



- Concept of circle
- Radius, diameter, chord and arc of circle
- Semicircle
- Circle - Segment and Sector

14.1 Introduction

You have studied the different types of geometrical shapes. Today we will study about such type of a shape that has special features. This is very useful for our life.

14.2 Activity :

Tie a pencil on one end of a thread and put the other end on a fixed point in the paper and rotate the pencil in such a way that thread is strained. We observe that there is a circle in this condition too. The fixed point is called center of the circle and the length from the fixed point to the pencil is called radius of the circle. In the adjacent figure, O is center of circle and OP is radius of the circle.

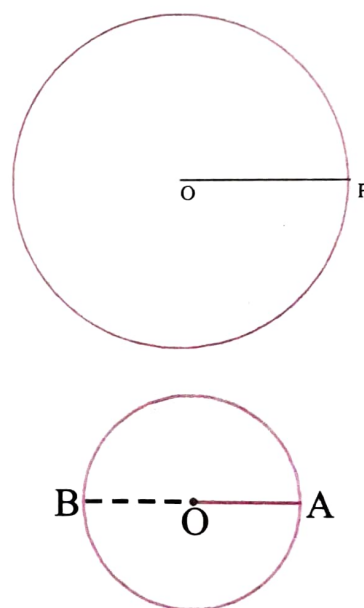
Constructed curve is **circle** which is set of all points in a plane which are at same distance from a fixed point.

The fixed point O is center of the circle. Line segment OA is **radius** of the circle and line segment AB is **diameter** of the circle.

Note : Usually, the radius of circle is denoted by English alphabet r and diameter is denoted by d .

14.3 Interior and exterior region of circle :

Excluding the circle, the region inside a circle is called interior region of the circle and excluding the circle, the region outside a circle is called exterior region of the circle.



Let us find out

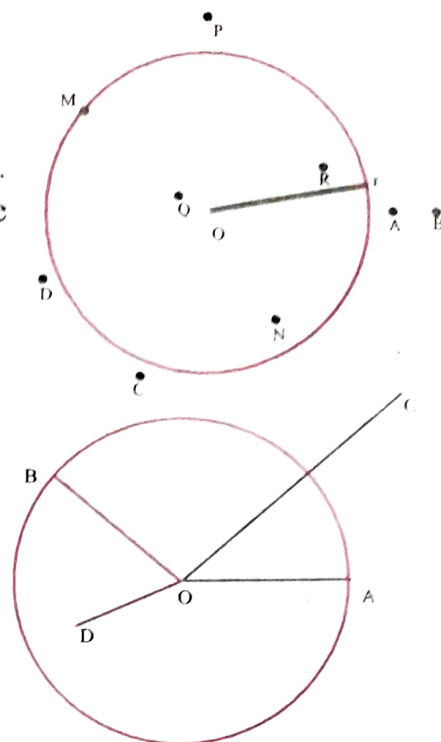
In adjacent figure :

1. Which points lie on the circle ?
2. Tell the name of points lie in exterior region of the circle.
3. Which points lie in the interior region (circular region) of the circle ?

Constructing of a Circle, Discuss and Conclude

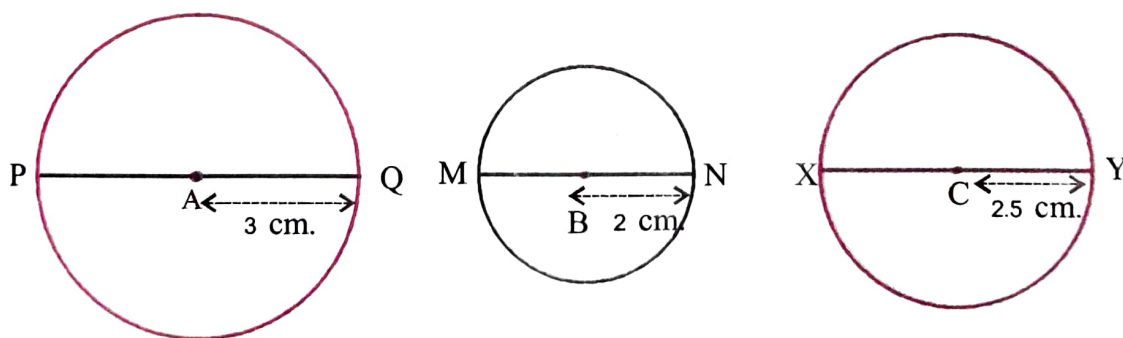
Draw a circle whose center is O and radius is OA. Take a point B on the circle, a point C in the exterior region of the circle and a point D in the circular region. Draw line segments OB, OC and OD.

1. What is the relation between lengths of line segments OA and OB ?
 2. Tell the relation between line segments OA and OD ?
 3. In the line segments OA and OC which is smaller?
- The points, whose distance from the center of the circle are equal to the radius, lie on the circle.
 - The points, whose distance from the center is smaller than the radius, are lie in interior or circular region of the circle.
 - The points, whose distance from the center is greater than the radius, are lie in exterior region of the circle.



Do these, discuss and conclude :

Draw the circles of radius 3 cm, 2 cm and 2.5 cm whose centers are A, B and C respectively. Draw their diameters PQ, MN and XY and measure them.



1. What are the measure of PQ, MN and XY ?
2. What is the relation between measures of diameter PQ and radius AP ?
3. What is the relation between measures of diameter MN and radius BM as well as that of diameter XY and radius CX ?

Hence, the length of diameter of a circle is twice the radius of that circle, i.e.,

$$\text{Diameter} = 2 \times \text{Radius or Radius} = \frac{\text{Diameter}}{2}$$

14.4 Circumference :

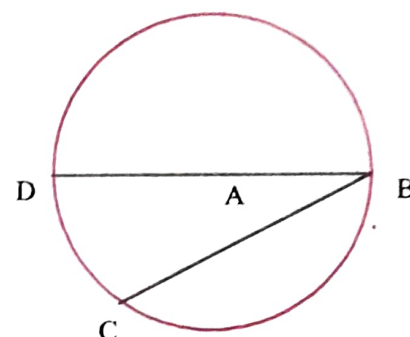
Wrap a thin wire in the boundary of a circular patch or plate. For this, press the one end of the wire by thumb. Again, wrap the wire in the direction of circular patch or plate upto the mark of the thumb. Now measure the length of this wire. Which type of measure of the circular patch is it ?

The length of the circular boundary is called the circumference of the circle.

14.5 Chord :

Assuming A as center, draw a circle of any radius. Mark two points B and C on the circle. Join point B to point C. Similarly, draw another line segment BD from point B passing through A.

1. What is the line segment BD called ?
2. What is the line segment BC called ?



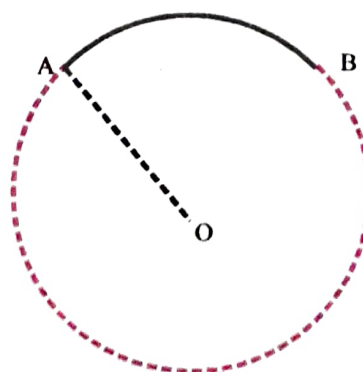
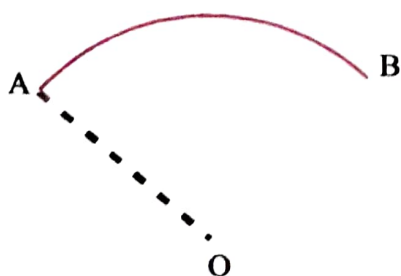
What we learnt :

The line segment joining any two points on a circle is called chord of the circle. The chord passing through the center of the circle is called diameter of the circle and it is the longest chord of the circle.

14.6 Arc

Do these, discuss and conclude :

Take a point O on a page of your practice book. Put a pencil in the compass. Take a point A at a distance of 3 cm. from the point O. Move the tip of the pencil from point A to point B by placing the tip of the compass at point O and tip of pencil at point A. What will be the curve from A to B called ?



This curve is called arc of the circle and represented it by arc AB or $\widehat{AB}$. This arc is a part of the circle which is completed by the point wise curve. OA is the radius of this circle. OA is also the radius of the arc AB. **A part of the circle is called an arc.**

What we learnt :

Discuss in group on the points given below and draw conclusions :

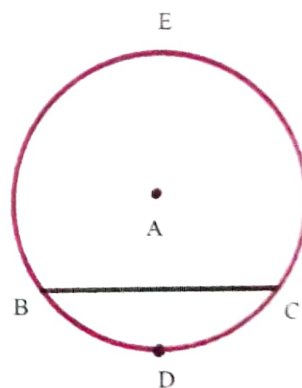
1. What is the relation between the radius of the circle and its diameter ?
2. How many radii are there in a circle ?
3. How many diameters are there in a circle ?
4. What is the name of the longest chord of a circle ?
5. Define the circumference ?
6. Draw an arc PQ, whose radius is 4.2 cm.
7. Draw a circle of radius 3.5 cm. Denote any two arcs AB and CD of the circle.
8. Define a circle of radius 5 cm by taking point O as centre. Take point P, 3.5 cm away from the point O. Find whether point P is a exterior of the circle or interior of the circle.

14.7 Minor arc and Major arc :

Draw a circle of any radius assuming a point A as center. Take two points B and C on the circle such that chord BC do not pass through A.

1. In how many parts the circle is divided by the chord BC?
2. Which part is larger among these parts of the circle ?

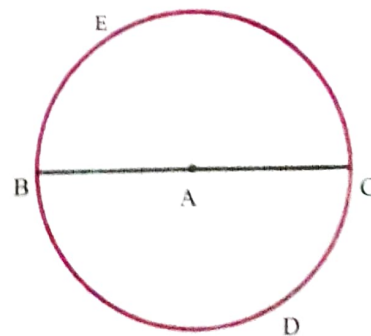
Both parts of the circle are called arc of the circle. The larger part is called major arc and the smaller part is called minor arc. In the figure the arc BEC is major arc and arc BDC is minor arc.



14.8 Semicircle :

Draw a circle of any radius taking a point A as its center. Draw the diameter BC of the circle. Cut this circle out of the exercise book. Bend it along to diameter BC and place both parts over each other.

1. Whether one part of the circle has covered the other part completely ?
2. What is the relation between the two parts of the circle?
3. What name can be given to each of these parts of the circle ?



In the figure, arc BEC and arc BDC are semicircle of the circular curve. Point B and point C of the diameter are included in every semicircle. The diameter is not included itself in the semicircle.

The region bounded by the semicircle and diameter is called semicircular region. In the figure, the region bounded by arc BDC and diameter BC is semicircular region. Similarly, the region bounded by arc BEC and diameter BC is also semicircular.

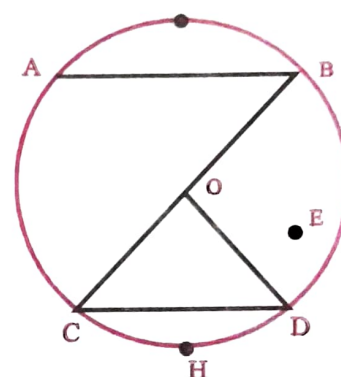
What we learnt :

The diameter of a circle divides the circle, into two equal parts. Each of these parts is called semicircle, in which the end points of diameter are included but the diameter itself is not included.

Exercise 14 (a)

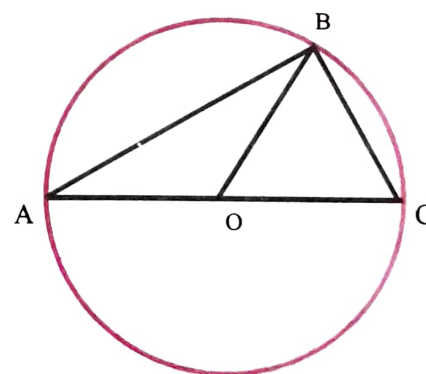
1. Write down by looking at the adjacent picture :

- (i) Center of the circle
- (ii) Name of three radii
- (iii) Name of a diameter
- (iv) Name of two chords
- (v) A point in interior region
- (vi) A point in exterior region
- (vii) Name of four arcs (two minor, two major)
- (viii) Name of a semicircle.



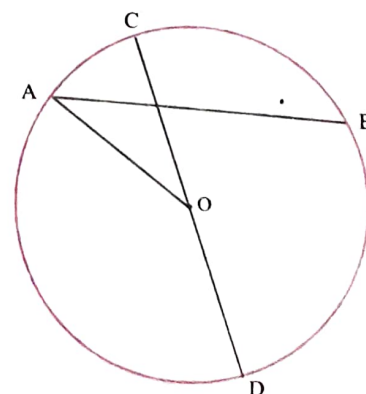
2. Answer the following questions by looking at the adjacent picture :

- (i) Tell the name of three radii.
- (ii) Tell the name of three chords.
- (iii) How many diameters are drawn in the figure ?
Write the name of them also.



3. O is the center of the circle in the adjacent figure. According to the picture, name the following parts of the circle :

- (i) Line segment OA
- (ii) Line segment AB and CD
- (iii) arc CBD
- (iv) arc CAD



4. Draw circle of the following radii with the help of a compass :
 (i) 4.5 cm (ii) 3.2 cm
5. Draw circle of the following diameters with the help of a compass :
 (i) 7.6 cm (ii) 10 cm
6. The radius of a circle is 4.5 cm. Find the measure of the diameter of the circle.
7. Draw a circle of any radius. Take two points P and Q on the circle and join them. Tell whether all the points of line segment PQ except point P and Q lie :
 (i) On the circle ?
 (ii) Outside the circle ?
 (iii) Inside the circle ?
8. The following statements are true or false :
 (i) The radius of a circle is chord of the circle.
 (ii) The diameter of a circle is chord of the circle.
 (iii) The diameter is largest chord of the circle.
9. Draw a line segment AB whose length is 4 cm. Assuming point A as a center, draw a circle, such that it passes through point B. Measure the radius of this circle and write it.

14.9. Segment of Circle :

Do it, Discuss and draw conclusions :

Draw a circle of any radius whose center is O. Draw a chord in it. Take two points X and Y on the circle.

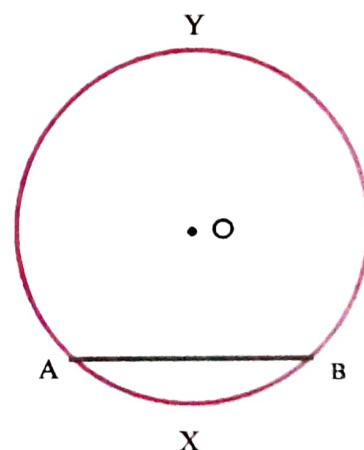
- (i) In how many parts the circular region is divided by chord AB ?
- (ii) What does each part called ?

The circular region divided into two parts AXB and AYB by the chord AB and each part is called segment of the circle.

What we Learnt :

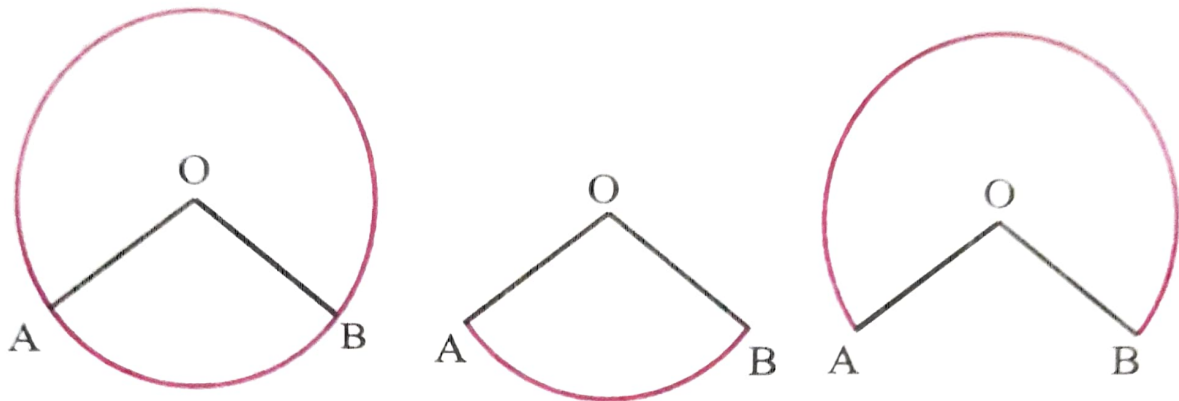
The region bounded by the arc and a chord of a circle is called segment.

Smaller part is called minor segment of the circle and larger part is called major segment of the circle. In the figure, the region bounded by the arc AXB and chord AB is minor segment of the circle and the region bounded by the arc AYB and chord AB is major segment of the circle.



14.10 Sector

Take a page and draw a circle of radius 3 cm, whose center is O. Take two points A and B on the circle. Draw the radii OA and OB. Cut off the circle with the circular area from the page. Now carefully cut from A to O and B to O and separate OAB part of the circular area according to the figure. What will be called the parts so obtained? Both obtained parts are called sector and smaller part is called **minor sector** and larger part is called **major sector**.



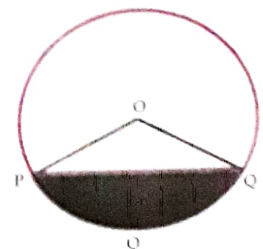
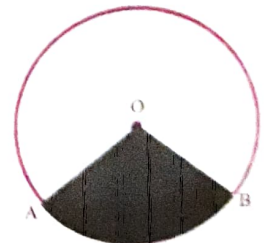
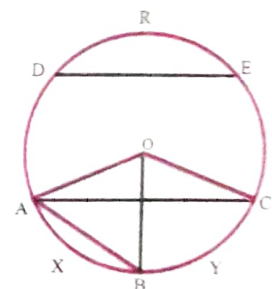
The area bounded by an arc of a circle and the radii passing through the end points of the arc is called sector.

Exercise 14 (b)

- O is the center of circle in the adjacent figure. Line segments OA, OB and OC are radii. Line segments AB, AC and DE are chords. These have a sector, with region bounded by OA, OB and arc AXB and the corresponding segment of circle, with region bounded by chord AB and arc AXB.

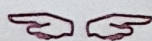
Similarly, according to the picture, write the names of five other sectors and their corresponding segment of circle on your exercise book.

- Write the radius of the sector shaded in the adjacent figure.
- Mention the name of the chord of the shaded sector and its corresponding segment in the adjacent figure.



We learnt in this Unit :

1. The set of all points located at a fixed distance (equal distance) from a fixed point in a plane is called a circle. The fixed point is called the center of the circle and fixed distance (equal distance) is called radius of the circle.
2. The points, whose distance from the center of the circle is equal to the radius, are lie on the circle. The points, whose distance from the center is smaller than the radius, lie in interior (or circular region) of the circle. The points, whose distance from the center is greater than the radius, lie in exterior region of the circle.
3. The length of the circular boundary is called the circumference of the circle.
4. The line segment joining any two points of a circle is called chord of the circle and diameter is the longest chord of the circle, which passes through the center of the circle.
5. A part of the circle is called an arc.
6. The diameter of a circle divides the circle into two equal parts. Each of these part is called semicircle, in which diameter itself is not included.
7. The region bounded by the arc of a circle and a chord is called segment of the circle.
8. The area bounded by an arc of a circle and the radii passing through the end points of the arc is called sector.



ANSWERS

Exercise 14 (a)

1. (i) Center O, (ii) OB, OC, OD (iii) BC, (iv) AB, CD, (v) E (vi) None, (vii) AB, AC, ABDC, BDCA, (viii) BAC. 2. (i) OA, OB, OC, (ii) AB, BC, AC, (iii) one, AC, 3. (i) radius, (ii) chord AB, diameter CD, (iii) semicircle (iv) semicircle; 6. 9 cm, 7. (i) No, (ii) No, (iii) Yes; 8. (i) False, (ii) True, (iii) True, 9. 9 cm.

Exercise 14 (b)

2. OA, OB, 3. Chord PQ, sector OPQ.

