Chapter 9

Right Triangles and Trigonometry

Section 6
Solving Right Triangles

GOAL 1: Solving a Right Triangle

Every right triangle has one right angle, two acute angles, one hypotenuse, and two legs. To **solve a right triangle** means to determine the measures of all six parts. You can solve a right triangle if you know either of the following:

- Two side lengths
- One side length and one acute angle measure

As you learned in Lesson 9.5, you can use the side lengths of a right triangle to find trigonometric ratios for the acute angles of the triangle. As you will see in this lesson, once you know the sine, the cosine, or the tangent of an acute angle, you can use a calculator to find the measure of the angle.

In general, for an acute angle A:

if $\sin A = x$, then $\sin^{-1} x = m\angle A$. ⟵ **The expression $\sin^{-1} x$ is read as "the inverse sine of x."**

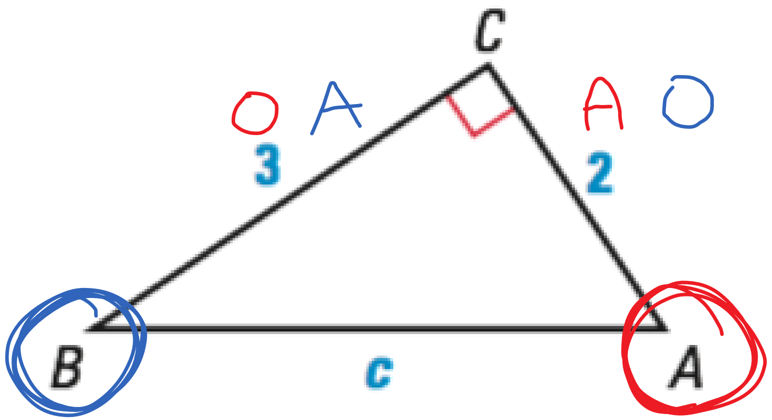
if $\cos A = y$, then $\cos^{-1} y = m\angle A$.

if $\tan A = z$, then $\tan^{-1} z = m\angle A$.

Example 1: Solving a Right Triangle

SOH CAH TOA

Solve the right triangle. Round decimals to the nearest tenth.



c: $2^2 + 3^2 = c^2$

$4 + 9 = c^2$

$\sqrt{13} = \sqrt{c^2} \rightarrow \boxed{3.6 = c}$

$\angle A$: $\tan A = \frac{3}{2}$

$A = \tan^{-1}\left(\frac{3}{2}\right) \rightarrow 56.3^\circ$

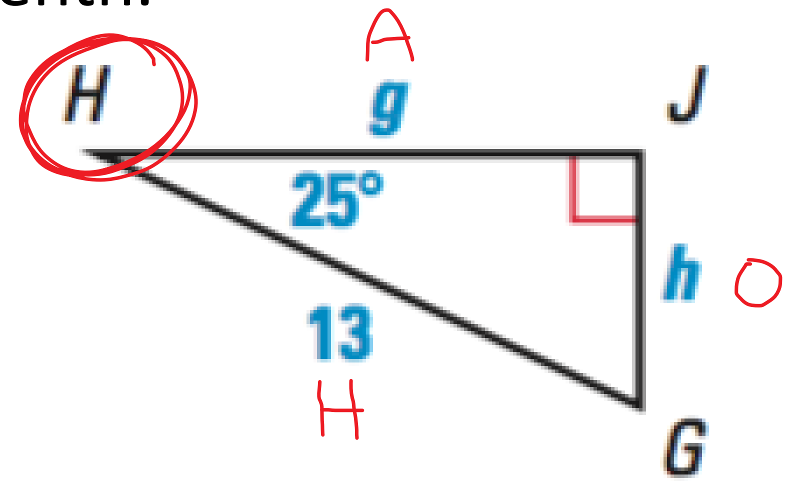
$\angle B$: $\tan B = \frac{2}{3}$

$B = \tan^{-1}\left(\frac{2}{3}\right) \rightarrow 33.7^\circ$

$(180 - 90 - 56.3)$

Example 2: Solving a Right Triangle

Solve the right triangle. Round decimals to the nearest tenth.



$\angle G: 180 - 90 - 25 = 65^\circ$

$g: \cos 25 = \frac{g}{13} \rightarrow 13(\cos 25)$

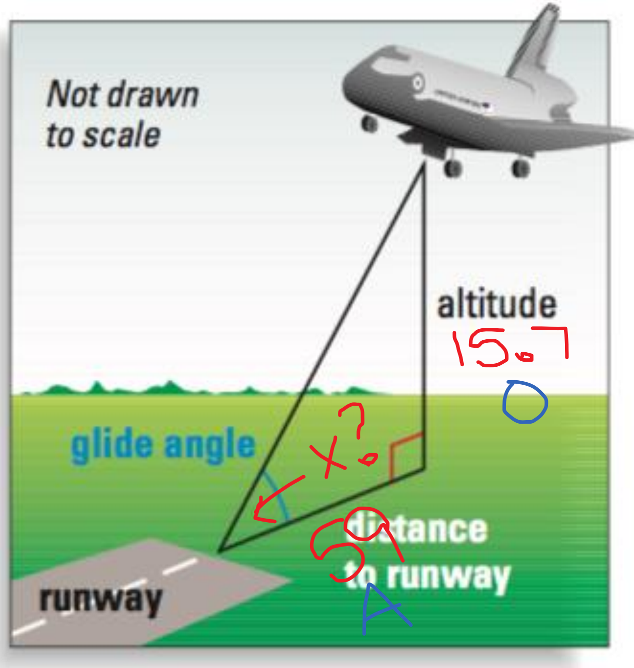
$= \boxed{11.8}$

$h: \sin 25 = \frac{h}{13} \rightarrow 13(\sin 25)$

$= \boxed{5.5}$

GOAL 2: Using Right Triangles in Real Life

Example 3: Solving a Right Triangle



SPACE SHUTTLE During its approach to Earth, the space shuttle's glide angle changes.

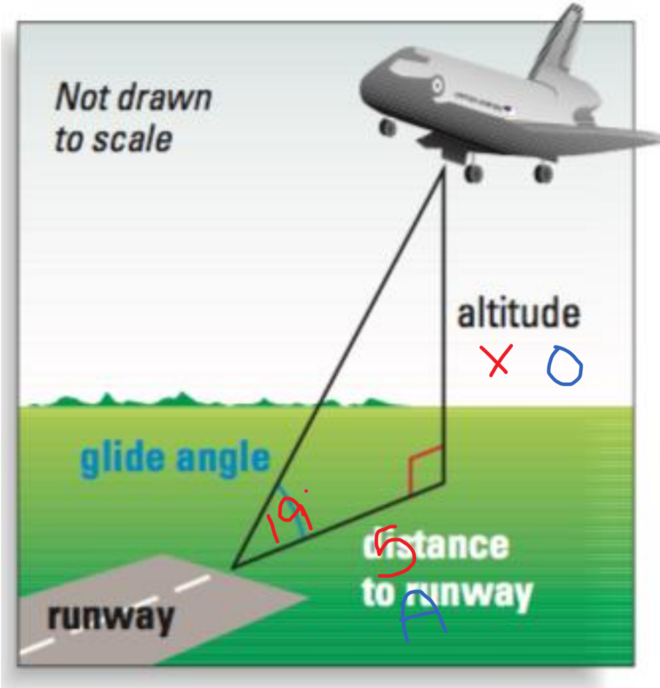
a) When the shuttle's altitude is about 15.7 miles, its horizontal distance to the runway is about 59 miles. What is its glide angle? Round your answer to the nearest tenth.

$$\tan A = \frac{15.7}{59}$$

$$A = \tan^{-1}\left(\frac{15.7}{59}\right) \rightarrow 14.9^\circ$$

Example 3: Solving a Right Triangle (continued)

b) When the space shuttle is about 5 miles from the runway, its glide angle is about 19*. Find the shuttle's altitude at this point in its descent. Round your answer to the nearest tenth.



$\tan 19 = \frac{x}{5}$

$5(\tan 19) \rightarrow 1.7$ miles

EXIT SLIP