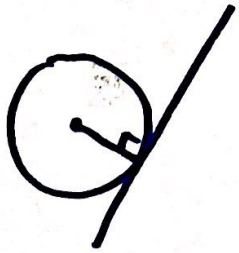
Properties of Tangent Lines



A <u>tangent line</u> is perpendicular to a radius.

1. We can use the Pythagorean Theorem ($a^2 + b^2 = c^2$) to prove or disprove that a line is tangent to a circle.

Example: Is $\overline{DE}$ tangent to ⊙ A?

$a^2 + b^2 \stackrel{?}{=} c^2$

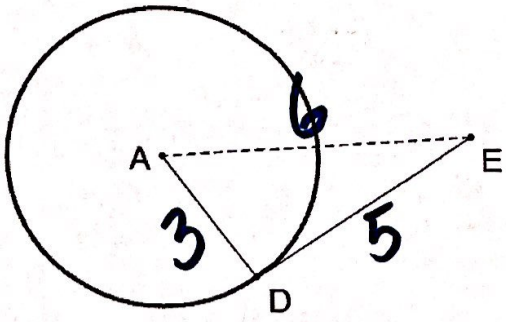
$3^2 + 5^2 = 6^2$

$9 + 25 = 36$

$34 \neq 36$

m $\overline{AD}$ = 3 cm
m $\overline{DE}$ = 5 cm
m $\overline{AE}$ = 6 cm

no!



2. We can use the Pythagorean Theorem ($a^2 + b^2 = c^2$) to find the missing lengths of a triangle formed between the radius and tangent.

Example: $\overline{BC}$ ***is tangent*** to ⊙ A. Find $\overline{AC}$.

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

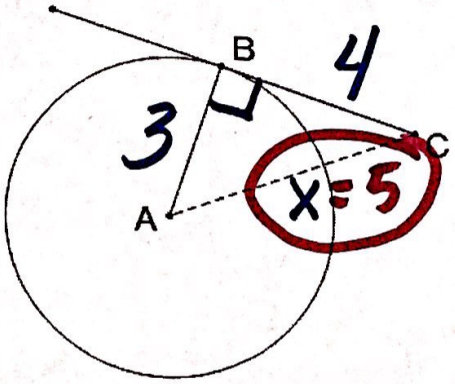
$3^2 + 4^2 = c^2$

$9 + 16 = c^2$

$\sqrt{25} = \sqrt{c^2}$

$5 = c$

m $\overline{AB}$ = 3 cm
m $\overline{BC}$ = 4 cm



Example: $\overline{QR}$ ***is tangent*** to ⊙ P. Find $\overline{QR}$.

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

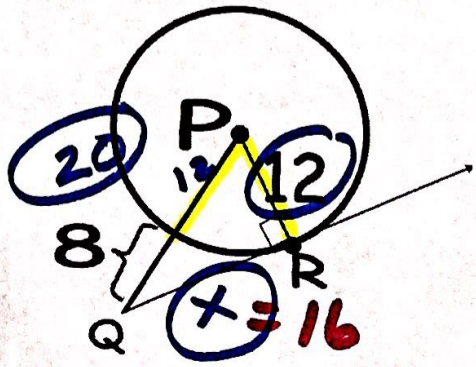
$12^2 + x^2 = 20^2$

$144 + x^2 = 400$

$-144 \quad -144$

$\sqrt{x^2} = \sqrt{256}$

$x = 16$



3. Two tangents from a common external point are congruent.

Example: Find the lengths of $\overline{HG}$ *and* $\overline{IG}$.

$x + 10 = 2x - 1$

$-x \quad -x$

$10 = x - 1$

$+1 \quad +1$

$11 = x$