

Name _____

Adv Geo – period _____

10.3 Homework Check: Any talking will result in a 0 grade. Use your homework. You are not provided time to complete the exercises. Copy the work from your homework. You have 5 minutes. Each problem is ¼ point, totaling 3 points.

<p>2 Given: Two concentric circles with center O; ∠BOC is acute.</p> <p>a Name a major arc of the smaller circle.</p> <p>b Name a minor arc of the larger circle.</p> <p>c What is $m\widehat{BC} + m\widehat{PQ}$?</p> <p>d Which is greater, $m\widehat{BC}$ or $m\widehat{PQ}$?</p> <p>e Is \widehat{BC} congruent to \widehat{QR}?</p>				2a	
				2b	
				2c	
				2d	
				2e	
<p>6 Given: $\odot D$, $\angle B \cong \angle C$ Conclusion: $\widehat{AB} \cong \widehat{AC}$</p>		<p>3 In circle E, find each of the following. b $m\widehat{AD}$ e $m\widehat{ADC}$</p>		3b	
				3e	
Statements	Reasons				
1. $\odot D$, $\angle B \cong \angle C$	1.				
2. $\widehat{AB} \cong \widehat{AC}$	2.	9b What fractional part of a circle is an arc that measures 240?			
3. $\widehat{AB} \cong \widehat{AC}$	3.	10a Find the measure of an arc that is 3/5 of its circle.			

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10.4 Secants and Tangents

Objectives

After studying this section, you will be able to

- Identify secant and tangent lines
- Identify secant and tangent segments
- Distinguish between two types of tangent circles
- Recognize common internal and common external tangents

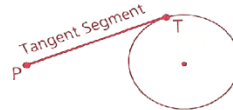
Definition A **secant** is a line that intersects a circle at exactly two points. (Every secant contains a chord of the circle.)

Definition A **tangent** is a line that intersects a circle at exactly one point. This point is called the **point of tangency** or **point of contact**.

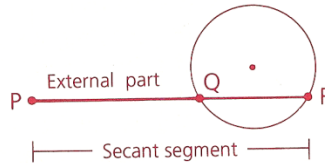
Postulate A **tangent line is perpendicular to the radius drawn to the point of contact**.

Postulate *If a line is perpendicular to a radius at its outer endpoint, then it is tangent to the circle.*

Definition A **tangent segment** is the part of a tangent line between the point of contact and a point outside the circle.



Definition A **secant segment** is the part of a secant line that joins a point outside the circle to the farther intersection point of the secant and the circle.

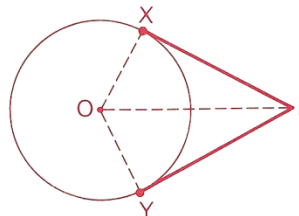


Definition The **external part** of a secant segment is the part of a secant line that joins the outside point to the nearer intersection point.

Theorem 85 *If two tangent segments are drawn to a circle from an external point, then those segments are congruent. (Two-Tangent Theorem)*

Given: $\odot O$;
 \overline{PX} and \overline{PY} are tangent segments.

Prove: $\overline{PX} \cong \overline{PY}$



Tangent Circles

Definition *Tangent circles* are circles that intersect each other at exactly one point.

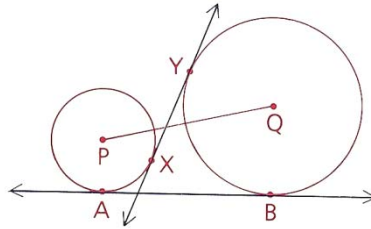


Common Tangents

\overleftrightarrow{PQ} is the line of centers.

\overleftrightarrow{XY} is a **common internal tangent**.

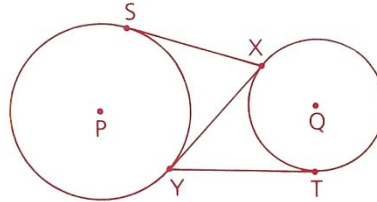
\overleftrightarrow{AB} is a **common external tangent**.



Problem 1

Given: \overleftrightarrow{XY} is a common internal tangent to $\odot P$ and $\odot Q$ at X and Y .
 \overleftrightarrow{XS} is tangent to $\odot P$ at S .
 \overleftrightarrow{YT} is tangent to $\odot Q$ at T .

Conclusion: $\overline{XS} \cong \overline{YT}$

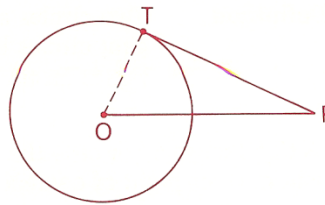


Proof

1 \overline{XS} is tangent to $\odot P$.	1 Given
\overline{YT} is tangent to $\odot Q$.	
2 \overleftrightarrow{XY} is tangent to $\odot P$ and $\odot Q$.	2 Given
3 $\overline{XS} \cong \overline{XY}$	3
4 $\overline{XY} \cong \overline{YT}$	4
5 $\overline{XS} \cong \overline{YT}$	5

Problem 2

\overleftrightarrow{TP} is tangent to circle O at T .
 The radius of circle O is 8 mm.
 Tangent segment \overline{TP} is 6 mm long.
 Find the length of \overline{OP} .



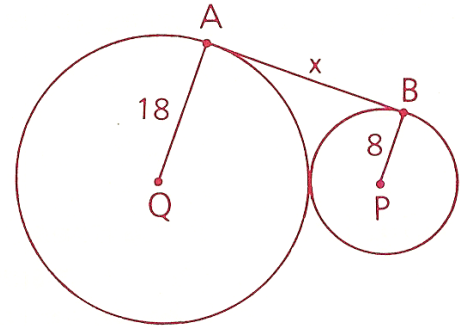
Solution

Common-Tangent Procedure

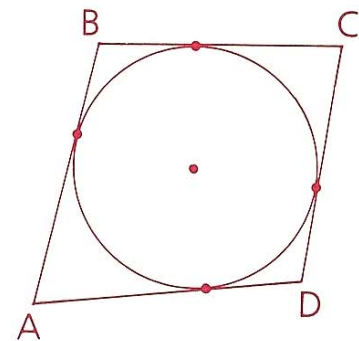
- 1 Draw the segment joining the centers.
- 2 Draw the radii to the points of contact.
- 3 Through the center of the smaller circle, draw a line parallel to the common tangent.
- 4 Observe that this line will intersect the radius of the larger circle (extended if necessary) to form a rectangle and a right triangle.
- 5 Use the Pythagorean Theorem and properties of a rectangle.

Problem 3 A circle with a radius of 8 cm is externally tangent to a circle with a radius of 18 cm. Find the length of a common external tangent.

Solution



Problem 4 A walk-around problem:
Given: Each side of quadrilateral ABCD is tangent to the circle.
 $AB = 10$, $BC = 15$, $AD = 18$
Find: CD



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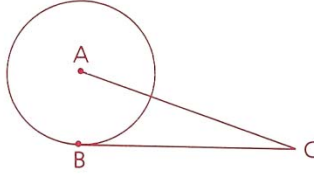
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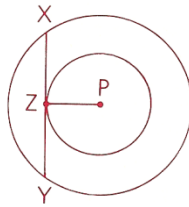
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Homework 10.4 Secants and Tangents

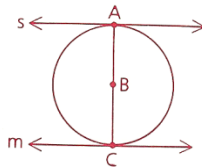
- 1 The radius of $\odot A$ is 8 cm.
Tangent segment \overline{BC} is 15 cm long.
Find the length of \overline{AC} .



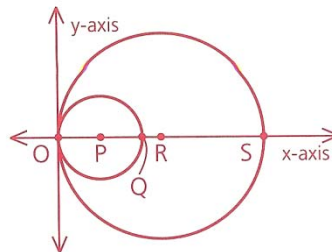
- 2 Concentric circles with radii 8 and 10 have center P.
 \overline{XY} is a tangent to the inner circle and is a chord of the outer circle.
Find \overline{XY} . (Hint: Draw \overline{PX} and \overline{PY} .)



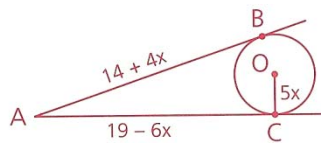
- 4 Given: \overline{AC} is a diameter of $\odot B$.
Lines s and m are tangents to the \odot at A and C .
Conclusion: $s \parallel m$



- 5 $\odot P$ and $\odot R$ are internally tangent at O.
P is at (8, 0) and R is at (19, 0).
a Find the coordinates of Q and S.
b Find the length of \overline{QR} .



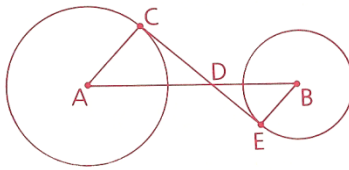
- 6 \overline{AB} and \overline{AC} are tangents to $\odot O$,
and $OC = 5x$. Find OC .



- 7 Given: \overline{CE} is a common internal tangent to circles A and B at C and E.

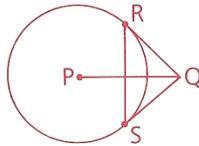
Prove: a $\angle A \cong \angle B$

b $\frac{AD}{BD} = \frac{CD}{DE}$

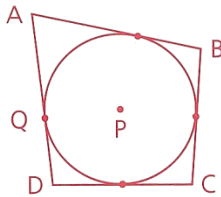


- 8 Given: \overline{QR} and \overline{QS} are tangent to $\odot P$ at points R and S.

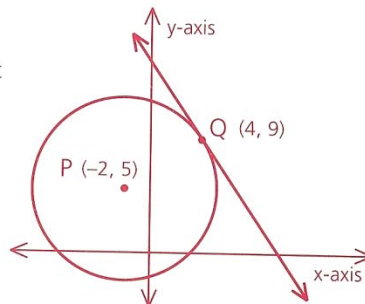
Prove: $\overline{PQ} \perp \overline{RS}$ (Hint: This can be proved in just a few steps.)



- 10 $\odot P$ is tangent to each side of ABCD. AB = 20, BC = 11, and DC = 14. Let AQ = x and find AD.



- 11 a Find the radius of $\odot P$.
b Find the slope of the tangent to $\odot P$ at point Q.



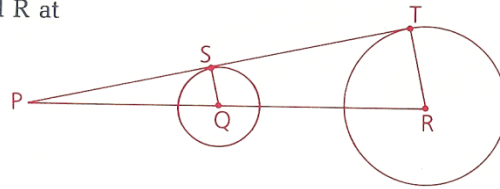
- 12 Two concentric circles have radii 3 and 7. Find, to the nearest hundredth, the length of a chord of the larger circle that is tangent to the smaller circle. (See problem 2 for a diagram.)

- 13 The centers of two circles of radii 10 cm and 5 cm are 13 cm apart.
- Find the length of a common external tangent. (Hint: Use the common-tangent procedure.)
 - Do the circles intersect?

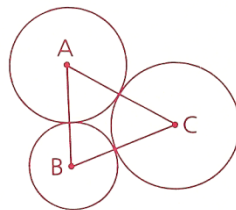
- 14 The centers of two circles with radii 3 and 5 are 10 units apart. Find the length of a common internal tangent. (Hint: Use the common-tangent procedure.)

- 15 Given: \overline{PT} is tangent to $\odot Q$ and R at points S and T .

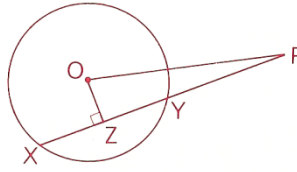
Conclusion: $\frac{PQ}{PR} = \frac{SQ}{TR}$



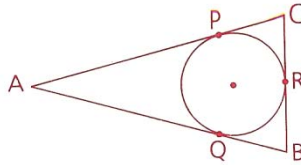
- 16 Given: Tangent $\odot A$, B , and C ,
 $AB = 8$, $BC = 13$, $AC = 11$
 Find: The radii of the three \odot (Hint:
 This is a walk-around problem.)



- 17 The radius of $\odot O$ is 10.
 The secant segment \overline{PX} measures 21 and is 8 units from the center of the \odot .
- Find the external part (\overline{PY}) of the secant segment.
 - Find OP .



- 18 Given: $\triangle ABC$ is isosceles, with base \overline{BC} .
 Conclusion: $\overline{BR} \cong \overline{RC}$



- 19 If two of the seven circles are chosen at random, what is the probability that the chosen pair are
- Internally tangent?
 - Externally tangent?
 - Not tangent?

