24 Constructions

After studying this chapter you will be able to get a good understanding of the followings.

- ★ Construction of a line segment.
- ★ Construction of an equilateral triangle.
- ★ Construction of a hexagon.

In chapter 15 on circles we learned about the pair of compasses and drawing a circle of a given radius by using it. Revise again how circular patterns were constructed by using the pair of compasses. Let us engage in the following activity to practise further the use of the pair of compasses.

Activity 24.1

(*a*)
- Draw a circle of radius 4 cm and name the centre as 'O'.
- Select any point 'A' on the circle and join 'O' and 'A'.
- Draw another circle of radius 4 cm with centre 'A'.
- Taking one point of intersection of the two circles as 'P', construct a triangle OPA.
- Measure the lengths OP, OA and AP.
- What can you say about the triangle OPA?

(*b*)
- Draw a circle of radius 5 cm with 'O' as the centre.
- Select any point 'A' on the circle and draw another circle of radius 5 cm with 'A' as centre.

- Take one point of intersection of these two circles as ‘B’, and with centre ‘B’ and radius 5 cm draw a third circle. Continue this activity.

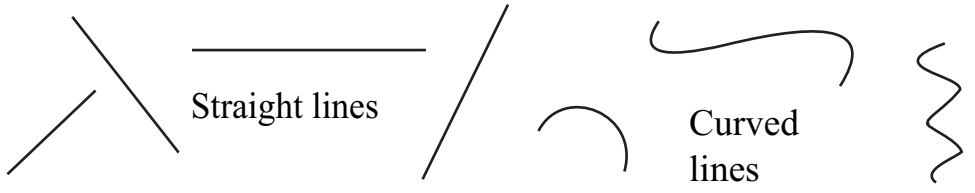
- Now observe how you get 6 circles of the same radius at the end according to a certain pattern.

- Name the points of intersection of the first circle and the other 6 circles as ‘A’, ‘B’, ‘C’, ‘D’, ‘E’ and ‘F’. What can you say about the figure you get when these points are joined in order ?

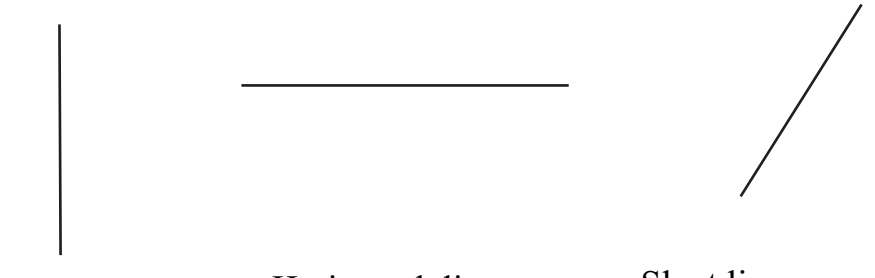
The lines we can see are of two forms,

(I) Straight lines
(II) Curved lines

The lines can be classified according to the form they are.



These are also straight lines.



24.1 Constructing a line segment

Activity 24.2

(i) Draw a straight line.

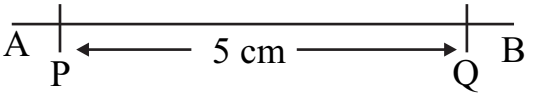
(ii) Name it AB.

(iii) Mark point 'P' on it.

(iv) Take a length of 5cm to the pair of compasses using a ruler.

(v) Now mark the limits of 5cm on AB from 'P' using the pair of compasses.

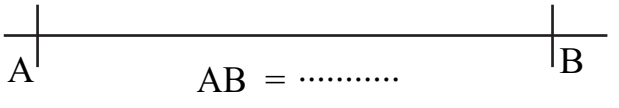
(vi) You have marked a line segment of 5cm in length. Name it as PQ.



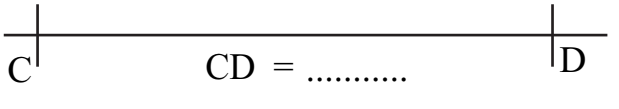
Exercise 24.1

(1) Measure and write the length of the line segments given below.

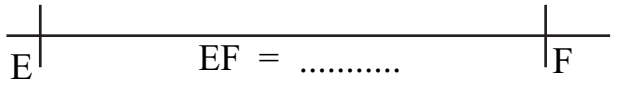
(i)



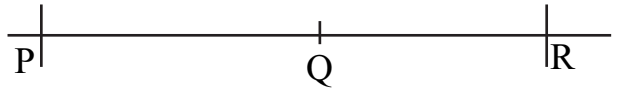
(ii)



(iii)



(iv)



PQ = ... QR = ... PR = ...

(v) Draw a straight line in your exercise book as shown below and construct the line segment XY with the length of 7.5 cm.

(2) Draw the line segments of the lengths given below using the pair of compasses and the ruler.

(i) AB = 6 cm
(ii) PQ = 8 cm
(iii) XY = 4.5 cm
(iv) CD = 10.5 cm

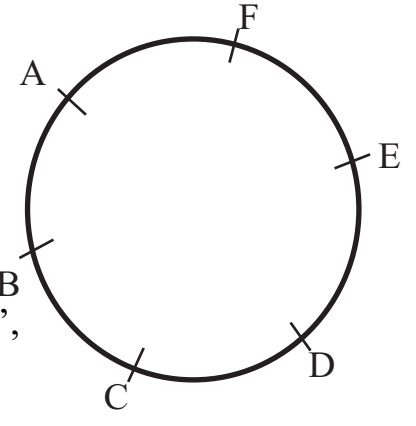
(3) On the straight line AE construct the line segments AB, BC, CD such that AB = 3 cm, BC = 4cm, CD = 3.5cm.

(4)

(i) Draw a circle of radius 5 cm as shown in the figure.

(ii) Divide the circle into 6 equal parts.

(iii) Name the points as 'A', 'B', 'C', 'D', 'E' and 'F'.

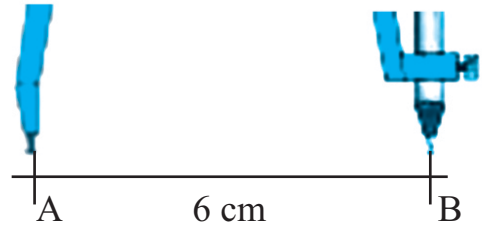


(iv) Measure the shortest distance between 'A' and 'F'.

24.2 Construction of Equilateral Triangles

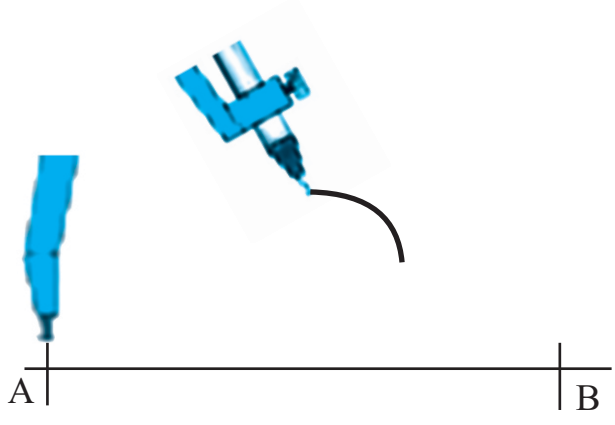
Activity 24.3

Let us construct an equilateral triangle by using the pair of compasses and the ruler.

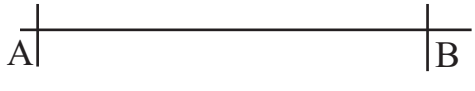


(i) Construct a line segment AB = 6 cm.

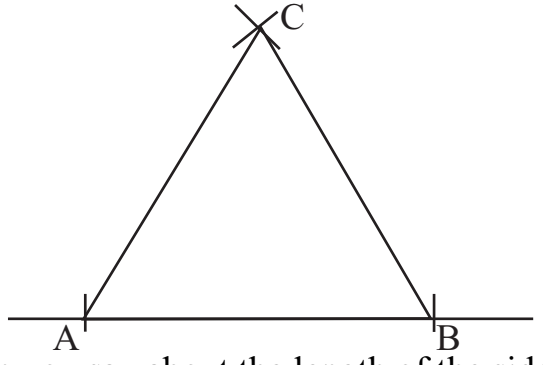
(ii) Without disturbing the gap in the pair of compasses and keeping the metal point on 'A' draw an arc above AB.



(iii) Without changing the gap of the pair of compasses, keep the metal point on 'B' and draw another arc above AB to intersect the former arc and name the point of intersection as 'C'.



(iv) Complete the triangle ABC by joining AC and BC.



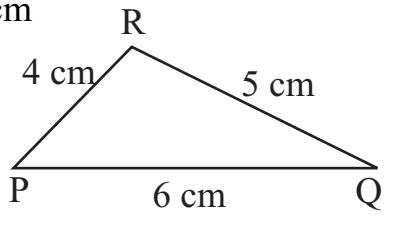
(v) What can you say about the length of the sides of the triangle ABC?
What is the special name of the triangle ABC?

A regular polygon having three equal sides is called an **equilateral triangle.**

Exercise 24.2

(1) Using each of the following as the length of a side, construct equilateral triangles.
(i) 7 cm (ii) 4 cm (iii) 5.5 cm

(2) Contruct the triangle PQR as given in the figure.



(3)
(i) Draw a circle of radius 6 cm.
(ii) Without changing the gap of the pair of compasses divide that circle into six equal parts.
(iii) Name those points as ‘A’,’ ‘B’, ‘C’, ‘D’, ‘E’, ‘F’.
(iv) Join AC, AE and EC and get the triangle ACE .
(v) Measure the length of the sides of the triangle ACE.
(vi) According to the length of the sides ,what can you say about the triangle ACE?

(vii) From this figure can you get another triangle equal to triangle ACE?

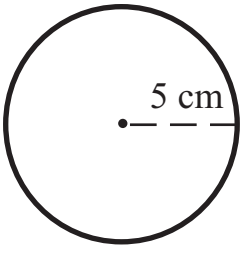
(viii) If possible, draw that triangle and name it.

(ix) Write the similarities between the two triangles obtained.

24.3 Contruction of a Regular Hexagon

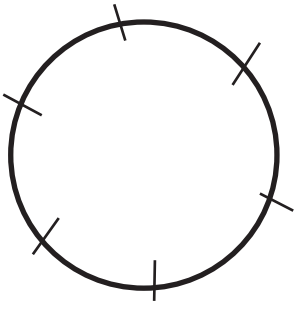
Activity 24.4

(i) Draw a circle of radius 5 cm.



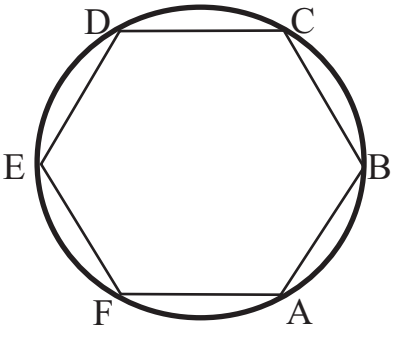
(ii) With the same radius in the pair of compasses divide the circle into equal parts. Name those division points as 'A', 'B', 'C', 'D', 'E' and 'F'.

(iii) Join the points of division in order.



(iv) What is the length of one side of the figure obtained?

(v) What special name can be given to the polygon?



Exercise 24.3

(1) Construct the following hexagon using only the pair of compasses and the ruler.
   (i) Draw a circle of radius 6 cm.
   (ii) Without changing the radius, divide the circle into equal parts.
   (iii) Join the points of division in order and get a regular hexagon.

(2) Construct a regular hexagon with sides 4 cm in length.

(3) (i) Measure and write the distance from the centre to a vertex of a regular hexagon of sides 5.5 cm in length.
   (ii) Write the relation between the radius and the length of a side of the regular hexagon.

(4) Draw a few regular hexagons of sides 4 cm in length on varnish paper of various colours and cut them out. Using the cut out hexagons construct a beautiful pattern. Exhibit it and discuss about the construction.

A regular polygon having six sides is called a **regular hexagon.**

Summary

- ★ A part of a straight line, of a definite length is called a **"line segment".**
- ★ By taking a definite length to the pair of compasses and by marking that gap on a straight line, a line segment can be constructed.
- ★ The closed figure constructed with three straight line segments of equal length is called an **"equilateral triangle".**
- ★ A **"regular hexagon"** can be obtained by constructing a closed figure on a circle with six line segments equal in length to the radius of the circle.