves.

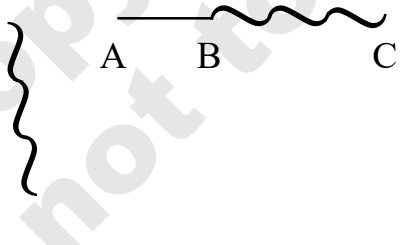
Simple figures represents an open curve and a closed figure a closed curve.

A line segment is drawn aside. In Mathematics it represents a curve also. A curve can be straight like the one drawn here.

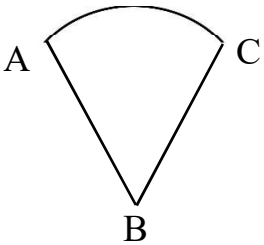


Hence, all line segments are curves but all curves are not line segments.

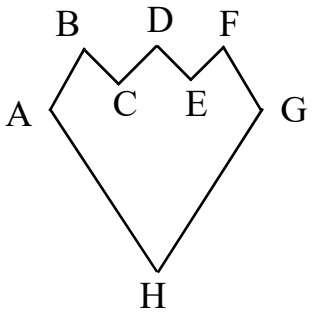
Look at the curves shown below-



(i)



(ii)



(iii) (iv)

(i) It is an open curve. It has no line segments.

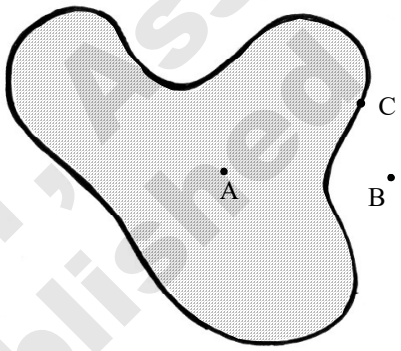
(ii) The curve is open. Its AB part is a line segment. That means a part of the curve is a line segment.

(iii) The curve is closed. Its AB and BC parts are line segments. AC is not a line segment.

(iv) This curve is also closed. It has the parts as AB,BC,CD, DE, EF, FG, GH, HA. All these are line segments. So, a curve can be formed by some or all the parts as line segments.

Like a closed figure, a closed curve also divides a plane into three parts, inside the curve, on the curve itself and outside the curve.

Look at the diagram given aside-



(i) The coloured part of the curve is the part inside the curve. A is a point inside the curve.

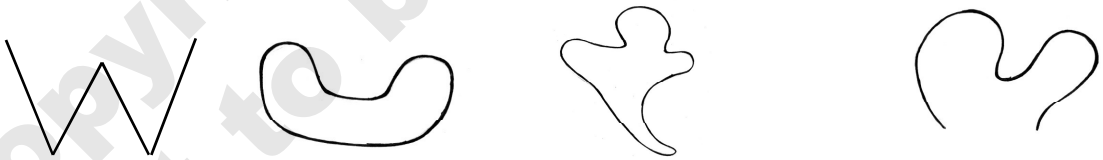
(ii) C is a point on the curve itself.

(iii) B is a point outside the curve.

The interior of a curve together with its boundary is called its 'region'. So, closed curve covers a definite region. Open curves do not have such a region. The shaded portion in the figure is surrounded by the curve on all sides. The portion inside the curve along with the boundary is called its region.

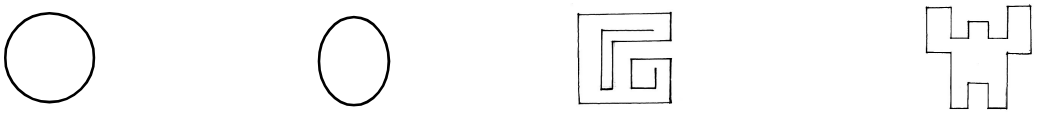
Do it yourself :

Some curves are shown below. Separate the open and closed curves from the curves given. Also colour the interior parts of the closed curves.



(i) (ii) (iii) (iv)

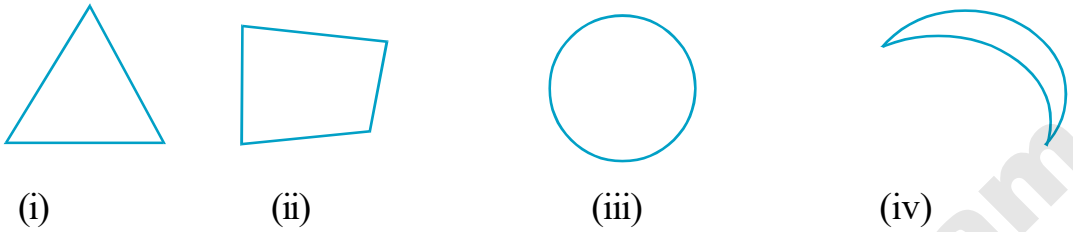
(v) (vi) (vii) (viii)



(ix) (x) (xi) (xii)

Polygon

Look at the following simple closed curves-



(i) (ii) (iii) (iv)

(v) (vi) (vii) (viii)

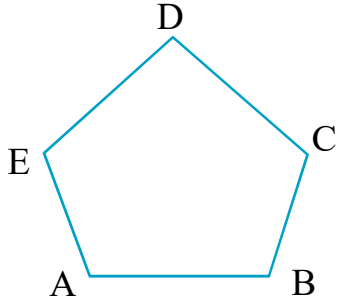
(ix) (x)

Among these (i), (ii), (v), (vi), (vii) and (x) curves are made up of only the line segments. These curves are called **polygons**.

So, a figure is a polygon if it is a simple closed figure made up entirely of line segments.

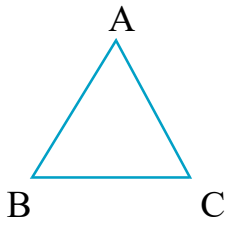
Curves (iii), (iv), (viii) and (ix) are not polygon. The line segments forming a polygon are called its sides. The meeting point of a pair of sides is called its **vertex**.

A, B, C, D and E are the vertices of the polygon drawn here. We read it as polygon ABCDE.

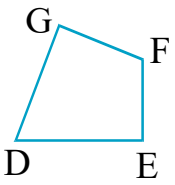


The polygon is made up of the line segments AB, BC, CD, DE and EA. So, AB, BC, CD, DE and EA are the sides of the polygon and A,B,C,D,E are its vertices.

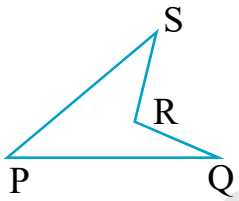
Look at the following polygons



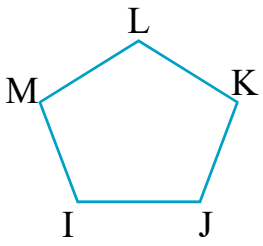
(i)



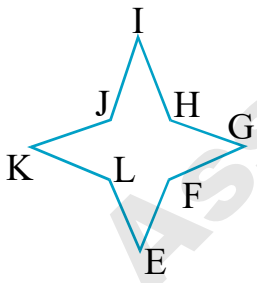
(ii)



(iii)



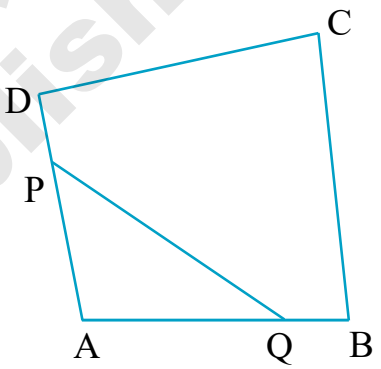
(iv)



(v)

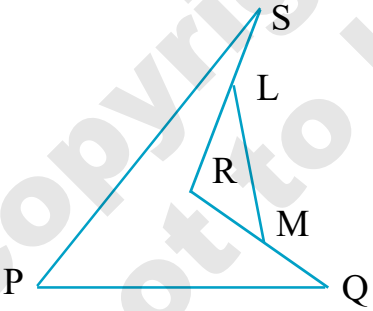
Consider the polygon (i), (ii) and (iv). If we take any two points on the curves of the polygon and join them by lines, they lie inside the polygon.

Consider the polygon ABCD. Take two points P and Q on the curves and join them. The line segment PQ thus formed lies inside the polygon.



PQ lies inside the polygon ABCD

If we consider the polygon (iii) and (v) of the above and join two points to get the line segment. These line segments may not lie inside the figure completely.



LM is out side the polygon PQRS

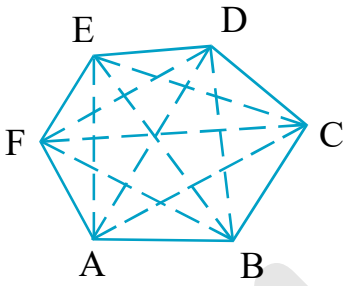
If we consider two points L and M on the sides QR and RS respectively of the polygon (iii) and join them. Then some parts of the line segments lie outside the polygon.

Polygons of the type (i), (ii) and (iv) are called **convex polygon**. On the other hand, (iii) and (v) are called **concave polygon**.

A polygon is called a convex polygon if any two points on them are joined by a line and the line lies completely inside the polygon.

On the other hand, a polygon is called a concave polygon if the line segment formed by joining any two points on the sides of the polygon do not lie entirely inside the plygon.

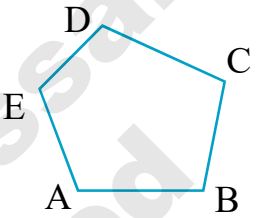
Here we shall discuss about the convex polygon only.



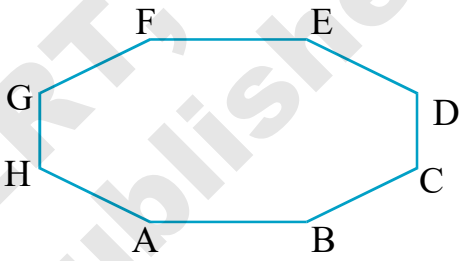
Look at the diagram of the polygon. Consider the pair of vertices of the polygon which are not adjacant. By joining these vertices we got the line segments AC, AD, AE,BD, BE, BF, CE, CF, CA, DF, DA and DB. These line segments are called the diagonals of the polygon.

Do it yourself :

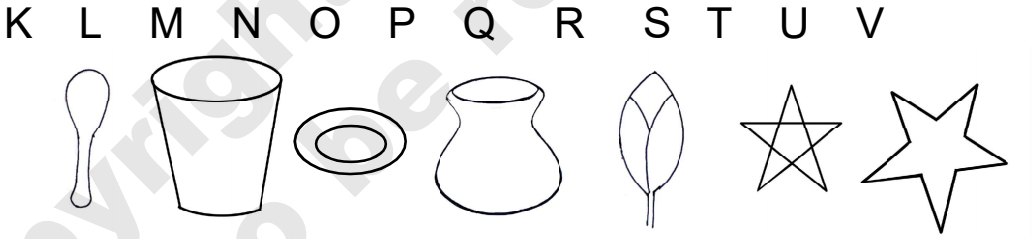
1. (i) Draw the diagonals of the two polygons drawn aside.



(ii) Count the number of diagonals you get in each case.

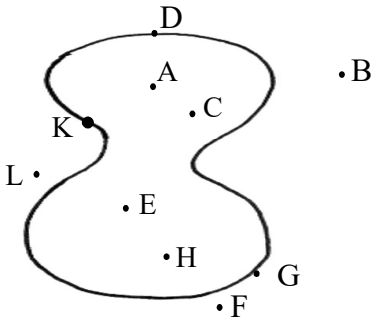


2. Divide the following diagrams as 'simple figure' and 'not simple figure' and make a list of the figures.



3. Separate the open and closed curves from the curves forming the simple figures of question 2.

4. From the given curve.



(i) Mention the interior points.

(ii) Mention the exterior points.

(iii) Mention the points on the curve itself.

5. Write 'Yes' or 'No'.

(i) On a piece of paper, if we move a pencil from a point continuously to reach another point and the line thus formed without crossing itself is called a simple curve.

(ii) On a piece of paper, if we move a pencil continuously from one point to another point and while moving and it crosses itself once or more than once then it is not a simple curve.

(iii) The curve mentioned in (i) is not an open curve.

(iv) The curve metioned in (i) will be a closed curve if two of its end points are same. That is the starting point and ending points are same.

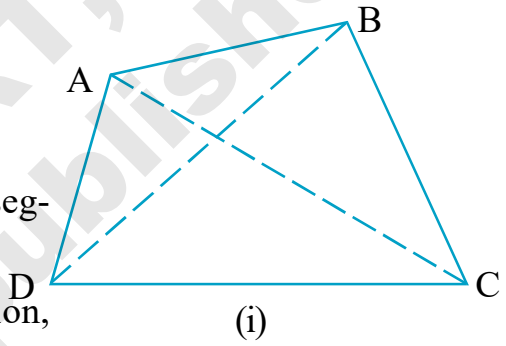
(v) The curve described in (ii) is a closed curve if its starting point and ending point are same. (Note that the curve which is not simple, is not considered under closed curve).

(vi) Straight line is a closed curve.

(vii) No parts of a curve are line segment.

(viii) Some parts of a curve may be line segments.

(ix) Closed curve has an exterior portion, which is called the region of the curve.



(i)

6. For the two polygons in figure (i) and (ii)

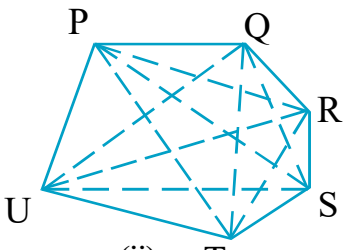
(i) Name the vertices.

(ii) Name their sides.

(iii) Name the diagonals.

(a) How many diagonals are there in figure (i)

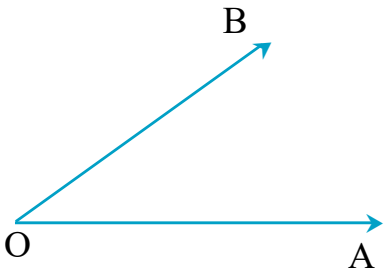
(b) How many diagonals are there in figure (ii)



(ii)

Angles

In the figure given, two rays $\overrightarrow{OA}$ and $\overrightarrow{OB}$ have a common end point O. The two rays together form an angle at the end point O. '$\angle$' is used as the symbol of angle. For example, the angle AOB is represented as $\angle$AOB.

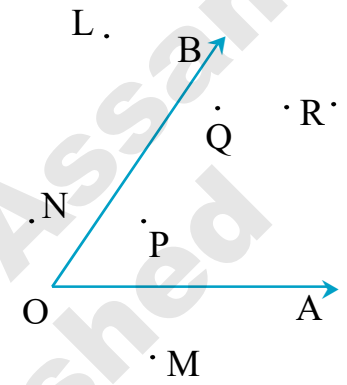


The angle is made up of two rays starting from a common end point. The common end point is the vertex of the angle. The two rays forming the angle are called the arms or sides of the angle.

O is the vertex of $\angle$AOB and $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are the sides of $\angle$AOB.

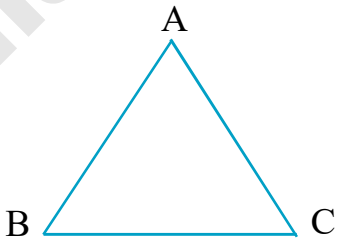
Interior and exterior of an angle :

Angles are drawn on planes. If the two sides of an angle extends infinitely, the portion of the plane formed inside the two sides of an angle is called the interior of the angle. On the other hand, the portion which lies out side the two sides of the angle is called the exterior of the angle. In the figure P, Q, R are the three points interior to the $\angle$AOB and L, M, N are three exterior points of the angle $\angle$AOB.



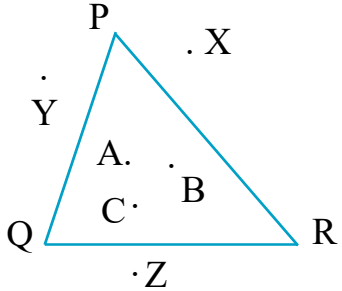
Triangle

Look at the polygon in the diagram. The polygon is made up of three line segments $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ A three-sided polygon is called a Triangle. Triangle is a polygon with least number of sides. We write ΔABC instead of writing 'Triangle ABC'.



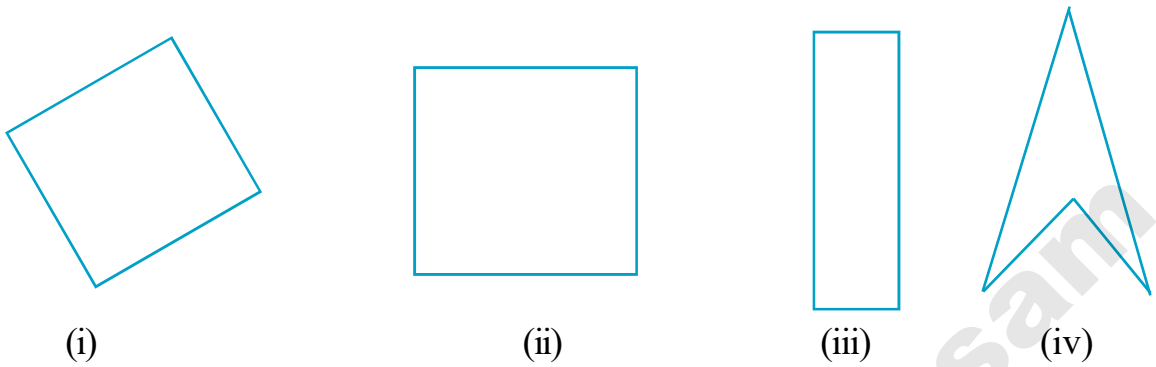
The line segments forming the triangle are called the sides of the triangle. $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ are the three sides of the ΔABC. The common point of two sides is the vertex of the tringle. The points A , B and C are the vertices of the ΔABC.

An angle of a triangle is formed at the common vertex of two sides. $\angle$BAC, $\angle$BCA and $\angle$ABC are the three angles of the ΔABC. So, a triangle has three vertices, three sides and three angles.



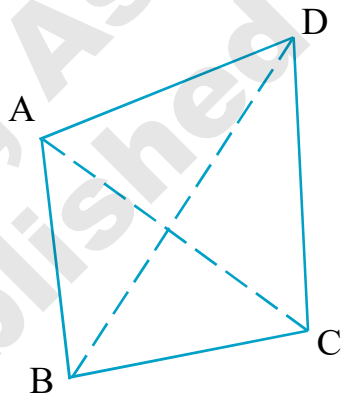
The part of the plane surrounded by the three sides of a triangle is called the interior of the triangle. On the other hand, the part outside the tiangle is called the exterior of the triangle. In ΔPQR, A, B, C are three interior points and X, Y, Z are three exterior points the triangle.

Quadrilateral



(i) (ii) (iii) (iv)

Look at the four polygons shown above. Each of these polygons are made up of four line segments. The polygons thus formed by 4 line segments are called Quadrilaterals. All the 4 line segments are four sides of the Quadrilateral.

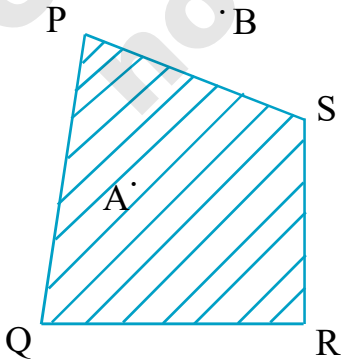


Four sides of the quadrilateral ABCD are $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DA}$. The common point of each of two sides of the quadrilateral is the vertex of the quadrilateral. Four vertices of the quadrilateral ABCD are A, B, C and D. At the common vertex of the two sides an angle is formed by these two sides. These angles are called the angles of the quadrilateral. Quadrilateral ABCD has four angles, they are $\angle$BAD, $\angle$ABC, $\angle$BCD and $\angle$ADC.

In quadrilateral ABCD the vertex C is the opposite of the vertex A and D is the opposite of the vertex B.

Line segments AC and BD are the diagoanals of the quadrilateral ABCD.

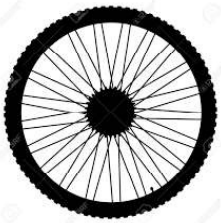
Interior and exterior of a Quadrilateral :



The part of the plane surrounded by four sides of a quadrilateral is called its interior. The external part of the quadrilateral is called its exterior.

Here, in the diagram PQRS, the region shown by drawing some line segments is the interior part of the quadrilateral and the external part where there is no lines drawn called the exterior of the quadrilateral. The quadrilateral and the interior part together is called the region of the quadrilateral. The point A is in the interior of the quadrilateral and B is its exterior point.

Circles




In our environment, we find many things that are round, The wheels of a bicycle, a round dish, a bangle, a coin etc. These round shapes are circles.

Take a pencil and a compass from the geometry box. Place the pointed end of the compass on a page of a note book. Move the pencil compass by placing the pointed end tightly on the paper. You will find that a round shape is formed on the paper by the compass. This round shape is the simple closed curve. This curve is called circle. The point marked by the sharp pointed end of the compass is the centre of the circle. There are infinite number of points on the simple curve by which the circle is formed. The distance from the centre to the every point of the curve is always same. That is every point on the circle is always equidistant from the centre.

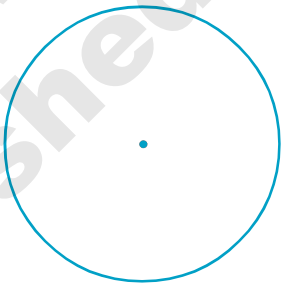


figure -1

So, we understaad that, the simple closed shape formed by collection of points and equidistant from a fixed point on a place is called the centre of the circle.

In figure-2, the centre of the circle is O. A is any point on the circle. Join O and A. OA is the radius of the circle. That is,

A radius is a line segment that connects the centre to a point on the circle. Measure of all the radii of a circle are equal.

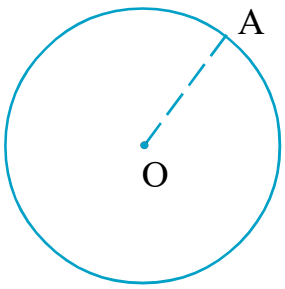


figure -2

In figure-3, A and B are any two points on the circle with centre O. Join A and B. We got a line segment AB, is the chord of the circle.

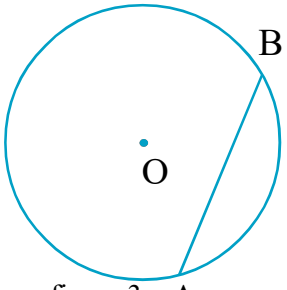


figure-3

A chord is a line segment connecting two points on a

circle. We can draw infinite number of chords on a circle.

In figure-4, PQ is a chord of the circle with centre O. This chord passes through O. PQ is the diameter of the circle. Any chord passes through the centre of the circle is called the diameter of the circle.We can draw infinite number of diameters for a circle. All the diameters of a circle are equal. Diameter is the longest chord of the circle.

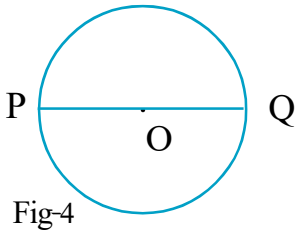


Fig-4

In figure-5 A and B are any two points on the circle with centre O. A portion in between A and B is called the arc of the circle. We write the arc AB as $\overset{\frown}{AB}$.

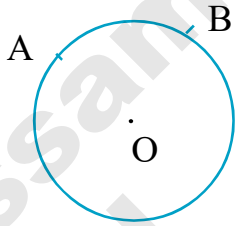


Fig-5

$\overline{AB}$ $\overline{AB}$

Two points on the circle divides the circle into two arcs. To make it more clear a point C is considered between the points A and B.

In figure - 6, the points A and B divides the circle with centre O into two arcs. These two arcs are $\overset{\frown}{ACB}$ and $\overset{\frown}{ADB}$, one of them is smaller and the other is bigger. The smaller arc is called minor arc and the bigger one is called major arc. Here $\overset{\frown}{ACB}$ is minor arc and $\overset{\frown}{ADB}$ is major arc.

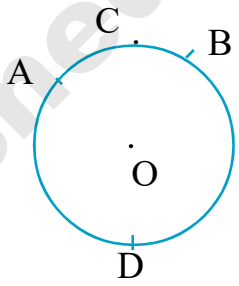


Fig-6

In figure - 7, AB is the diameter of the circle with centre O. Two end points of the diameter divide the circle into two equal areas. Each arc thus formed is called the semi circle of the circle.

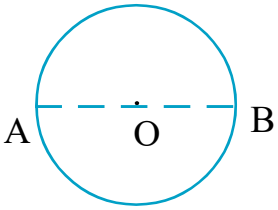


Fig-7

Draw a circle. The portion of the plane encircled by the circle is called the interior of the circle. The portion of the plane outside the circle is called the exterior of the circle . The circle with its interior is called the circular region.

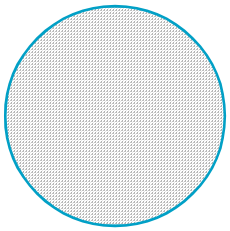


Fig-8

In figure-8, the coloured part is the interior of the circle.

In figure - 9, AB is an arc of the circle with centre O. OA and OB are two radii. A region in the interior of a circle enclosed by an arc on one side and a pair of radii on the other two sides is called a sector, The sector produced by the minor arc is called minor sector and the sector produced by the major arc is called major sector of the circle. In the figure

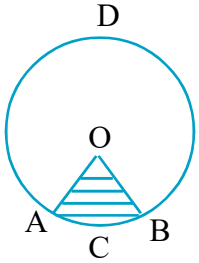


Fig-9

OACB is minor and OADB is major sector of the circle.

In figure - 10, AB is an arc of the circle with centre O. AB is a chord formed by joining the points A and B. A region in the interior of a circle enclosed by a chord and an arc is called a segment of the circle.

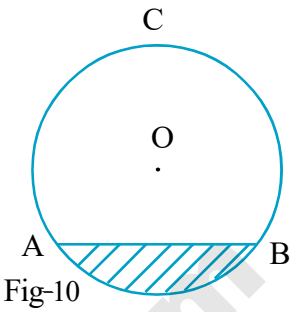
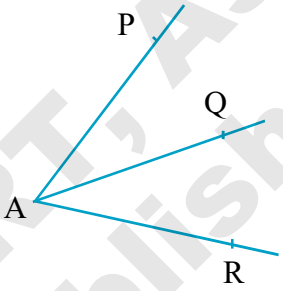


Fig-10

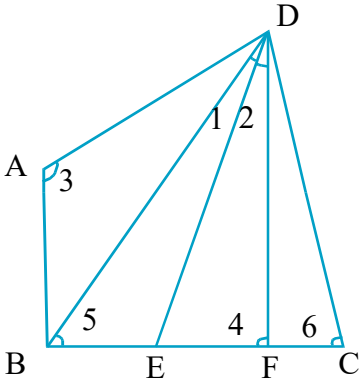
The segment produced by the minor arc is called the minor segment and the segment produced by the major arc is called the major segment of the circle.

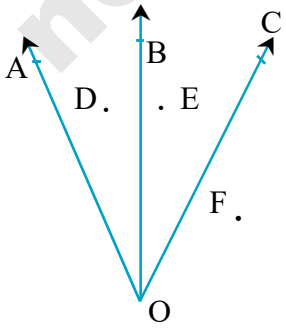
Exercise

1. Name all the angles of the figure.



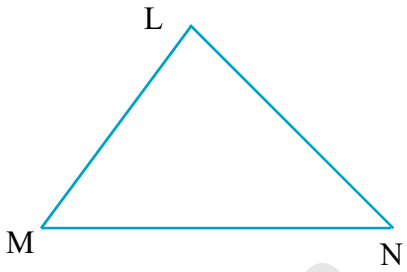
2. From the figure, name the angles $\angle 1$, $\angle 2$, $\angle 3$, $\angle 4$, $\angle 5$ and $\angle 6$.
(For example $\angle 1 = \angle BDE$)





3. From the figure on the lefthand side.
(i) Name two sides of $\angle BOC$.
(ii) Name the interior point of $\angle AOB$.
(iii) Name the exterior points of $\angle BOC$.

4. For the triangle LMN



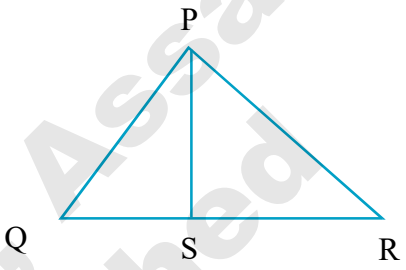
(i) Name the sides

(ii) Name the angles

(iii) Name two sides forming $\angle M$

(iv) Name the angle formed by the sidesLM and NL.

5. From the adjacent figure.



(i) Name 3 triangles

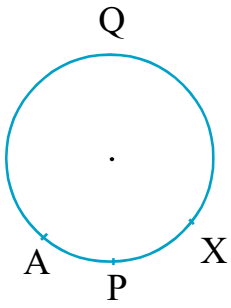
(ii) Name six line segments

(iii) Which two triangles have PR as the common side?

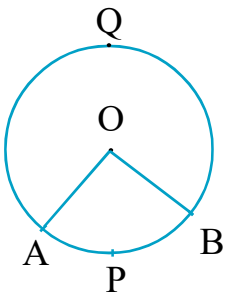
(iv) Which two triangles have $\angle Q$ as the common angle?

6. Draw a circle with centre O. Draw a radius, a chord and a diameter of that circle and name them.

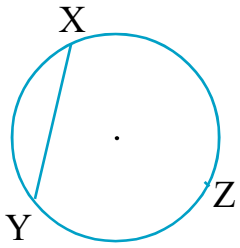
7. Name the minor arc and major arc of the circle.



8. Mark the minor sector formed by the arc AB of the circle and name it.



9. Mark the major segment of the circle formed by the arc XY and name it.



10. Put (✓) on the right answer and a (×) on the incorrect one.

(i) An angle has three vertices.

(ii) A triangle has three angles.

(iii) Three vertices of a triangle are collinear.

(iv) A triangle is a closed curve.

(v) A quadrilateral has four diagonals.

(vi) Each side of a quadrilateral intersects each other.

(vii) A circle has infinite number of radii.

(viii) All the chords of a circle are equal to each other.

(ix) The centre of a circle lies out side the circle.

(x) The arcs which are smaller than semi circle are called minor arcs.

(xi) The region encircled by an arc and the chord joining two end points of the arc is called the sector of the circle.

(xii) The sector formed by the arc greater than the semi-circle is called the major sector of the circle.

* * * * * *

Answers

1. $\angle PAQ$, $\angle QAR$, $\angle PAR$
2. $\angle 2 = \angle EDF$, $\angle 3 = \angle DAB$, $\angle 4 = \angle DFE$, $\angle 5 = \angle DBE$, $\angle 6 = \angle DCF$
3. (i) OB, OC, (ii) D (iii) D, F
4. (i) LM MN NL (ii) $\angle LMN$, $\angle MNL$, $\angle NLM$
   (iii) LM, NM, (iv) $\angle MLN$
5. (i) ΔPQS, ΔPRS, ΔPQR (ii) $\overline{PQ}$, $\overline{PS}$, $\overline{PR}$, $\overline{QS}$, $\overline{RS}$, $\overline{QR}$
   (iii) ΔPQR and ΔPSR (iv) Δ PQR and ΔPQS
6. Discuss with your teachers.
7. Minor arc = APX , Major arc = AQX
8. Minor sector = OAPB Major sector = OAQB
10. (i) × (ii) ✓ (iii) × (iv) ✓ (v) × (vi) ✓
    (vii) ✓ (viii) × (ix) × (x) ✓ (xi) × (xii) ✓