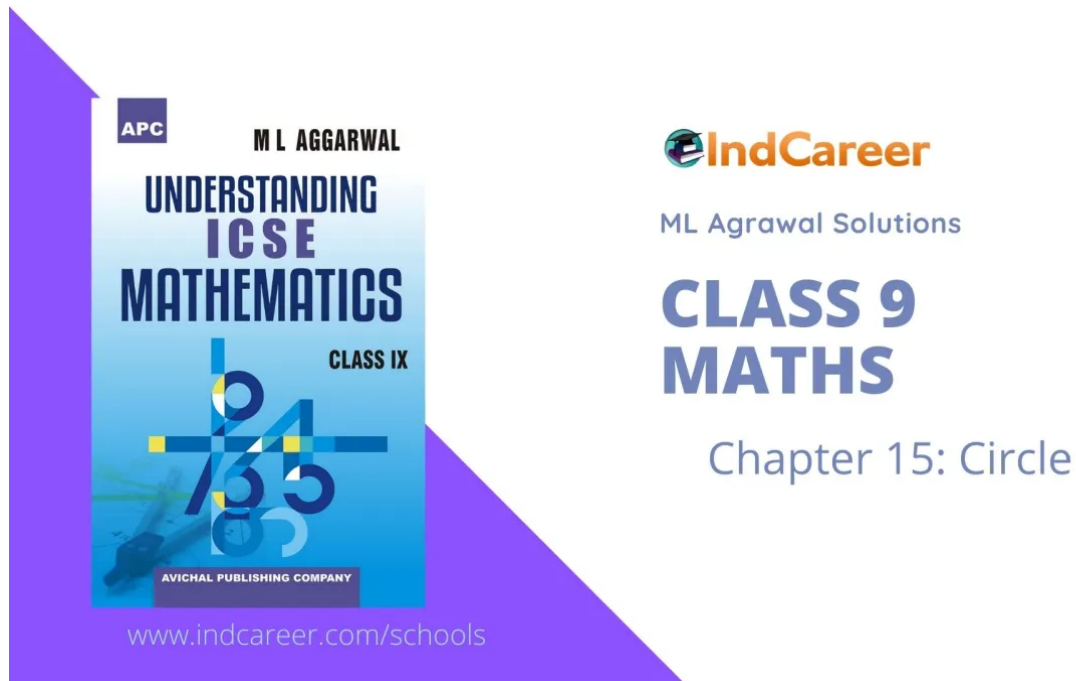


ML Aggarwal Solutions for Class 9 Maths

Chapter 15- Circle



For any clarifications or questions you can write to **info@indcareer.com**

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ML Aggarwal Solutions for Class 9 Maths

Chapter 15- Circle

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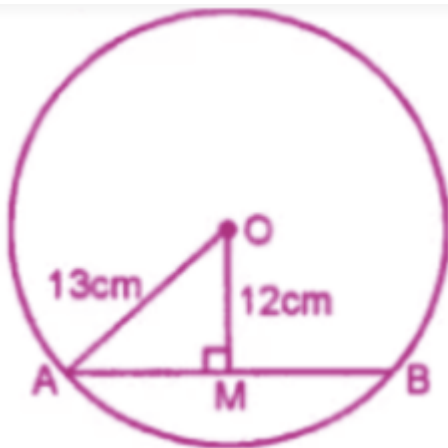
ML Aggarwal 9th Maths Chapter 15, Class 9 Maths Chapter 15 solutions

Exercise 15.1

1. Calculate the length of a chord which is at a distance of 12 cm from the centre of a circle of radius 13 cm.

Solution:

AB is chord of a circle with center O and OA is its radius $OM \perp AB$



Therefore, $OA = 13 \text{ cm}$, $OM = 12 \text{ cm}$

Now from right angled triangle OAM,

$OA^2 = OM^2 + AM^2$ by using Pythagoras theorem,

$$13^2 = 12^2 + AM^2$$

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$$AM^2 = 13^2 - 12^2$$

$$AM^2 = 169 - 144$$

$$AM^2 = 25$$

$$AM = 5$$

We know that OM perpendicular to AB

Therefore, M is the midpoint of AB

$$AB = 2 AM$$

$$AB = 2 (5)$$

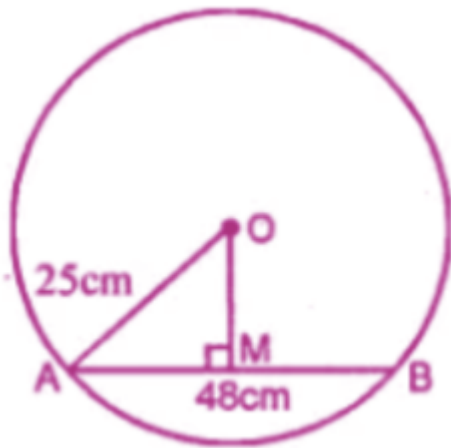
$$AB = 10 \text{ cm}$$

2. A chord of length 48 cm is drawn in a circle of radius 25 cm. Calculate its distance from the center of the circle.

Solution:

AB is the chord of the circle with centre O and radius OA

OM is perpendicular to AB



Therefore, AB = 48 cm

$$OA = 25 \text{ cm}$$

$$OM \perp AB$$

M is the mid-point of AB

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$$AM = \frac{1}{2} AB = \frac{1}{2} \times 48 = 24 \text{ cm}$$

Now right $\triangle OAM$,

$$OA^2 = OM^2 + AM^2$$

(by Pythagoras Axiom)

$$(25)^2 = OM^2 + (24)^2$$

$$OM^2 = (25)^2 - (24)^2 = 625 - 576$$

$$= 49 = (7)^2$$

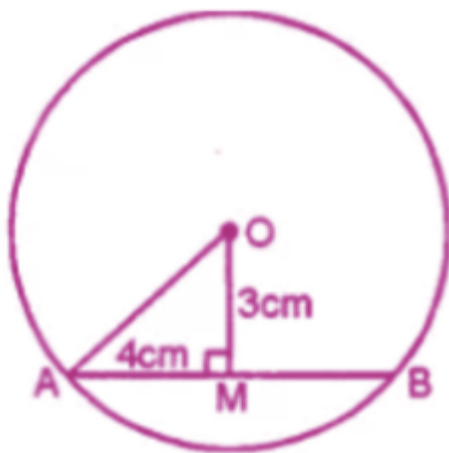
$$OM = 7 \text{ cm}$$

3. A chord of length 8 cm is at a distance of 3 cm from the centre of the circle. Calculate the radius of the circle.

Solution:

AB is the chord of a circle with center O

And radius OA and $OM \perp AB$



$$AB = 8 \text{ cm}$$

$$OM = 3 \text{ cm}$$

$$OM \perp AB$$

M is the mid-point of AB

$$AM = \frac{1}{2} AB = \frac{1}{2} \times 8 = 4 \text{ cm.}$$

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Now in right $\triangle OAM$

$$OA^2 = OM^2 + AM^2$$

(By Pythagoras Axiom)

$$= (3)^2 + (4)^2 = 9 + 16 = 25$$

$$= (5)^2$$

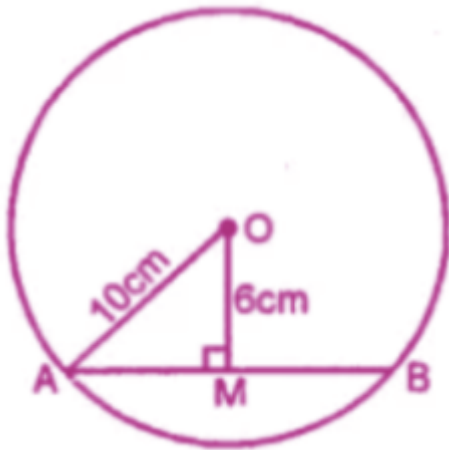
$$OA = 5 \text{ cm.}$$

4. Calculate the length of the chord which is at a distance of 6 cm from the centre of a circle of diameter 20 cm.

Solution:

AB is the chord of the circle with centre O

And radius OA and $OM \perp AB$



Diameter of the circle = 20 cm

Radius = $20/2 = 10$ cm

OA = 10 cm, OM = 6 cm

Now in right $\triangle OAM$,

$$OA^2 = AM^2 + OM^2$$

(By Pythagoras Axiom)

$$(10)^2 = AM^2 + (6)^2$$

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$$AM^2 = 10^2 - 6^2$$

$$AM^2 = 100 - 36 = 64 = (8)^2$$

$$AM = 8 \text{ cm}$$

$$OM \perp AB$$

M is the mid-point of AB.

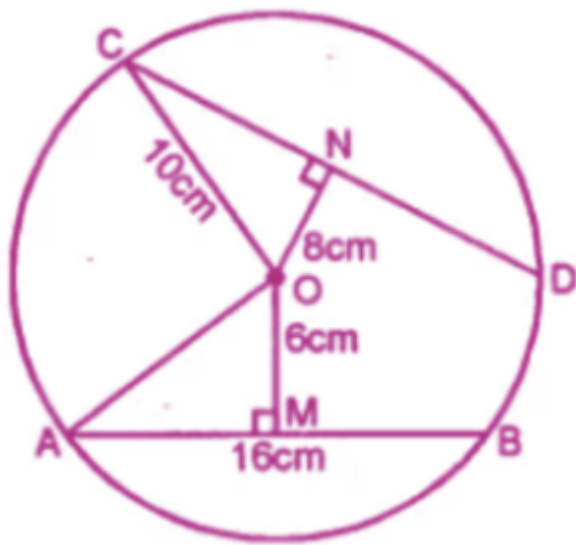
$$AB = 2 AM = 2 \times 8 = 16 \text{ cm.}$$

5. A chord of length 16 cm is at a distance of 6 cm from the centre of the circle. Find the length of the chord of the same circle which is at a distance of 8 cm from the centre.

Solution:

AB is a chord a circle with centre O and

OA is the radius of the circle and $OM \perp AB$



$$AB = 16 \text{ cm, } OM = 6 \text{ cm}$$

$$OM \perp AB$$

$$AM = \frac{1}{2} AB = \frac{1}{2} \times 16 = 8 \text{ cm}$$

Now in right $\triangle OAM$

$$OA^2 = AM^2 + OM^2$$

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(By Pythagoras Axiom)

$$= (8)^2 + (6)^2$$

$$64 + 36 = 100 = (10)^2$$

Now CD is another chord of the same circle

ON $\perp$ CD and OC is the radius.

In right $\triangle ONC$

$$OC^2 = ON^2 + NC^2$$

(By Pythagoras Axioms)

$$(10)^2 = (8)^2 + (NC)^2$$

$$100 = 64 + NC^2$$

$$NC^2 = 100 - 64 = 36 = (6)^2$$

$$NC = 6$$

But ON $\perp$ AB

N is the mid-point of CD

$$CD = 2 NC = 2 \times 6 = 12 \text{ cm}$$

6. In a circle of radius 5 cm, AB and CD are two parallel chords of length 8 cm and 6 cm respectively. Calculate the distance between the chords if they are on :

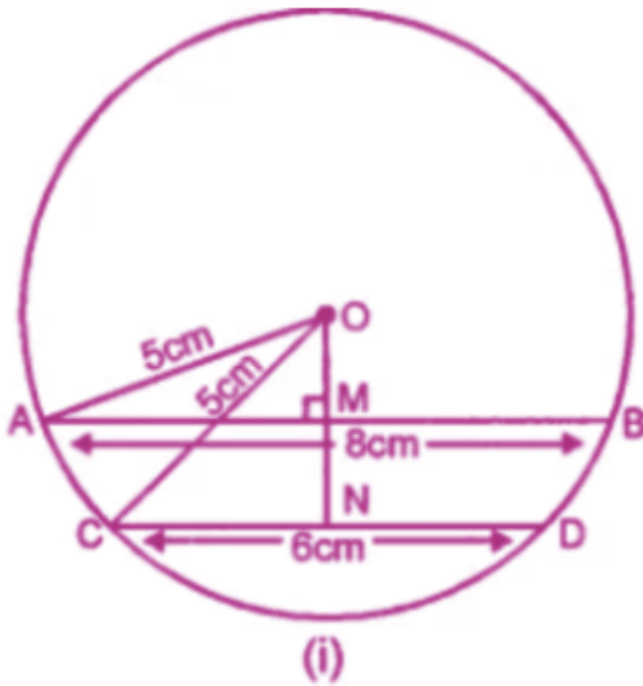
(i) the same side of the centre.

(ii) the opposite sides of the centre

Solution:

Two chords AB and CD of a Circle with centre O and radius OA or OC

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$$OA = OC = 5 \text{ cm}$$

$$AB = 8 \text{ cm}$$

$$CD = 6 \text{ cm}$$

OM and ON are perpendiculars from O to AB and CD respectively.

M and N are the Mid-points of AB and

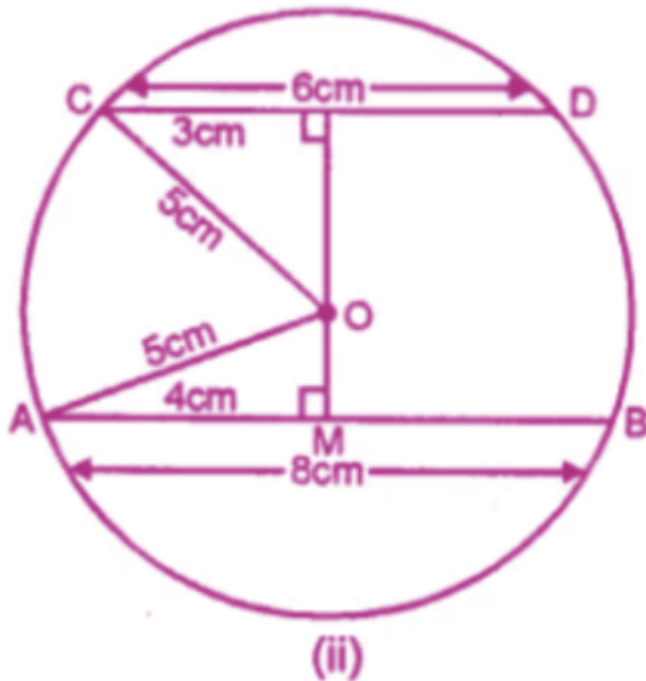
CD respectively

In figure (i) chord are on the same side

And in figure (ii) chord are on the opposite

Sides of the centre

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In right $\triangle OAM$

$$OA^2 = AM^2 + OM^2$$

(By Pythagoras Axiom)

$$(5)^2 = (4)^2 + OM^2$$

$$AM = \frac{1}{2} AB$$

$$25 = 16 + OM^2$$

$$OM^2 = 25 - 16 = 9 = (3)^2$$

$$OM = 3 \text{ cm}$$

Again in right $\triangle OCN$,

$$OC^2 = CN^2 + ON^2$$

$$(5)^2 = (3)^2 + ON^2$$

$$(CN = \frac{1}{2} CD)$$

$$25 = 9 + ON^2$$

$$ON^2 = 25 - 9 = 16 = (4)^2$$

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$$ON = 4$$

In fig (i), distance $MN = ON - OM$

$$= 4 - 3 = 1\text{ cm.}$$

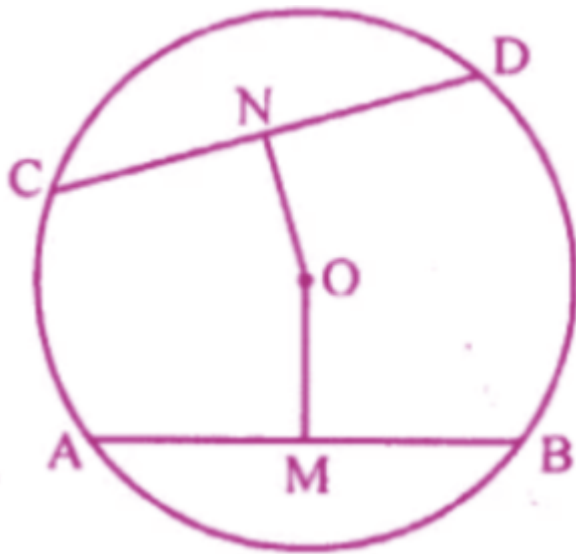
In fig (ii)

$$MN = OM + ON = 3 + 4 = 7\text{ Cm}$$

7. (a) In the figure given below, O is the centre of the circle. AB and CD are two chords of the circle, OM is perpendicular to AB and ON is perpendicular to CD. AB = 24 cm, OM = 5 cm, ON = 12 cm. Find the:

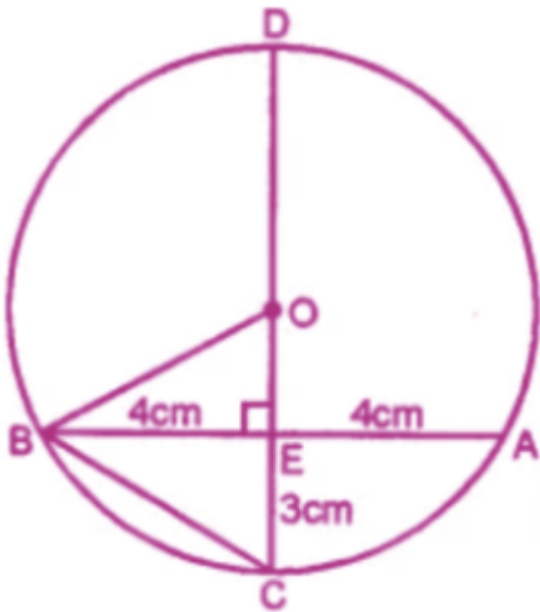
(i) radius of the circle.

(ii) length of chord CD.



(b) In the figure (ii) given below, CD is the diameter which meets the chord AB in E such that $AE = BE = 4\text{ cm}$. If $CE = 3\text{ cm}$, find the radius of the circle.

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Solution:

(a) Given : $AB = 24 \text{ cm}$, $OM = 5 \text{ cm}$, $ON = 12 \text{ cm}$

$OM \perp AB$

M is midpoint of AB

$AM = 12 \text{ cm}$

(i) Radius of circle $OA = \sqrt{OM^2 + AM^2}$

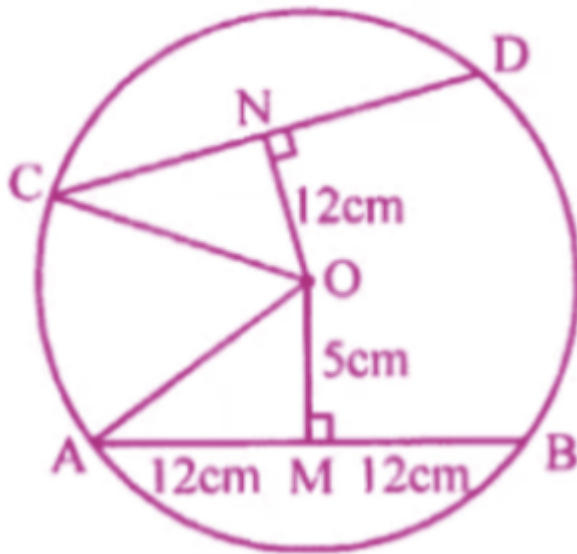
(ii) Again $OC^2 = ON^2 + CN^2$

$$13^2 = 12^2 + CN^2$$

$$CN = \sqrt{(13^2 - 12^2)} = \sqrt{(169 - 144)} = \sqrt{25}$$

$CN = 5 \text{ cm}$

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As $ON \perp CD$, N is mid-Point of CD

$$CD = 2CN = 2 \times 5 = 10 \text{ cm}$$

(b) $AB = 8 \text{ cm}$, $EC = 3 \text{ cm}$

Let radius $OB = OC = r$

$$OE = (r-3) \text{ Cm.}$$

Now in right $\triangle OBE$

$$OB^2 = BE^2 + OE^2$$

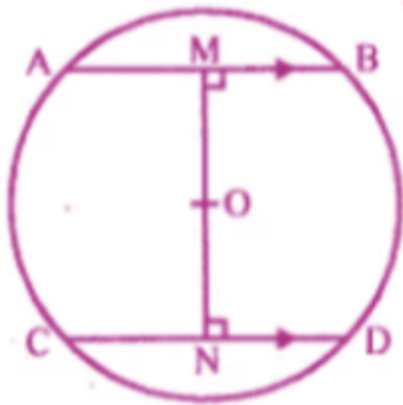
$$r^2 = (4)^2 + (r - 3)^2$$

$$r^2 = 16 + r^2 - 6r + 9$$

$$6r = 25 \text{ (} r = 25/6 = 4 \frac{1}{6} \text{ cm)}$$

8. In the adjoining figure, AB and CD are two parallel chords and O is the centre. If the radius of the circle is 15 cm, find the distance MN between the two chords of length 24 cm and 18 cm respectively.

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Solution:

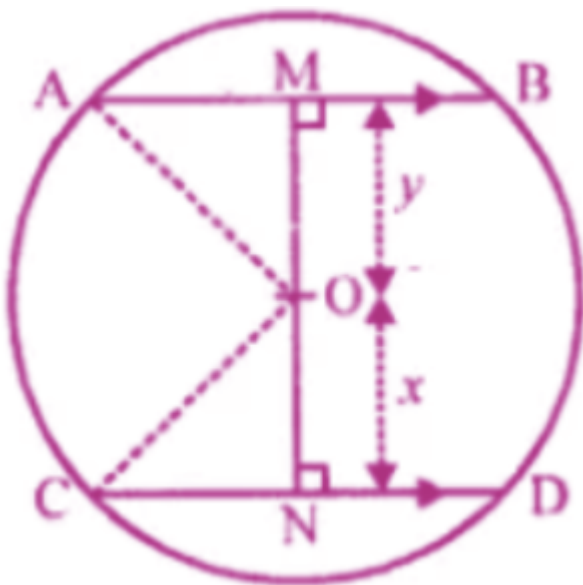
In the figure, chords $AB \parallel CD$

O is the centre of the circle

Radius of the Circle = 15 cm

Length of $AB = 24$ cm and $CD = 18$ cm

Join OA and OC



$AB = 24$ cm and $OM \perp AB$

$AM = MB = 24/2 = 12$ cm

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Similarly $ON \perp CD$

$$CN = ND = 18/2 = 9 \text{ cm}$$

Similarly In right $\triangle CNO$

$$OC^2 = CN^2 + ON^2 \quad (15)^2 = (9)^2 + ON^2$$

$$225 = 81 + ON^2$$

$$ON^2 = 225 - 81 = 144 = (12)^2$$

$$ON = 12 \text{ cm}$$

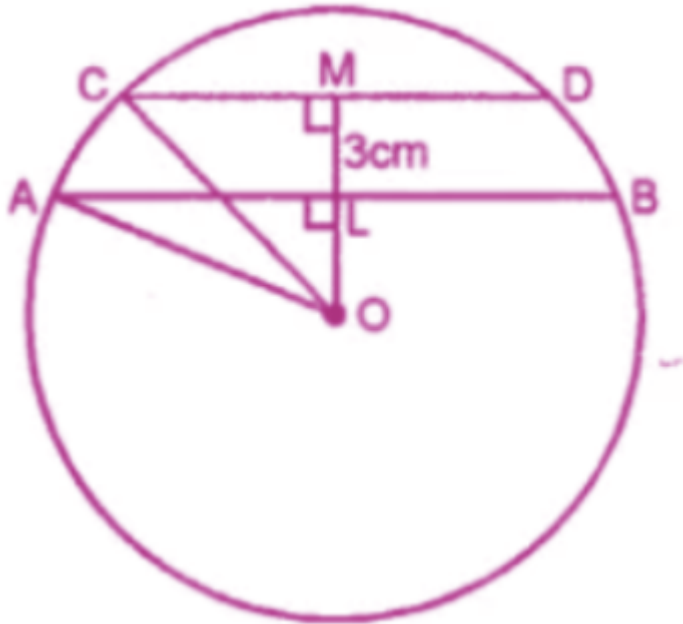
$$\text{Now } MN = OM + ON = 9 + 12 = 21 \text{ cm}$$

9. AB and CD are two parallel chords of a circle of lengths 10 cm and 4 cm respectively. If the chords lie on the same side of the centre and the distance between them is 3 cm, find the diameter of the circle.

Solution :

AB and CD are two parallel chords and $AB = 10 \text{ cm}$, $CD = 4 \text{ cm}$ and distance between

AB and CD = 3 cm



Let radius of circle $OA = OC = r$

$OM \perp CD$ which intersects AB in L.

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Let $OL = x$, then $OM = x + 3$

Now right $\triangle OLA$

$$OA^2 = AL^2 + OL^2$$

$$r^2 = (5)^2 + x^2 = 25 + x^2$$

(l is mid- point of AB)

Again in right $\triangle OCM$

$$OC^2 = CM^2 + OM^2$$

$$r^2 = (2)^2 + (x + 3)^2$$

(M is mid-point of CD)

$$r^2 = 4 + (x + 3)^2$$

(M is mid-Point of CD)

$$r^2 = 4 + (x + 3)^2$$

from (i) and (ii)

$$25 + x^2 = 4 + (x + 3)^2$$

$$25 + x^2 = 4 + x^2 + 9 + 6x$$

$$6x = 25 - 13 = 12$$

$$x = 12/6 = 2 \text{ cm}$$

Substituting the value of x in (i)

$$r^2 = 25 + x^2 = 25 + (2)^2 = 25 + 4$$

$$r^2 = 29$$

$$r = \sqrt{29} \text{ cm}$$

Diameter of the circle = $2r$

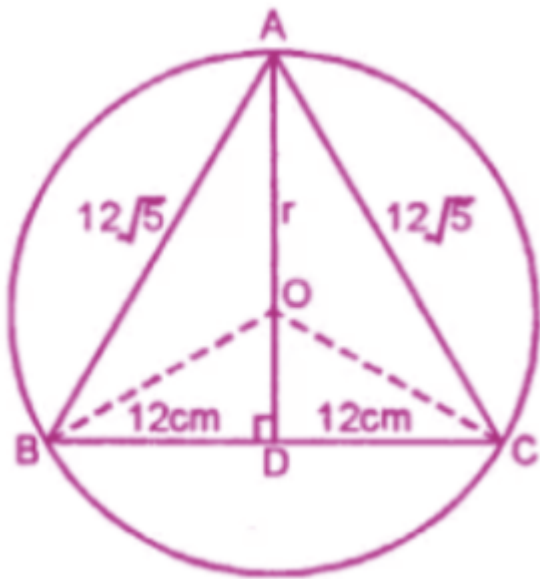
$$= 2 \times \sqrt{29} \text{ cm} = 2\sqrt{29} \text{ cm}$$

10. ABC is an isosceles triangle inscribed in a circle. If $AB = AC = 12\sqrt{5}$ cm and $BC = 24$ cm, find the radius of the circle.

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Solution :

$AB = AC = 12\sqrt{5}$ and $BC = 24$ cm.



Join OB and OC and OA

Draw $AD \perp BC$ which will pass through

Centre O

OD bisect BC in D

$BD = DC = 12$ cm

In right $\triangle ABD$

$$AB^2 = AD^2 + BD^2$$

$$(12\sqrt{5})^2 = AD^2 + BD^2$$

$$(12\sqrt{5})^2 = AD^2 + (12)^2$$

$$144 \times 5 = AD^2 + 144$$

$$720 - 144 = AD^2$$

$$AD^2 = 576 \quad (AD = \sqrt{576} = 24)$$

Let radius of the circle = $OA = OB = OC = r$

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$$OD = AD - AO = 24 - r$$

Now in right $\triangle OBD$,

$$OB^2 = BD^2 + OD^2$$

$$r^2 = (12)^2 + (24 - r)^2$$

$$r^2 = 144 + 576 + r^2 - 48r$$

$$48r = 720$$

$$48r = 720$$

$$r = 720/48 = 15$$

$$48r = 720$$

$$r = 720/48 = 15\text{cm.}$$

Radius = 15 cm.

11. An equilateral triangle of side 6 cm is inscribed in a circle. Find the radius of the circle.

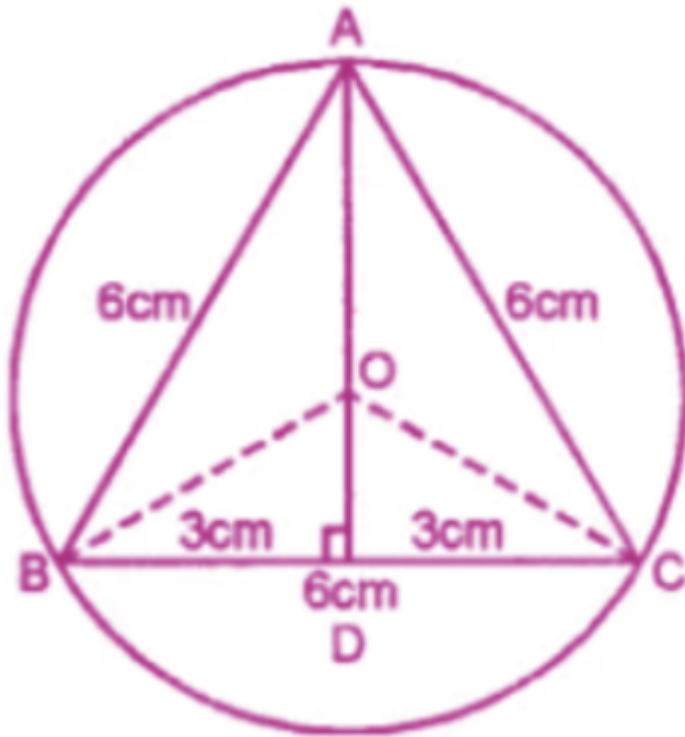
Solution :

ABC is an equilateral triangle inscribed in a

Circle with centre O. Join OB and OC,

From A, Draw $AD \perp BC$ which will pass

Through the centre O of the circle.



Each side of $\triangle ABC = 6$ cm.

$$AD = \frac{\sqrt{3}}{2} a = \frac{\sqrt{3}}{2} \times 6 = 3\sqrt{3} \text{ cm.}$$

$$OD = AD - AO = 3\sqrt{3} - r$$

Now in right $\triangle OBD$

$$OB^2 = BD^2 + OD^2$$

$$r^2 = (3)^2 + (3\sqrt{3} - r)^2$$

$$r^2 = 9 + 27 + r^2 - 6\sqrt{3}r$$

(D is mid-point of BC)

$$6\sqrt{3}r = 36$$

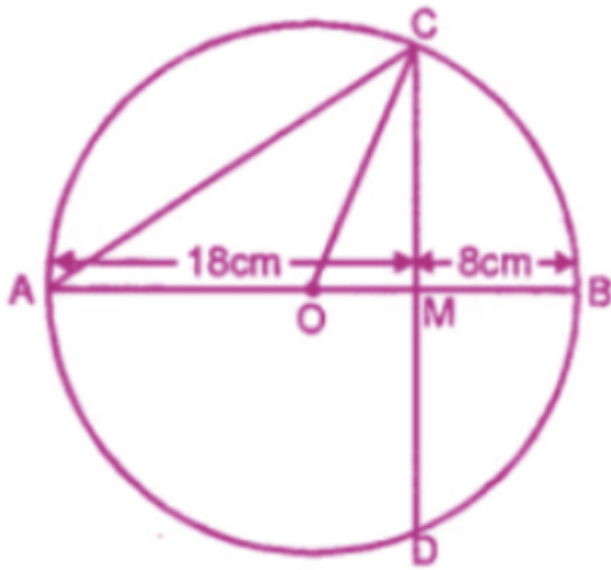
$$R = \frac{36}{6\sqrt{3}} = \frac{6}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3} \text{ cm}$$

$$\text{Radius} = 2\sqrt{3} \text{ cm}$$

12. AB is a diameter of a circle. M is a point in AB such that AM = 18 cm and MB = 8 cm. Find the length of the shortest chord through M.

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Solution:



$AM = 18 \text{ cm}$ and $MB = 8 \text{ cm}$

$AB = AM + MB = 18 + 8 = 26 \text{ cm}$

Radius of the circle $= 26/2 = 13 \text{ cm}$

Let CD is the shortest chord drawn through M.

$CD \perp AB$

Join OC

$OM = AM - AO = 18 - 13 = 5 \text{ cm}$

$OC = OA = 13 \text{ cm}$

Now in right $\triangle OMC$

$$OC^2 = OM^2 + MC^2$$

$$(13)^2 = (5)^2 + MC^2 \quad (MC^2 = 13^2 - 5^2)$$

$$MC^2 = 169 - 25 = 144 = (12)^2$$

$$MC = 12$$

M is Mid-Point of CD

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$$CD = 2 \times MC = 2 \times 12 = 24 \text{ cm}$$

Exercise 15.2

1. If arcs APB and CQD of a circle are congruent, then find the ratio of AB: CD.

Solution:

$$\text{arc APB} = \text{arc CQD} \text{ (given)}$$

$$AB = CD$$

(if two arcs are congruent, then their

Corresponding chords are equal)

$$\text{Ratio of AB and CD} = AB / CD = AB / AB = 1/1$$

$$AB : CD = 1 : 1$$

2. A and B are points on a circle with centre O. C is a point on the circle such that OC bisects $\angle AOB$, prove that OC bisects the arc AB.

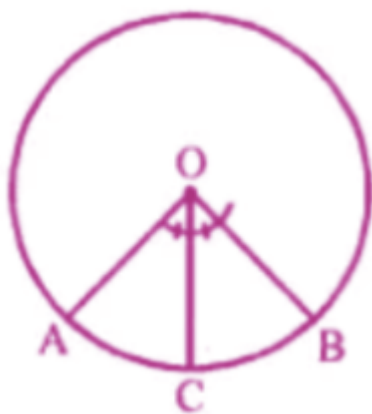
Solution:

Given : in a given circle with centre O, A

And B are Two points on the circle. C i

another point on the circle such that

$$\angle AOC = \angle BOC$$



To prove : arc AC = arc BC

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Proof : OC is the bisector of $\angle AOB$

Or $\angle AOC = \angle BOC$

But these are the angle subtended by the

arc AC and BC

arc AC = arc BC.

3. Prove that the angle subtended at the centre of a circle is bisected by the radius passing through the mid-point of the arc.

Solution :

Given : AB is the arc of the circle with

Centre O and C is the mid-Point of arc AB.

To prove : OC bisects the $\angle AOB$

I.e $\angle AOC = \angle BOC$

Proof : C is the mid-point of arc AB.

arc AC = arc BC



But arc AC and arc BC subtend $\angle AOC$ and

$\angle BOC$ at the centre

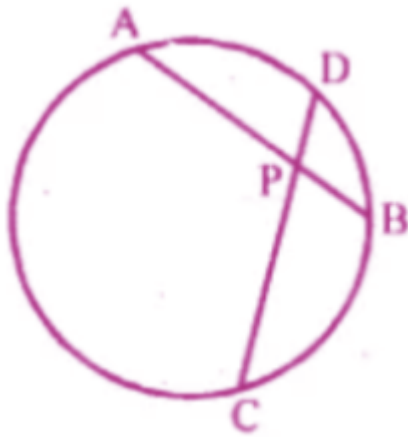
$\angle AOC = \angle BOC$

Hence OC Bisects the $\angle AOB$.

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4. In the given figure, two chords AB and CD of a circle intersect at P. If $AB = CD$, prove that $\text{arc AD} = \text{arc CB}$.

Solution :



Given: two chord AB and CD of a Circle

Intersect at P and $AB = CD$

To prove : $\text{arc AD} = \text{arc CB}$

Proof : $AB = CD$ (given)

minor arc AB = minor arc CD

subtracting arc BD from both sides

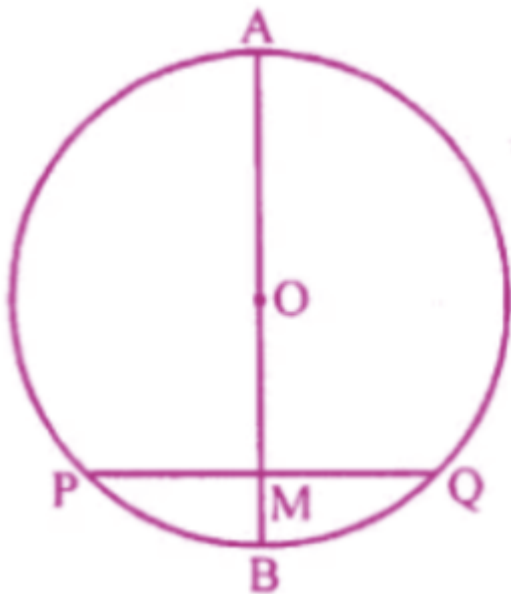
$\text{arc AB} - \text{arc BD} = \text{arc CD} - \text{arc BD}$

$\text{arc AD} = \text{arc CB}$

Chapter test

1. In the given figure, a chord PQ of a circle with centre O and radius 15 cm is bisected at M by a diameter AB. If $OM = 9$ cm, find the lengths of : (i) PQ (ii) AP (iii) BP

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Solution:

Given, radius = 15 cm

$OA = OB = OP = OQ = 15 \text{ cm}$

Also, $OM = 9 \text{ cm}$



$$MB = OB - OM = 15 - 9 = 6 \text{ cm}$$

$$AM = OA + OM = 15 + 9 \text{ cm} = 24 \text{ cm}$$

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In $\triangle OMP$, By using Pythagoras Theorem,

$$OP^2 = OM^2 + PM^2$$

$$15^2 = 9^2 + PM^2$$

$$PM^2 = 255 - 81$$

$$PM = \sqrt{144} = 12 \text{ cm}$$

Also, In $\triangle OMQ$

By using Pythagoras Theorem

$$OQ^2 = OM^2 + QM^2$$

$$15^2 = OM^2 + QM^2$$

$$15^2 = 9^2 + QM^2 \quad (QM^2 = 225 - 81)$$

$$QM = \sqrt{144} = 12 \text{ cm}$$

$$PQ = PM + QM$$

(As radius is bisected at M)

$$PQ = 12 + 12 \text{ cm} = 24 \text{ cm}$$

(ii) Now in $\triangle APM$

$$AP^2 = AM^2 + OM^2$$

$$AP^2 = 24^2 + 12^2$$

$$AP^2 = 576 + 144$$

$$AP = \sqrt{720} = 12\sqrt{5} \text{ cm}$$

(iii) Now in $\triangle BMP$

$$BP^2 = BM^2 + PM^2$$

$$BP^2 = 6^2 + 12^2$$

$$BP^2 = 36 + 144$$

$$BP = \sqrt{180} = 6\sqrt{5} \text{ cm}$$

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2. The radii of two concentric circles are 17 cm and 10 cm ; a line PQRS cuts the larger circle at P and S and the smaller circle at Q and R. If QR = 12 cm, calculate PQ.

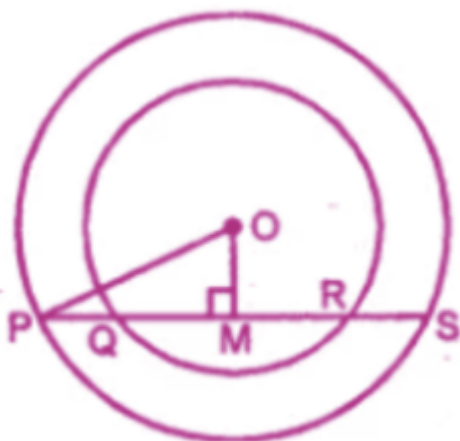
Solution :

A line PQRS intersects the outer circle at P

And S and inner circle at Q and R radius of

Outer circle $OP = 17$ cm and radius of inner

Circle $OQ = 10$ cm



$QR = 12$ cm

From O, draw $OM \perp PS$

$QM = \frac{1}{2} QR = \frac{1}{2} \times 12 = 6$ cm

In right $\triangle OQM$

$$OQ^2 = OM^2 + QM^2$$

$$(10)^2 = OM^2 + (6)^2$$

$$OM^2 = 10^2 - 6^2$$

$$= 100 - 36 = 64 = (8)^2$$

$$OM = 8 \text{ cm}$$

Now in right $\triangle OPM$

$$OP^2 = OM^2 + PM^2$$

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$$(17)^2 = OM^2 + PM^2$$

$$PM^2 = (17)^2 - (8)^2$$

$$= 289 - 64 = 225 = (15)^2$$

$$PM = 15 \text{ cm}$$

$$PQ = PM - QM = 15 - 6 = 9 \text{ cm}$$



ML Aggarwal Solutions Class 9 Maths

- Chapter 1- Rational and Irrational Numbers
- Chapter 2- Compound Interest
- Chapter 3- Expansions
- Chapter 4- Factorization
- Chapter 5- Simultaneous Linear Equations
- Chapter 6- Problems on Simultaneous Linear Equations
- Chapter 7- Quadratic Equations
- Chapter 8- Indices
- Chapter 9- Logarithms
- Chapter 10- Triangles
- Chapter 11- Mid Point Theorem
- Chapter 12- Pythagoras Theorem
- Chapter 13- Rectilinear Figures
- Chapter 14- Theorems on Area
- Chapter 15- Circle
- Chapter 16- Mensuration
- Chapter 17- Trigonometric Ratios
- Chapter 18- Trigonometric Ratios and Standard Angles
- Chapter 19- Coordinate Geometry
- Chapter 20- Statistics

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About ML Aggarwal

M. L. Aggarwal, is an Indian mechanical engineer, educator. His achievements include research in solutions of industrial problems related to fatigue design. Recipient Best Paper award, Manipal Institute of Technology, 2004. Member of TSTE.

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