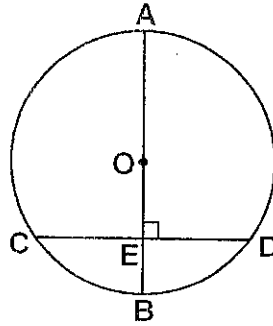


Name: _____
 Segments and Angles

- 1) In the accompanying diagram of circle O, diameter \overline{AB} is perpendicular to chord \overline{CD} at E.



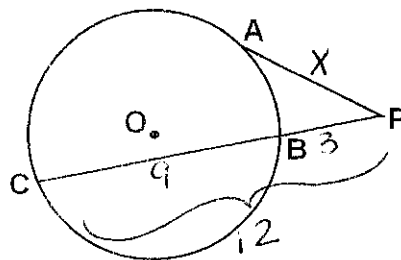
Which of the following three statements is *true*?

- I. $\overline{CE} \cong \overline{ED}$
 II. $\overline{CB} \cong \overline{BD}$
 III. $\overline{AC} \cong \overline{AD}$

All

- 2) In a circle whose radius is 13, a chord has a length of 24. Find the distance of this chord from the center of the circle.

- 3) In the accompanying diagram, \overline{AP} is a tangent and \overline{PBC} is a secant to circle O.

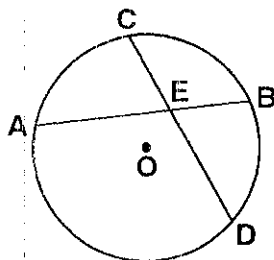


$$\begin{aligned}
 (\text{Tan})^2 &= (\text{Sec})(\text{Ext}) \\
 X^2 &= 12(3) \\
 \sqrt{X^2} &= \sqrt{36} \\
 \boxed{X} &= \boxed{6}
 \end{aligned}$$

If $PC = 12$ and $BC = 9$, find the length of \overline{AP} .

Questions 4 and 5 refer to the following:

In the above diagram, chords \overline{AB} and \overline{CD} intersect at point E in circle O.



- 4) If $AE = 12$, $CE = 8$, and $ED = 6$, find EB .

$$(AE)(EB) = (CE)(ED)$$

$$(12)(x) = (8)(6)$$

$$\frac{12x}{12} = \frac{48}{12}$$

$$\boxed{x = 4}$$

- 5) If $AE = 8$, $EB = 9$, $CE = x + 2$, and $ED = x - 4$, find x .

$$(AE)(EB) = (CE)(ED)$$

$$8(9) = (x+2)(x-4)$$

$$72 = x^2 - 4x + 2x - 8$$

$$72 = x^2 - 2x - 8$$

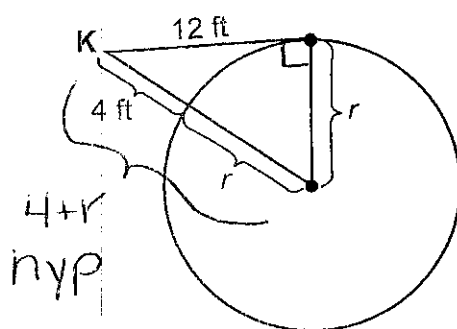
$$\begin{array}{r} 72 = x^2 - 2x - 8 \\ -72 \quad \quad -72 \\ \hline 0 = x^2 - 2x - 80 \end{array}$$

$$0 = (x-10)(x+8)$$

$$x = 10 \quad | \quad x = -8 \text{ reject}$$

$$\boxed{x = 10}$$

- 6) Kimi wants to determine the radius of a circular pool without getting wet. She is located at point K, which is 4 feet from the pool and 12 feet from the point of tangency, as shown in the accompanying diagram.



$$r^2 + 12^2 = (4+r)^2$$

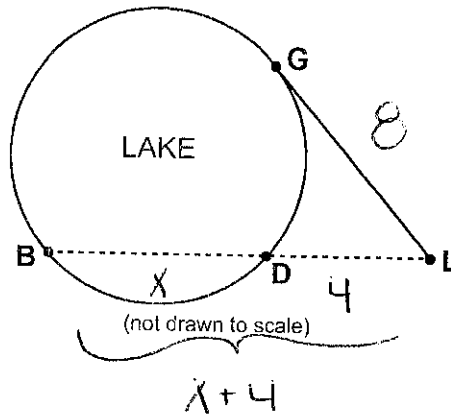
$$r^2 + 144 = (4+r)(4+r)$$

$$\begin{array}{r} r^2 + 144 = 16 + 4r + 4r + r^2 \\ -r^2 \quad \quad \quad -r^2 \\ \hline 144 = 16 + 8r \\ -16 \quad -16 \\ \hline 128 = 8r \\ \frac{128}{8} = \frac{8r}{8} \end{array}$$

$$\boxed{16 = r}$$

What is the radius of the pool?

- 7) In the accompanying diagram, cabins B and G are located on the shore of a circular lake, and cabin L is located near the lake. Point D is a dock on the lake shore and is collinear with cabins B and L. The road between cabins G and L is 8 miles long and is tangent to the lake. The path between cabin L and dock D is 4 miles long.



$$(\overline{\text{Tan}})^2 = (\overline{\text{Sec}})(\overline{\text{Ext}})$$

$$8^2 = (x+4)(4)$$

$$64 = 4x + 16$$

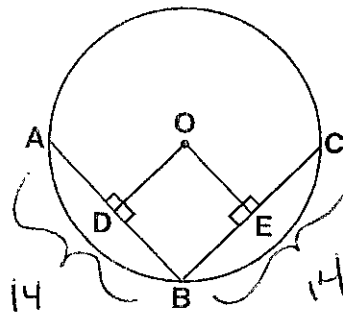
$$\begin{array}{r} 64 = 4x + 16 \\ -16 \quad -16 \\ \hline 48 = 4x \end{array}$$

$$\frac{48}{4} = \frac{4x}{4}$$

$$\boxed{12 = x}$$

What is the length, in miles, of \overline{BD} ?

- 8) In circle O below, $\overline{OD} \perp \overline{AB}$, $\overline{OE} \perp \overline{BC}$, and $\overline{OD} \cong \overline{OE}$.



$$\frac{14}{2} = \boxed{7}$$

If $AB = 14$, find EC .

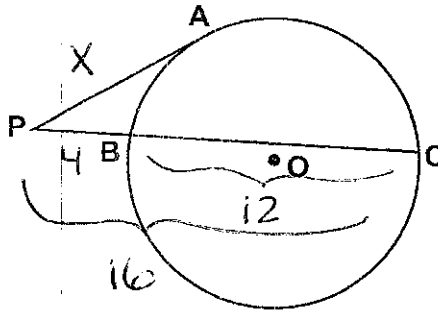
- 9) In the accompanying diagram, \overline{PA} is tangent to circle O at A, secant \overline{PBC} is drawn, $PB = 4$, and $BC = 12$. Find PA. [Show all work.]

$$(\overline{Tan})^2 = (\overline{Sec})(\overline{Ext})$$

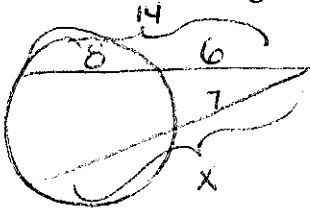
$$X^2 = 16(4)$$

$$\sqrt{X^2} = \sqrt{64}$$

$$\boxed{X=8}$$



- 10) Two secant segments are drawn to a circle from an external point. The external segment of the first secant segment is 6 and its internal segment is 8. Find the length of the *second* secant segment if its external segment is 7.



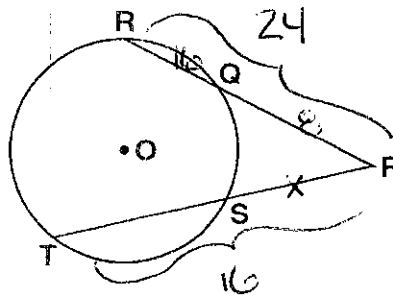
$$(\overline{Sec})(\overline{Ext}) = (\overline{Sec})(\overline{Ext})$$

$$14(6) = x(7)$$

$$\frac{84}{7} = \frac{7x}{7}$$

$$\boxed{x=12}$$

- 11) In the diagram below, secant segments \overline{PR} and \overline{PT} intersect at P.



$$(\overline{Sec})(\overline{Ext}) = (\overline{Sec})(\overline{Ext})$$

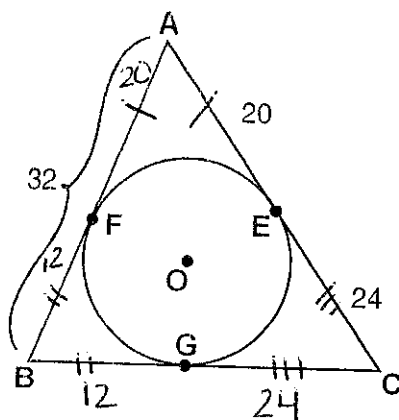
$$24(8) = 16(x)$$

$$\frac{192}{16} = \frac{16x}{16}$$

$$\boxed{12=x}$$

If $PR = 24$, $QR = 16$, and $PT = 16$, find PS .

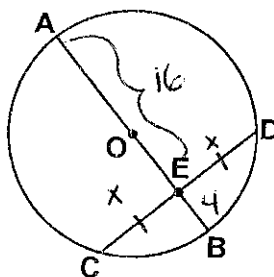
- 12) In the accompanying diagram, \overline{AFB} , \overline{AEC} , and \overline{BGC} are tangent to circle O at F, E, and G, respectively.



If $AB = 32$, $AE = 20$, and $EC = 24$, find BC .

$$12 + 24 = \boxed{36}$$

- 13) In circle O, diameter \overline{AB} is perpendicular to chord \overline{CD} at E.



If $AE = 16$ and $EB = 4$, what is CD ?

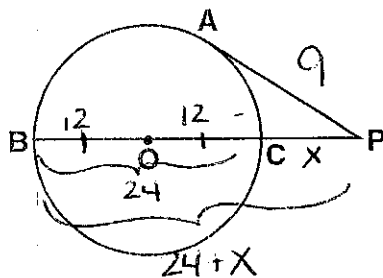
$$(AE)(EB) = (CE)(ED)$$

$$(16)(4) = x(x)$$

$$\sqrt{64} = \sqrt{x^2}$$

$$\boxed{8 = x}$$

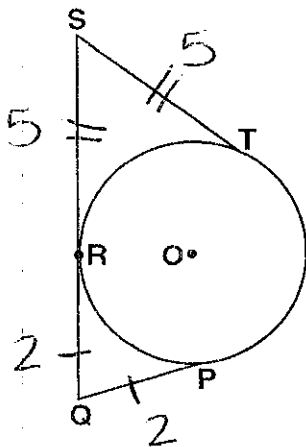
- 14) In the diagram below, diameter \overline{BC} is extended to point P and tangent \overline{PA} is drawn.



If $OC = 12$ and $AP = 9$, find PC .

$$\begin{aligned}
 (\overline{Tan})^2 &= (\overline{Sec})(\overline{Ext}) \\
 9^2 &= (x+24)(x) \\
 81 &= x^2 + 24x \\
 -81 & \qquad \qquad -81 \\
 \hline
 0 &= x^2 + 24x - 81 \\
 0 &= (x+27)(x-3) \\
 x &= -27 \quad \boxed{x=3} \\
 & \text{reject}
 \end{aligned}$$

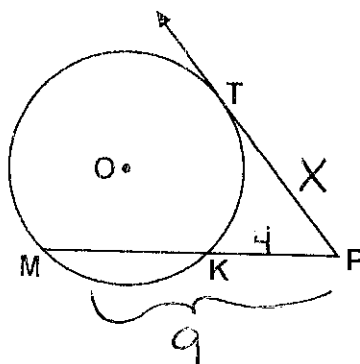
- 15) In the diagram below, \overline{ST} , \overline{QP} , and \overline{SQ} are tangents to circle O.



If $ST = 5$ and $QP = 2$, find SQ .

$$5 + 2 = \boxed{7}$$

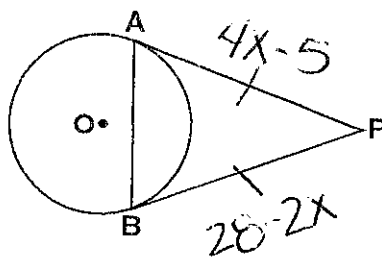
- 16) In the accompanying diagram, \overline{PT} is tangent to circle O at T and \overline{PKM} is a secant.



If $PK = 4$ and $PM = 9$, find PT .

$$\begin{aligned} (\text{Tan})^2 &= (\text{Sec})(\text{Ext}) \\ X^2 &= 9(4) \\ \sqrt{X^2} &= \sqrt{36} \\ \boxed{X=6} \end{aligned}$$

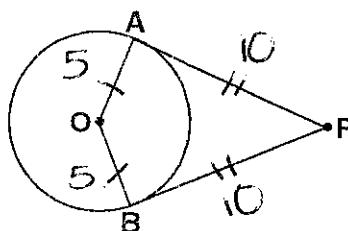
- 17) In the diagram below, \overline{PA} and \overline{PB} are tangents to circle O from P and chord \overline{AB} is drawn.



If $PA = 4x - 5$ and $PB = 28 - 2x$, find x .

$$\begin{aligned} 4x-5 &= 28-2x \\ +2x & \quad \quad +2x \\ \hline 6x-5 &= 28 \\ +5 & \quad +5 \\ \hline 6x &= 33 \\ \underline{6} & \quad \underline{6} \\ \boxed{X=5.5} \end{aligned}$$

- 18) In the diagram below, \overline{PA} and \overline{PB} are tangent segments to circle O.



If $PA = 10$ and $OA = 5$, find the perimeter of quadrilateral PAOB.

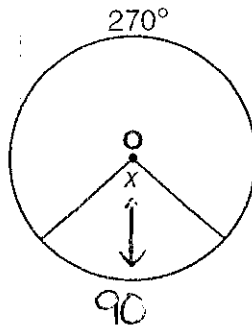
$$5+10+5+10 = \boxed{30}$$

Questions 19 through 22 refer to the following:

For the given circle, find the value of x .

19)

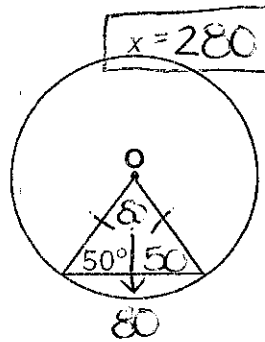
central $\angle = \text{arc}$



$$360 - 270 = 90$$

$$x = 90^\circ$$

20)

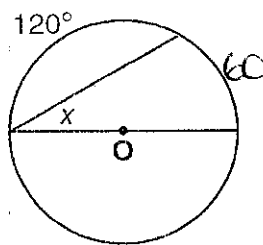


$$180 - 100 = 80$$

$$360 - 80 = 280$$

21)

inscribed $\angle = \frac{\text{arc}}{2}$

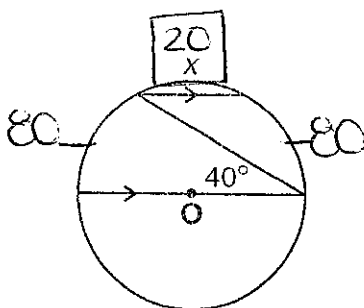


$$180 - 120 = 60$$

$$x = \frac{60}{2}$$

$$x = 30$$

22)

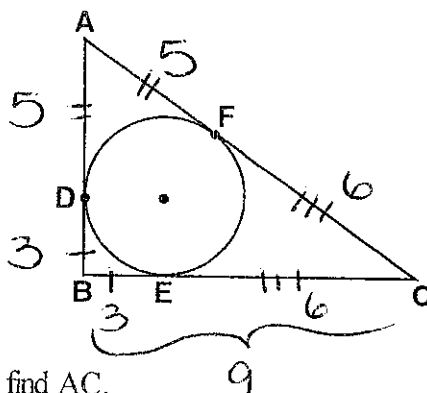


$$\frac{40 = \text{ARC}}{1 \quad 2}$$

$$80 = \text{ARC}$$

$$180 - 160 = 20$$

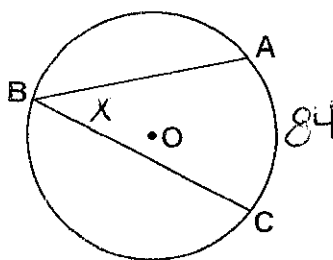
23)



If $AD = 5$, $DB = 3$, and $BC = 9$, find AC .

$$5 + 6 = \boxed{11}$$

24) In the accompanying figure of circle O, the measure of \widehat{AC} is 84° .



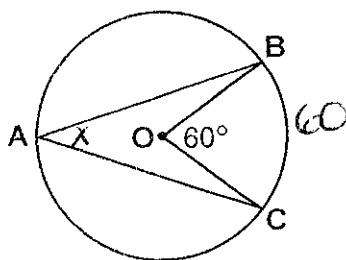
What is the measure of $\angle ABC$?

$$\text{inscribed } \angle = \frac{\text{arc}}{2}$$

$$X = \frac{84}{2}$$

$$\boxed{X = 42}$$

25) In the accompanying figure, central angle BOC measures 60° .



What is the number of degrees in the measure of inscribed angle BAC?

$$x = \frac{60}{2}$$

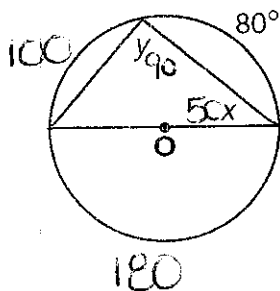
$$2$$

$$x = 30$$

Questions 26 through 28 refer to the following:

For the given circle, find the value of x and y .

26)



$$180 - 80 = 100$$

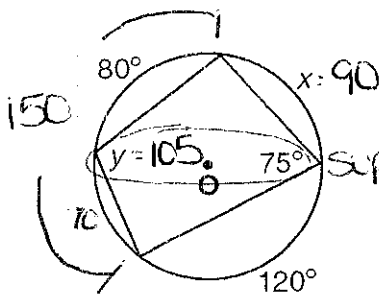
$$x = \frac{100}{2} = 50$$

$$x = 50$$

$$y = \frac{180}{2} = 90$$

$$y = 90$$

27)



$$\frac{75}{2} = \text{arc}$$

$$150 = \text{arc}$$

$$150 - 80 = 70$$

$$80 + 70 + 120 = 270$$

$$360 - 270 = 90$$

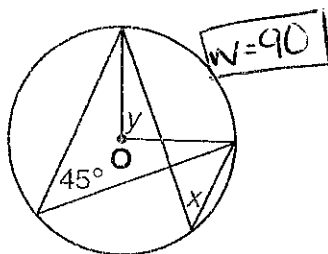
$$x = 90$$

$$y = \frac{(90 + 120)}{2}$$

$$y = \frac{210}{2}$$

$$y = 105$$

28)



$$\angle = \frac{\text{ARC}}{2}$$

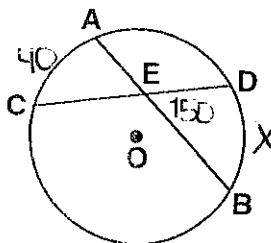
$$x = \frac{90}{2}$$

$$\frac{45}{1} = \frac{w}{2}$$

$$\boxed{x = 45}$$

$$90 = w$$

$$\boxed{y = 90}$$

29) In circle O below, chords \overline{AB} and \overline{CD} intersect at E.

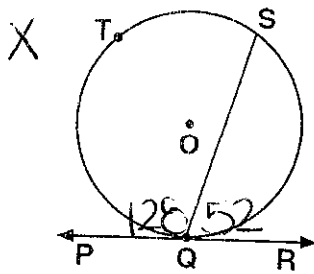
$$\angle = \frac{(\text{arc} + \text{arc})}{2}$$

$$\frac{50}{1} = \frac{(40 + x)}{2}$$

If $m\angle 1 = 50^\circ$ and $m\widehat{AC} = 40^\circ$, what is $m\widehat{DB}$?

$$\begin{array}{r} 100 = 40 + x \\ -40 \quad -40 \\ \hline 60 = x \end{array}$$

30)



$$\begin{array}{r} 180 \\ -52 \\ \hline 128 \end{array}$$

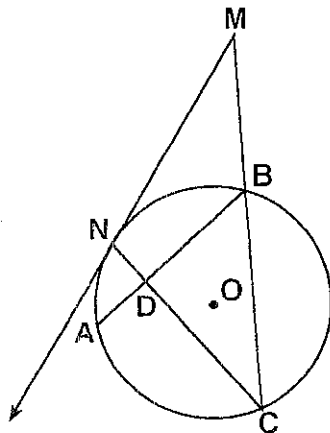
If $m\angle SQR = 52^\circ$, find $m\widehat{QTS}$.

$$\angle = \frac{\text{ARC}}{2}$$

$$\frac{128}{1} = \frac{x}{2}$$

$$\boxed{256 = x}$$

- 33) In the accompanying diagram of circle O , the ratio $m\widehat{BC}:m\widehat{CA}:m\widehat{AN}:m\widehat{NB}$ is $5:4:1:2$. Chord \overline{CB} is extended to external point M , chords \overline{AB} and \overline{CN} intersect at D , and tangent \overline{MN} is drawn.



Find:

- (a) $m\widehat{BC}$
- (b) $m\angle ABC$
- (c) $m\angle NMC$
- (d) $m\angle NDA$
- (e) $m\angle MND$