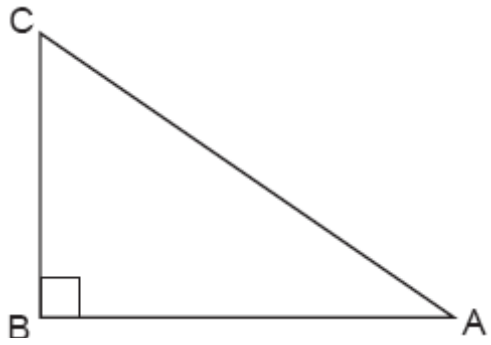
A.A.43: Determine the measure of an angle of a right triangle, given an acute angle and the length of another side.

1. 060820a, P.I. A.A.43
Cassandra is calculating the measure of angle A in right triangle ABC, as shown in the accompanying diagram. She knows the lengths of $\overline{AB}$ and $\overline{BC}$.

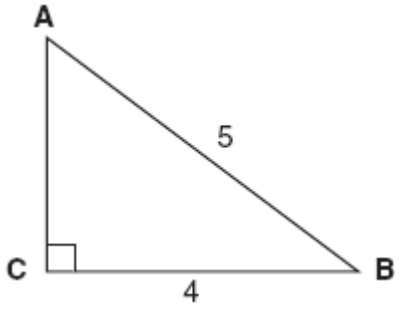


If she finds the measure of angle A by solving only one equation, which concept will be used in her calculations?

[A] $\cos A$ [B] Pythagorean theorem

[C] $\sin A$ [D] $\tan A$

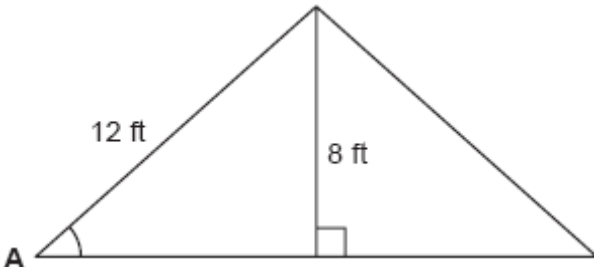
2. 080824ia, P.I. A.A.43
Which equation could be used to find the measure of one acute angle in the right triangle shown below?



[A] $\sin A = \frac{4}{5}$ [B] $\cos B = \frac{5}{4}$

[C] $\tan B = \frac{4}{5}$ [D] $\tan A = \frac{5}{4}$

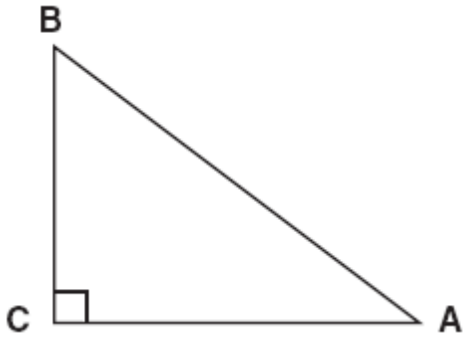
3. 060816ia, P.I. A.A.43
The center pole of a tent is 8 feet long, and a side of the tent is 12 feet long as shown in the diagram below.



If a right angle is formed where the center pole meets the ground, what is the measure of angle A to the *nearest degree*?

[A] 42 [B] 48 [C] 56 [D] 34

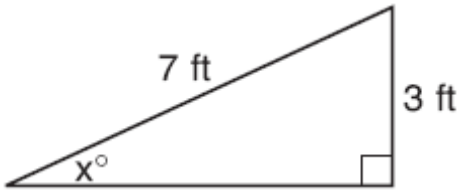
4. 080829ia, P.I. A.A.43
In the diagram of ΔABC shown below, $BC = 10$ and $AB = 16$.



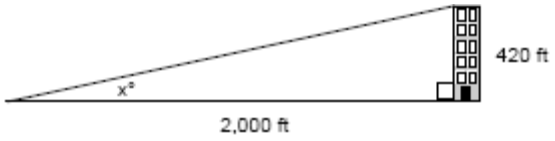
To the *nearest tenth of a degree*, what is the measure of the largest acute angle in the triangle?

[A] 51.3 [B] 32.0 [C] 38.7 [D] 90.0

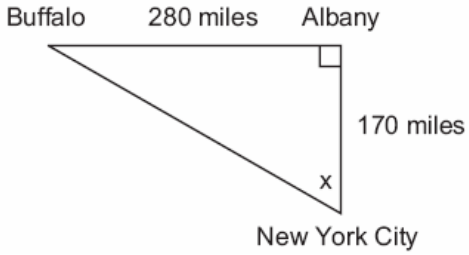
5. 060735a, P.I. A.A.43
Ron and Francine are building a ramp for performing skateboard stunts, as shown in the accompanying diagram. The ramp is 7 feet long and 3 feet high. What is the measure of the angle, *x*, that the ramp makes with the ground, to the *nearest tenth of a degree*?



6. 089927a, P.I. A.A.43
A person standing on level ground is 2,000 feet away from the foot of a 420-foot-tall building, as shown in the accompanying diagram. To the *nearest degree*, what is the value of *x*?

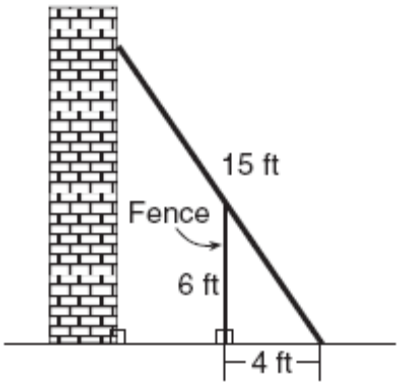


7. 060231a, P.I. A.A.43
As seen in the accompanying diagram, a person can travel from New York City to Buffalo by going north 170 miles to Albany and then west 280 miles to Buffalo.



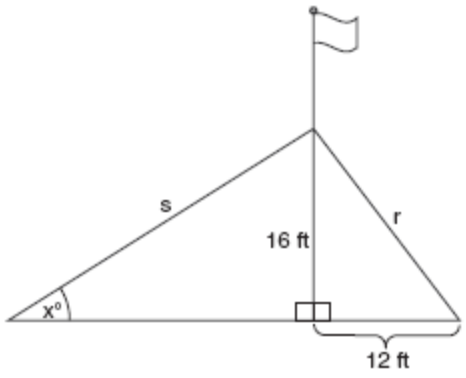
a If an engineer wants to design a highway to connect New York City directly to Buffalo, at what angle, *x*, would she need to build the highway? Find the angle to the *nearest degree*.
b To the *nearest mile*, how many miles would be saved by traveling directly from New York City to Buffalo rather than by traveling first to Albany and then to Buffalo?

8. 010438a, P.I. A.A.43
In the accompanying diagram, the base of a 15-foot ladder rests on the ground 4 feet from a 6-foot fence.



a If the ladder touches the top of the fence and the side of a building, what angle, to the *nearest degree*, does the ladder make with the ground?
b Using the angle found in part *a*, determine how far the top of the ladder reaches up the side of the building, to the *nearest foot*.

9. 060539a, P.I. A.A.43
The accompanying diagram shows a flagpole that stands on level ground. Two cables, *r* and *s*, are attached to the pole at a point 16 feet above the ground. The combined length of the two cables is 50 feet. If cable *r* is attached to the ground 12 feet from the base of the pole, what is the measure of the angle, *x*, to the *nearest degree*, that cable *s* makes with the ground?



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[1] D

[2] A

[3] A

[4] A

[2] 25.4, and appropriate work is shown, such as solving the equation $\sin x = \frac{3}{7}$.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.
or [1] A correct trigonometric equation is written, but no further correct work is shown.
or [1] 25.4, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[5]

[3] 12 and the equation $\tan x = \frac{420}{2000} = .21$ is shown.
or [3] 12 and the Pythagorean theorem and an appropriate trigonometric function are correctly used.
[2] Tan function is correctly used, but the answer is not rounded, such as 11.859.
or [2] The setup is correct, but one computational mistake is made, and an appropriate angle is found.
or [2] The answer is incorrectly expressed, such as $\tan x = 12$.
[1] The tan function is set up correctly, but the angle is not computed.
or [1] 12 and no work is shown.
or [1] 12 and $\sin x = \frac{420}{2000}$ is used.
or [1] 78 and $\cos x = \frac{420}{2000}$ is used.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[6]

a [2] 59, and the equation $\tan x = \frac{280}{170}$ is shown, or the Pythagorean theorem is used first to find the hypotenuse, and either sine or cosine is used correctly to find x.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 59, but no work is shown.
b [2] 122, if the Pythagorean theorem is used or if a trigonometric function of the angle is used before it was rounded to 59°.
or [2] 120, if $\cos 59 = \frac{170}{hyp}$ is used.
or [2] 123, if $\sin 59 = \frac{170}{hyp}$ is used.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 122 or 120 or 123, but no work is shown.
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[7]

a [2] 56, and appropriate work is shown, such as $\tan A = \frac{6}{4}$ or finding the hypotenuse and then using sine or cosine or using proportional sides of similar triangles.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The length of the hypotenuse is found correctly, but no further correct work is shown.
or [1] 56, but no work is shown.
b [2] 12, and appropriate work is shown, such as $\sin 56 = \frac{h}{15}$.
or [2] An appropriate answer is found based on an incorrect angle found in part a.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 12, but no work is shown.
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[8]

[4] 32, and appropriate work is shown, such as $12^2 + 16^2 = r^2$, $50 - r = s$, and $\sin x = \frac{16}{30}$.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown to find r = 20 and s = 30 and the trigonometric equation $\sin x = \frac{16}{30}$ is written, but it is not solved or is solved incorrectly.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function to find the angle.
or [2] The lengths of rand s are found correctly, but no further correct work is shown.
or [2] Incorrect lengths are found for rand s, but the sine function is used correctly to find an appropriate angle.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] The length of r is found correctly, but no further correct work is shown.
or [1] 32, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[9]