

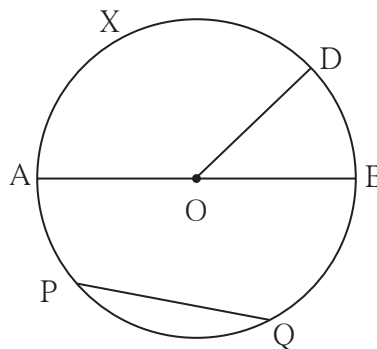


Let's recall.

In the adjoining figure O is the centre of the circle.

With reference to the figure fill in the blanks.

- Seg OD is ..... of the circle.
- Seg AB is ..... of the circle.
- Seg PQ is ..... of the circle.
- ..... is the central angle.
- Minor arc : arc AXD, arc BD, ....., ....., .....
- Major arc : arc PAB, arc PDQ, ....
- Semicircular arc : arc ADB,....
- $m(\text{arc DB}) = m\angle \dots\dots\dots$                       •  $m(\text{arc DAB}) = 360^\circ - m\angle \dots\dots\dots$



Let's learn.

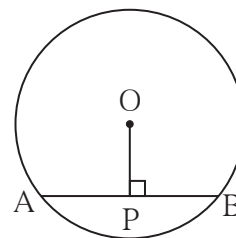
### Properties of chord of a circle

#### Activity I :

Draw chord AB of a circle with centre O.

Draw perpendicular OP to chord AB .

Measure seg AP and seg PB.

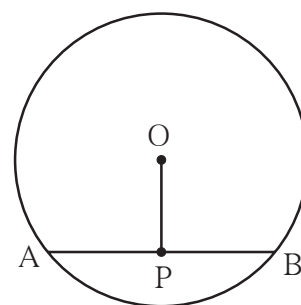


Draw five circles with different radii. Draw a chord and perpendicular from the centre to each chord in each circle. Verify with a divider that the two parts of the chords are equal. You will get the following property.

**The perpendicular drawn from the centre of a circle  
to its chord bisects the chord.**

## Activity II:

Draw five circles of different radii on a paper. Draw a chord in each circle. Find the midpoint of each chord. Join the centre of the circle and midpoint of the chord as shown in the figure. Name the chord as AB and midpoint of the chord as P. Check with set - square or protractor that  $\angle APO$  or  $\angle BPO$  are right angles.

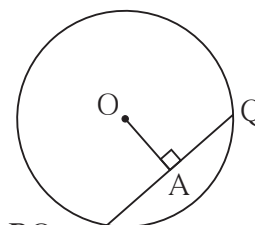


Check whether the same result is observed for the chord of each circle. You will get the following property.

**The segment joining the centre of a circle and midpoint of its chord is perpendicular to the chord.**

## Solved Examples

**Ex. (1)** In a circle with centre O, seg PQ is a chord of length 7 cm. seg OA  $\perp$  chord PQ, then find  $l(AP)$ .



**Solution:** Seg OA  $\perp$  chord PQ,  $\therefore$  point A is midpoint of chord PQ

$$\therefore l(PA) = \frac{1}{2} l(PQ) = \frac{1}{2} \times 7 = 3.5 \text{ cm}$$

**Ex. (2)** Radius of a circle with centre O is 10 cm. Find the length of the chord if the chord is at a distance of 6 cm from the centre.

**Solution:** Distance of the chord from the centre of the circle is the length of perpendicular drawn from the centre of the circle to the chord.

AB is the chord of the circle with centre O.

seg OP  $\perp$  chord AB.

Radius of the circle =  $l(OB) = 10$  cm.

$l(OP) = 6$  cm.  $\triangle OPB$  is a right angled triangle.

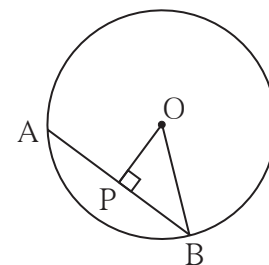
According to Pythagoras theorem,

$$[l(OP)]^2 + [l(PB)]^2 = [l(OB)]^2$$

$$\therefore 6^2 + [l(PB)]^2 = 10^2$$

$$\therefore [l(PB)]^2 = 10^2 - 6^2$$

$$\therefore [l(PB)]^2 = (10 + 6)(10 - 6) = 16 \times 4 = 64$$



$$\therefore l(PB) = 8 \text{ cm.}$$

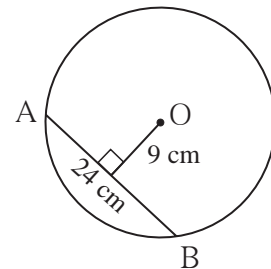
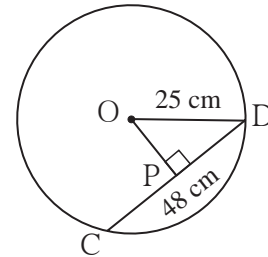
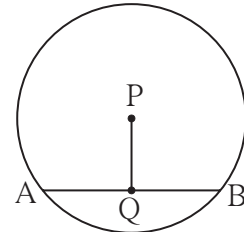
We know that, the perpendicular drawn from centre of the circle to the chord bisects the chord.

$$\therefore l(AB) = 2 \times l(PB) = 2 \times 8 = 16$$

$\therefore$  length of chord AB is 16 cm.

### Practice Set 17.1

- In a circle with centre P, chord AB is drawn of length 13 cm, seg PQ  $\perp$  chord AB, then find  $l(QB)$ .
- Radius of a circle with centre O is 25 cm. Find the distance of a chord from the centre if length of the chord is 48 cm.
- O is centre of the circle. Find the length of radius, if the chord of length 24 cm is at a distance of 9 cm from the centre of the circle.



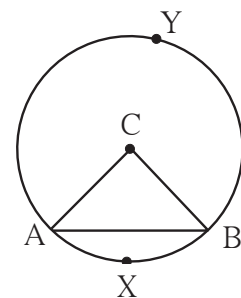
- C is the centre of the circle whose radius is 10 cm. Find the distance of the chord from the centre if the length of the chord is 12 cm.



Let's learn.

### Arcs corresponding to the chord of a circle

In the adjoining figure, seg AB is a chord of a circle with centre O. Arc AXB is minor arc and arc AYB is a major arc. These two arcs are called corresponding arcs of chord AB. Moreover chord AB is called corresponding chord of arc AXB and arc AYB.



## Congruent arcs

**If the measures of two arcs of circle are same then two arcs are congruent.**

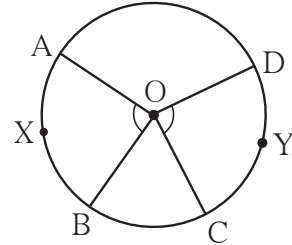
In the circle with centre O

$$\therefore m\angle AOB = m\angle COD$$

$$\therefore m(\text{arc AXB}) = m(\text{arc CYD})$$

$$\therefore \text{arc AXB} \cong \text{arc CYD}$$

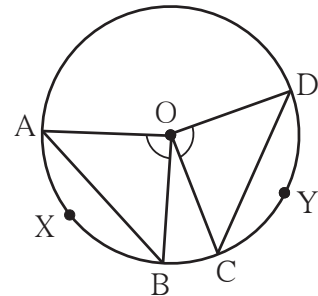
Verify this using tracing paper.



With the help of following activity find out the properties of the chord and the corresponding arc and remember them.

### Activity I :

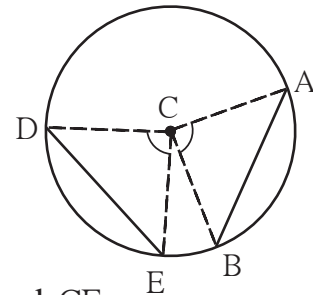
- (1) Draw a circle with centre O
- (2) Draw  $\angle COD$  and  $\angle AOB$  of same measure. You will find that the arc AXB and arc CYD are congruent.



- (3) Draw chords AB and CD.
- (4) Using compass experience that the length of chord AB and chord CD is also same.

### Activity II :

- (1) Draw a circle with centre C.
- (2) Draw the congruent chords AB and DE of the circle. Draw the radii CA, CB, CD and CE.
- (3) Check that  $\angle ACB$  and  $\angle DCE$  are congruent.
- (4) Hence show that measure of arc AB and arc DE is equal. Hence these arcs are congruent.

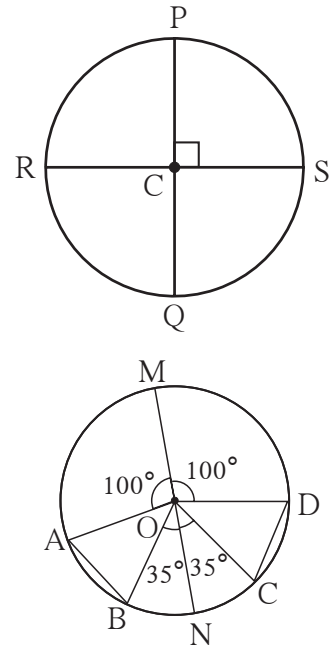


### Now I know.

The chords corresponding to congruent arcs are congruent. In a circle if two chords are congruent then their corresponding minor arcs and major arcs are congruent

### Practice Set 17.2

1. The diameters PQ and RS of the circle with centre C are perpendicular to each other at C. State, why arc PS and arc SQ are congruent. Write the other arcs which are congruent to arc PS
2. In the adjoining figure O is the centre of the circle whose diameter is MN. Measures of some central angles are given in the figure. Hence find the following
  - (1)  $m\angle AOB$  and  $m\angle COD$
  - (2) Show that arc AB  $\cong$  arc CD.
  - (3) Show that chord AB  $\cong$  chord CD



### Answers

#### Practice Set 17.1

1. 6.5 cm      2. 7 cm      3. 15 cm      4. 8 cm

#### Practice Set 17.2

1. (1) Because the arcs are of equal measures, that is  $90^\circ$  each.  
 (2) arc PS  $\cong$  arc PR  $\cong$  arc RQ
2. (1)  $m\angle AOB = m\angle COD = 45^\circ$   
 (2) arc AB  $\cong$  arc CD because the arcs are of equal measures that is  $45^\circ$  each.  
 (3) chord AB  $\cong$  chord CD because corresponding chords of congruent arcs are congruent.



## Miscellaneous Exercise 2

1. Questions and their alternative answers are given. Choose the correct alternative answer.
  - (1) Find the circumference of a circle whose area is  $1386 \text{ cm}^2$ .  
 (A)  $132 \text{ cm}^2$       (B)  $132 \text{ cm}$       (C)  $42 \text{ cm}$       (D)  $21 \text{ cm}^2$
  - (2) The side of a cube is  $4 \text{ m}$ . If it is doubled, how many times will be the volume of the new cube, as compared with the original cube ?  
 (A) Two times    (B) Three times    (C) Four times    (D) Eight times
2. Pranalee was practising for a  $100 \text{ m}$  running race. She ran  $100 \text{ m}$  distance  $20$  times. The time required, in seconds, for each attempt was as follows.  
 $18, 17, 17, 16, 15, 16, 15, 14, 16, 15,$   
 $15, 17, 15, 16, 15, 17, 16, 15, 14, 15$  Find the mean of the times taken for running.
3.  $\triangle DEF$  and  $\triangle LMN$  are congruent in the correspondence  $EDF \leftrightarrow LMN$ . Write the pairs of congruent sides and congruent angles in the correspondence.
4. The cost of a machine is ₹  $2,50,000$ . It depreciates at the rate of  $4\%$  per annum. Find the cost of the machine after three years.
5. In  $\square ABCD$  side  $AB \parallel$  side  $DC$ , seg  $AE \perp$  seg  $DC$ . If  $l(AB) = 9 \text{ cm}$ ,  $l(AE) = 10 \text{ cm}$ ,  $A(\square ABCD) = 115 \text{ cm}^2$ , find  $l(DC)$ .
6. The diameter and height of a cylindrical tank is  $1.75 \text{ m}$  and  $3.2 \text{ m}$  respectively. How much is the capacity of tank in litre ? ( $\pi = \frac{22}{7}$ )
7. The length of a chord of a circle of  $16.8 \text{ cm}$ , radius is  $9.1 \text{ cm}$ . Find its distance from the centre.
8. The following tables shows the number of male and female workers, under employment gurantee scheme, in villages A, B, C and D.

Village	A	B	C	D
No. of females	150	240	90	140
No. of males	225	160	210	110

- (1) Show the information by a sub-divided bar-diagram.
- (2) Show the information by a percentage bar diagram.

9. Solve the following equations.

(1)  $17(x+4) + 8(x+6) = 11(x+5) + 15(x+3)$

(2)  $\frac{3y}{2} + \frac{y+4}{4} = 5 - \frac{y-2}{4}$                       (3)  $5(1-2x) = 9(1-x)$

10. Complete the activity according to the given steps.

(1) Draw rhombus ABCD. Draw diagonal AC.

(2) Show the congruent parts in the figure by identical marks.

(3) State by which test and in which correspondence  $\triangle ADC$  and  $\triangle ABC$  are congruent.

(4) Give reason to show  $\angle DCA \cong \angle BCA$ , and  $\angle DAC \cong \angle BAC$

(5) State which property of a rhombus is revealed from the above steps.

11. The shape of a farm is a quadrilateral. Measurements taken of the farm, by naming its corners as P, Q, R, S in order are as follows.  $l(PQ) = 170$  m,  $l(QR) = 250$  m,  $l(RS) = 100$  m,  $l(PS) = 240$  m,  $l(PR) = 260$  m.

Find the area of the field in hectare ( 1 hectare = 10,000 sq.m)

12. In a library, 50% of total number of books is of Marathi. The books of English are  $\frac{1}{3}$  rd of Marathi books. The books on mathematics are 25% of the English books. The remaining 560 books are of other subjects. What is the total number of books in the library?

13. Divide the polynomial  $(6x^3+11x^2-10x-7)$  by the binomial  $(2x+1)$ . Write the quotient and the remainder.

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### Answers

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1. (1) B    (2) D                      2. 15.7 second

3. side ED  $\cong$  side LM, side DF  $\cong$  side MN, side EF  $\cong$  side LN,  $\angle E \cong \angle L$ ,

$\angle D \cong \angle M$ ,  $\angle F \cong \angle N$                       4. ₹ 2,21,184                      5. 14 cm                      6. 7700

7. 3.5 cm    9. (1)  $x = 16$ , (2)  $y = \frac{9}{4}$  (3)  $x = -4$                       11. 3.24 hectare

12. 1920                      13.  $3x^2 + 4x - 7$ , remainder 0