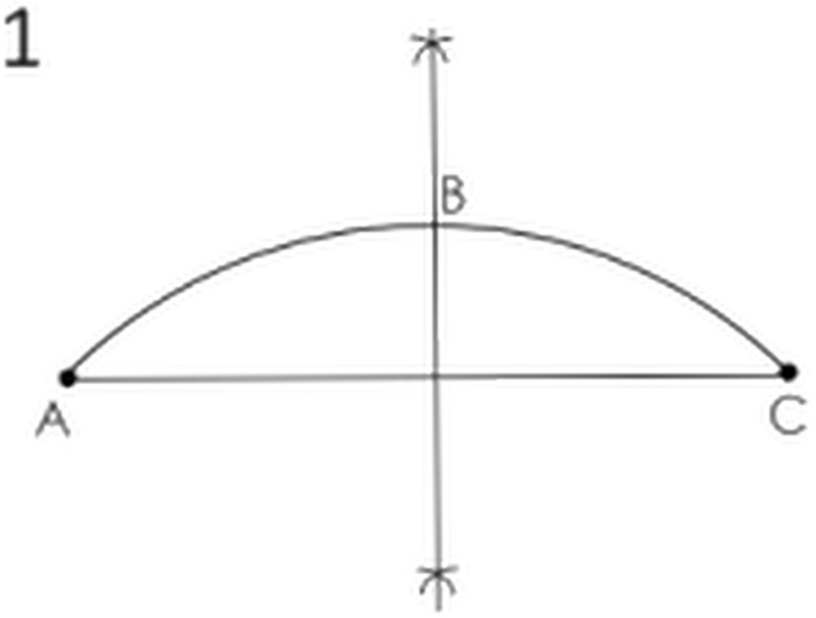
Exercise 13.1

Q1. Divide an arc of any length.

(i) Into two equal parts.

Solution:

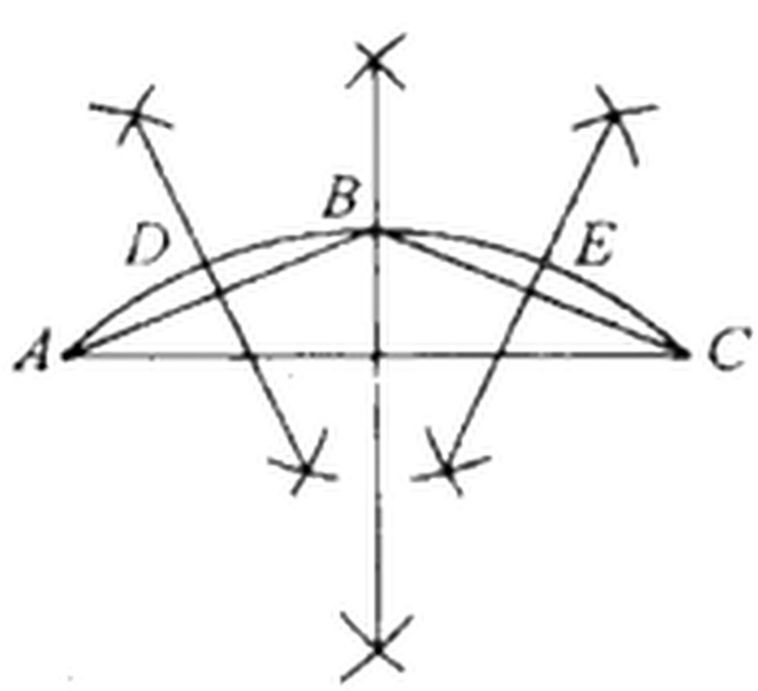


Steps of construction:

1. Draw an arc $\overset{\frown}{AC}$.
2. Join A with C
3. Draw the right bisector of $\overline{AC}$ which intersects the arc $\overset{\frown}{AC}$ at point B.
4. Therefore, the given arc $\overset{\frown}{AC}$ has been divided into two equal arcs $\overset{\frown}{AB}$ and $\overset{\frown}{BC}$.

(ii) Into four equal parts

Solution:

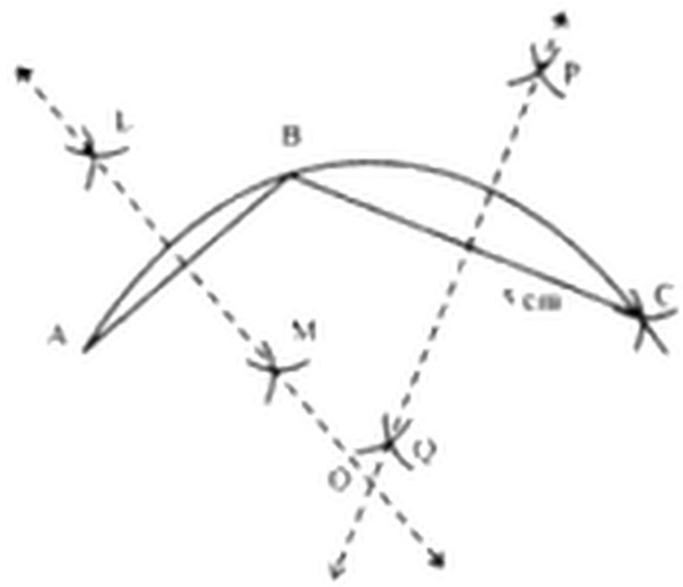


Steps of construction:

1. Draw an arc $\overset{\frown}{AC}$.
2. Join A with C
3. Draw the right bisector of $\overline{AC}$ which intersects the arc $\overset{\frown}{AC}$ at point B.
4. Join B with A and C.
5. Draw the right bisectors of $\overline{AB}$ and $\overline{BC}$ which intersect the arc $\overset{\frown}{AC}$ at points D and E respectively.

6. Therefore, the given arc $\overset{\frown}{AC}$ has been divided into four equal arcs $\overset{\frown}{AD}$, $\overset{\frown}{DB}$, $\overset{\frown}{BE}$ and $\overset{\frown}{EC}$.

2. Practically find the centre of an arc ABC.



Solution:

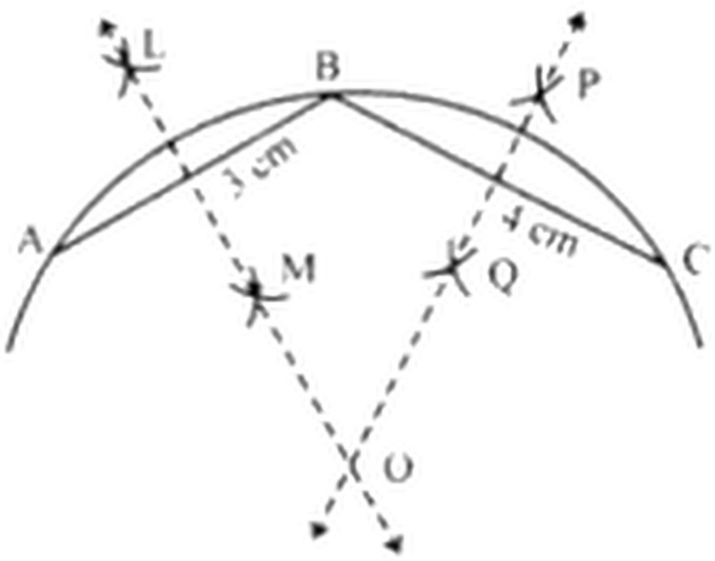
Steps of Construction:

1. Draw an arc $\overset{\frown}{ABC}$.
2. Join A with B and B with C.
3. Draw LM and PQ right

   Bisectors of AB and BC respectively.

   LM and PQ intersect at point O.
4. O is the required centre of an arc ABC.

3. (i) If $|\overline{AB}|$ = 3 cm and $|\overline{BC}|$ = 4 cm are the lengths of two chords of an arc, then locate the centre of the arc.



Solution:

Steps of Construction:

1. Draw an arc $\overset{\frown}{ABC}$.
2. Draw $|\overline{AB}|$ = 3 cm and $|\overline{BC}|$ = 4
3. Draw $\overleftrightarrow{LM}$ and $\overleftrightarrow{PQ}$ right bisectors of $\overline{AB}$

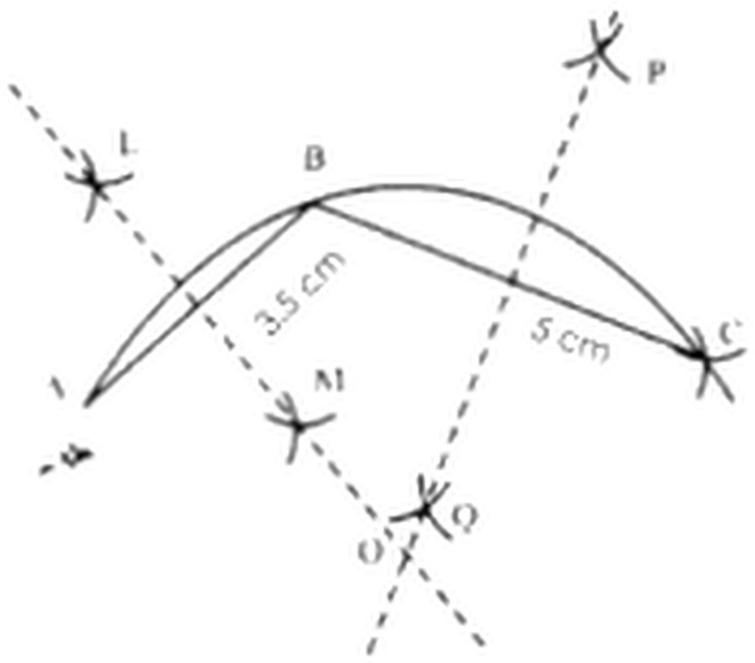
   and $\overline{BC}$ respectively. $\overleftrightarrow{LM}$ and $\overleftrightarrow{PQ}$ intersect at point O.
4. O is the required centre of an arc ABC.

(ii) If $|\overline{AB}|$ = 3.5 cm and $|\overline{BC}|$ = 5 cm are the lengths of two chords of an arc, then locate the centre of the arc.

Solution:

Steps of Construction:

1. Draw an arc $\overset{\frown}{ABC}$.
2. Draw |AB| = 3.5 cm and |BC| = 5 cm.
3. Draw $\overleftrightarrow{LM}$ and $\overleftrightarrow{PQ}$ right bisectors of $\overline{AB}$ and $\overline{BC}$ respectively. $\overleftrightarrow{LM}$ and $\overleftrightarrow{PQ}$ intersect at pint O.
4. O is the required centre of an arc ABC.

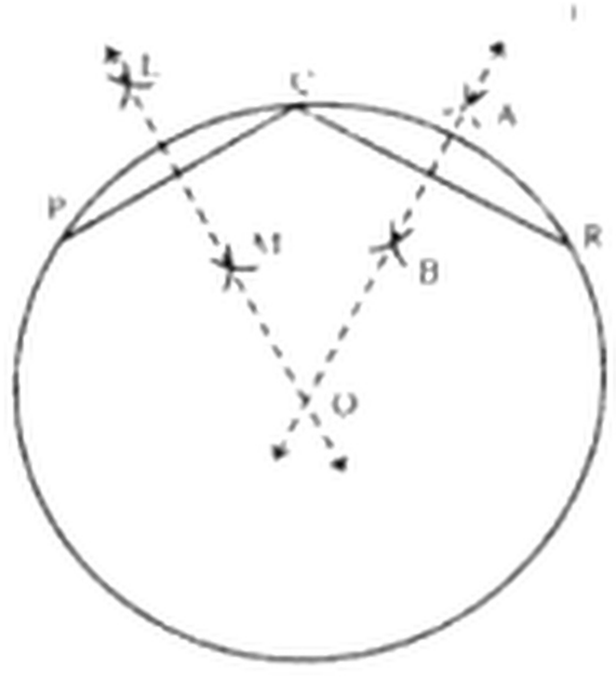


4. For an arc draw two perpendicular bisectors of the chords $\overline{PQ}$ and $\overline{QR}$ of this arc, construct a circle through P, Q and R.

Solution:

Steps of Construction:

1. Draw an arc $\overset{\frown}{PQR}$.
2. Join P with Q and Q with R.
3. Draw $\overleftrightarrow{LM}$ and $\overleftrightarrow{AB}$ right bisectors of $\overline{PQ}$ and $\overline{QR}$

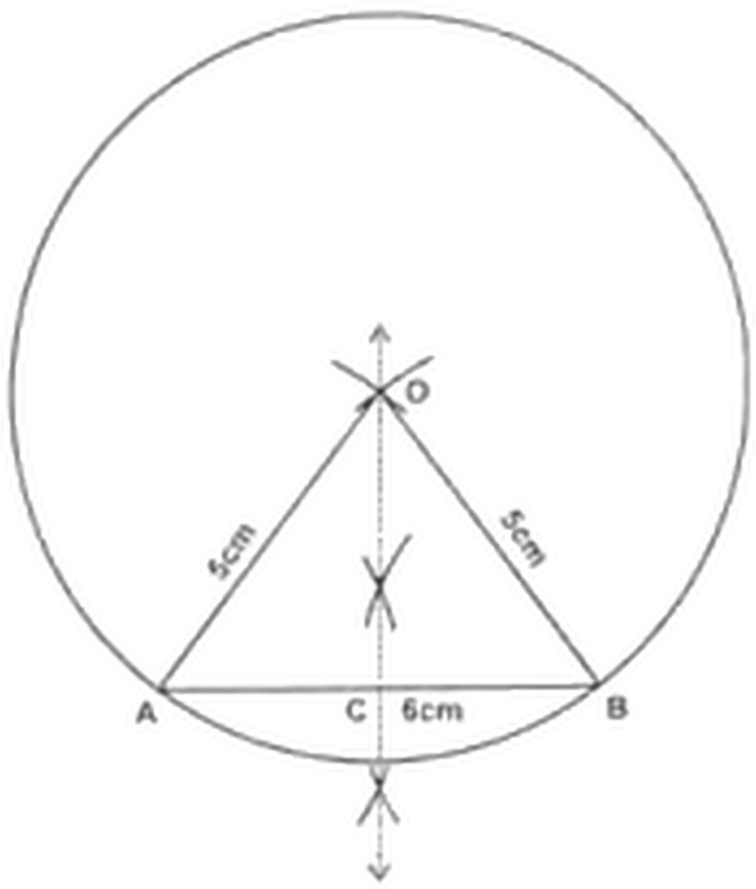


respectively. $\overline{LM}$ and $\overline{AB}$ intersect at point O.

4. O is the required centre of an arc $\overset{\frown}{PQR}$.

5. Draw a circle with radius $\overline{OP} = \overline{OQ} = \overline{OR}$ having centre at O, which is the required circle.

5. Describe circle of radius 5 cm passing through points A and B, 6 cm apart. Also find distance from the centre to the line segment AB.



Solution:

Steps of Construction:

1. We draw a line segment AB of length 6cm

2. We draw right bisector of Ab intersecting it at point C.

3. From points A and B we draw arcs of radius 5cm each, intersecting the bisector at point O.

4. Taking O as centre we draw a circle of radius 5cm passing through the points A and B.

5. To find the distance of centre O from AB we consider right angle OAC.

By Pythagoras theorem.

$$\left(m\overline{OC}\right)^2+\left(m\overline{AC}\right)^2=\left(m\overline{OA}\right)^2$$

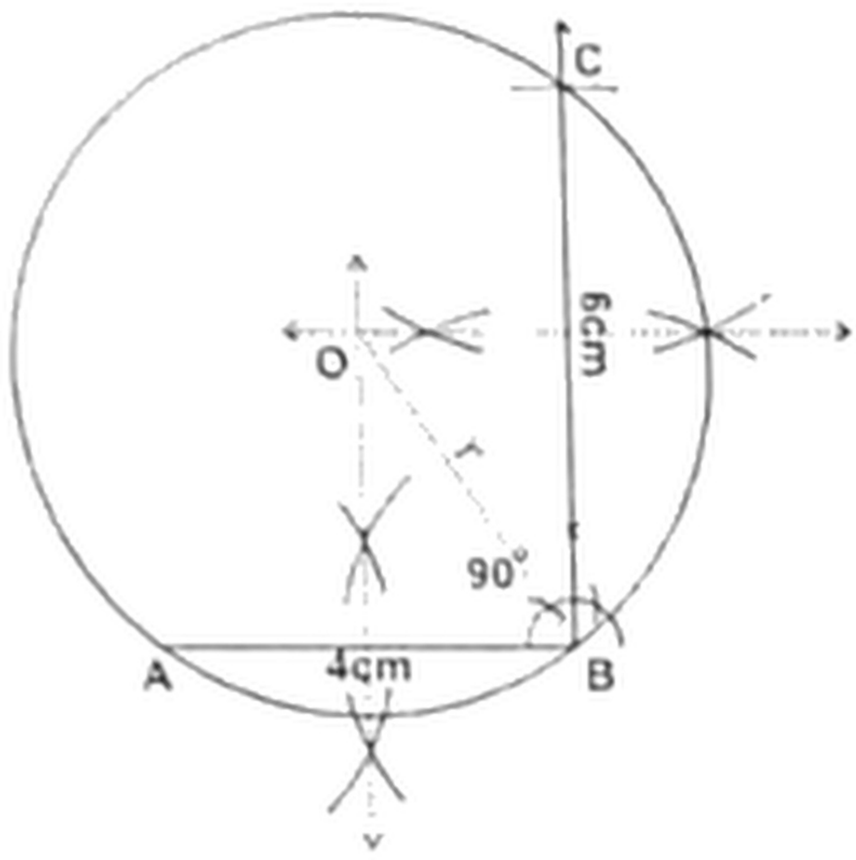
$$\left(m\overline{OC}\right)^2+(3)^2=(5)^2$$

$$\left(m\overline{OC}\right)^2=25-9$$

$$\left(m\overline{OC}\right)^2=16$$

$$m\overline{OC}=4\,\text{cm}$$

6. If $|\overline{AB}|$ = 4 cm and $|\overline{BC}|$ = 6 m, such that $\overline{AB}$ is perpendicular to $\overline{BC}$, construct a circle through points A, B and C. Also measure its radius.



Solution:

Steps of Construction:

1. Draw $\overline{AB}$ = 4 cm and $\overline{BC}$ = 6 m, such that $\overline{AB}$ is perpendicular to $\overline{BC}$.

2. We draw right bisectors of $\overline{AB}$ and $\overline{BC}$, intersecting each other at point O.

3. Taking O as centre we draw a circle of radius $m\overline{OA} = m\overline{OB} = m\overline{OC}$ passing through the points A, B and C.

4. The radius is measured to be 3.6 cm

5. By Pythagoras theorem

$$r^2 = 2^2 + 3^2$$
$$r^2 = 4 + 9$$
$$r = \sqrt{13}$$
$$r = 3.6cm$$