



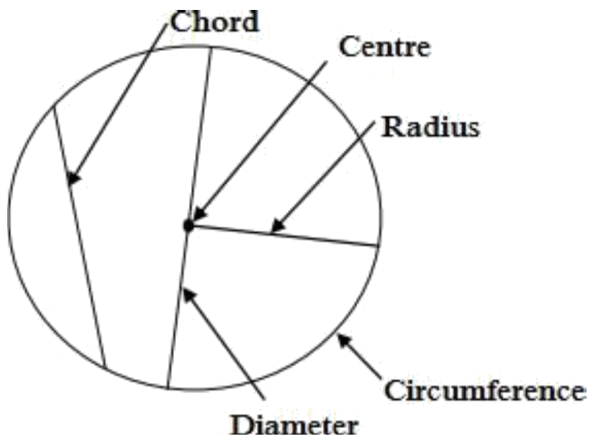
# Grade 10



# MATHEMATICS



## Chord of a Circle

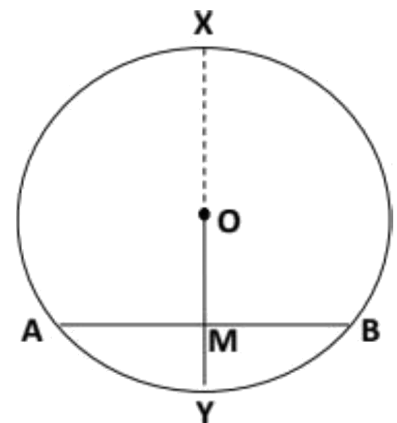


A straight line segment joining two points on a circle is defined as a chord.

A chord which passes through the Centre of the circle is called a diameter

### Activity

- Cut out a circular lamina
- Fold it into two parts along the Centre
- Draw that line (XY)
- Draw the chord AB
- Measure the length of AM and MB
- Measure the magnitude of angles  $\widehat{XMA}$  and  $\widehat{XMB}$
- Check whether your answers as  $AM = MB$  and  $\widehat{XMA} = \widehat{XMB} = 90^\circ$





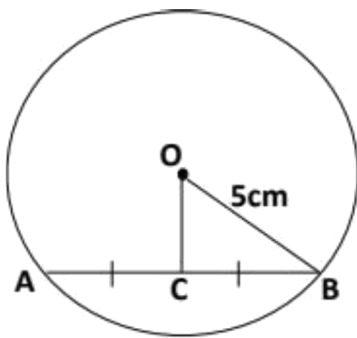
### Theorem:

The straight line joining the center of the circle to the midpoint of a chord is perpendicular to the chord.

- It is very important to have the knowledge of Pythagoras' relation, when solving the problems related to the above theorem

### Problems

AB is a chord of a circle with center O and radius 5 cm. The midpoint of AB is C. If AB = 8 cm, find the length of OC

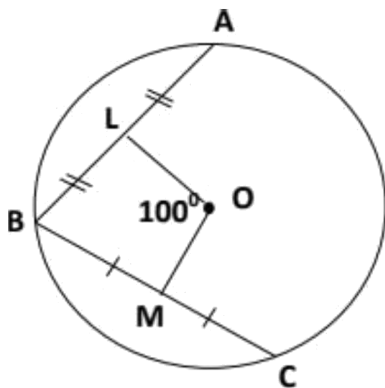


$\angle OCB = 90^\circ$  (according to above theorem)

By applying the Pythagoras theorem to  $\triangle OCB$

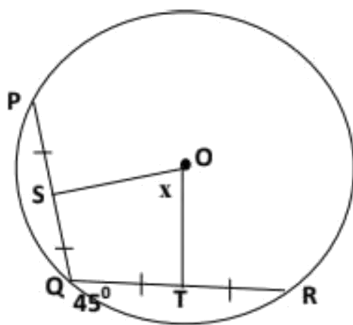
$$\begin{aligned} OB^2 &= OC^2 + CB^2 \\ OC^2 &= OB^2 - CB^2 \quad AB = 8 \quad CB = 4 \\ CB &= \frac{AB}{2} = \frac{8}{2} = 4 \text{ cm} \\ \therefore OC^2 &= 5^2 - 4^2 \\ &= 25 - 16 \\ OC &= 3 \text{ cm} \end{aligned}$$

### Assignments

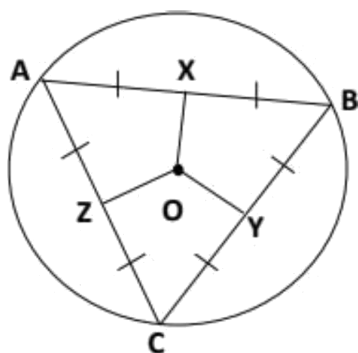


- 1). As given in the figure, circle of center O consists of AB and BC chords. Mid points of AB and BC are L and M respectively

If  $\angle LOM = 100^\circ$ , Find  $\angle LBM$

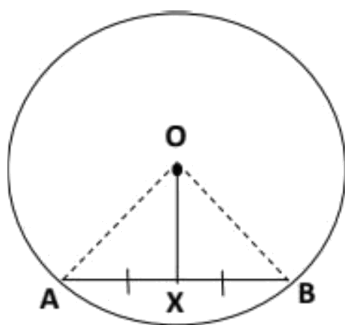


- 2). As given in the figure, the length of a chord PQ with centre  $O$  is 16 cm. The midpoint of PQ is S and the length of OS is 6 cm. Calculate the radius of the circle. Find the value of  $x$  ( $\hat{SOT}$ )



- 3). As given in the figure AB, BC and CA are three equal chords of a circle with center  $O$ . The midpoint of chords are X, Y and Z. Find the magnitude of  $\hat{XOY}$

### The formal proof of the theorem



**Data** - AB is a chord of a circle with center O. The midpoint of AB is  $x$

**To be proved** - OX is perpendicular to AB

**Construction** - Join OA and OB

**Proof** - In the triangle OXA and OXB

$$AO = BO \text{ (Radii of the circle)}$$

$$AX = XB \text{ (since X is the midpoint of AB)}$$

$$OX \text{ (common side)}$$

$$\triangle OXA \equiv \triangle OXB \text{ (sss)}$$

$$\hat{OXA} = \hat{OXB} \text{ (Corresponding angles of congruent triangles)}$$

$$\text{But } \hat{OXA} + \hat{OXB} = 180^\circ \text{ (Angles on a straight line)}$$

$$2 \hat{OXA} = 180^\circ$$

$$\hat{OXA} = 90^\circ$$

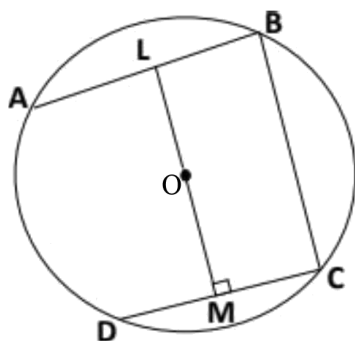
$$AB \perp OX$$



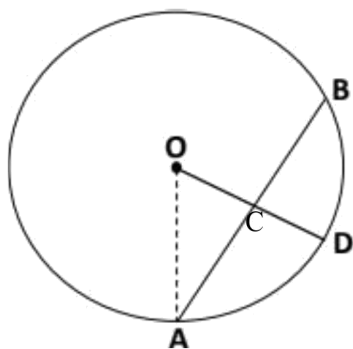
### Assignments

1). The midpoint of the chord AB of a circle with center  $O$  is X. If  $\angle XBO = 45^\circ$ , show that  $OX = XB$

2). The Centre of the given circle is  $O$  and radius is 5cm.  $AB = 6$ cm and  $BC = CD = 8$ cm. Find the perimeter of BLMC polygon



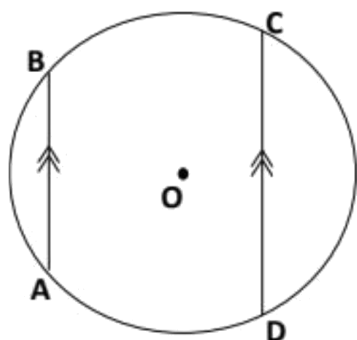
3). If the radius is 5cm and the CD distance is 2cm, Find the length of chord AB.



4). Find the length of the chord AB in the above problem when the CD length is 3cm

5). As shown in the figure AB and DC are two parallel chords, if  $AB = 12$ cm,  $CD = 16$ cm, radius

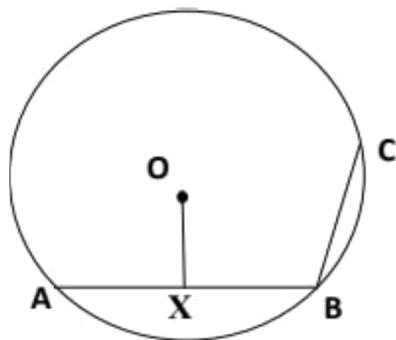
$= 10$ cm Find the area of the trapezium ABCD



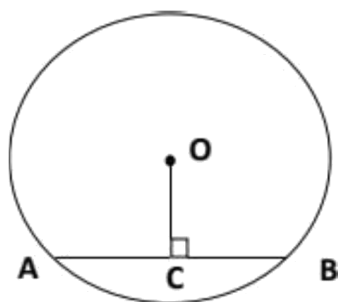


6).

If  $2BC = AB$ , show that  $AX = BC$



Theorem - The perpendicular drawn from the Centre of a circle to a chord bisects the chord



If  $OC \perp AB$

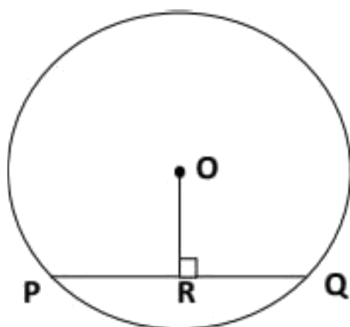
$AC = CB$

### Problems

1).

In the figure  $PQ \perp OR$

and Centre is O. If the length of PQ is 10 cm, find the length of PR

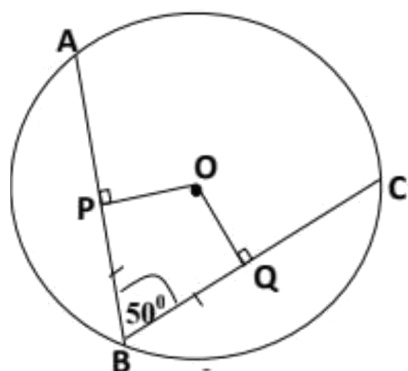




2) In the above figure ,If  $PQ = 12\text{cm}$  and  $OR = 8\text{ cm}$  ,find the perimeter of triangle OPR.

3). Find the length of the perpendicular drawn to a chord of length of 24 cm from the Centre of a circle of radius 13 cm

4)



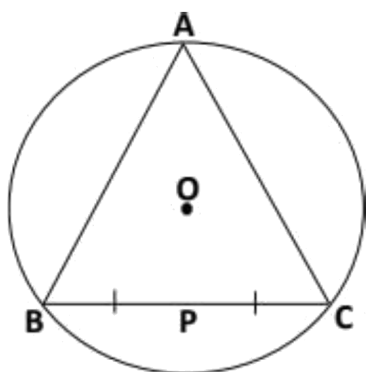
O is center of the given figure.  $AB = BC$   $OP \perp AB$   
and

$OQ \perp BC$

If  $\angle PBQ = 50^\circ$

find the value of  $\angle BPQ$

5).



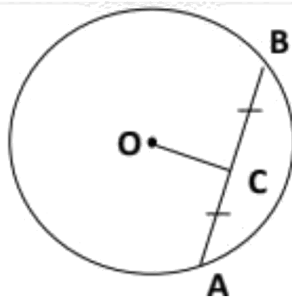
ABC is an equiangular triangle, If  $PC = 5\text{ cm}$ . Find the perimeter of  $\Delta ABC$





### Exercises

1).

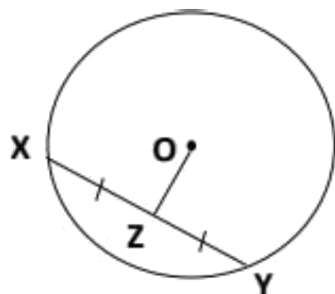


C is the midpoint of the chord AB of the circle with Centre O .According to this information ,fill in the blanks

I. OC and AB .....

II.  $\angle AOC = \dots\dots\dots = \dots\dots\dots$

2).



In the circle with the center O , OZ and XY are perpendicular to each other

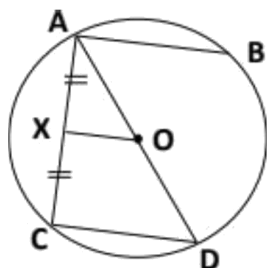
I. If  $XZ = 3$  cm ,Find the YZ length

II. What is the length of XY chord

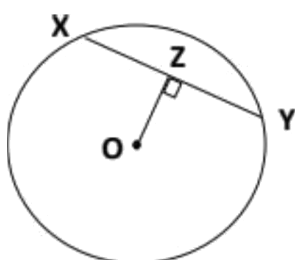




3). According to the information given in the figure, name two  $90^\circ$  angles



4).



In the given figure  $OZ = 3\text{cm}$  and  $XY = 8\text{cm}$

length  $XY =$

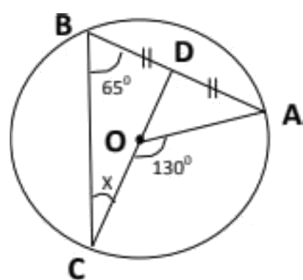
Length of the radius of the circle =

5). R is the midpoint of the PQ chord of the circle with center O .OR has been joined and OP and OQ radius also have been drawn

Denote this information in a figure clearly

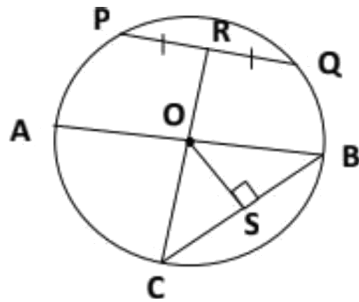
Name two right angled triangles

6). According to the information. Find the value of  $x$ . Here O is the center of the circle .





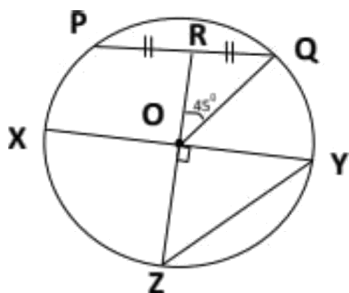
7).



O is the Centre of the circle

- i. Name the diameter
- ii. Name two chords
- iii. If PQ is 8 cm and  $OR = 3\text{cm}$ , Find the radius of the circle

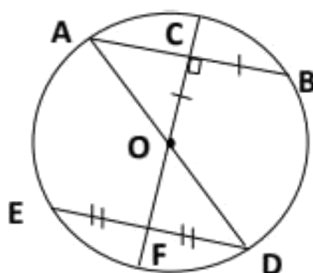
8).



O is the center of the circle .According to the information given in the figure

- i. Find the value of  $\angle QOR$
- ii. Is PQ and XY perpendicular? write with the reason
- iii. Find the value of  $\angle OYZ$
- iv. Is OQ and ZY parallel

9).

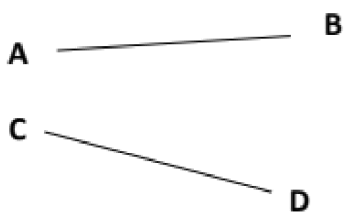


O is the center of circle .According to the information given in the figure

- i. Show that  $AC = OC$
- ii. Show that  $\angle ODF = 45^\circ$



10).



Construct the circle such that AB and CD becomes two chords