SECTION 9.2: TANGENTS

Standards:

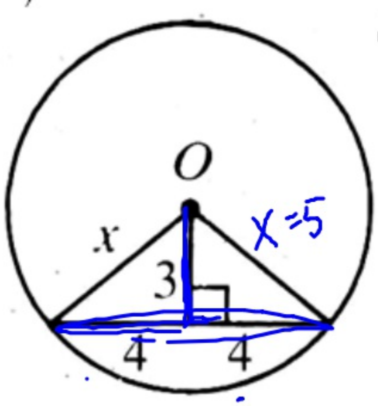
7.0 - Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.

21.0 - Students prove and solve problems regarding relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.

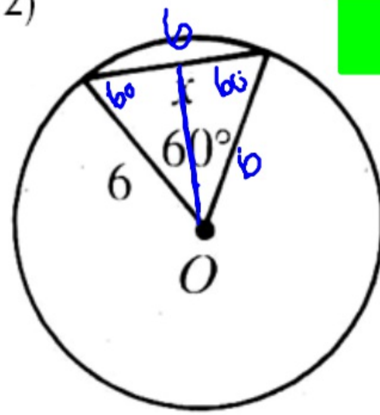
WARMUP #2

1-4: Find the value of x. O is the center of each circle.

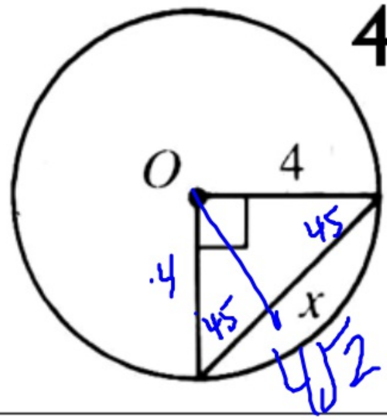
1) 5



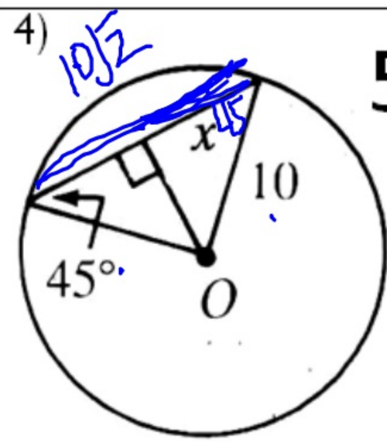
2)



3) $4\sqrt{2}$

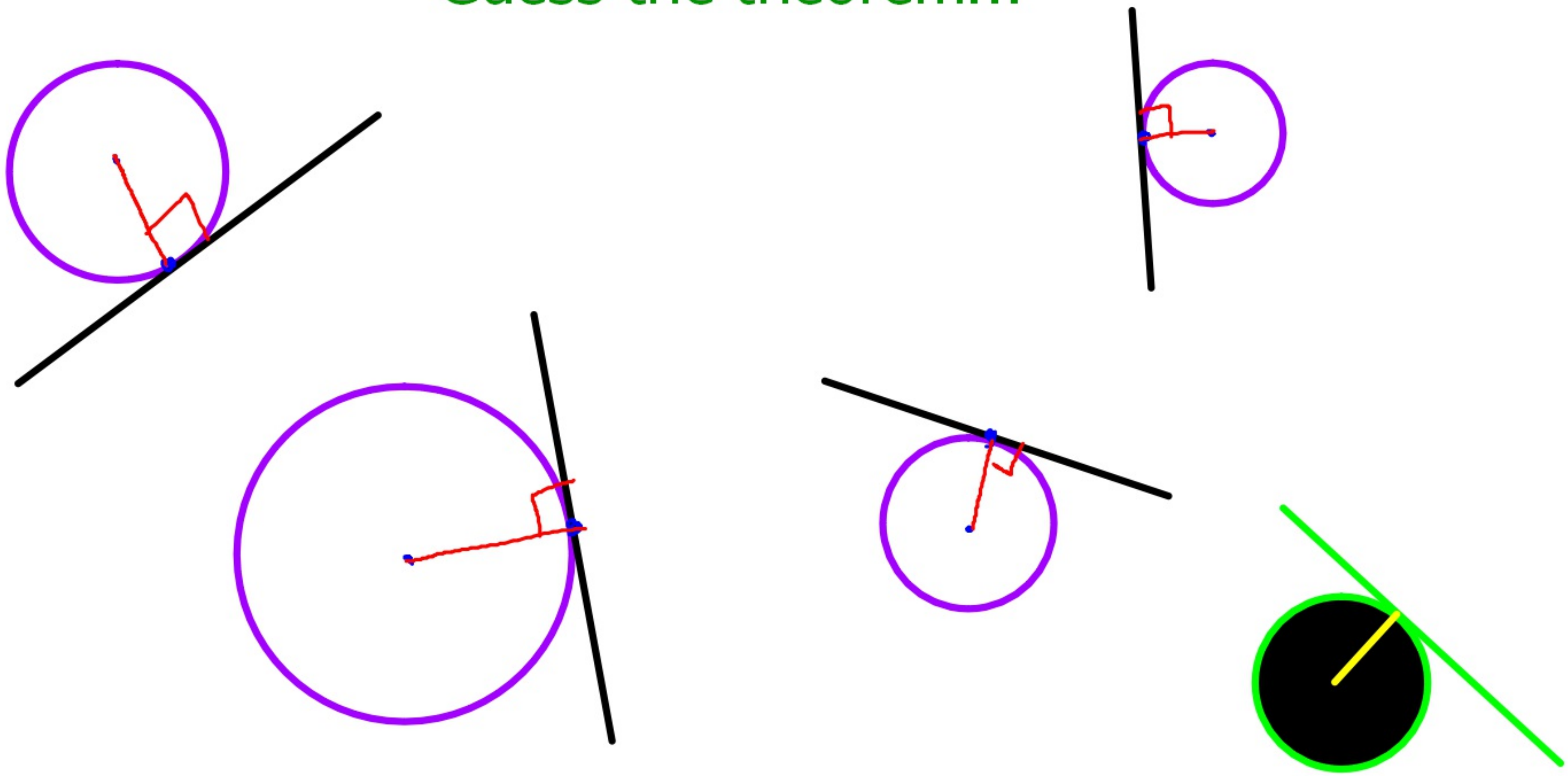


4) $5\sqrt{2}$



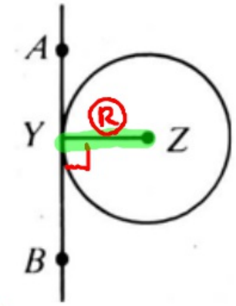
Draw a radius to the point of tangency on each figure.

Guess the theorem...



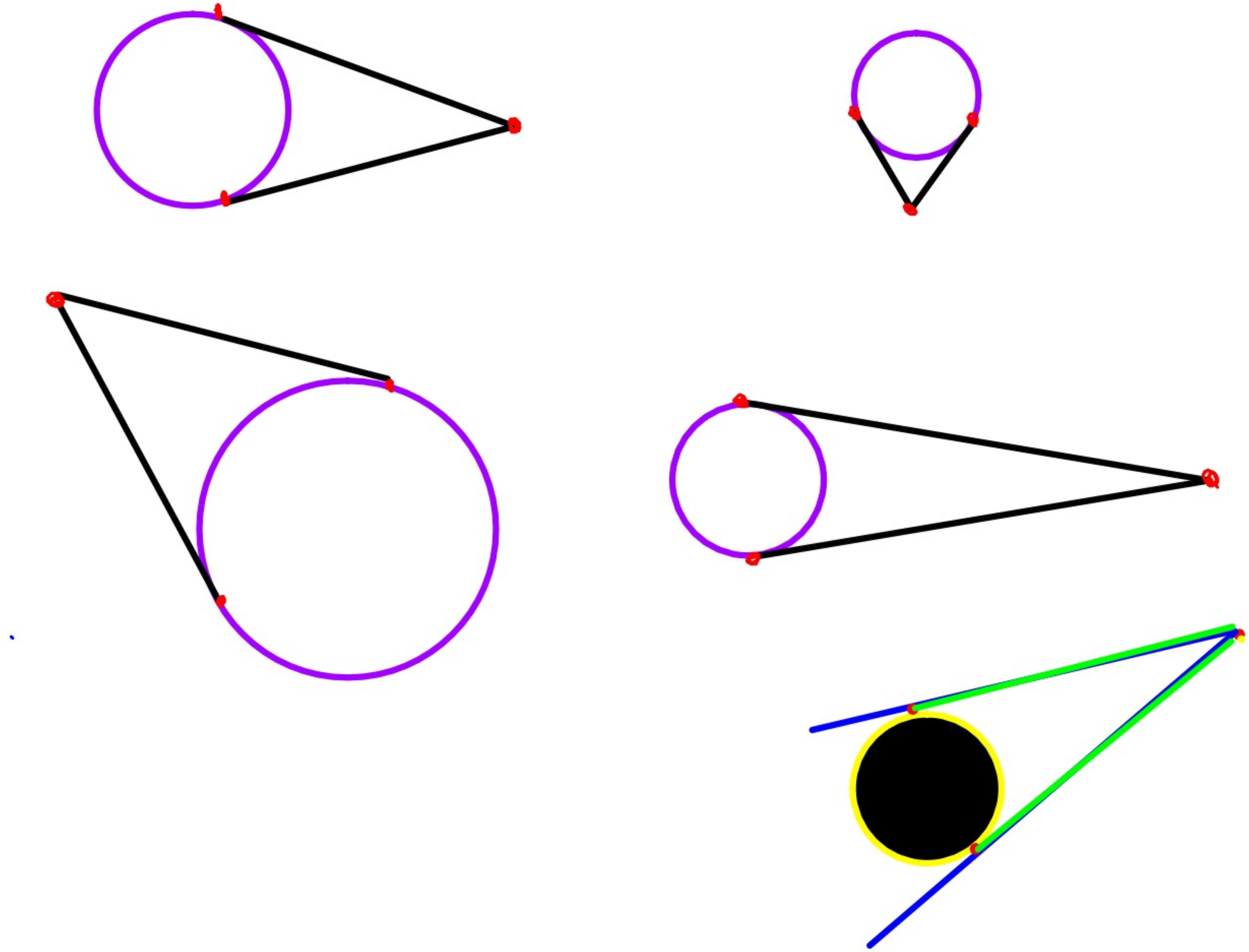
THEOREM

If a line is tangent to a circle, then the line is perpendicular to the radius drawn to the point of tangency.



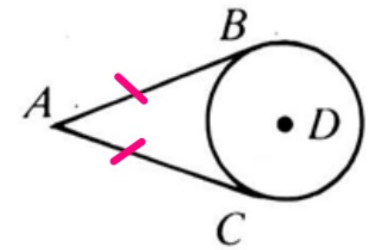
$\overline{ZY} \perp \overline{AB}$

Guess the theorem......



COROLLARY

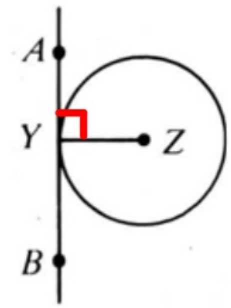
Tangents to a circle from a point are ≅



$\overline{AB} \cong \overline{AC}$

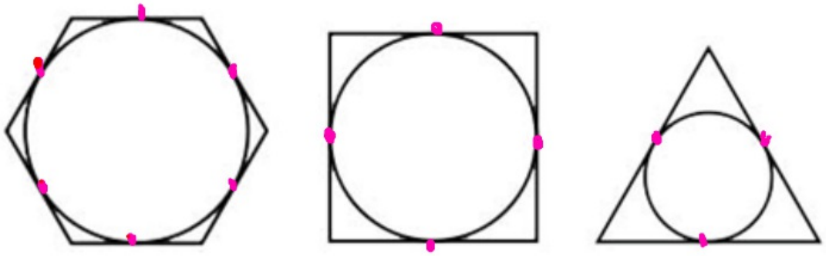
THEOREM

If a line in the plane of a circle is perpendicular to a radius at its outer endpoint, then the line is tangent to the circle.



If $\overline{AB} \perp \overline{YZ}$, then $\overline{AB}$ is tangent to circle Z at Y

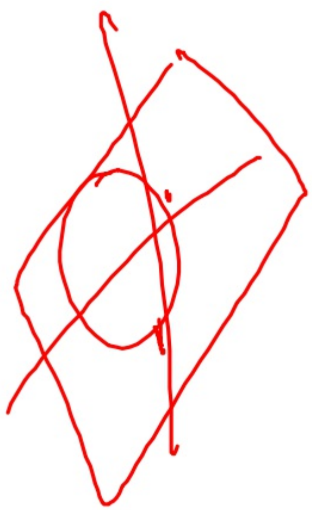
CIRCUMSCRIBED POLYGONS & INSCRIBED CIRCLES

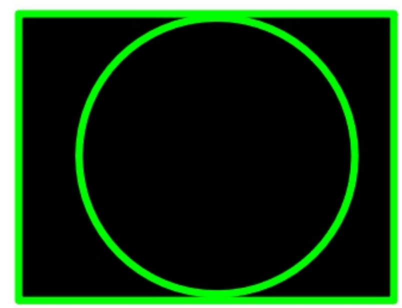


When each side of a polygon is tangent to a circle.

Inscribed = inside

Circumscribed = outside

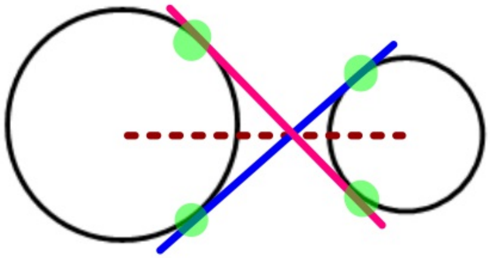




COMMON TANGENT

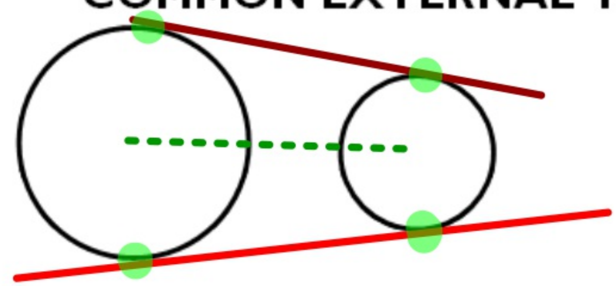
a line that is tangent to each of 2 coplanar circles

COMMON INTERNAL TANGENT



Intersects the segment joining the centers.

COMMON EXTERNAL TANGENT

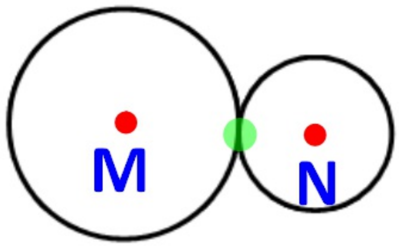


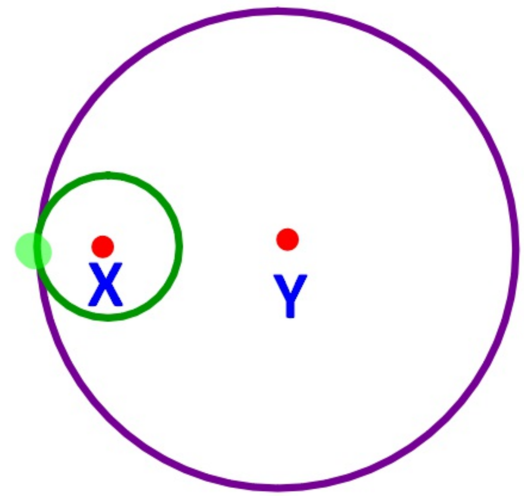
Does not intersect the segment joining the centers.

TANGENT CIRCLES

coplanar circles that are tangent to the same line at the same pt.

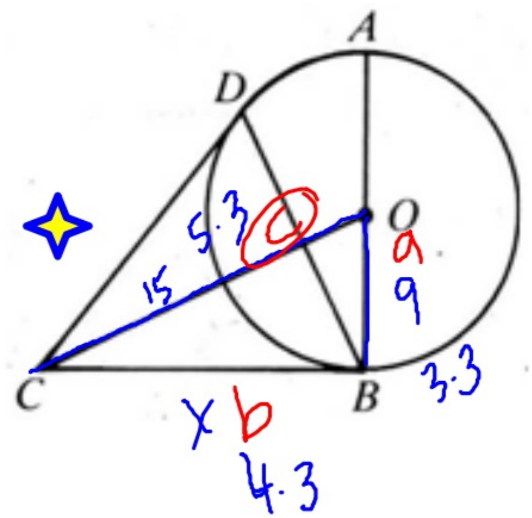
EXTERNALLY TANGENT CIRCLES	INTERNALLY TANGENT CIRCLES





1-8: $\overleftrightarrow{CB}$ and $\overleftrightarrow{CD}$ are tangent to circle O at *B* and *D*, resp

1) If $OC = 15$ and $OB = 9$, then $BC =$ **12** .



special △

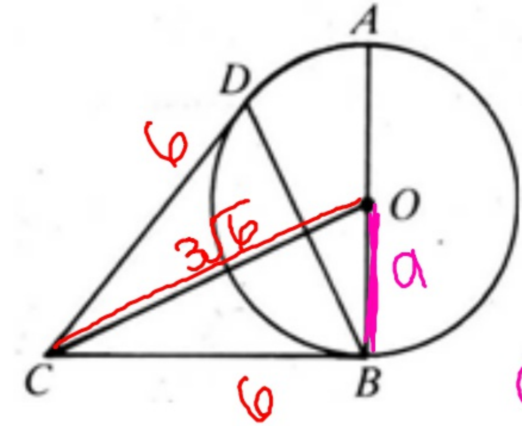
3 : 4 : 5

3·3 (9) 3·4 (12) 3·5 (15)

3·2 (6) 4·2 (8) 5·2 (10)

$\overleftrightarrow{CB}$ and $\overleftrightarrow{CD}$ are tangent to circle O at *B* and *D*, respectively.

2) If $OC = 3\sqrt{6}$ and $BC = 6$, then $OB =$ $\underline{\;3\sqrt{2}\;}$.



$$a^2 + 6^2 = (3\sqrt{6})^2$$

$$a^2 + 36 = 9 \cdot 6 \;\; 54$$

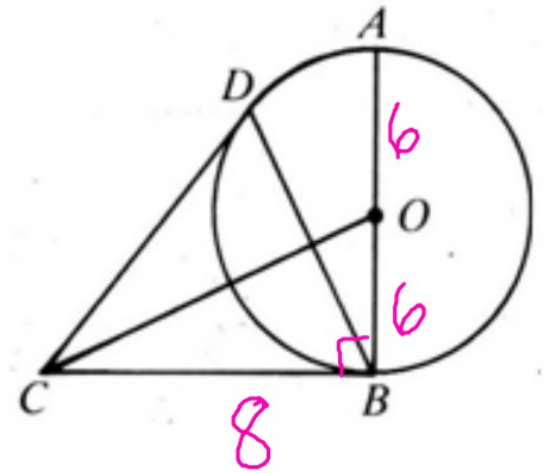
$$-36 \quad -36$$

$$a^2 = \sqrt{18}$$

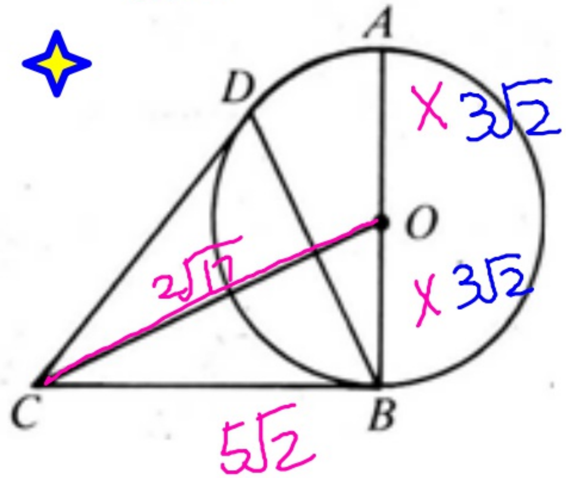
$$3\sqrt{2}$$

3) If $AB = 12$ and $BC = 8$, then

$OC =$ **10** .



4) If $OC = 2\sqrt{17}$ and $BC = 5\sqrt{2}$, then $AB =$ $6\sqrt{2}$.



$$x^2 + (5\sqrt{2})^2 = (2\sqrt{17})^2$$

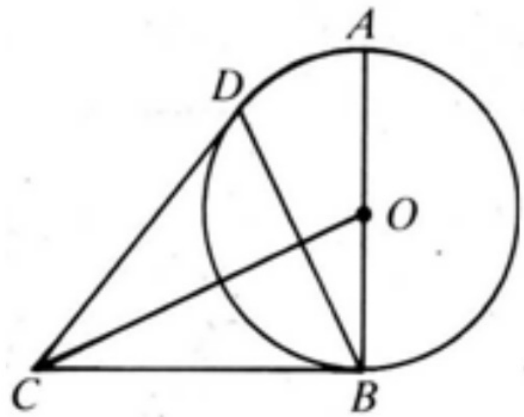
$25 \cdot 2$ $4 \cdot 17$

$$x^2 + 50 = 68$$

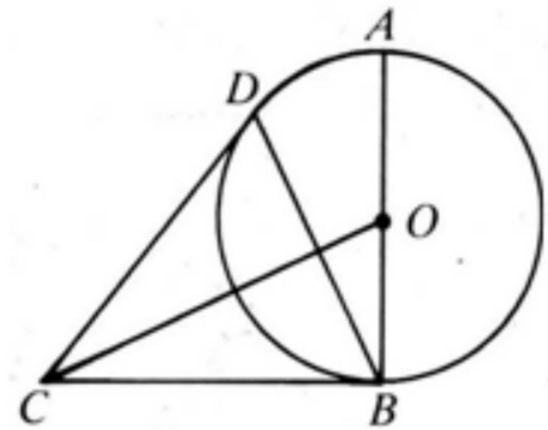
$$x^2 = 18$$

$$3\sqrt{2}$$

5) If $m(\angle OCB) = 30$ and $OB = 4$, then $OC =$ ______.



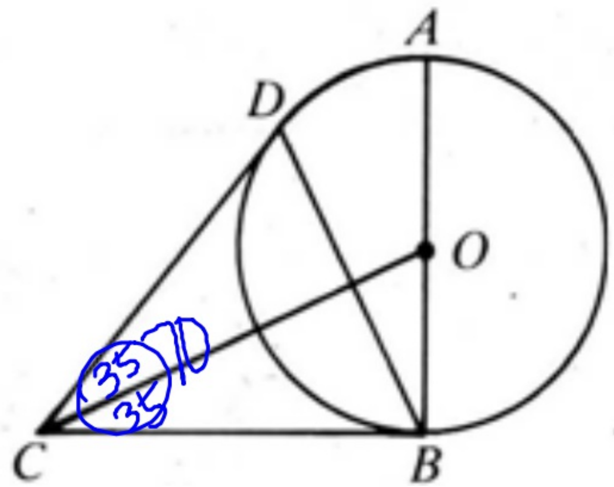
6) If $m(\angle COB) = 60$ and $CB = 6\sqrt{3}$, then $AB =$ ________ .

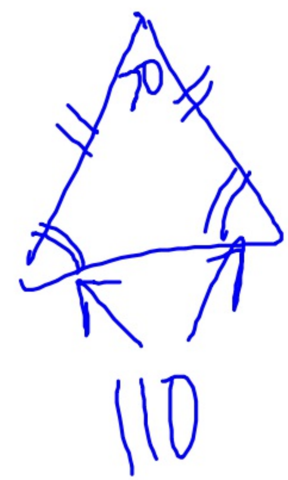


1-8: *CB* and *CD* are tangent to circle O at *B*

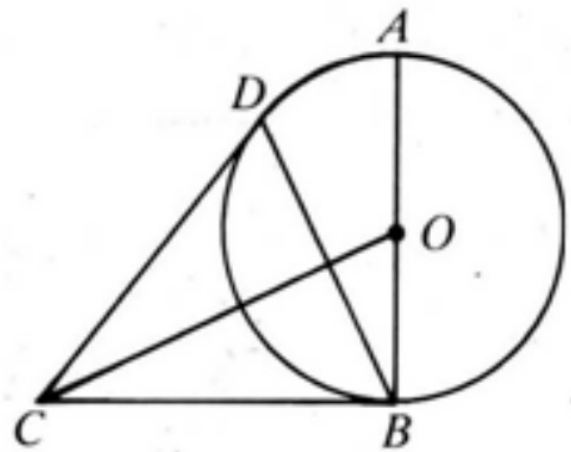
7) If $m(\angle BCD) = 70$, then

$m(\angle CBD) = m(\angle$ **CDB** $) =$ **55** .





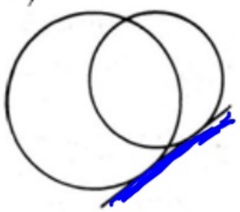
8) If $m(\angle BCD) = 50$, then $m(\angle DBO) =$ ______.



9-14: (a) Tell whether the circles are externally tangent, internally tangent, or not tangent.

(b) Tell whether the line is a common external tangent, a common internal tangent, or neither.

9)

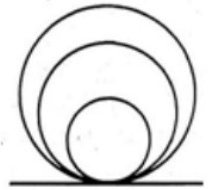


(circles)

a)not tangent

b)common ext. tangent

10)



a)int tangent

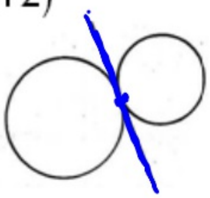
b) common ext tangent

11)

a) not tangent

b) neither

12)



a) ext. tangent

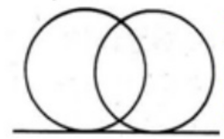
b) common int tangent line

13)

a) not tan

b) common int tan

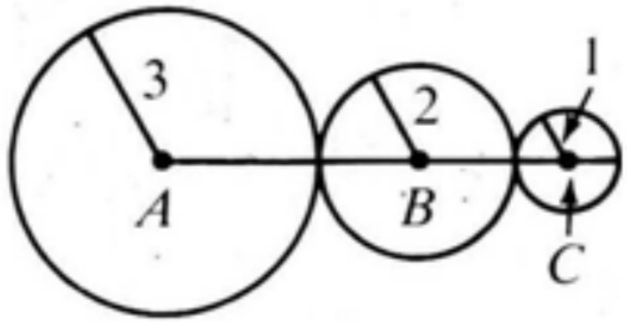
14)



a) not tangent

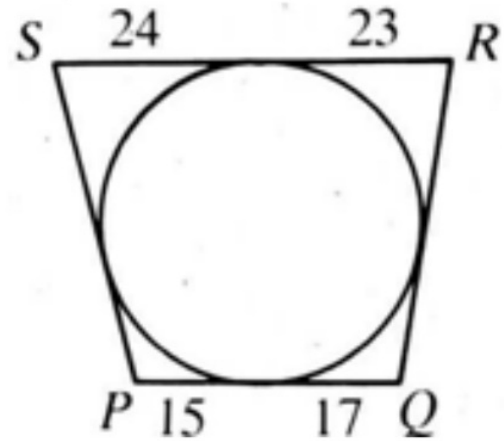
b) common ext tan

15) Find AC



AC = 8

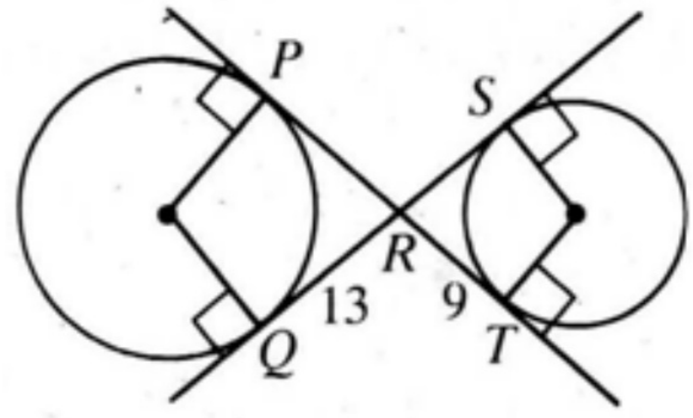
16) Find *SP* and *RQ*



SP = 39

RQ = 40

17) Find PT and QS



PT = QS = 22

HOMEWORK

HW 9.2

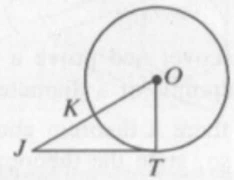
- Pg. 335 (WE): # 1-6, 8a, 8b, 10
- Pg. 337 (M-R-E): #1-3

HW 9.2

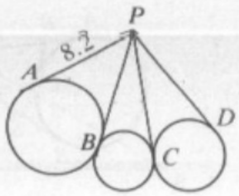
- Pg. 335 (CE)1-3, 5
- Pg. 335 (WE): # 1-6, 8a-c 10, 17, 18
- Pg. 337 (M-R-E): #1-3

Written Exercises

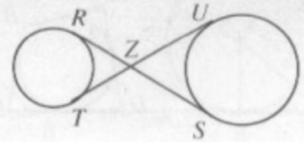
$\overline{JT}$ is tangent to $\odot O$ at T. Complete.



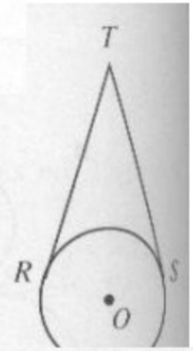
1. If $OT = 6$ and $JO = 10$, then $JT =$ ___?___.
2. If $OT = 6$ and $JT = 10$, then $JO =$ ___?___.
3. If $m\angle TOJ = 60$ and $OT = 6$, then $JO =$ ___?___.
4. If $JK = 9$ and $KO = 8$, then $JT =$ ___?___.
5. The diagram below shows tangent lines and circles. Find PD.



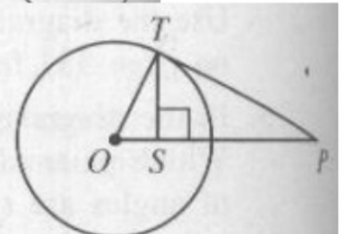
6. $\overline{RS}$ and $\overline{TU}$ are common internal tangents to the circles. If $RZ = 4.7$ and $ZU = 7.3$, find RS and TU.



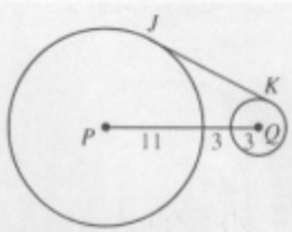
8. Given: $\overline{TR}$ and $\overline{TS}$ are tangents to $\odot O$ from T;
   $m\angle RTS = 36$
   a. Copy the diagram. Draw $\overline{RS}$ and find $m\angle TSR$ and $m\angle TRS$.
   b. Draw radii $\overline{OS}$ and $\overline{OR}$ and find $m\angle ORS$ and $m\angle OSR$.
   c. Find $m\angle ROS$.



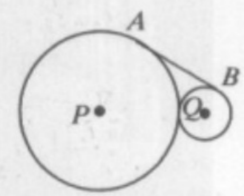
10. Given: $\overline{PT}$ is tangent to $\odot O$ at T; $\overline{TS} \perp \overline{PO}$
    Complete the following statements.
    a. TS is the geometric mean between ___?___ and ___?___.
    b. TO is the geometric mean between ___?___ and ___?___.
    c. If $OS = 6$ and $SP = 24$, $TS =$ ___?___ and $TP =$ ___?___.



17. $\overline{JK}$ is tangent to $\odot P$ and $\odot Q$. $JK =$ ___?___ (*Hint*: What kind of quadrilateral is $JPQK$?)

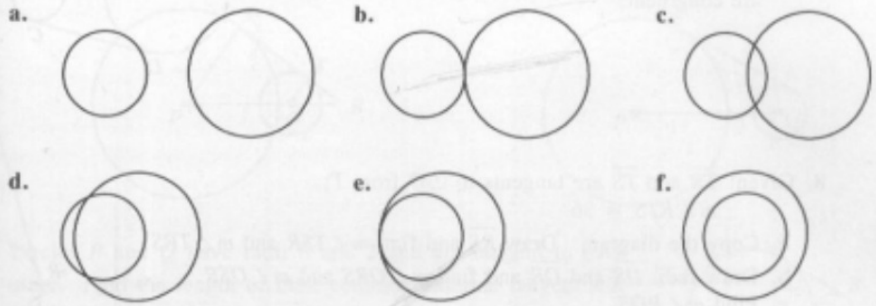


18. Circles P and Q have radii 6 and 2 and are tangent to each other. Find the length of their common external tangent $\overline{AB}$. (*Hint*: Draw $\overline{PQ}$, $\overline{PA}$, and $\overline{QB}$.)



Classroom Exercises

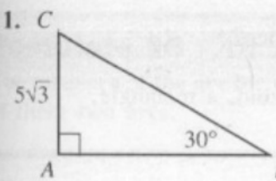
1. How many common external tangents can be drawn to the two circles?



2. How many common internal tangents can be drawn to each pair of circles in Exercise 1 above?
3. **a.** Which pair of circles shown above are externally tangent?
   b. Which pair are internally tangent?

Mixed Review Exercises

Find AB. In Exercise 3, $\overline{CB}$ is tangent to $\odot A$.

1.


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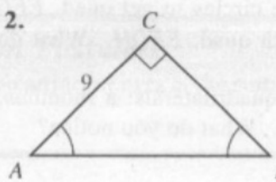

3.