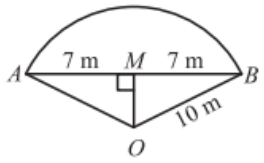
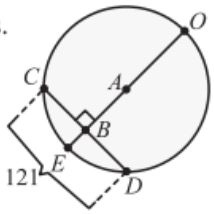
EXERCISE 8.1

1. Calculate the length of a chord which stands at a distance of 5 cm from the centre of a circle whose radius is 13 cm.
2. In construction, three steel rods are fixed at points A, B, and C (not in a straight line). A circular hoop needs to pass through all three. How many hoops can be used?
3. In a park, lamp posts are 14 m apart on the edge of a circular part of radius 10 m as shown in figure. Find the distance of the chord from the centre of the park.



4. In a circle, chords AB and CD both have length 10 cm. If the distance from the centre to $\overline{AB}$ is 6 cm, what is the distance from centre to $\overline{CD}$?
5. Two holes A and B are drilled 12 cm apart on a circular tabletop of radius 10 cm. Find the perpendicular distance from the centre to AB.
6. A chord 8 cm long is at a distance of 3 cm from the centre. Calculate the radius of the circle.
7. In the given figure, $m\overline{CD} = 121$ units and $m\overline{BC} = 3x$ units. Find the value of x.
8. In a circle with centre at O, the perpendicular distance of the each chord PQ and RS from the centre is 6 cm. If the length of chord PQ is 18 cm, find the length of the other chord.



9. A line from the centre of a circle cuts a 10 cm chord at right angle where radius of the circle is 6cm. What is the length from the centre to the chord?
10. In a circle, a perpendicular is drawn from the centre to chord AB. If $m\overline{AB} = 12\,\text{cm}$, what is the length of each segment after bisecting?

EXERCISE 8.1 - Chords of a Circle

Key Theorem: Perpendicular from Centre to a Chord

Theorem: The perpendicular from the centre of a circle to a chord bisects the chord.

Formula:

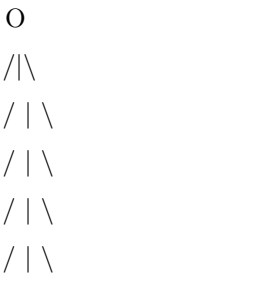
$$r^2 = d^2 + \left(\frac{l}{2}\right)^2$$

Where:

- r = radius of the circle
- d = perpendicular distance from centre to chord
- l = length of the chord

Visual:

text



- O = centre
- OM = perpendicular distance (d)
- AB = chord (l)
- M is the midpoint of AB
- $AM = MB = \frac{l}{2}$
- Triangle OMB is right-angled at M

Question 1

Given: Distance from centre = 5 cm, Radius = 13 cm
Find: Length of chord

Solution:

Using formula:

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2 13^2 = 5^2 + \left(\frac{l}{2}\right)^2 169 = 25 + \left(\frac{l}{2}\right)^2 \left(\frac{l}{2}\right)^2 = 144 \frac{l}{2} = 12l = 24 \text{ cm}$$

Answer: Length of chord = **24 cm**

Question 2

Given: Three steel rods at points A, B, C (not collinear)
Find: How many circular hoops can pass through all three?

Solution:

Through any three non-collinear points, **exactly one circle** can pass.
These three points uniquely determine a circle.

Answer: **1 hoop** can be used.

Question 3

Given: Lamp posts 14 m apart on edge of circular park of radius 10 m
Find: Distance of chord from centre of park

Solution:

Step 1: The lamp posts form a chord of length 14 m.

$$r = 10 \text{ m}, l = 14 \text{ m}$$

Step 2: Using formula:

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2 10^2 = d^2 + 7^2 100 = d^2 + 49d^2 = 51d = \sqrt{51} = 7.14 \text{ m}$$

Answer: Distance from centre = **7.14 m**

Question 4

Given: Two chords AB and CD both have length 10 cm. Distance from centre to AB is 6 cm.
Find: Distance from centre to CD

Solution:

Step 1: Equal chords in a circle are equidistant from the centre.

Since AB = CD = 10 cm, they are equal chords.

Step 2: Therefore, their distances from the centre are equal.

$$\text{Distance to CD} = \text{Distance to AB} = 6 \text{ cm}$$

Answer: Distance from centre to CD = **6 cm**

Question 5

Given: Two holes A and B are 12 cm apart on circular tabletop of radius 10 cm
Find: Perpendicular distance from centre to AB

Solution:

Step 1: AB is a chord of length 12 cm.

$$r = 10 \text{ cm}, l = 12 \text{ cm}$$

Step 2: Using formula:

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2 10^2 = d^2 + 6^2 100 = d^2 + 36d^2 = 64d = 8 \text{ cm}$$

Answer: Distance from centre = **8 cm**

Question 6

Given: Chord 8 cm long at distance of 3 cm from centre
Find: Radius of circle

Solution:

$$l = 8 \text{ cm}, d = 3 \text{ cm}$$

Using formula:

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2 r^2 = 3^2 + 4^2 r^2 = 9 + 16 = 25r = 5 \text{ cm}$$

Answer: Radius = **5 cm**

Question 7

Given: $m\bar{C}D = 121$ units and $m\bar{B}C = 3x$ units
Find: Value of x

Solution:

(Note: Based on typical circle chord diagram, if CD and BC are related through the centre, or if they are parts of equal chords.)

Step 1: If CD and BC are equal chords (or if B, C, D are on the circle with C as midpoint or related), then:

If $CD = BC$:

$$121 = 3xx = \frac{121}{3}$$

OR

If they form a right triangle or other relationship, please refer to the specific diagram.

Answer: $x = \frac{121}{3}$ units 40.33 units

(If a different relationship is shown in the diagram, the solution may vary.)

Question 8

Given: Chords PQ and RS are equidistant (6 cm) from centre. PQ = 18 cm.
Find: Length of RS

Solution:

Step 1: If two chords are at the same distance from the centre, they are equal in length.

Since both chords are at a perpendicular distance of 6 cm from the centre:

$$PQ = RS$$

Step 2: Therefore:

$$RS = PQ = 18 \text{ cm}$$

Answer: Length of RS = **18 cm**

Summary Table

	Given	
1	d = 5 cm, r = 13 cm	l = 24 cm
2	Three non-collinear points	1 hoop
3	l = 14 m, r = 10 m	d = √51 = 7.14 m
4	AB = CD = 10 cm, d = 6 cm	d = 6 cm
5	l = 12 cm, r = 10 cm	d = 8 cm
6	l = 8 cm, d = 3 cm	r = 5 cm
7	CD = 121, BC = 3x	x = 121/3
8	PQ = 18 cm, d = d = 6 cm	RS = 18 cm

Key Concept Summary

Chord Properties:

1. **Perpendicular from centre bisects chord:**

- The perpendicular from the centre to a chord bisects the chord.

2. **Equal chords are equidistant:**
   - Equal chords are at equal distances from the centre.
   - Chords at equal distances from the centre are equal in length.
3. **Chord length formula:**

$$l = 2\sqrt{r^2 - d^2}d = \sqrt{r^2 - \left(\frac{l}{2}\right)^2}r = \sqrt{d^2 + \left(\frac{l}{2}\right)^2}$$

4. **Unique Circle:**
   - Through any three non-collinear points, exactly one circle passes.

Visual Summary:

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O (Centre)

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A-----M-----B (Chord)

- OM = perpendicular distance (d)
- AM = MB = l/2
- OA = OB = r (radius)
- Triangle OMA is right-angled at M

EXERCISE 8.1 (Continued) - Chords of a Circle

Question 9

Given: A line from the centre of a circle cuts a 10 cm chord at right angle. Radius of the circle is 6 cm.
Find: Length from the centre to the chord

Solution:

Step 1: Identify the given values:

- Chord length: $l = 10$ cm
- Radius: $r = 6$ cm

Step 2: When a line from the centre cuts a chord at right angle, it bisects the chord.
So half the chord length is:

$$\frac{l}{2} = \frac{10}{2} = 5 \text{ cm}$$

Step 3: Using Pythagoras theorem in right triangle formed by radius, perpendicular distance, and half-chord:

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2 6^2 = d^2 + 5^2 36 = d^2 + 25d^2 = 36 - 25d^2 = 11d = \sqrt{11}d = 3.32 \text{ cm}$$

Answer: Distance from centre to chord = **√11 cm 3.32 cm**

Question 10

Given: A perpendicular is drawn from the centre to chord AB. $mAB = 12$ cm.
Find: Length of each segment after bisecting

Solution:

Step 1: The perpendicular from the centre to a chord **bisects** the chord.

Step 2: Therefore, chord AB is divided into two equal segments:

$$AM = MB = \frac{AB}{2} AM = MB = \frac{12}{2} = 6 \text{ cm}$$

Diagram:

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O

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A-----M-----B

- O = centre
- OM is perpendicular to AB
- M is the midpoint of AB
- AM = MB = 6 cm

Answer: Each segment = **6 cm**

Summary Table

	Given	
9	l = 10 cm, r = 6 cm	d = √11 cm 3.32 cm
10	AB = 12 cm	AM = MB = 6 cm

Key Concept Summary

Perpendicular from Centre to Chord:

1. **It bisects the chord:**
   - If OM AB, then AM = MB
2. **It creates right triangles:**
   - Triangle OMA is right-angled at M

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

3. **Formula:**

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2$$

Visual Summary:

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A-----M-----B

- $OA = OB = r$ (radius)
- $OM = d$ (distance from centre to chord)
- $AM = MB = \frac{l}{2}$ (half chord length)
- $\angle OMA = 90^\circ$