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10.1: The Circle

Objectives

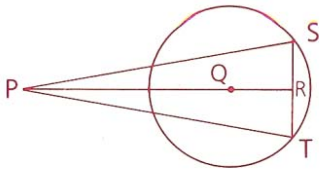
After studying this section, you will be able to

- Identify the characteristics of circles
- Recognize chords and diameters of circles
- Recognize special relationships between radii and chords

Problem 1

Given: $\odot Q$, $\overline{PR} \perp \overline{ST}$

Prove: $\overline{PS} \cong \overline{PT}$

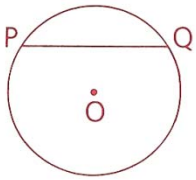


Proof

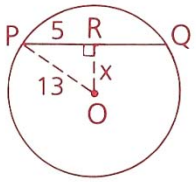
1 $\odot Q$, $\overline{PR} \perp \overline{ST}$	1 Given
2 $\overline{PR}$ bisects $\overline{ST}$.	2
3 $\overline{PR} \perp$ bis. $\overline{ST}$	3
4 $\overline{PS} \cong \overline{PT}$	4

Problem 2

The radius of circle O *is* 13 *mm. The length of chord* $\overline{PQ}$ *is* 10 *mm. Find the distance from chord* $\overline{PQ}$ *to the center,* O.



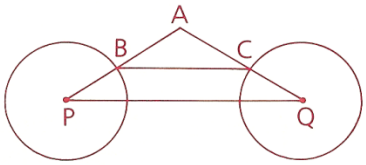
Solution



Problem 3

Given: $\triangle ABC$ *is isosceles* $(\overline{AB} \cong \overline{AC})$.
Ⓢ P *and* Q,
$\overline{BC} \parallel \overline{PQ}$

Prove: $\odot P \cong \odot Q$



Proof

1 $\triangle ABC$ is isosceles $(\overline{AB} \cong \overline{AC})$.	1 Given
2 Ⓢ P and Q, $\overline{BC} \parallel \overline{PQ}$	2 Given
3 $\angle ABC \cong \angle P$, $\angle ACB \cong \angle Q$	3
4 $\angle ABC \cong \angle ACB$	4
5 $\angle P \cong \angle Q$	5
6 $\overline{AP} \cong \overline{AQ}$	6
7 $\overline{PB} \cong \overline{CQ}$	7
8 $\odot P \cong \odot Q$	8

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10.2 CONGRUENT CHORDS

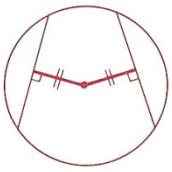
Objective

After studying this section, you will be able to

- Apply the relationship between congruent chords of a circle

Part One: Introduction

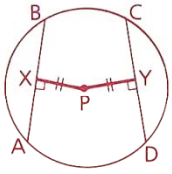
If two chords are the same distance from the center of a circle, what can we conclude?



Theorem 77 ***If two chords of a circle are equidistant from the center, then they are congruent.***

Given: $\odot P$, $\overline{PX} \perp \overline{AB}$, $\overline{PY} \perp \overline{CD}$, $\overline{PX} \cong \overline{PY}$

Prove: $\overline{AB} \cong \overline{CD}$

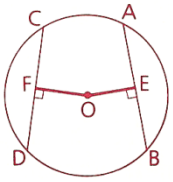


The proof of Theorem 77 is left for you to do. (Use four congruent triangles.) The converse of Theorem 77 can also be proved.

Theorem 78 ***If two chords of a circle are congruent, then they are equidistant from the center of the circle.***

Given: $\odot O$, $\overline{AB} \cong \overline{CD}$, $\overline{OE} \perp \overline{AB}$, $\overline{OF} \perp \overline{CD}$

Prove: $\overline{OE} \cong \overline{OF}$



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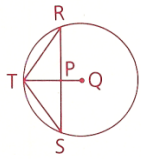
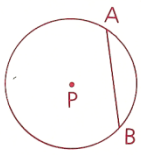
10.1 Homework

4 Given: $\odot Q$, $\overline{QT} \perp \overline{RS}$
Prove: $\overrightarrow{TQ}$ bisects $\angle RTS$.

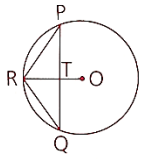


5 Chord $\overline{AB}$ measures 12 mm and the radius of $\odot P$ is 10 mm. Find the distance from $\overline{AB}$ to P.



6 Find the length of a chord that is 15 cm from the center of a circle with a radius of 17 cm.

10 Given: $\odot O$;
$\overleftrightarrow{OR}$ bisects $\overline{PQ}$.
Prove: $\overrightarrow{RO}$ bisects $\angle PRQ$.

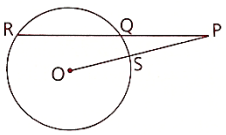


14 Two circles intersect and have a common chord 24 cm long. The centers of the circles are 21 cm apart. The radius of one circle is 13 cm. Find the radius of the other circle.

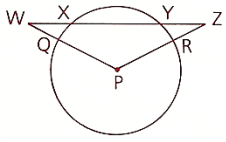
16 $\overline{PQ}$ is a diameter of $\odot O$. P = (−3, 17) and Q = (5, 2). Find the center and the radius of $\odot O$.

22 Find the radius of a circle in which a 48-cm chord is 8 cm closer to the center than a 40-cm chord.

23 In circle O, PQ = 4, RQ = 10, and PO = 15. Find PS (the distance from P to $\odot O$).



20 Given: $\odot P$, $\overline{WX} \cong \overline{YZ}$
Prove: $\overline{WQ} \cong \overline{ZR}$



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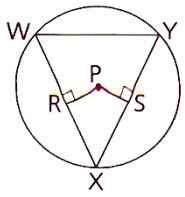
10.2 Homework

Problem Set A, *continued*

3 Given: $\odot P$, $\overline{PR} \perp \overline{WX}$, $\overline{PS} \perp \overline{XY}$, $\overline{PR} \cong \overline{PS}$

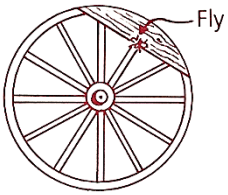
Conclusion: $\angle W \cong \angle Y$



6 A fly is sitting at the midpoint of a wooden chord of a circular wheel. The wheel has a radius of 10 cm, and the chord has a length of 12 cm.

a How far from the hub (center) is the fly?

b The wheel is spun. What is the path of the fly?

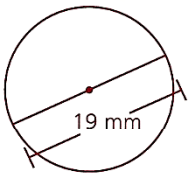


Problem Set B

7 To the nearest hundredth, find

a The area of the circle

b The circumference of the circle



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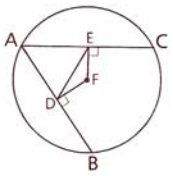
10 Given: $\odot F$, $\overline{AB} \cong \overline{AC}$, $\overline{DF} \perp \overline{AB}$, $\overline{EF} \perp \overline{AC}$

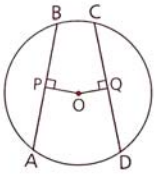
Prove: $\triangle ADE$ is isosceles.



11 In circle O, $PB = 3x - 17$, $CD = 15 - x$, and $OQ = OP = 3$.

a Find AB.

b Find the radius of $\odot O$.



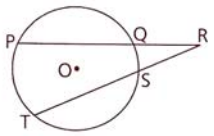
12 A regular hexagon with a perimeter of 24 is inscribed in a circle. How far from the center is each side?

13 A 16-by-12 rectangle is inscribed in a circle. Find the radius of the circle.

Problem Set C

14 Given: $\odot O$, $\overline{PQ} \cong \overline{TS}$

Prove: $\overline{RQ} \cong \overline{RS}$



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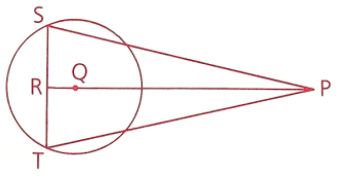
Classwork 10.1 – hand in before the period ends.

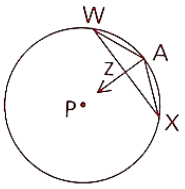
2 Given: $\odot Q$, $\overline{PR} \perp \overline{ST}$

Prove: $\angle S \cong \angle T$



18 Given: $\odot P$;
Z is the midpt. of $\overline{WX}$.
$\triangle WAX$ is isosceles, with base $\overline{WX}$.

Prove: $\overrightarrow{AZ}$ passes through P.



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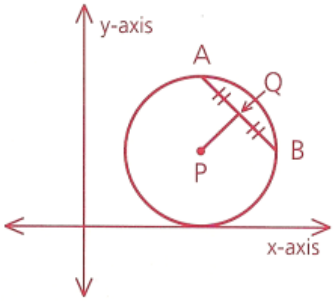
17 ⊙P just touches (is tangent to) the x-axis. P = (15, 13) and Q = (19, 16).

a Find the radius of ⊙P.

b Find PQ.

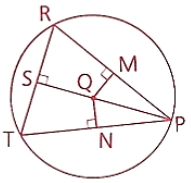
c Find the length of $\overline{AB}$.



10.2

8 Given: ⊙Q, $\overline{PS} \perp \overline{RT}$, $\overline{MQ} \perp \overline{RP}$, $\overline{NQ} \perp \overline{PT}$

Conclusion: $\overline{MQ} \cong \overline{QN}$



S	R
1. ⊙Q, $\overline{PS} \perp \overline{RT}$	1.
2. $\overline{MQ} \perp \overline{RP}$ & $\overline{NQ} \perp \overline{PT}$	2.
3. $\overline{RS} \cong \overline{ST}$	3.
4. $\overline{SP} \cong \overline{SP}$	4.
5. ∠QST & ∠QSR rt ∠s	5.
6. ∠QST ≅ ∠QSR	6.
7. △PSR ≅ △PST	7.
8. $\overline{RP} \cong \overline{TP}$	8.
9. $\overline{MQ} \cong \overline{QN}$	9.