15   Circles

After studying this chapter, you will be able to get a good understanding of,

★   drawing patterns with the use of a pair of compasses.
★   identifying the centre, radius and the diameter of a circle.
★   constructing circular patterns using circles.

15.1 Can you remember what you have learned ?...

You have already studied about the circles and about building up of constructions and patterns using circular objects. Do the following exercise to revise the knowledge you have gained in the past.

Exercise 15.1

(1)   Find some circular objects from the environment around you and draw circles by using them.
(2)   Find 5 circular objects of different sizes and construct a few circular patterns using them.
(3)   Draw a circle on a sheet of paper by using a circular object, cut it out and fold it to get four equal parts and then unfold it.

Answer the questions on the next page related to the given figure.
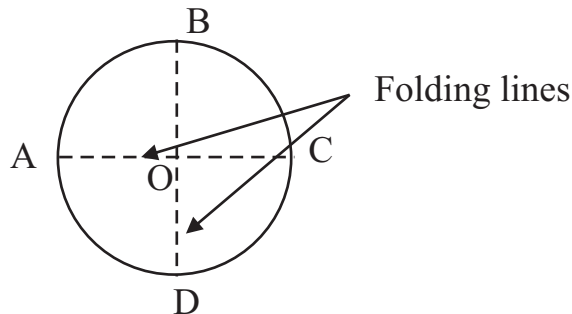
(i)   What are the magnitudes of $\overset{\wedge}{AOB}$ and $\overset{\wedge}{BOC}$?

(ii)   Measure the lengths OB, OC, AC, BD.

(iii) Is there any relation among the above lengths of (ii)?

As explained above, circles can be drawn by using circular objects. A question that arises here is how we can draw a circle of a required size.
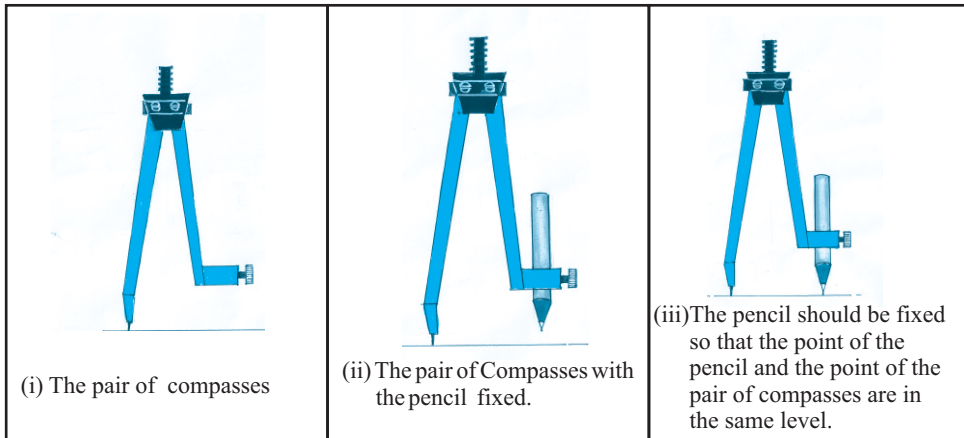
Activity 15.1

Materials needed: A pencil, a piece of thread, a pin, a ruler and a white sheet of paper.

Keep the sheet of paper on the table. Fix up the pin on the table so that it will pierce the middle of the paper. Now tie the thread so that one end of it is on the pin and the other end on the pencil. Now by moving the pencil around the pin so that the thread is stretched, we can construct a figure. Do it now and get the figure.

(i)   What is the figure you constructed?

(ii) Find the length from the pin to any point on the figure. Do these lengths differ?

(iii) Do the above activity repeatedly by changing the length of the thread.

(iv) Do you notice that the size of the figure depends on the length of the thread?

The pair of compasses can be used as in the following figure to construct a circle clearly and correctly to the size we need. For this, the pair of compasses should be moved as in activity 15.1.

When a certain construction is done using the pair of compasses it should be adjusted correctly. Follow the following steps for this.

| (i) The pair of compasses | (ii) The pair of Compasses with the pencil fixed. | (iii) The pencil should be fixed so that the point of the pencil and the point of the pair of compasses are in the same level. |

Follow the following steps in constructing a circle using a pair of compasses adjusted correctly.

Step (i)

Mark a point 'O' in the middle of a page of your exercise book.

Step (ii)

Adjust the pair of compasses so that there is a gap between the point of the pencil and the point of the pair of compasses. (As an example let us assume that the gap is taken as 4 cm.)

Step (iii)

Keeping the point of the pair of compasses fixed at 'O', move the pencil around the point without changing the gap. The figure drawn in the book will be the construction.

Now you will note that a circle is drawn around point 'O'.

radius

P

O
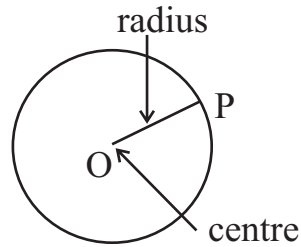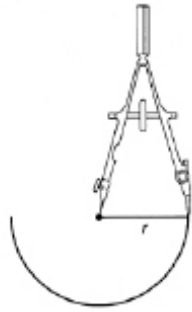
centre

The locus of a point moving with a constant distance from a fixed point is a **circle.**

15.2 Parts of a circle

The radius and the centre: We have mentioned above that the locus of a point moving equidistant from a fixed point is a circle. It is said that this fixed point in a circle is its **centre** and the constant distance is the **radius.**

As given in the figure, 'O' is the centre of the circle and OP is its radius.

Activity 15.2

P_1, P, O, P_2
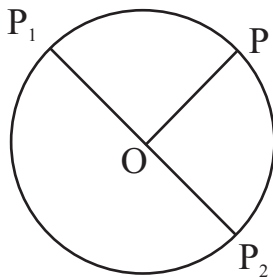
Copy this circle and answer the following questions.

(i) Measure and write the lengths of OP , OP_1, and OP_2.

(ii) What is the relation among the lengths OP , OP_1 and OP_2?

(iii) What can you say about the distance between 'O' and any other point on the circle?

(iv) Name the centre and the radius of the circle.

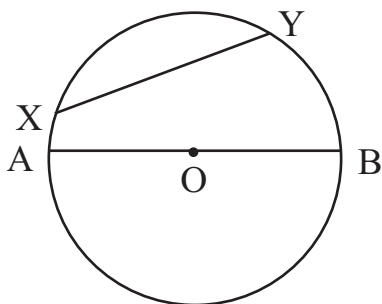The line segment joining the centre of a circle and any point on it is the **radius** of the circle.

(I)   Draw a few circles with the same centre and with different radii.

(ii) Draw a line on a white sheet of paper and draw a large circle with the centre on that line. Taking the point of intersection of this circle and the line as the centre draw a circle with radius half that of the former circle. By doing this activity repeatedly draw a few circles.

15.3 The Chord and the Diameter

The line joining any two points on the circle is known as a **chord.**
The chord passing through the centre of the circle is known as a **diameter**. Accordingly the chord with the greatest length is the diameter.

XY and AB are chords of the circle with centre 'O' and since the chord AB passes through the centre of the circle, it is a diameter.

> The line segment joining any two points on a circle and passing through the centre is a diameter of the circle.

According to the above figure OA and OB are radii of the circle and AB is the diameter of the circle.
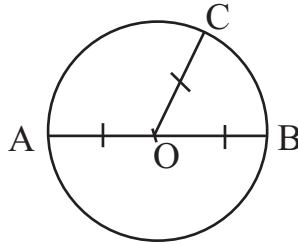
$$\therefore\ OA = OB =\ \text{the radius of the circle}$$

The diameter of the circle $= AB = OA + OB$
$$= OA + OA$$
$$= 2 \times (OA)$$

> The length of the diameter of a circle is twice its radius.

Exercise 15.2

(1) Name the centre, radius and the diameter of this circle.

(2) (i)   Draw any circle.
     (ii)   Name the centre of this circle as 'O' and mark any point 'P' on the circle.
     (iii) Extend the line segment PO to meet the circle at 'Q'.
     (iv)   Measure the length of the radius and the diameter of the circle.

(3) What is the length of the longest chord that can be drawn in a circle of radius 5 units?

(4) Draw a circle and draw two diameters perpendicular to each other. Taking the mid points of the radii obtained already as centres draw four circles with radius half the length of the radius of the first circle.

(5) Draw two chords AB and AC of length 5 cm each through any point 'A' on a circle of radius 5 cm.

(6) Draw a line segment $XY = 5$ cm and taking 'X' and 'Y' as centres and radius 5 cm, draw two circles.

     (i) What is the distance between the centres of the circles?
     (ii) What is the distance from the centres to the point of intersection of the circles?

Patterns can be constructed for various decorative purposes by using circles. A few such patterns are shown below. See whether they can be constructed.
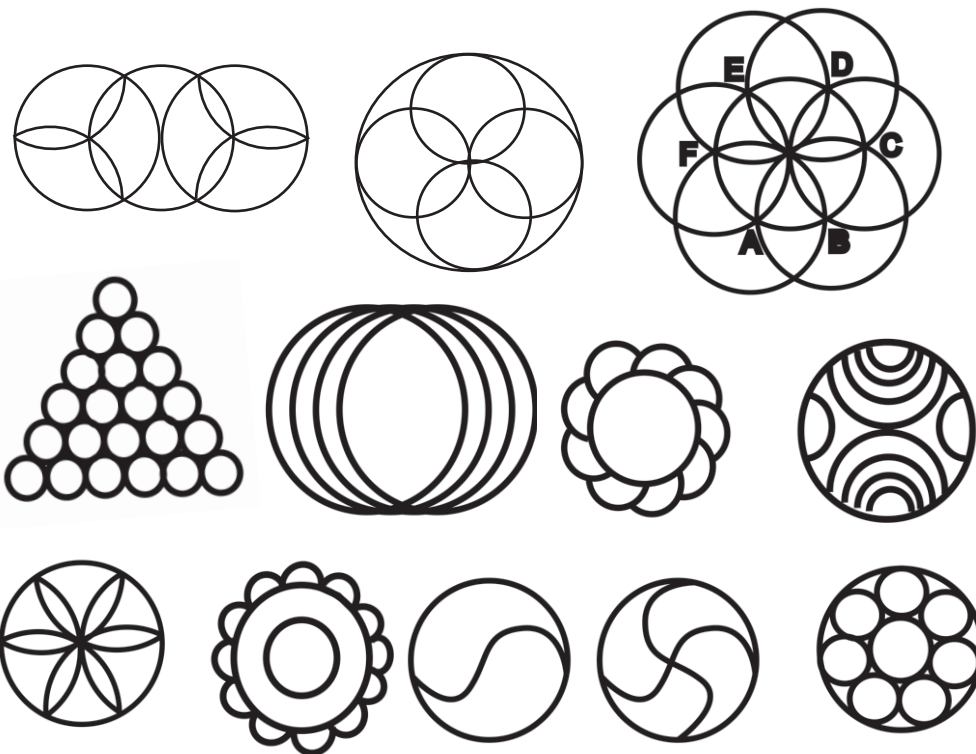
Summary

★ The locus of a point equidistant from a fixed point is a circle.

★ The fixed point mentioned above is the centre of the circle.

★ The line joining the centre of a circle and any point on the circle is a radius.

★ The line joining any two points on a circle is a chord.

★ The line joining any two points of a circle and passing through the centre is the diameter of the circle.

★ The longest chord of a circle is its diameter.

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