Lesson 4.06
# Trigonometric Ratios to Find Angles

Geometry GT

Recall

If $\sqrt{x} = 6$, what does x equal? What if $\sqrt{x} = 4.38$?

If $x^2 = 196$, what does x equal? What if $x^2 = 103$?

Explore

Consider a right triangle with side lengths 20, 21, and 29. Pick one of the acute angles, and label the sides as opposite, adjacent, and hypotenuse, relative to your chosen angle.

With your chosen angle, set up two different trigonometric ratios, and use a protractor to estimate the angle measure.
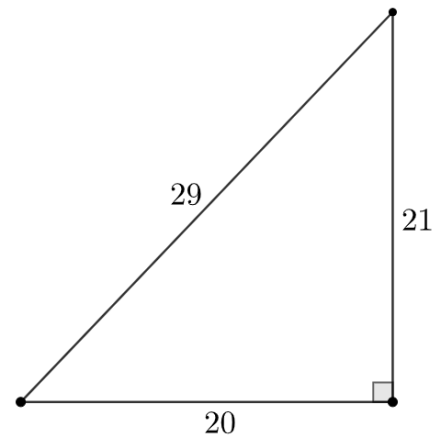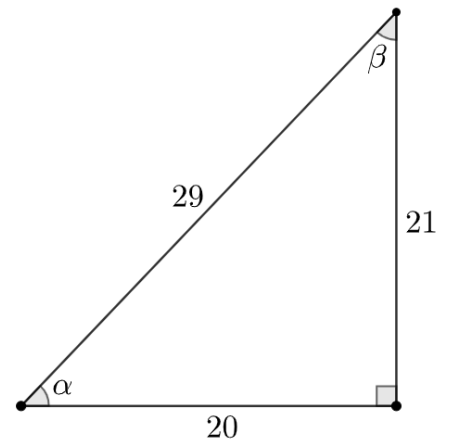
Trigonometric ratios depend on a(n) _____ and result in a(n) _____ .

However, the inverses of a trigonometric ratios depend on a(n) _____ and result in

a(n) _____ .

Inverse trigonometric ratios are written with the same names, but either prefixed with "arc" (example: arcsin) or with a -1 exponent (example: $\sin^{-1}$).

Find α and β.

Discuss

A good rule of thumb for a safe angle to use when leaning a ladder is the angle formed by your body when you stand on the ground and hold your arms out parallel to the ground. On most people that ratio is approximately 4 to 1.
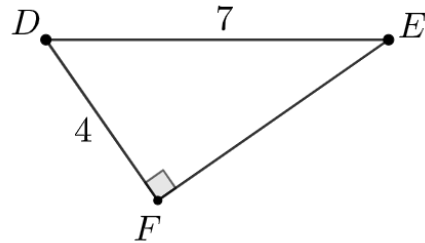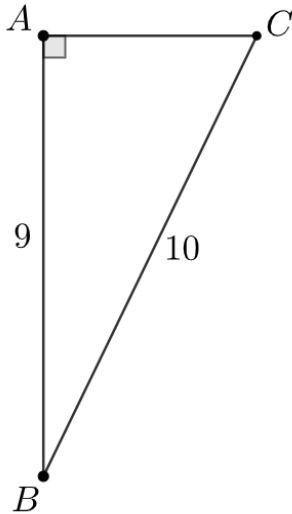
Assuming the 4 to 1 ratio, what are the angles formed by your body and the ladder? What are the angles in the triangle formed by the ladder, the ground, and the railing?

If the ladder is 13 feet long and the roof is 12 feet tall, what angle is formed between the ladder and ground?

Demonstrate

Find all missing side and angle measures.

Practice

1. Ramps in parking garages need to be both steep and safe. The maximum safe incline for a ramp is $8.5°$. If an individual ramp needs to rise 15 feet, is a horizontal distance of 95 feet make a safe ramp? If not, provide dimensions that would make the ramp safe.

2. $ABCD$ is a rectangle. Find the length of $\overline{AC}$ and the measures of α and θ.
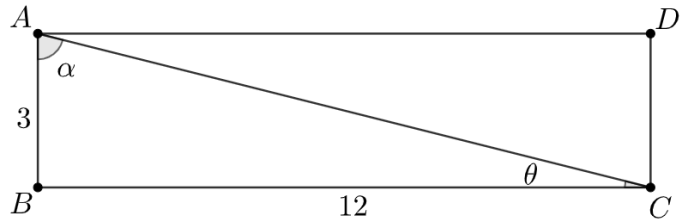
3. In $\triangle ABC$, $\overline{AB} \perp \overline{AC}$, $AB = 21$, and $AC = 35$. Find all missing side and angle measures.
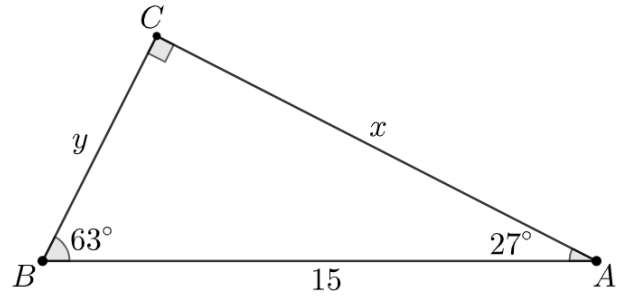
4. Select **all** the true equations:

   A. $\sin(27°) = \dfrac{x}{15}$

   B. $\cos(63°) = \dfrac{y}{15}$

   C. $\tan(27°) = \dfrac{y}{x}$

   D. $\sin(63°) = \dfrac{x}{15}$

   E. $\tan(63°) = \dfrac{y}{x}$

5. Find the area of the isosceles trapezoid.