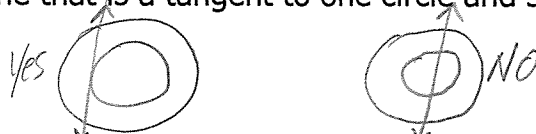


1. Determine if the following statements are sometimes, always or never true when there are a pair of concentric circles. Justify your answer.

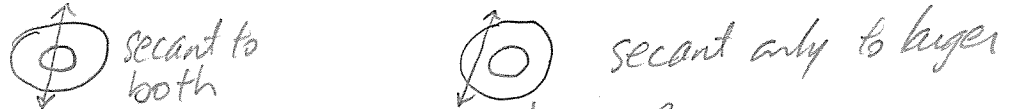
a. There Sometimes exists a line that is a tangent to one circle and s a secant to the other circle.



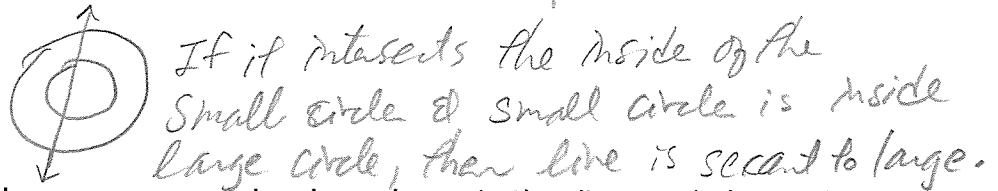
b. There never exists a line that is a tangent to both circles.

In concentric circles, if a line is tangent to the smaller circle, then it is inside the larger circle which makes it a secant.

c. A line that is a secant on one circle is Sometimes a secant for the other circle.



d. A line that intersects the inside of the small circle is always is secant for both circles.



2. Two circles intersect and have a common chord, as shown in the diagram below. The radii of the circles are 13 and 15. The distance between the centers is 14. Find the length of the common chord.

$$\triangle ABC \cong \triangle ADC \text{ (SSS)}$$

$$\triangle ABE \cong \triangle ADE \text{ (SAS)}$$

$$\triangle BCE \cong \triangle DCE \text{ (SAS)}$$

Now, we can use Pyth Thm.

$$x^2 + y^2 = 13^2 \rightarrow y^2 = 169 - x^2$$

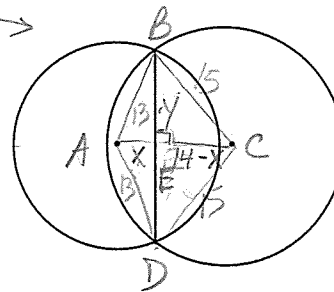
$$(14-x)^2 + y^2 = 15^2$$

$$196 - 28x + x^2 + y^2 = 225$$

$$196 - 28x + x^2 + 169 - x^2 = 225$$

$$140 = 28x$$

$$5 = x$$



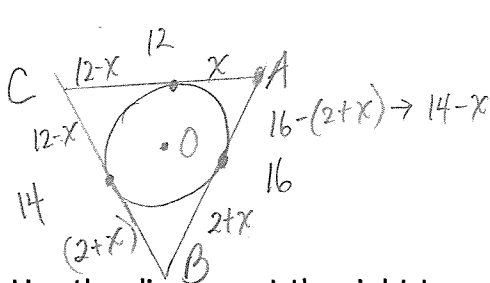
$BD = 24$

$$x^2 + y^2 = 169$$

$$25 + y^2 = 169$$

$$y = 12$$

3. $\triangle ABC$ is circumscribed about circle O. $AC = 12$, $CB = 14$ and $AB = 16$. Find the length of the tangent segment from point A.



$$14 - x = x$$

$$14 = 2x$$

$$7 = x$$

Tang. Segmt = 7

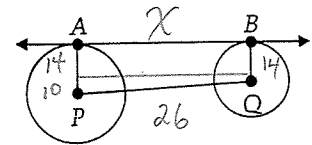
4. Use the diagram at the right to answer the following.

a. $AP = 24$, $BQ = 14$, $PQ = 26$, $AB = \underline{24}$

$$10^2 + x^2 = 26^2$$

$$x^2 = 576$$

$$x = 24$$



b. $AB = 16$, $PQ = 20$, $AP = 18$, $BQ = \underline{6}$

$$(18-x)^2 + 16^2 = 20^2$$

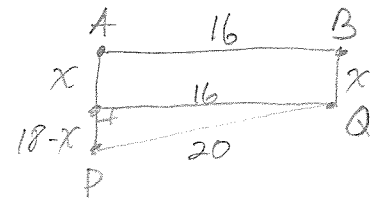
$$324 - 36x + x^2 - 144 = 0$$

$$x^2 - 36x + 180 = 0$$

$$(x-30)(x-6) = 0$$

$$x = 30, x = 6$$

↑
OMIT



5. In the diagram at the right, t is a tangent line.

$$CD = BC + 2$$

$$AM = 2\sqrt{7}$$

$$AD = 12$$

Find CD.

$$12^2 + (4\sqrt{7})^2 = BD^2$$

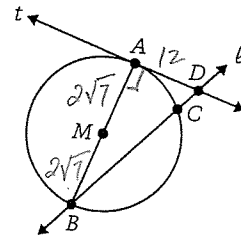
$$144 + 112 =$$

$$16 = BD$$

$$BD = BC + CD$$

$$16 = BC + BC + 2$$

$$14 = 2BC \rightarrow BC = 7 \rightarrow \boxed{CD = 9}$$



6. \overline{UR} and \overline{ST} are common internal tangents of circle P and Q.

$$UP = 6$$

$$QS = 5$$

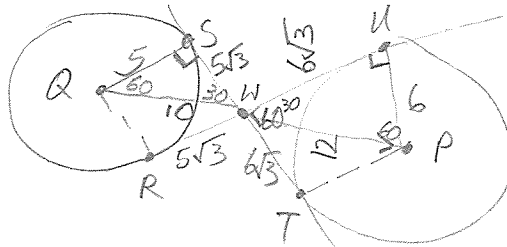
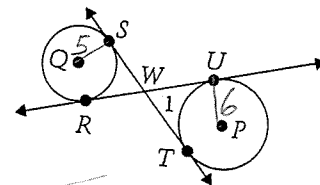
$$m\angle 1 = 60^\circ$$

$$ST = 5\sqrt{3} + 6\sqrt{3} = 11\sqrt{3}$$

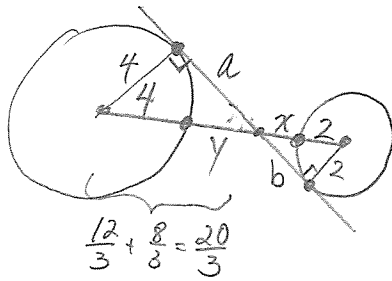
$$RU = 11\sqrt{3}$$

$$PQ = 10 + 12 = 22$$

Find ST, RU and PQ.



7. Two circles have radii 4 and 2. The centers are 10 units apart. Find the length of the **common internal tangent**.



Similar Triangles

$$\frac{4+y}{4} = \frac{x+2}{2}$$

$$8+2y = 4x+8$$

$$y = 2x$$

$$x+y = 4$$

$$x+2x = 4$$

$$x = \frac{4}{3}$$

$$y = \frac{8}{3}$$

$$a^2 + 4^2 = \left(\frac{20}{3}\right)^2$$

$$a^2 = \frac{400}{9} - \frac{144}{9}$$

$$a = \sqrt{\frac{256}{9}} = \frac{16}{3}$$

$$b = \frac{16}{6} = \frac{8}{3}$$

8. \overline{JK} is tangent to circle P and Q. Find JK.

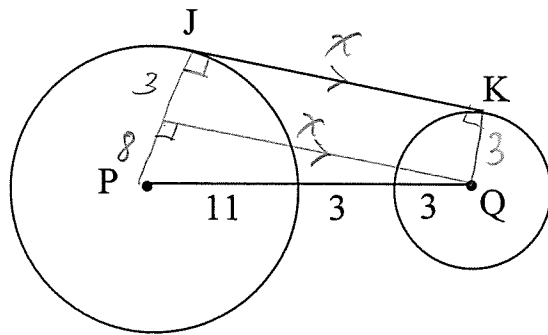
Common int. tang = $a+b = \frac{24}{3} = 8$

$$x^2 + 8^2 = 17^2$$

$$x^2 = 225$$

$$x = 15$$

$$\text{JK} = 15$$



9. SR is tangent to Circle P and Q.
 QT = 6, TR = 8, PR = 30

Find PQ, PS, ST.

because

$\overline{TQ} \parallel \overline{SP}$:

$$\frac{8}{10} = \frac{x}{20}$$

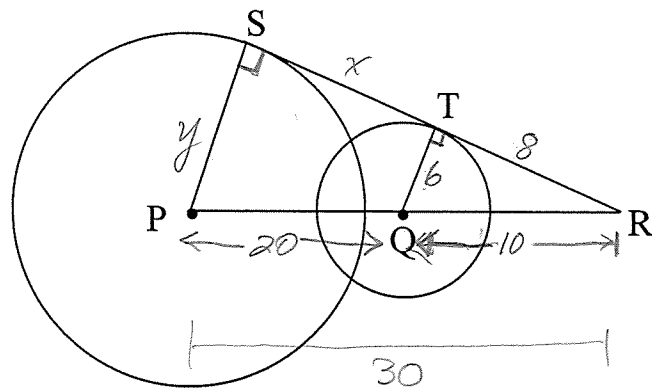
$$10x = 160$$

$$x = 16$$

$$\frac{8}{6} = \frac{24}{y}$$

$$8y = 144$$

$$y = 18$$



$$\text{PQ} = 20$$

$$\text{PS} = 18$$

$$\text{ST} = 16$$

