

**Review of Pythagorean Theorem and its Converse**

**The Pythagorean Theorem**

This theorem states the following in words: Sum of the legs squared equals the hyp. squared

The Pythagorean Theorem:  
 $a^2 + b^2 = c^2$

**Example 1:** Find the missing side x. Leave answers in radical form where its appropriate.

<p>a.) </p> $a^2 + b^2 = c^2$ $20^2 + x^2 = 29^2$ $-20^2 \quad -20^2$ $\underline{\hspace{2cm}}$ $\sqrt{x^2} = \sqrt{441}$ $x = 21$	<p>b.) </p> $(\sqrt{5})^2 + (\sqrt{10})^2 = x^2$ $5 + 10 = x^2$ $\sqrt{15} = \sqrt{x^2}$ $x = \sqrt{15}$	<p>c.) </p> $8^2 + x^2 = (6\sqrt{3})^2$ $-8^2 \quad -8^2$ $\underline{\hspace{2cm}}$ $\sqrt{x^2} = \sqrt{44} \quad x = \frac{2\sqrt{11}}{x^2}$ $x = 2\sqrt{11}$	<p>d.) </p> $x^2 + 6^2 = 9^2$ $-6^2 \quad -6^2$ $\underline{\hspace{2cm}}$ $\sqrt{x^2} = \sqrt{45}$ $x = 3\sqrt{5}$
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**The Converse of the Pythagorean Theorem**

<p>If <math>a^2 + b^2 = c^2</math>,              then <math>\Delta</math> will be a(n) <u>right</u>.</p>	<p>If <math>a^2 + b^2 &gt; c^2</math>,              then <math>\Delta</math> will be a(n) <u>acute</u>.</p>	<p>If <math>a^2 + b^2 &lt; c^2</math>,              then <math>\Delta</math> will be a(n) <u>obtuse</u>.</p>
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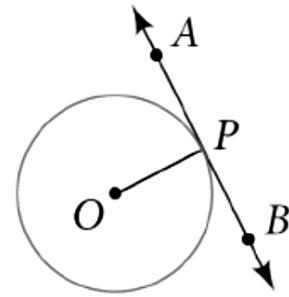
**Example 2:** The lengths of the sides of a triangle are given. Classify each triangle appropriately.

<p>a.) 4, 5, 6  <math>a</math> <math>b</math> <math>c</math>  <math>4^2 + 5^2 = 6^2</math>  <math>41 \neq 36</math> Acute <math>\Delta</math>  <math>41 &gt; 36</math></p>	<p>b.) 7, 12, 8  <math>a</math> <math>c</math> <math>b</math>  <math>7^2 + 8^2 = 12^2</math>  <math>113 \neq 144</math> Obtuse <math>\Delta</math>  <math>113 &lt; 144</math></p>	<p>c.) 30, 16, 34  <math>a</math> <math>b</math> <math>c</math>  <math>30^2 + 16^2 = 34^2</math>  <math>1156 \neq 1156</math> Right <math>\Delta</math></p>	<p>d.) <math>\sqrt{7}, \sqrt{16}, \sqrt{11}</math>  <math>a</math> <math>c</math> <math>b</math>  <math>(\sqrt{7})^2 + (\sqrt{11})^2 = (\sqrt{16})^2</math>  <math>7 + 11 = 16</math>  <math>18 \neq 16</math> Acute <math>\Delta</math>  <math>18 &gt; 16</math></p>
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# Tangent Lines in Circles

## Tangent Line Theorem

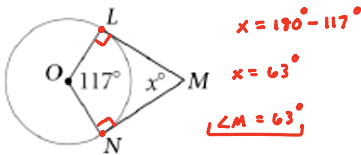
- **tangent line (in a circle)** → a line in the plane of the circle that intersects the circle at exactly one point
- **point of tangency** → the point where a circle and tangent line meet
- If a line is tangent to a circle, then the line is perpendicular to the radius drawn to the point of tangency.



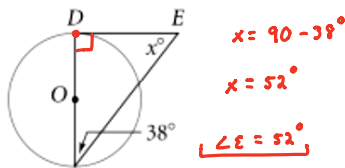
So in the diagram to the right →  $\overline{AB} \perp \overline{OP}$  which means  $\angle OPA \cong \angle OPB$  because they are  $90^\circ$

### Example 3: Complete each problem using the Tangent Line Theorem.

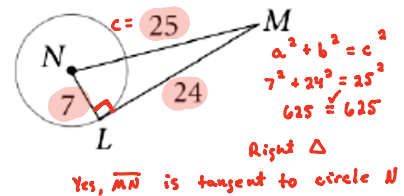
a.) Find measure of angle M.



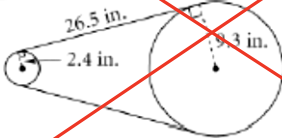
b.) Find measure of angle E.



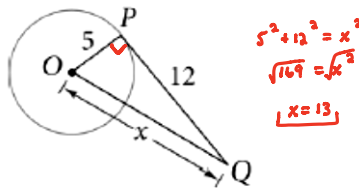
c.) Is  $\overline{MN}$  tangent to circle N?



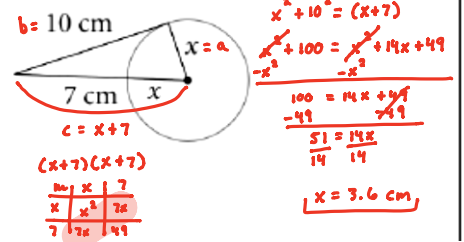
~~d.) A dirt bike chain fits tightly around two gears like given figure below. What is the distance between the centers of the gears?~~



e.) Find the length of OQ.



f.) Find the length of the radius.

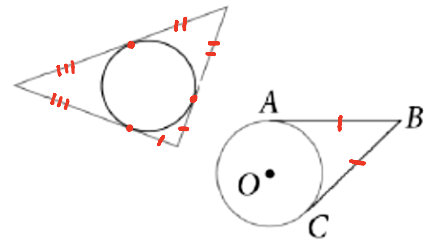


## Circumscribed About Circle Theorem

- **circumscribed (about a circle)** → a triangle (or any polygon) that is about the circle where each side of the triangle is tangent to the circle.

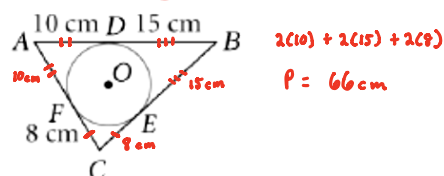
- If two segments are tangent to a circle from the same point outside of the circle, then those two segments are congruent

So in the far right diagram,  $\overline{AB} \cong \overline{CB}$



### Example 4: Find what is asked if each triangle is circumscribed in the given circle.

a.) Find the **perimeter** of triangle ABC.



b.) Triangle PQR has a **perimeter of 88 cm**. Find the **length of QR**.

