

9.1 Tangent Properties

- a. I can determine and apply the relationship between a radius and a tangent line at the point of tangency.
- b. I can determine and apply the relationship between two tangent segments with a common endpoint outside the circle.

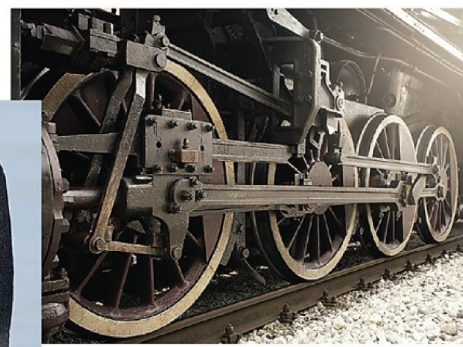
LESSON

9.1

Tangent Properties

In this lesson you will investigate the relationship between a tangent line to a circle and the radius of the circle, and between two tangent segments to a common point outside the circle.

Rails act as tangent lines to the wheels of a train. Each wheel of a train theoretically touches only one point on the rail. The point where the rail and the wheel meet is a point of tangency. Why can't a train wheel touch more than one point at a time on the rail? How is the radius of the wheel to the point of tangency related to the rail? Let's investigate.

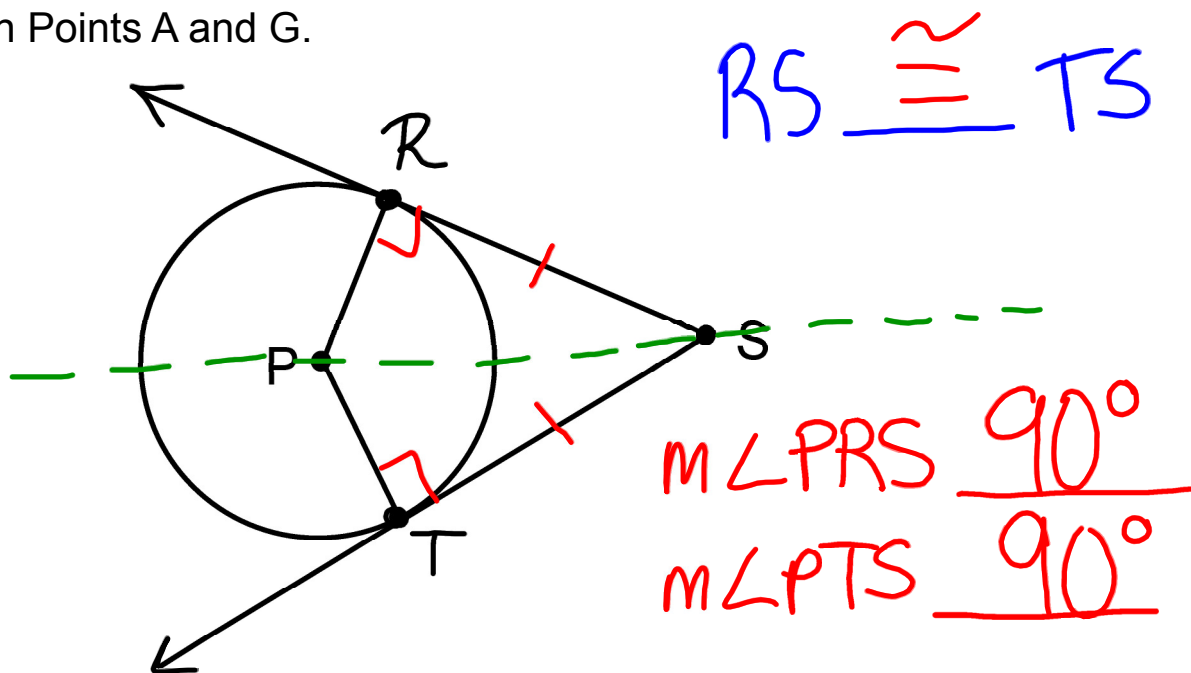


**The rail is tangent to the wheels of the train.
The adult penguins' heads are tangent to each other.**

Please get

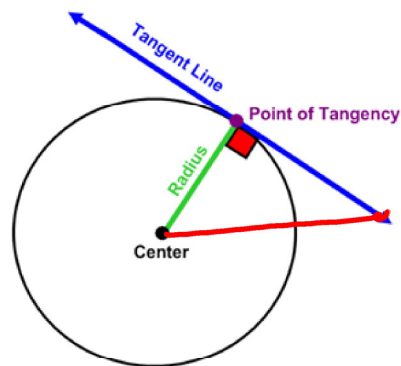
- 1 piece of patty paper
- protractor
- compass

1. Draw a circle on your patty paper using your compass, leave sufficient room to be able to draw a point outside the circle as shown below.
2. Label points P and S
3. Using your protractor, draw two rays from point S that are tangent to Circle P. Label the points where they appear to touch the circle with Points A and G.



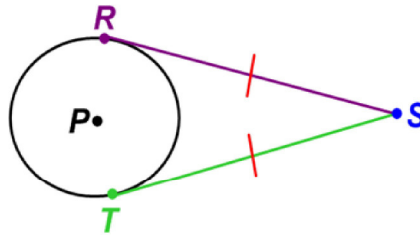
Tangent Conjecture

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



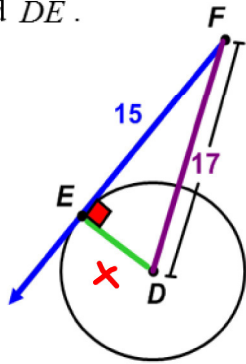
Tangent Segments Conjecture

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



Examples

1. \overline{FE} is tangent to circle D at point E .
Find \overline{DE} .

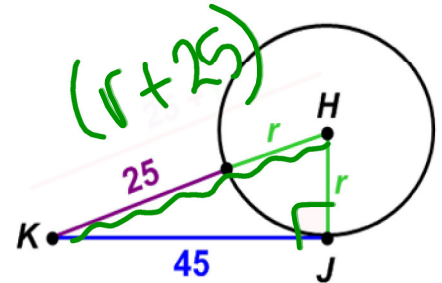


$$a^2 + b^2 = c^2$$

$$\begin{aligned} x^2 + 15^2 &= 17^2 \\ x^2 + 225 &= 289 \\ -225 \quad -225 & \\ \hline \sqrt{x^2} &= \sqrt{64} \end{aligned}$$

$$\boxed{x=8} \quad \boxed{DE=8}$$

2. \overline{KJ} is tangent to circle H at point J .
Find the radius of circle H .

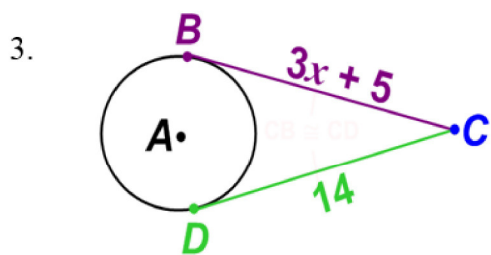


$$\begin{aligned} 45^2 + r^2 &= (r+25)^2 \\ 45^2 + r^2 &= (r+25)(r+25) \\ 2025 + r^2 &= r^2 + 25r + 625 + 25r \end{aligned}$$

$$\begin{aligned} 2025 &= 50r + 625 \\ -625 & \quad -625 \end{aligned}$$

$$\frac{1400}{50} = \frac{50r}{50}$$

$$\boxed{28=r}$$

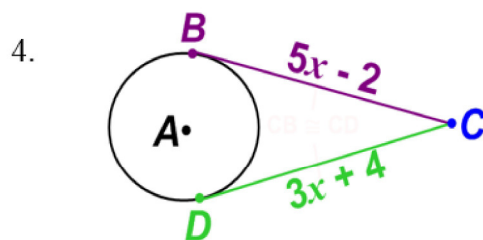
Solve for the value of x .

$$3x + 5 = 14$$

$$\begin{array}{r} -5 \\ -5 \end{array}$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$\boxed{x = 3}$$



$$5x - 2 = 3x + 4$$

$$\begin{array}{r} -3x \\ -3x \end{array}$$

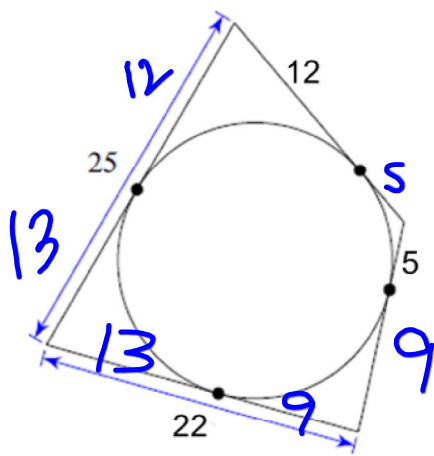
$$2x - 2 = 4$$

$$\begin{array}{r} +2 \\ +2 \end{array}$$

$$\frac{2x}{2} = \frac{6}{2}$$

$$\boxed{x = 3}$$

5. Find the perimeter of the polygon below.



$$P = 78$$

6. Given $AB = 18$, $BC = 10$, and $CD = 15$. Find AD .

