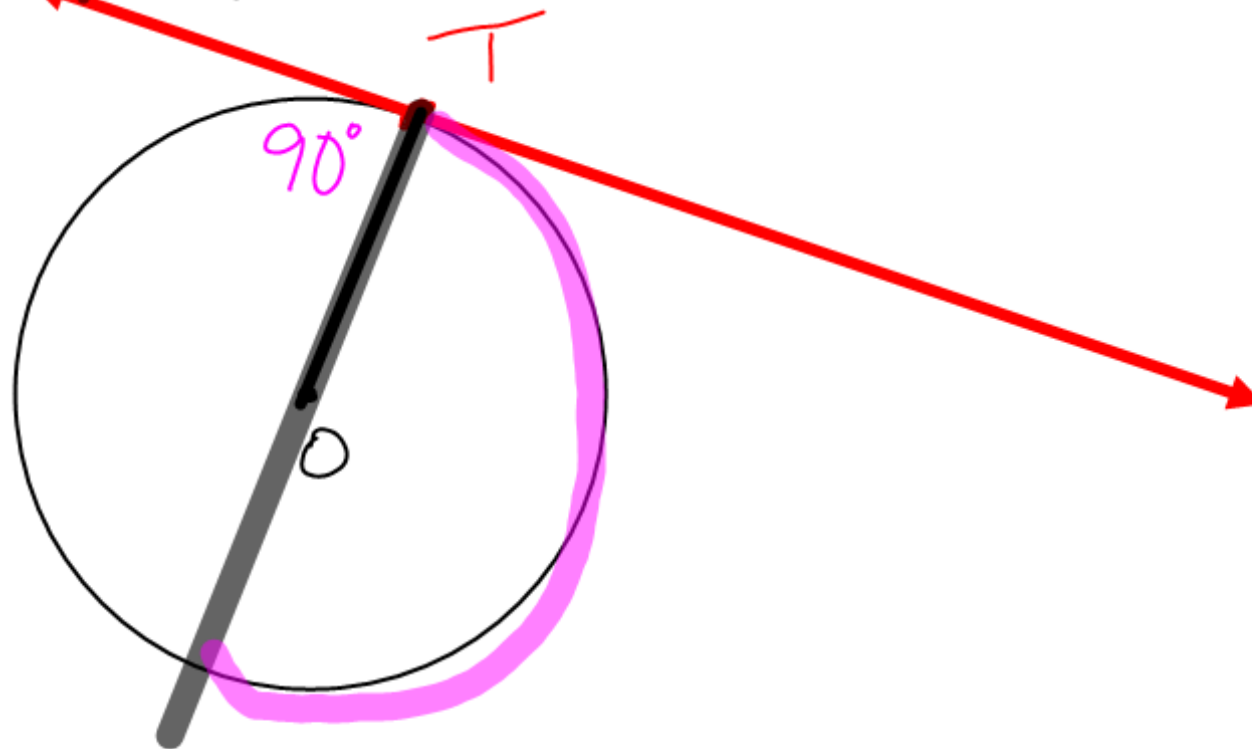


### Tangent Property #1

- ~~1.)~~ Construct a circle and label its center O.
- ~~2.)~~ Using your straightedge, draw a line which appears to touch the circle at only one point. Label the point T (for "point of tangency"). Connect T to O.
- 3.) Use your protractor to measure the angles at T.
- 4.) Draw another circle of a different size. Repeat. What seems to be true?

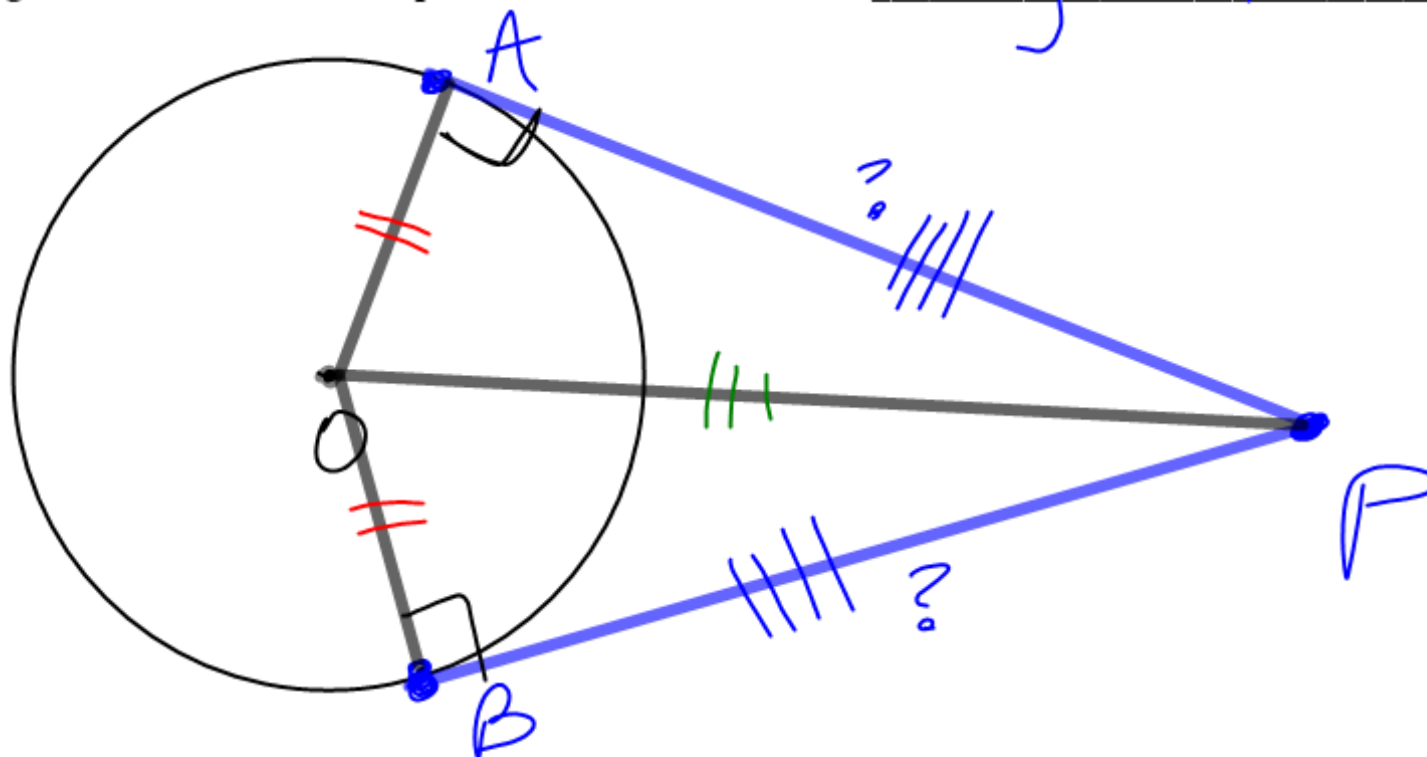
A tangent to a circle is perpendicular to the radius drawn to the point of tangency.



**Tangent Property #2**

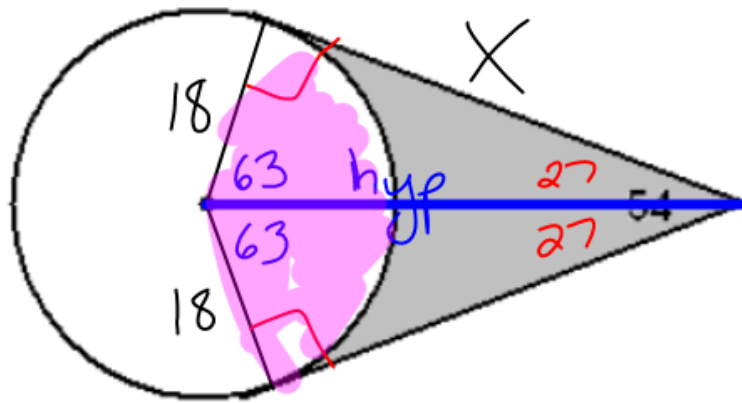
- 1.) Construct a circle and label its center O.
- 2.) Choose a point outside the circle and label it P.
- 3.) Draw two lines through P, each of which being tangent to the circle. Mark the points of tangency as A and B.
- 4.) Measure to find the values of  $\overline{PA}$  and  $\overline{PB}$ . What do you notice?
- 5.) Try it again. What seems to be true?

Tangent segments to a circle from a point outside the circle are congruent.



[ EX 1 ]

The circle has a radius of 18 cm. Two tangents are drawn to it from a point outside the circle. Find the area of the shaded region.



$$\tan 63 = \frac{X}{18}$$

$$1.9626 = \frac{X}{18}$$

$$X = \underline{\underline{35.33}}$$

$$\Delta = \frac{(35.33)(18)}{2} = 317.97$$

$$\text{Kite} = \downarrow * 2 = 635.94$$

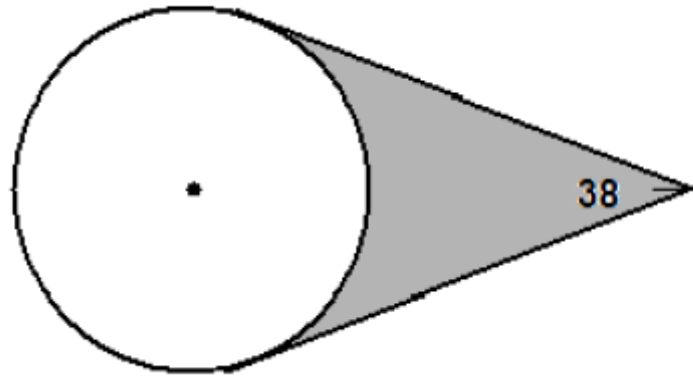
$$\text{sector} = \frac{126}{360} \cdot \pi (18)^2 = 356.26$$

$$\text{shade} = 635.94 - 356.26$$

$$= \boxed{279.68 \text{ cm}^2}$$

[ EX 2 ]

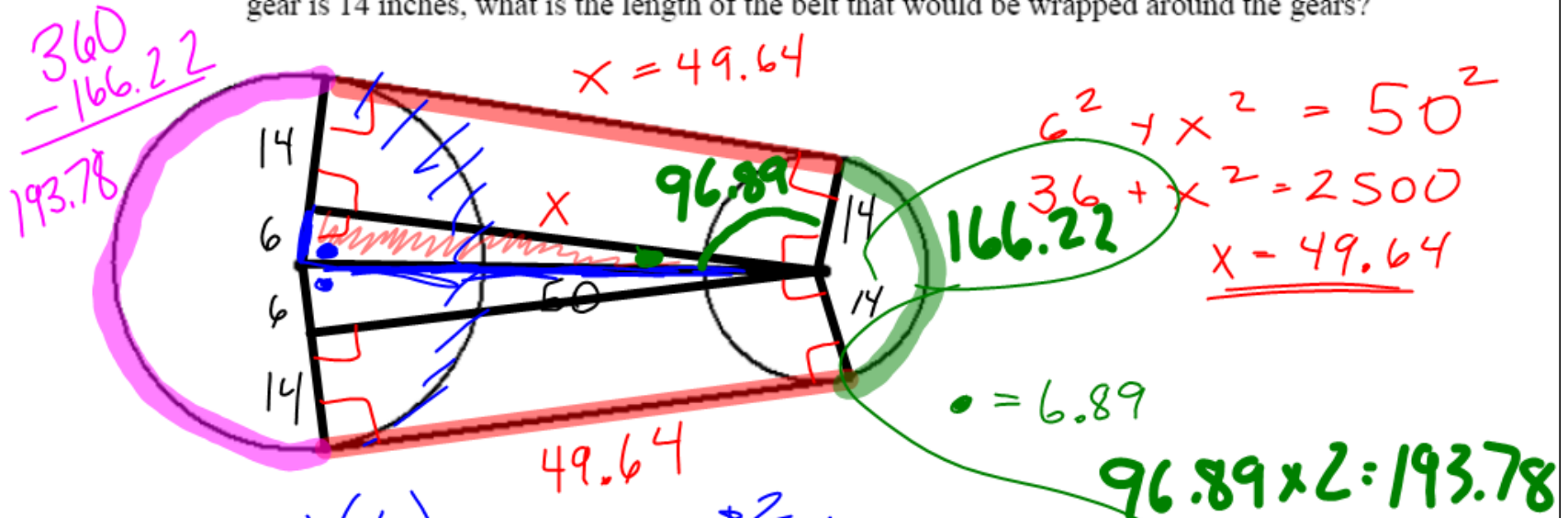
The circle has a radius of 40 cm. Two tangents are drawn to it from a point outside the circle. Find the area of the shaded region.



$$2664.1 \text{ cm}^2$$

[ EX 3 ]

A belt connects two gears on a mechanical object. The distance between the centers of the gears is 50 inches. If the radius of the larger gear is 20 inches and the radius of the smaller gear is 14 inches, what is the length of the belt that would be wrapped around the gears?



$$\theta = \cos^{-1}\left(\frac{6}{50}\right) = 83.11 \xrightarrow{\times 2} 166.22$$

$$\text{Belt} = 2(49.64) + \frac{193.78}{360} [2\pi(20)] + \frac{166.22}{360} [2\pi(14)]$$

$$\text{Belt} = 207.54 \text{ in}$$