Section Overview

Professional Development

Similarity in Right Triangles — *Lesson 8-1*

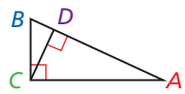
Why? Similarity relationships in right triangles and geometric means are used to estimate distances in surveying, architecture, and highway design.

The **geometric mean** of two numbers a and b is the postive number x, such that $\frac{a}{x} = \frac{x}{b}$, or $x^2 = ab$.

Example: Let x be the geometric mean of 12 and 9.

$$\frac{12}{x} = \frac{x}{9}$$
$$x^2 = (12)(9) = 108$$
$$x = \sqrt{108} = 6\sqrt{3}$$

Given:



Theorem: $\triangle ABC \sim \triangle ACD \sim \triangle CBD$

Corollaries:

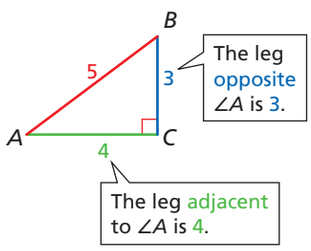
$$(CD)^2 = (BD)(DA)$$
$$(CB)^2 = (BD)(BA)$$
$$(CA)^2 = (DA)(BA)$$

Trigonometric Ratios and Angle Measures — *Lessons 8-2, 8-3*

Why? Trigonometric ratios can be used to find angle measures in right triangles and are used in indirect measurement and with vectors.

Trigonometric Ratios

$$\sin A = \frac{\text{opposite leg}}{\text{hypotenuse}} = \frac{3}{5} = 0.6$$
$$\cos A = \frac{\text{adjacent leg}}{\text{hypotenuse}} = \frac{4}{5} = 0.8$$
$$\tan A = \frac{\text{opposite leg}}{\text{adjacent leg}} = \frac{3}{4} = 0.75$$



Inverse Trigonometric Functions

If $\sin A = x$, then $\sin^{-1} x = m\angle A$.
If $\cos A = x$, then $\cos^{-1} x = m\angle A$.
If $\tan A = x$, then $\tan^{-1} x = m\angle A$.

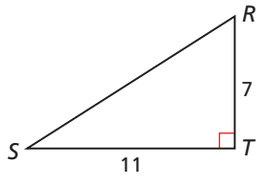
$\sin A = \frac{3}{5}$, so $\sin^{-1}\left(\frac{3}{5}\right) = m\angle A \approx 37°$

$\tan B = \frac{4}{3}$, so $\tan^{-1}\left(\frac{4}{3}\right) = m\angle B \approx 53°$

Solving Right Triangles — *Lesson 8-3*

Why? Many real-world problems require that you find the unknown lengths and angle measures in a right triangle.

There is more than one way to find the unknown measures in $\triangle RST$.



Method 1:

By the Pythagorean Theorem, $SR = \sqrt{7^2 + 11^2} \approx 13.0$

$m\angle S = \tan^{-1}\left(\frac{7}{11}\right) \approx 32°$

$m\angle R \approx 90° - 32° = 58°$

Method 2:

$m\angle S = \tan^{-1}\left(\frac{7}{11}\right) \approx 32°$

$m\angle R \approx 90° - 32° = 58°$

$\sin S = \frac{7}{RS}$, so $RS = \frac{7}{\sin S} = \frac{7}{\sin\left[\tan^{-1}\left(\frac{7}{11}\right)\right]} \approx 13.0$