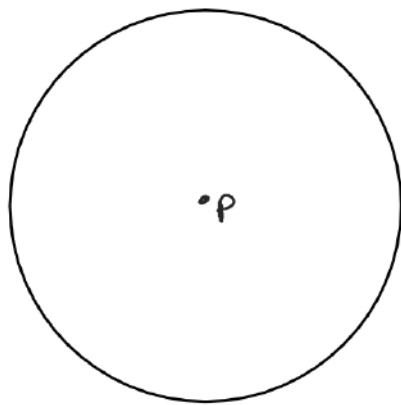


Tangents to a Circle

A tangent to a circle is a line in a plane of the circle that intersects the circle in exactly one point. That point is the point of tangency.

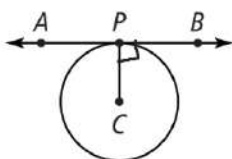


R is point of tangency

Theorem

If \overleftrightarrow{AB} is tangent to $\odot C$ at P , then \overleftrightarrow{AB} is perpendicular to \overline{CP} .

If...

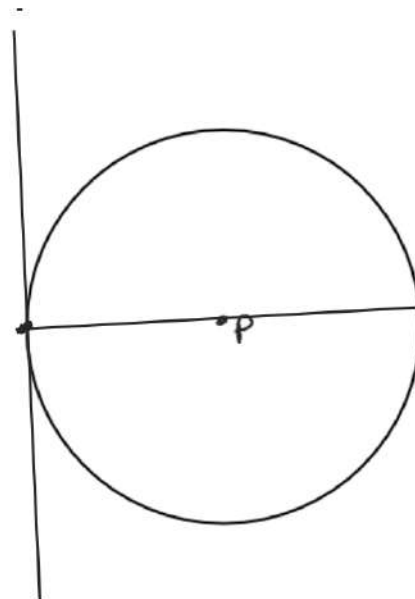
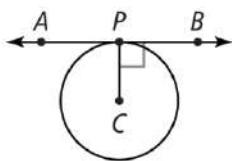


Then... $\overleftrightarrow{AB} \perp \overline{CP}$

Converse

If \overleftrightarrow{AB} is perpendicular to radius \overline{CP} at P , then \overleftrightarrow{AB} is tangent to $\odot C$.

If...



B. Segment ST is tangent to $\odot R$. What is the radius of $\odot R$?

$$a = x$$

$$b = 24$$

$$c = x + 18$$

$$a^2 + b^2 = c^2$$

$$x^2 + 24^2 = (x + 18)^2$$

$$x^2 + 576 = x^2 + 18x + 18x + 324 \quad (x + 18)^2$$

$$x^2 + 576 = x^2 + 36x + 324$$

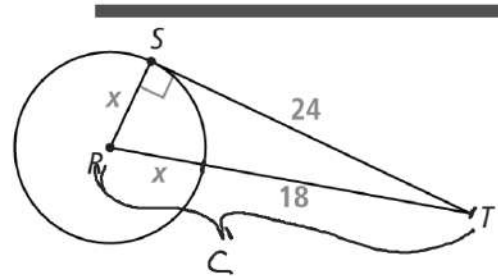
$$-x^2$$

$$-x^2$$

$$576 = 36x + 324$$

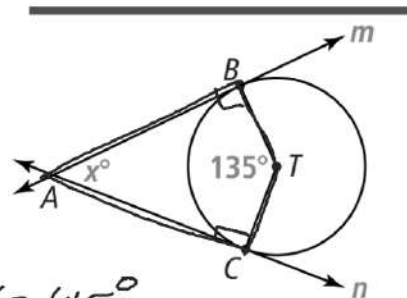
$$252 = 36x$$

$$x = 7$$



C. Line m is tangent to $\odot T$ at B , and line n is tangent to $\odot T$ at C . What is the value of x ?

SOLUTION



$$x = 45^\circ$$

2. Use $\odot N$.

a. Is \overleftrightarrow{MP} tangent to $\odot N$? Explain.

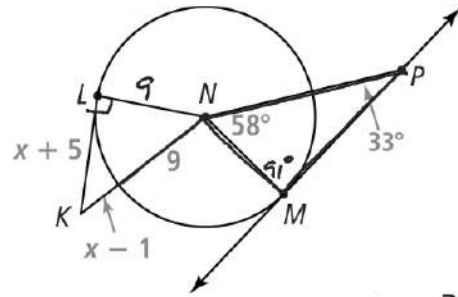
No, our $\angle NMP$ is not a right angle. So \overline{NM} is not perpendicular to \overline{MP} .

CHECK ANSWER

b. If \overline{LK} is tangent to $\odot N$ at L , what is KN ?

Enter your answer.

$$\begin{aligned} LN &= x + 8 \\ &= 7 + 8 \\ &= 15 \end{aligned}$$

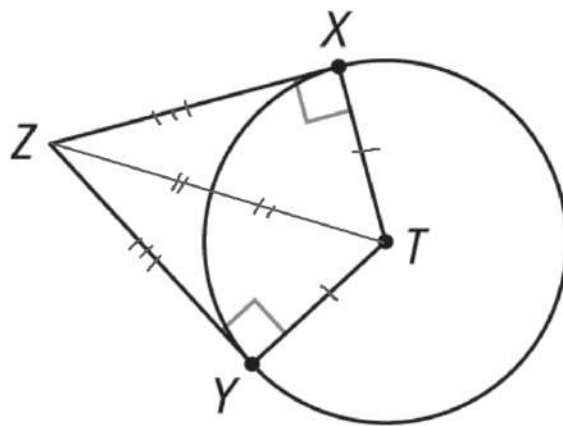


$$(LN)^2 + (LK)^2 = (KN)^2$$

$$LN = 9 \quad LK = x + 5 \quad KN = 9 + x - 1 = x + 8$$

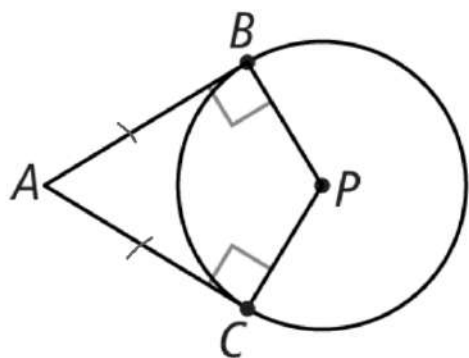
$$\begin{aligned} 9^2 + (x + 5)^2 &= (x + 8)^2 \\ 9^2 + (x + 5)(x + 5) &= (x + 8)(x + 8) \\ 81 + x^2 + 10x + 25 &= x^2 + 16x + 64 \\ \cancel{x^2} + 10x + 106 &= \cancel{x^2} + 16x + 64 \\ 10x + 106 &= 16x + 64 \\ -10x & \quad -10x \\ 106 &= 6x + 64 \\ 42 &= 6x \\ x &= 7 \end{aligned}$$

\overline{YZ} and \overline{XZ} are tangent to the circle. What is the relationship between \overline{YZ} and \overline{XZ} ?



If two segments with a common endpoint exterior to a circle are tangent to the circle, then the segments are congruent.

If...



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

3. If $TX = 12$ and $TZ = 20$, what are XZ and YZ ?

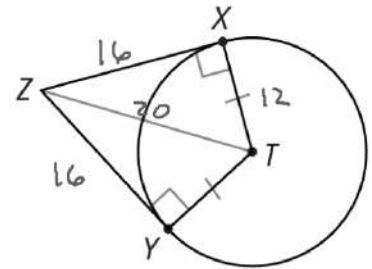
$$a^2 + 12^2 = 20^2$$

Enter your answer

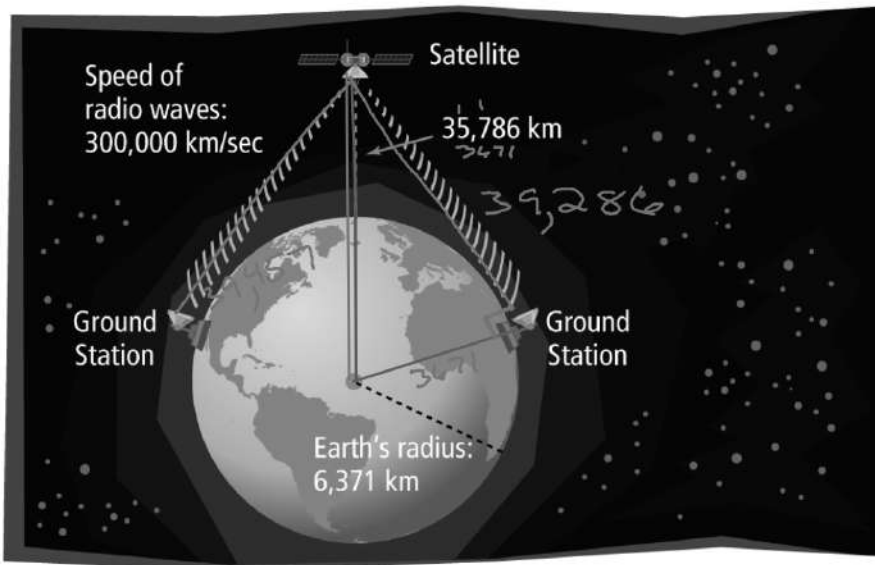
$$a^2 + 144 = 400$$

$$a^2 = 256$$

$$a = 16$$



A satellite requires a line of sight for communication. Between the ground stations farthest from the satellite, what is the amount of time needed for a signal to go from one station up to the satellite, and then down to the other station?



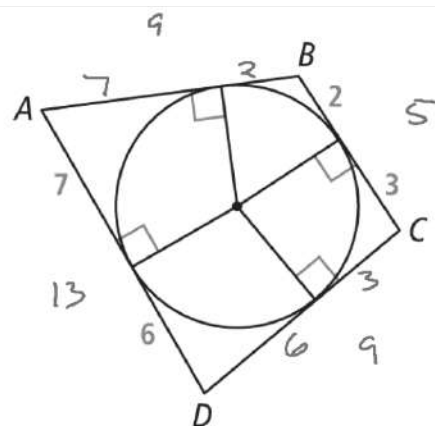
$$a^2 + (3671)^2 = (39,457)^2$$

$$\frac{78,572}{300,000} \approx .26 \text{ sec}$$

4. What is the perimeter of $ABCD$?

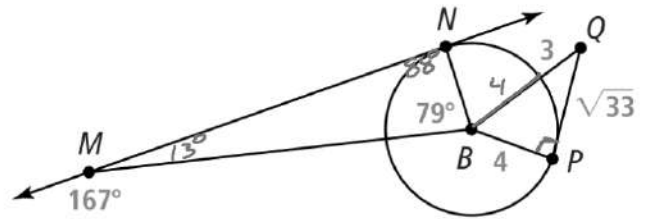
$$\begin{aligned} P &= AB + BC + CD + AD \\ &= 9 + 5 + 9 + 13 \\ &= 36 \end{aligned}$$

CHECK ANSWER



5. Is \overleftrightarrow{MN} tangent to $\odot B$?

Enter your answer.



$$a^2 + b^2 = c^2$$

$$4^2 + (\sqrt{33})^2 = 7^2$$

$$16 + 33 = 49$$

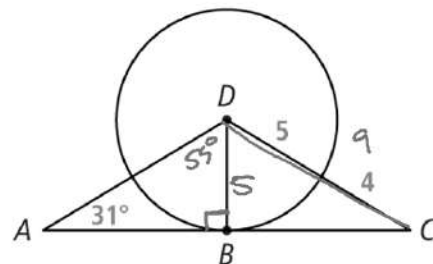
$$49 = 49$$

. Is \overline{QP} tangent to $\odot B$?

7. Segment AC is tangent to $\odot D$ at B . Find $m\angle ADB$.

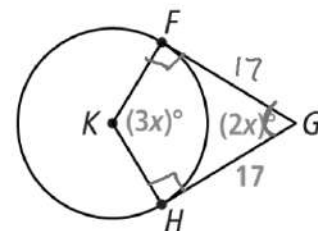
Enter your answer.

$$\begin{aligned}5^2 + b^2 &= 9^2 \\25 + b^2 &= 81 \\b^2 &= 54 \\b &= 7.48\end{aligned}$$



Segment AC is tangent to $\odot D$ at B . Find BC .

9. Segment FG is tangent to $\odot K$ at F and \overline{HG} is tangent to $\odot K$ at H . Find FG .



Enter your answer $3x + 2x + 90 + 90 = 360$

$$5x + 180 = 360$$

$$5x = 180$$

$$x = 36$$

$$\begin{aligned} m\angle FGH &= 2x \\ &= 2(36) \\ &= 72^\circ \end{aligned}$$

10. Segment FG is tangent to $\odot K$ at F and \overline{HG} is tangent to $\odot K$ at H . Find $m\angle FGH$.

