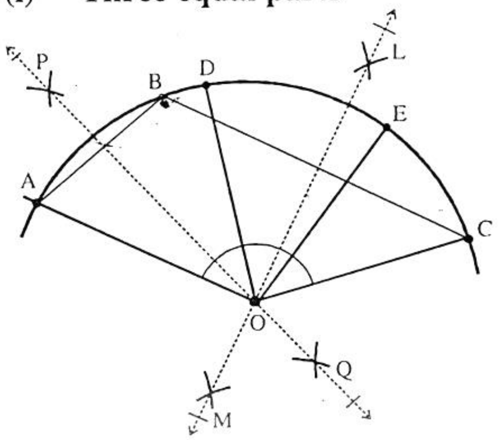
EXERCISE 13.1

Q.1 Divide an arc of any length
- **(i) Into three equal parts**
- **(ii) Into four equal parts**
- **(iii) Into six equal parts**

Solution:

(i) Three equal parts



Steps of Construction:

i. Take an arc AC of any length.

ii. Take any point B on the arc AC and join A to B and B to C.

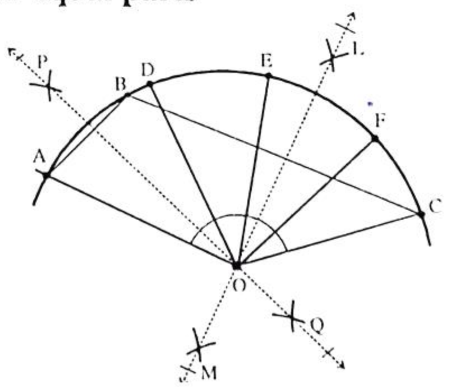
iii. Draw right bisectors $\overleftrightarrow{PQ}$ and $\overleftrightarrow{LM}$ of $\overline{AB}$ and $\overline{BC}$ respectively, which meet each other at point "O". Point O is the centre of circle having the arc AC.

iv. Join end points of arc AC with centre O to form central angle AOC.

v. Measure the central angle and divide it into three equal central angles cutting the arc AC at points D and E.

vi. Arcs of same radii corresponding to equal central angles are equal. Thus three equal parts of the arc ABC are
$m\widehat{AD} = m\widehat{DE} = m\widehat{EC}$.

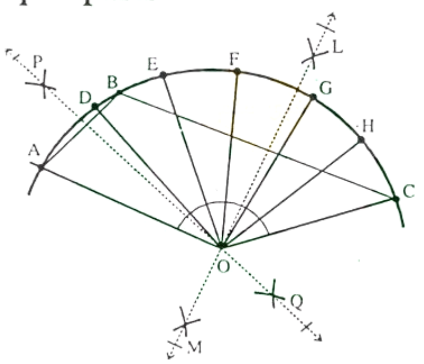
(ii) Four equal parts



Steps of Construction:

i. Take an arc AC of any length.
ii. Take any point B on the arc AC and join A to B and B to C.
iii. Draw right bisectors $\overleftrightarrow{PQ}$ and $\overleftrightarrow{LM}$ of $\overline{AB}$ and $\overline{BC}$ respectively, which meet each other at point "O". Point O is the centre of circle having the arc AC.
iv. Join end points of arc AC with centre O to form central angle AOC.
v. Measure the central angle and divide it into four equal central angles cutting the arc AC at points D, E and F.
vi. Arcs of same radii corresponding to equal central angles are equal. Thus four equal parts of the arc ABC are $m\widehat{AD} = m\widehat{DE} = m\widehat{EF} = m\widehat{FC}$.

(iii)Six equal parts

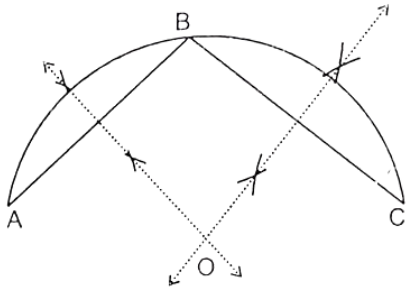


Steps of Construction:

i. Take an arc AC of any length.
ii. Take any point B on the arc AC and join A to B and B to C.
iii. Draw right bisectors $\overleftrightarrow{PQ}$ and $\overleftrightarrow{LM}$ of $\overline{AB}$ and $\overline{BC}$ respectively, which meet each other at point "O". Point O is the centre of circle having the arc AC.
iv. Join end points of arc AC with centre O to form central angle AOC.
v. Measure the central angle and divide it into six equal central angles cutting the arc AC at points D, E, F, G and H.

Arcs of same radii corresponding to equal central angles are equal. Thus six equal parts of the arc ABC are $m\widehat{AD} = m\widehat{DE} = m\widehat{EF} = m\widehat{FG} = m\widehat{GH} = m\widehat{HC}$

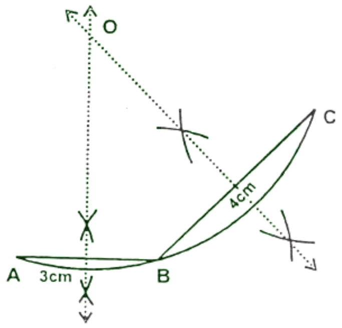
Q.2 Practically find the centre of an arc ABC



Steps of Construction:

i. We draw an arc ABC of any length.
ii. We draw line segments $\overline{AB}$ and $\overline{BC}$.
iii. We draw right bisectors of $\overline{AB}$ and $\overline{BC}$, intersecting each other at point O.
iv. Point 'O' is the required centre of arc ABC.

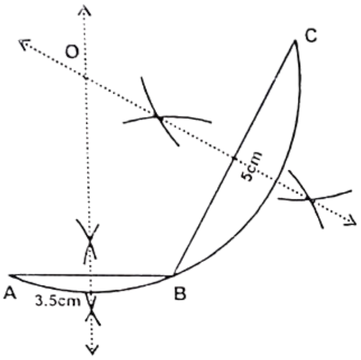
Q. 3 (i) If $|\overline{AB}| = 3cm$ and $|\overline{BC}| = 4cm$ are the lengths of two chords of an arc, then locate the centre of the arc.



Steps of Construction:

i. We draw $|\overline{AB}| = 3cm$ and $|\overline{BC}| = 4cm$, inclined at any angle.
ii. We draw right bisectors of $\overline{AB}$ and $\overline{BC}$ intersecting each other at point O, which is the required centre of arc ABC.
iii. Taking centre 'O', we draw an arc ABC of radius $m\overline{OA} = m\overline{OB} = m\overline{OC}$.

(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.



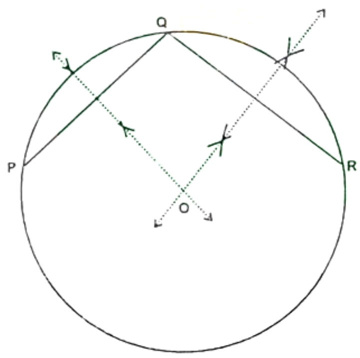
Steps of Construction:

i. We draw $|\overline{AB}| = 3.5cm$ and $|\overline{BC}| = 5cm$, inclined at any angle.

ii. We draw right bisectors of $\overline{AB}$ and $\overline{BC}$ intersecting each other at point O, which is the required centre of arc ABC.

iii. Taking centre 'O', we draw an arc ABC of radius $m\overline{OA} = m\overline{OB} = m\overline{OC}$.

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.



Steps of construction:

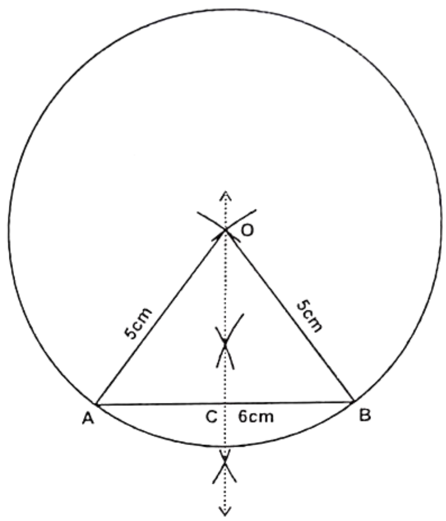
i. We take an arc PQR of any length.

ii. We take two chords $\overline{PQ}$ and $\overline{QR}$ of any lengths of arc PQR.

iii. We draw right bisectors of $\overline{PQ}$ and $\overline{QR}$, intersecting each other at point 'O', which is the centre of arc PQR.

iv. Taking 'O' as centre, we complete the required circle passing through P, Q and R.

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



Steps of Construction:

i. We draw a line segment $\overline{AB}$ of length 6cm.

ii. We draw right bisector of $\overline{AB}$ intersecting it at point 'C'.

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

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

v. To find the distance of centre O from $\overline{AB}$, we consider right angle ΔOAC.

By Pythagorean Theorem

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

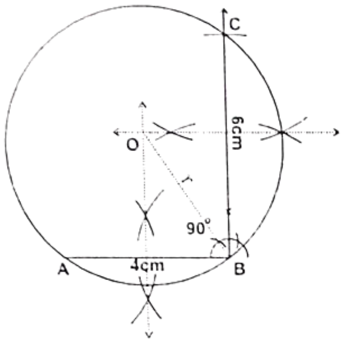
$(m\overline{OC})^2 + (3)^2 = (5)^2$

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

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

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

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



Steps of construction:

i. We draw $\overline{AB}$ and $\overline{BC}$, 4 cm and 6 cm long respectively, perpendicular to each other.

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

iii. 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.

iv. The radius of this circle is measured to be 3.6 cm.

v. By Pythagoras theorem

$r^2 = 2^2 + 3^2$

$r^2 = 4 + 9$

$\sqrt{r^2} = \sqrt{13}$

r = 3.6cm