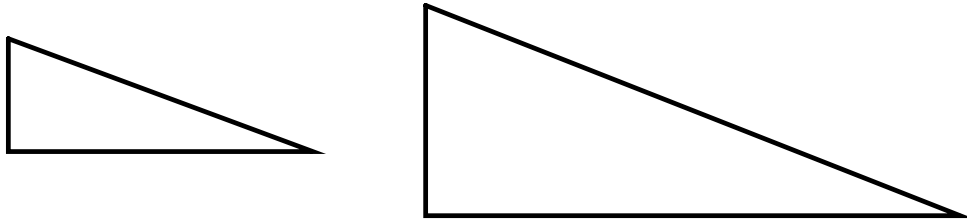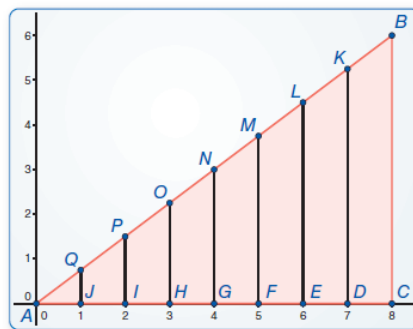# 9-4: The Tangent Ratio

Essential Question

How is a right triangle used to find the tangent of an acute angle? Is there a unique right triangle that must be used?

Work with a partner. Use dynamic geometry software.

a. Construct △ABC, as shown. Construct segments perpendicular to $\overline{AC}$ to form right triangles that share vertex A and are similar to △ABC with vertices, as shown

Sample
Points
A(0, 0)
B(8, 6)
C(8, 0)
Angle
$m\angle BAC = 36.87°$

b. Calculate each given ratio to complete the table for the decimal value of tan A for each right triangle. What can you conclude?

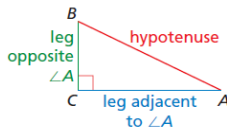| Ratio	$\dfrac{BC}{AC}$	$\dfrac{KD}{AD}$	$\dfrac{LE}{AE}$	$\dfrac{MF}{AF}$	$\dfrac{NG}{AG}$	$\dfrac{OH}{AH}$	$\dfrac{PI}{AI}$	$\dfrac{QJ}{AJ}$
tan A								

Core Concept

Tangent Ratio
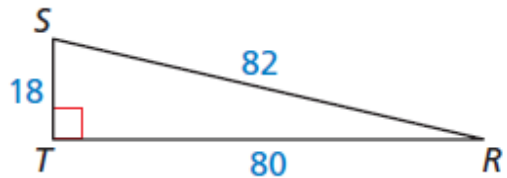
Let $\triangle ABC$ be a right triangle with acute $\angle A$.

The tangent of $\angle A$ (written as tan A) is defined as follows.

$$\tan A = \frac{\text{length of leg opposite } \angle A}{\text{length of leg adjacent to } \angle A} = \frac{BC}{AC}$$
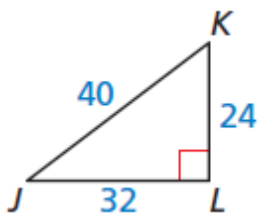
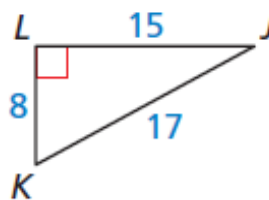Find tan S and tan R. Write each answer as a fraction and as a decimal rounded to four places.

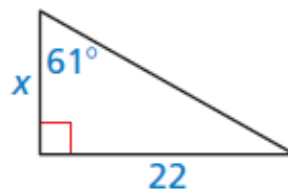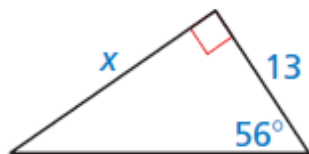Find tan J and tan K. Write each answer as a fraction and as a decimal rounded to four places.
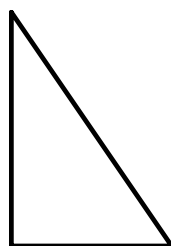
1.

2.

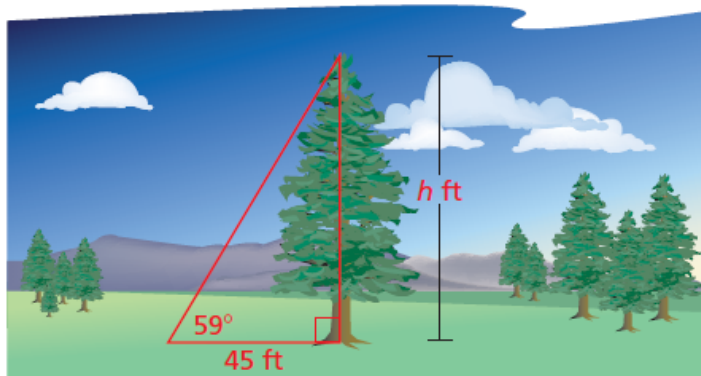# Example: finding Missing Sides

Find the value of x. Round your answer to the nearest tenth.

Use a special right triangle to find the tangent of a 60 ° angle.

You are measuring the height of a spruce tree. You stand 45 feet from the base of the tree. You measure the angle of elevation from the ground to the top of the tree to be 59 °. Find the height h of the tree to the nearest f--+

6. You are measuring the height of a lamppost. You stand 40 inches from the base of the lamppost. You measure the angle of elevation from the ground to the top of the   70° lamppost to be 70 °. Find the height h of the lamppost to the nearest inch.