Lesson 30: Trigonometry and the Pythagorean Theorem

Classwork

Exercises 1–2

1. In a right triangle, with acute angle of measure θ, $\sin\theta = \frac{1}{2}$. What is the value of $\cos\theta$? Draw a diagram as part of your response.

2. In a right triangle, with acute angle of measure θ, $\sin\theta = \frac{7}{9}$. What is the value of $\tan\theta$? Draw a diagram as part of your response.

Example 1

a. What common right triangle was probably modeled in the construction of the triangle in Figure 2? Use $\sin 53 \approx 0.8$.

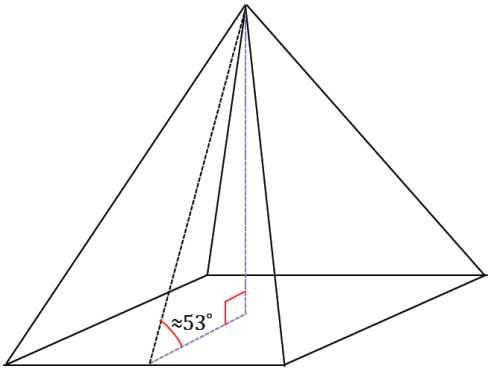


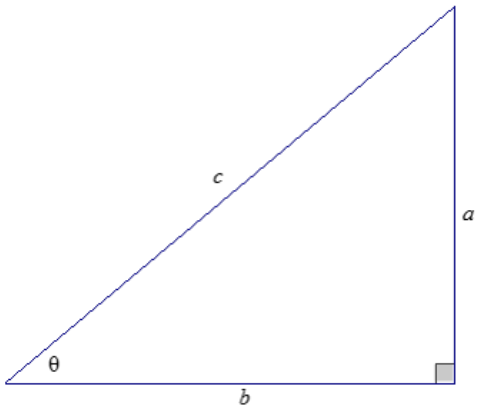
Figure 1

b. The actual angle between the base and lateral faces of the pyramid is actually closer to 52°. Considering the age of the pyramid, what could account for the difference between the angle measure in part (a) and the actual measure?

c. Why do you think the architects chose to use a 3–4–5 as a model for the triangle?

Example 2

Show why $\tan\theta = \frac{\sin\theta}{\cos\theta}$.



Exercises 3–4

3. In a right triangle, with acute angle of measure θ, $\sin\theta = \frac{1}{2}$, use the Pythagorean identity to determine the value of $\cos\theta$.

4. Given a right triangle, with acute angle of measure θ, $\sin\theta = \frac{7}{9}$, use the Pythagorean identity to determine the value of $\tan\theta$.

Problem Set

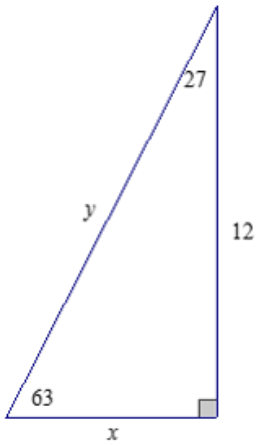
1. If $\cos\theta = \frac{4}{5}$, find $\sin\theta$ and $\tan\theta$.

2. If $\sin\theta = \frac{44}{125}$, find $\cos\theta$ and $\tan\theta$.

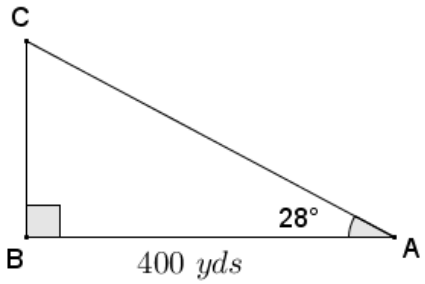
3. If $\tan\theta = 5$, find $\sin\theta$ and $\cos\theta$.

4. If $\sin\theta = \frac{\sqrt{5}}{5}$, find $\cos\theta$ and $\tan\theta$.

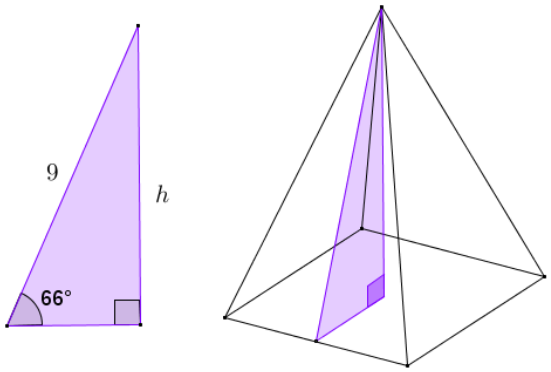
5. Find the missing side lengths of the following triangle using sine, cosine, and/or tangent. Round your answer to four decimal places.



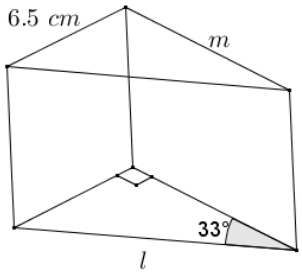
6. A surveying crew has two points A and B marked along a roadside at a distance of 400 yd. A third point C is marked at the back corner of a property along a perpendicular to the road at B. A straight path joining C to A forms a $28°$ angle with the road. Find the distance from the road to point C at the back of the property and the distance from A to C using sine, cosine, and/or tangent. Round your answer to three decimal places.



7. The right triangle shown is taken from a slice of a right rectangular pyramid with a square base.
   a. Find the height of the pyramid (to the nearest tenth).
   b. Find the lengths of the sides of the base of the pyramid (to the nearest tenth).
   c. Find the lateral surface area of the right rectangular pyramid.



8. A machinist is fabricating a wedge in the shape of a right triangular prism. One acute angle of the right triangular base is $33°$, and the opposite side is $6.5\ cm$. Find the length of the edges labeled l and m using sine, cosine, and/or tangent. Round your answer to the nearest thousandth of a centimeter.



9. Let $\sin\theta = \frac{l}{m}$, where $l, m > 0$. Express $\tan\theta$ and $\cos\theta$ in terms of l and m.