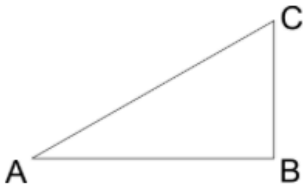
Example Question #2 : How To Find The Tangent Of An Angle



Triangle ABC shown is a right triangle. If the tangent of angle C is $\frac{3}{7}$, what is the length of segment BC?

Possible Answers:

3

$\sqrt{21}$

$\sqrt{58}$

7

3.5

Correct answer:

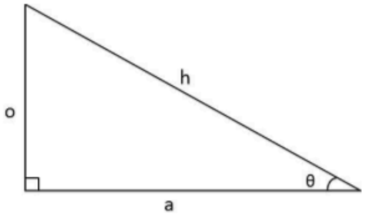
7

Explanation:

Use the definition of the tangent and plug in the values given:

tangent C = Opposite / Adjacent = AB / BC = 3 / 7

Therefore, BC = 7.



For the above triangle, $o = 21$ and $a = 8$. Find θ.

Possible Answers:

This triangle cannot exist.

67.6°

69.1°

22.4°

20.9°

Correct answer:

69.1°

Example Question #11 : Trigonometry

Josh is at the state fair when he decides to take a helicopter ride. He looks down at about a 35 ° angle of depression and sees his house. If the helicopter was about 250 ft above the ground, how far does the helicopter have to travel to be directly above his house?

sin 35 ° = 0.57 cos 35 ° = 0.82 tan 35 ° = 0.70

Possible Answers:

438.96 ft

304.88 ft

142.50 ft

205.00 ft

357.14 ft

Correct answer:

357.14 ft

Explanation:

The angle of depression is the angle formed by a horizontal line and the line of sight looking down from the horizontal.

This is a right triangle trig problem. The vertical distance is 250 ft and the horizontal distance is unknown. The angle of depression is 35°. We have an angle and two legs, so we use tan Θ = opposite ÷ adjacent. This gives an equation of tan 35° = 250/d where d is the unknown distance to be directly over the house.

A piece of wire is tethered to a 30 foot building at a 37° 37$˚$ angle. How far back is this wire from the bottom of said building? Round to the nearest inch.

Possible Answers:

$34\text{ feet and }4\text{ inches}$

$39\text{ feet and }10\text{ inches}$

$37\text{ feet and }7\text{ inches}$

$38\text{ feet and }5\text{ inches}$

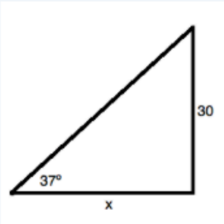
$49\text{ feet and }10\text{ inches}$

Correct answer:

$39\text{ feet and }10\text{ inches}$

Explanation:

Begin by drawing out this scenario using a little right triangle:



Note importantly: We are looking for x as the the distance to the bottom of the building. Now, this is not very hard at all! We know that the tangent of an angle is equal to the ratio of the side *adjacent* to that angle to the *opposite* side of the triangle. Thus, for our triangle, we know:

$$tan(37)=\frac{30}{x}$$

Using your calculator, solve for x:

$$x=\frac{30}{tan(37)}$$

This is 39.8113446486123. Now, take the decimal portion in order to find the number of inches involved.

$$0.8113446486123*12=9.7361357833476$$

Thus, rounded, your answer is 39 feet and 10 inches.

On a grid, what is the cosine of the angle formed between a line from the origin to $(-3, 9)$ and the x-axis?

Possible Answers:

$-\frac{\sqrt{10}}{10}$

$\frac{3\sqrt{10}}{10}$

$-\frac{3\sqrt{10}}{10}$

$\frac{\sqrt{10}}{10}$

None of the answers provided is correct.

Correct answer:

$-\frac{\sqrt{10}}{10}$

Explanation:

If the point to be reached is $(-3, 9)$, then we may envision a right triangle with sides 3 and 9, and hypotenuse c. The Pythagorean Theorem tells us that $a^2 + b^2 = c^2$, so we plug in and find that: $3^2 + 9^2 = c^2 = 90$.

Thus, $c = \sqrt{90} = 3\sqrt{10}$.

Now, **SOHCAHTOA** tells us that $\text{cosine} = \frac{\text{adjacent}}{\text{hypotenuse}}$, so we know that:

$$\cos x^\circ = \frac{3}{3\sqrt{10}} = \frac{1}{\sqrt{10}} = \frac{\sqrt{10}}{10}$$

Thus, our cosine is approximately $\frac{\sqrt{10}}{10}$. However, as we are in the second quadrant, cosine must be negative! Therefore, our true cosine is $-\frac{\sqrt{10}}{10}$.

What is the cosine of the angle formed between the origin and the point $(-3, 7)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(-3, 7)$? Round to the nearest hundredth.

Possible Answers:

0.94

-0.94

-0.61

-0.40

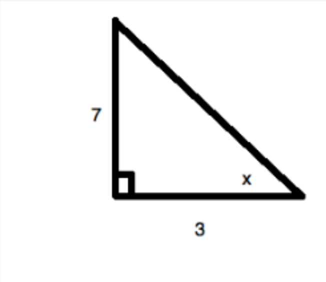
0.40

Correct answer:

-0.40

Explanation:

Recall that when you calculate a trigonometric function for an obtuse angle like this, you always use the x-axis as your reference point for your angle. (Hence, it is called the "reference angle.") Now, it is easiest to think of this like you are drawing a little triangle in the second quadrant of the Cartesian plane. It would look like:



So, you first need to calculate the hypotenuse:

$$h = \sqrt{3^2 + 7^2} = \sqrt{9 + 49} = \sqrt{56}$$

So, the cosine of an angle is:

$\frac{adjacent}{hypotenuse}$ or, for your data, $\frac{3}{\sqrt{56}}$.

This is approximately 0.40089186286863. Rounding, this is 0.40. However, since $(-3, 7)$ is in the second quadrant your value must be negative: -0.40.

What is the cosine of the angle formed between the origin and the point $(-6, -11)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(-6, -11)$? Round to the nearest hundredth.

Possible Answers:

0.88

-0.88

0.48

0.78

-0.48

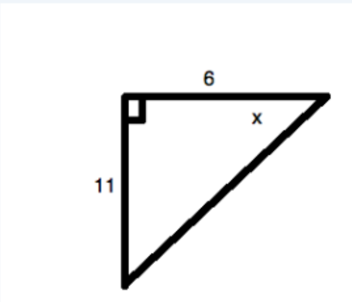
Correct answer:

-0.48

Explanation:

Recall that when you calculate a trigonometric function for an obtuse angle like this, you always use the x-axis as your reference point for your angle. (Hence, it is called the "reference angle.")

Now, it is easiest to think of this like you are drawing a little triangle in the third quadrant of the Cartesian plane. It would look like:



So, you first need to calculate the hypotenuse. You can do this by using the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are the lengths of the legs of the triangle and c the length of the hypotenuse. Rearranging the equation to solve for c, you get:

$$c = \sqrt{a^2 + b^2}$$

Substituting in the given values:

$$c = \sqrt{6^2 + 11^2} = \sqrt{36 + 121} = \sqrt{157}$$

So, the cosine of an angle is:

adjacent 6

If $cos(x) = -\frac{\sqrt{3}}{2}$ and $0 \leq x \leq \pi$, what is the value of $cos(x+\pi)$?

Possible Answers:

$\frac{\sqrt{3}}{3}$

$\frac{2}{\sqrt{3}}$

$2\sqrt{5}$

2

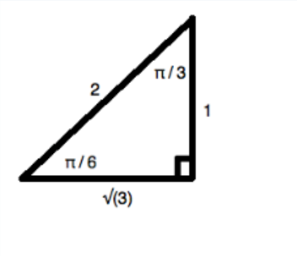
$\frac{1}{2}$

Correct answer:

$\frac{1}{2}$

Explanation:

Based on this data, we can make a little triangle that looks like:



This is because $cos(x) = \frac{adjacent}{hypotenuse}$.

Now, this means that x must equal $\frac{\pi}{2} + \frac{\pi}{6} = \frac{4\pi}{6} = \frac{2\pi}{3}$. (Recall that the cosine function is negative in the second quadrant.) Now, we are looking for:

$cos(\frac{2\pi}{3} + \pi)$ or $cos(\frac{5\pi}{3})$. This is the cosine of a reference angle of:

$2\pi - \frac{5\pi}{3} = \frac{\pi}{3}$

Looking at our little triangle above, we can see that the cosine of $\frac{\pi}{3}$ is $\frac{1}{2}$.

Right triangle ΔABC has sides $AB = 5$, $BC = 7$ and $AC = \sqrt{74}$. What is the cosine of $\angle A$?

Possible Answers:

$\frac{\sqrt{74}}{5}$

$\frac{7}{5}$

$\frac{7}{\sqrt{74}}$

$\frac{5}{\sqrt{74}}$

$\frac{5}{7}$

Correct answer:

$\frac{5}{\sqrt{74}}$

Explanation:

SOHCAHTOA tells us that $\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$, and we know the hypotenuse is the longest side of the triangle, $\sqrt{(74)}$ $\sqrt{(74)}$. Our adjacent side will be the other side that has $A A$ as a vertex, $AB = 5$ $AB = 5$.

Thus, $\cos(A) = \frac{AB}{AC} = \frac{5}{\sqrt{74}}$.

$cos(x) = 0.5$ **and** x **is between** 0 **and** π**. What is the value of** $cos(0.5x)$**?**

Possible Answers:

$\frac{\sqrt{3}}{2}$

$\sqrt{2}$

1

$3\sqrt{3}$

0.25

Correct answer:

$\frac{\sqrt{3}}{2}$

Explanation:

For 0 to π, we know that $cos(\frac{\pi}{3}) = 0.5$. So, the question asks, what is the value of $cos(0.5x)$, where $x = \frac{\pi}{3}$. Therefore, it is asking what the value of $cos(\frac{\pi}{6})$ is, which is $\frac{\sqrt{3}}{2}$.

To the nearest $.001$, what is the cosine formed from the origin to $(5, 6)$? Assume counterclockwise rotation.

Possible Answers:

$.640$

$.925$

$.710$

$.333$

$.355$

Correct answer:

$.640$

Explanation:

If the point to be reached is $(5, 6)$, then we may envision a right triangle with sides 5 and 6, and hypotenuse c. The Pythagorean Theorem tells us that $a^2 + b^2 = c^2$, so we plug in and find that: $5^2 + 6^2 = c^2 = 61$

Thus, $c = \sqrt{61}$

Now, **SOHCAHTOA** tells us that $\text{cosine} = \frac{\text{adjacent}}{\text{hypotenuse}}$, so we know that:

$$\cos x^\circ = \frac{5}{\sqrt{61}} \approx 0.6402$$

Thus, our cosine is approximately $.640$.

Two drivers race to a finish line. Driver A drives north 6 blocks, and east 20 blocks and crosses the goal. Driver B drives the shortest direct route between the two points. Relative to east, what is the cosine of the angle at which Driver B raced? Round to the nearest $.001$.

Possible Answers:

$.700$

$.836$

$.073$

$.958$

$.445$

Correct answer:

$.958$

Explanation:

If the point to be reached is 6 blocks north and 20 blocks east, then we may envision a right triangle with sides 20 and 6, and hypotenuse c. The Pythagorean Theorem tells us that $a^2 + b^2 = c^2$, so we plug in and find that: $20^2 + 6^2 = c^2 = 436$

Thus, $c = \sqrt{436} = 2\sqrt{109}$

Now, **SOHCAHTOA** tells us that $\text{cosine} = \frac{\text{adjacent}}{\text{hypotenuse}}$, so we know that:

$$cosx^\circ = \frac{20}{2\sqrt{109}} = \frac{10}{\sqrt{109}} \approx .9578$$

Thus, our cosine is approximately $.958$.

If $\tan(x) = \frac{5}{12}$, then what is $\cos(x) =$?

Possible Answers:

$\frac{5}{13}$

$\frac{12}{13}$

$\frac{13}{12}$

$\frac{5}{12}$

$\frac{13}{5}$

Correct answer:

$\frac{12}{13}$

Explanation:

If $\tan(x) = \frac{5}{12}$,

and being that $\tan(x) = \frac{opposite}{adjacent}$,

$\frac{5}{12} = \frac{opposite}{adjacent}$.

From this, you can construct a right triangle where 5 is the opposite side to the reference angle and 12 is the adjacent side to the reference angle.

After constructing this triangle, you can then proceed to apply the Pythagorean Theorem.

$C^2 = A^2 + B^2$

As 5 and 12 are the legs of the constructed right triangle, 5 and 12 are a and b in no particular order. Hence:

$A = 5,\ B = 12$

$C^2 = A^2 + B^2$

$C^2 = 5^2 + 12^2$

$C^2 = 25 + 144$

If $\tan(x) = \frac{5\sqrt{3}}{5}$, what is $\cos(x)$?

Possible Answers:

$.024$

$.335$

$.062$

$.500$

$.070$

Correct answer:

$.500$

Explanation:

SOHCAHTOA tells us that $\tan = \frac{\text{opposite}}{\text{adjacent}}$. Since this is true, we know that our right triangle has sides 5 5 and $5\sqrt{3}$ $5\sqrt{3}$. With that as the case, we can use the Pythagorean Theorem to figure out the hypotenuse.

$$5^2 + (5\sqrt{3})^2 = c^2 = (25 + 75) = 100$$

Thus, $c = \sqrt{100} = 10$. Now, we can calculate cosine using **SOHCAHTOA** again.

$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{5}{10} = .5$$

Thus, $\cos(x) = .5$.

In a given right triangle ΔABC, hypotenuse $AC = 42$ and $\angle C = 75^{\circ}$. Using the definition of $\cos$, find the length of leg CB. Round all calculations to the nearest tenth.

Possible Answers:

12.6

2.2

5.5

8.3

1.4

Correct answer:

12.6

Explanation:

In right triangles, SOHCAHTOA tells us that $\cos C = \frac{\text{adjacent}}{\text{hypotenuse}}$, and we know that $A = 75°$ $A = 75^{\circ}$ and hypotenuse $AC = 42$ $AC = 42$. Therefore, a simple substitution and some algebra gives us our answer.

$\cos 75^{\circ} = \frac{CB}{42}$

$.3 = \frac{CB}{42}$ Use a calculator or reference to approximate cosine.

$12.6 = CB$ Isolate the variable term.

Thus, $12.6 = CB$.

Edgar is standing at the top of a 35-foot long slide looking down the slope. He knows the angle the top of the slide makes with the vertical ladder he just climbed is $68\check{}$. How far, to the nearest foot, did Edgar climb to the top of the ladder?

Possible Answers:

25

13

5

37

19

Correct answer:

13

Explanation:

Edgar is effectively standing on top of a right triangle, since the angle from the vertical ladder to the ground can be assumed to be $90\check{}$. In this case, the cosine function will help us out, so long as we remember our **SOHCAHTOA** mnemonic.

$$\cos\ 68^\circ = \frac{x}{35}$$

We can solve for $\cos\ 68^\circ$, since the problem allows us to round.

$$\cos\ 68^\circ \approx 0.375$$

$$0.375 \approx \frac{x}{35}$$

$$x \approx 13.111$$

Thus, Edgar climbed 13 feet, rounded to the nearest foot.

An airline pilot must know the exact vertical height of his plane above the runway to know when to extend the landing gear under the nose. If the nose of the plane is 43 feet away from the ground and the plane is descending at an angle of 75° to the vertical, how far above the ground to the nearest $.01$ foot is the landing gear?

(Ignore the height of the plane itself).

Possible Answers:

14.40

37.72

11.13

42.80

7.99

Correct answer:

11.13

Explanation:

The plane itself is effectively at the top of a right triangle, with topmost angle 75° 75° and hypotenuse 43 43 feet. If this is the case, then **SOHCAHTOA** tells us that $\cos(75)^{\circ}=\frac{\text{adjacent}}{\text{hypotenuse}}=\frac{x}{43}$.

Now, solve for the adjacent:

$x=\cos(75^{\circ})\cdot 43\approx 11.13$

Thus, our plane's nose is approximately 11.13 feet from the runway.

A stone monument stands as a tourist attraction. A tourist wants to catch the sun at just the right angle to "sit" on top of the pillar. The tourist lies down on the ground 8 meters away from the monument, points the camera at the top of the monument, and the camera's display reads "DISTANCE -- 12 METERS". To the nearest $.01$ degree, what angle is the sun at relative to the horizon?

Possible Answers:

62.82°

23.20°

78.44°

48.19°

18.13°

Correct answer:

48.19°

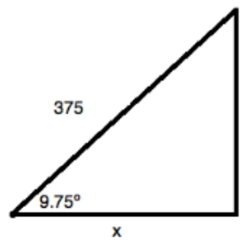
Explanation:

Our answer lies in *inverse functions*. If the monument is 8 meters away and the camera is 12 meters from the monument's top at the desired angle, then:

$$\cos x^{\circ} = \frac{8}{12}$$

Thus, using inverse functions we can say that $x = \cos^{-1}\frac{8}{12} \approx 48.189$

Thus, our buttress strikes the buliding at approximately a 48.19° angle.



What is x in the right triangle above? Round to the nearest hundredth.

Possible Answers:

355.83

264.52

64.44

369.58

63.51

Correct answer:

369.58

Explanation:

Recall that the cosine of an angle is the ratio of the adjacent side to the hypotenuse of that triangle. Thus, for this triangle, we can say:

$$cos(9.75) = \frac{x}{375}$$

Solving for x, we get:

$$375 * cos(9.75) = x$$

$x = 369.58352214677914$ or 369.58

A right triangle has leg lengths 8 and 10. What is the sine of the angle opposite from the side of length 10?

Possible Answers:

$\frac{4}{5}$

$\frac{5}{\sqrt{41}}$

$\frac{\sqrt{3}}{2}$

$\frac{4}{\sqrt{41}}$

Correct answer:

$\frac{5}{\sqrt{41}}$

Explanation:

Using SOHCAHTOA, the sine of an angle is simply the length of the side opposite to it over the hypotenuse; however, we do not have the length of the hypotenuse yet.

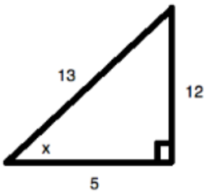
Using the Pythagorean Theorem, we can solve for it:

$8^2 + 10^2 = h^2$

$h = \sqrt{164} = 2\sqrt{41}$

So, the sine of this angle is:

$\frac{10}{2\sqrt{41}} = \frac{5}{\sqrt{41}}$



What is the value of $cos(x)(\frac{cos(x)}{\sin(x)})+sin(x)$**?**

Possible Answers:

$\frac{1}{2}$

$\frac{12}{13}$

1

$\frac{15}{7}$

$\frac{13}{12}$

Correct answer:

$\frac{13}{12}$

Explanation:

As with all trigonometry problems, begin by considering how you could rearrange the question. They often have hidden easy ways out. So begin by noticing:

$$cos(x)(\frac{cos(x)}{\sin(x)})+sin(x)=(\frac{cos^2(x)}{\sin(x)})+sin(x)$$

Now, you can treat $sin(x)$ like it is any standard denominator. Therefore:

$$(\frac{cos^2(x)}{\sin(x)})+sin(x)=(\frac{cos^2(x)}{\sin(x)})+\frac{sin^2(x)}{sin(x)}$$

Solve for x**:**

$sin(3x) = 0.5$ **if** $\frac{-\pi}{2} \leq 3x \leq \frac{\pi}{2}$

Possible Answers:

$\frac{3\pi}{2}$

$\frac{\pi}{2}$

$\frac{\pi}{18}$

3π

$\frac{\pi}{6}$

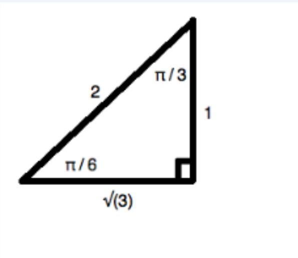
Correct answer:

$\frac{\pi}{18}$

Explanation:

$sin(3x) = 0.5$

Recall that the standard $30 - 60 - 90$ triangle, in radians, looks like:



Since $sin(x) = \frac{opposite}{hypotenuse}$, you can tell that $sin(\frac{\pi}{6}) = \frac{1}{2}$.

Therefore, you can say that $3x$ must equal $\frac{\pi}{6}$:

$3x = \frac{\pi}{6}$

You have a 30-60-90 triangle. If the hypotenuse length is 8, what is the length of the side opposite the 30 degree angle?

Possible Answers:

4

$4\sqrt{3}$

3

$3\sqrt{3}$

$4\sqrt{2}$

Correct answer:

4

Explanation:

$\sin(30^\circ) = \frac{1}{2}$

sine = opposite / hypotenuse

½ = opposite / 8

Opposite = 8 * ½ = 4

If a right triangle has a 30 degree angle, and the opposite leg of the 30 degree angle has a measure of 12, what is the value of the hypotenuse?

Possible Answers:

18

15

$12 * 2^{1/2}$

24

$12 * 3^{1/2}$

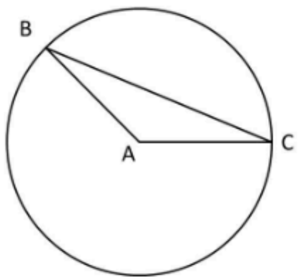
Correct answer:

24

Explanation:

Use SOHCAHTOA. Sin(30) = 12/x, then 12/sin(30) = x = 24.

You can also determine the side with a measure of 12 is the smallest side in a 30:60:90 triangle. The hypotenuse would be twice the length of the smallest leg.



The above circle has a radius of 8 and a center at A. $\angle A = 127^{\circ}$. Find the length of chord BC.

Possible Answers:

11.3

14.3

16

12.8

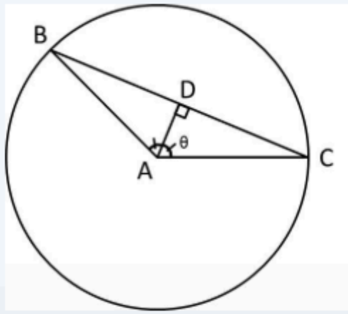
7.1

Correct answer:

14.3

Explanation:

We can solve for the length of the chord by drawing a line the bisects the angle and the chord, shown below as AD.



In this circle, we can see the triangle $\triangle ADC$ has a hypotenuse equal to the radius of the circle (AC), an angle θ equal to half the angle made by the

A man has set up a ground-level sensor to look from the ground to the top of a 30 foot tall building. The sensor must have an angle of $25.5°$ 25. 5°$ upward to the top of the building. How far is the sensor from the top of the building? Round to the nearest inch.

Possible Answers:

$62 \text{ feet and } 11 \text{ inches}$

$33 \text{ feet and } 9 \text{ inches}$

$69 \text{ feet and } 8 \text{ inches}$

$69 \text{ feet and } 4 \text{ inches}$

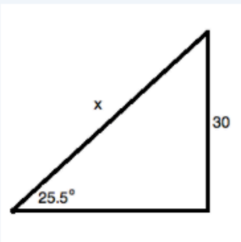
$10 \text{ feet and } 9 \text{ inches}$

Correct answer:

$69 \text{ feet and } 8 \text{ inches}$

Explanation:

Begin by drawing out this scenario using a little right triangle:



Note importantly: We are looking for x as the the distance to the *top* of the building. We know that the sine of an angle is equal to the ratio of the side opposite to that angle to the *hypotenuse* of the triangle. Thus, for our triangle, we know:

$$sin(25.5) = \frac{30}{x}$$

Using your calculator, solve for x:

$$x = \frac{30}{sin(25.5)}$$

This is 69.6846149202954. Now, take the decimal portion in order to find the number of inches involved.

$$0.6846149202954 * 12 = 8.2153790435448$$

Thus, rounded, your answer is 69 feet and 8 inches.

If $sin(x) = 0.5$, what is $sin(8x)$ if x is between 0 and 2π?

Possible Answers:

-0.5

0.5

$\frac{\sqrt{3}}{2}$

-1.5

$-\frac{\sqrt{3}}{2}$

Correct answer:

$-\frac{\sqrt{3}}{2}$

Explanation:

Recall that $sin(\frac{\pi}{6}) = 0.5$.

Therefore, we are looking for $sin(8 * \frac{\pi}{6})$ or $sin(\frac{4\pi}{3})$.

Now, this has a reference angle of $\frac{\pi}{3}$, but it is in the third quadrant. This means that the value will be negative. The value of $sin(\frac{\pi}{3})$ is $\frac{\sqrt{3}}{2}$. However, given the quadrant of our angle, it will be $-\frac{\sqrt{3}}{2}$.

What is the sine of the angle formed between the origin and the point $(4, -10)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(4, -10)$?

Possible Answers:

$\frac{5}{\sqrt{29}}$

$-\frac{5}{\sqrt{29}}$

-2.5

$4\sqrt{10}$

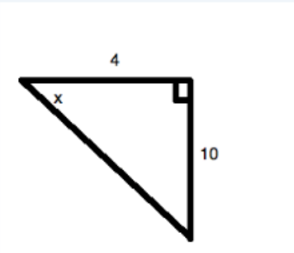
2.5

Correct answer:

$-\frac{5}{\sqrt{29}}$

Explanation:

You can begin by imagining a little triangle in the fourth quadrant to find your reference angle. It would look like this:



Now, to find the sine of that angle, you will need to find the hypotenuse of the triangle. Using the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are leg lengths and c is the length of the hypotenuse, the hypotenuse is $\sqrt{a^2 + b^2}$, or, for our data:

$$\sqrt{4^2 + 10^2} = \sqrt{16 + 100} = \sqrt{116} = 2\sqrt{29}$$

The sine of an angle is:

$$\frac{opposite}{hypotenuse}$$

For our data, this is:

$$\frac{10}{2\sqrt{29}} = \frac{5}{\sqrt{29}}$$

What is the sine of the angle formed between the origin and the point $(-3, -8)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(-3, -8)$?

Possible Answers:

$-\frac{3}{8}$

$\frac{8}{\sqrt{73}}$

$-4\sqrt{55}$

$-\frac{8}{\sqrt{73}}$

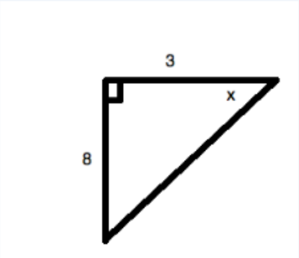
$\frac{8}{3}$

Correct answer:

$\frac{8}{\sqrt{73}}$

Explanation:

You can begin by imagining a little triangle in the third quadrant to find your reference angle. It would look like this:



Now, to find the sine of that angle, you will need to find the hypotenuse of the triangle. Using the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are leg lengths and c is the length of the hypotenuse, the hypotenuse is $\sqrt{a^2 + b^2}$, or, for our data:

$\sqrt{3^2 + 8^2} = \sqrt{9 + 64} = \sqrt{73}$

The sine of an angle is:

$\frac{opposite}{hypotenuse}$

For our data, this is:

Evaluate the expression below.

$sin(45^o) + cot(45^o)$

Possible Answers:

$\sqrt{2}$

$\frac{1+\sqrt{3}}{2}$

$\frac{2+\sqrt{3}}{2}$

$\frac{1+\sqrt{2}}{2}$

$\frac{2+\sqrt{2}}{2}$

Correct answer:

$\frac{2+\sqrt{2}}{2}$

Explanation:

At 45^o, sine and cosine have the same value.

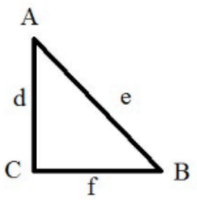
$sin(45^o) = cos(45^o) = \frac{\sqrt{2}}{2}$

Cotangent is given by $\frac{cos}{sin}$.

$cot(45^o = \frac{cos(45^o)}{sin(45^o)}) = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$

Now we can evaluate the expression.

$sin(45^o) + cot(45^o) = (\frac{\sqrt{2}}{2}) + 1 = (\frac{\sqrt{2}}{2}) + \frac{2}{2} = \frac{\sqrt{2}+2}{2}$



For triangle $\triangle ABC$ ΔABC **, what is the cotangent of angle** $\angle B$ $\angle B$**?**

Possible Answers:

$\frac{f}{d}$

$\frac{d}{e}$

$\frac{f}{e}$

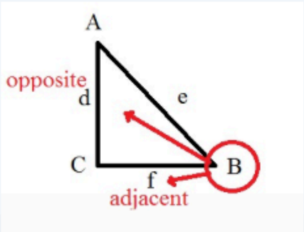
$\frac{d}{f}$

Correct answer:

$\frac{f}{d}$

Explanation:

The cotangent of the angle of a triangle is the adjacent side over the opposite side. The answer is $\frac{f}{d}$



What is the tangent of the angle formed between the origin and the point $(-5, -16)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(-5, -16)$? Round to the nearest hundredth.

Possible Answers:

-3.2

0.31

5.14

3.2

-0.31

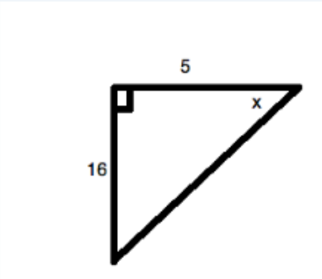
Correct answer:

3.2

Explanation:

Recall that when you calculate a trigonometric function for an obtuse angle like this, you always use the x-axis as your reference point for your angle. (Hence, it is called the "reference angle.")

Now, it is easiest to think of this like you are drawing a little triangle in the third quadrant of the Cartesian plane. It would look like:



So, the tangent of an angle is:

$\frac{opposite}{adjacent}$ or, for your data, $\frac{16}{5}$, or 3.2. Since $(-5, -16)$ is in the third quadrant, your value must be positive, as the tangent function is positive in this quadrant.

A ramp is being built at an angle of 30° from the ground. It must cover 10 horizontal feet. What is the length of the ramp? Round to the nearest hundredth of a foot.

Possible Answers:

$12.41\,ft$

$5.77\,ft$

$16.91\,ft$

$11.55\,ft$

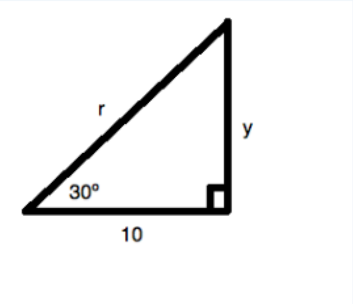
$13.53\,ft$

Correct answer:

$11.55\,ft$

Explanation:

Based on our information, we can draw this little triangle:



Since we know that the tangent of an angle is $\frac{opposite}{adjacent}$, we can say:

$tan(30) = \frac{y}{10}$

This can be solved using your calculator:

$y = 10tan(30)$ or 5.77350269189626

Now, to solve for r, use the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are the legs of a triangle and c is the triangle's hypotenuse. Here, $c = r$, so we can substitute that in and rearrange the equation to solve for r:

$r = \sqrt{a^2 + b^2}$

Substituting in the known values:

$r = \sqrt{10^2 + 5.77350269189626^2}$, or approximately 11.54700538379252. Rounding, this is 11.55.

What is the tangent of the angle formed between the origin and the point $(-17, 4)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(-17, 4)$? Round to the nearest hundredth.

Possible Answers:

4.25

0.24

-0.24

-1.48

-4.25

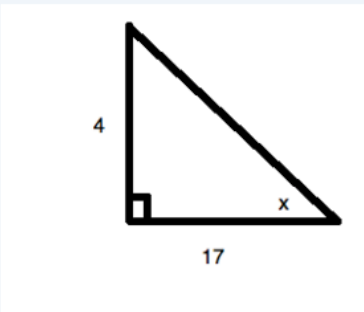
Correct answer:

-0.24

Explanation:

Recall that when you calculate a trigonometric function for an obtuse angle like this, you always use the x-axis as your reference point for your angle. (Hence, it is called the "reference angle.")

Now, it is easiest to think of this like you are drawing a little triangle in the second quadrant of the Cartesian plane. It would look like:



So, the tangent of an angle is:

$\frac{opposite}{adjacent}$ or, for your data, $\frac{4}{17}$.

This is 0.23529411764706. Rounding, this is 0.24. However, since $(-17, 4)$ is in the second quadrant, your value must be negative. (The tangent function is negative in that quadrant.) Therefore, the answer is -0.24.

What is the tangent of the angle formed between the origin and the point $(4, -3)$ if that angle is formed with one side of the angle beginning on the x-axis and then rotating counter-clockwise to $(4, -3)$? Round to the nearest hundredth.

Possible Answers:

-0.6

-1.33

1.33

0.8

-0.75

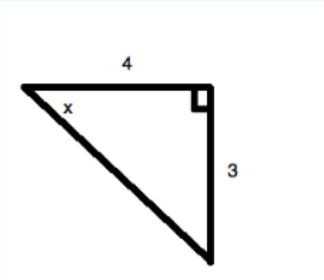
Correct answer:

-0.75

Explanation:

Recall that when you calculate a trigonometric function for an obtuse angle like this, you always use the x-axis as your reference point for your angle. (Hence, it is called the "reference angle.")

Now, it is easiest to think of this like you are drawing a little triangle in the fourth quadrant of the Cartesian plane. It would look like:



So, the tangent of an angle is:

$\frac{opposite}{adjacent}$ or, for your data, $\frac{3}{4}$ or 0.75. However, since $(4, -3)$ is in the fourth quadrant, your value must be negative. (The tangent function is negative in that quadrant.) This makes the correct answer -0.75.

Which of the following represents a tangent function that has a period half that of one with a period of 16π ?

Possible Answers:

$f(x) = 8tan(x) + 8$

$f(x) = \frac{1}{2}tan(16x)$

$f(x) = 14tan(8x) - 12$

$f(x) = 8tan(x)$

$f(x) = tan^8(x)$

Correct answer:

$f(x) = 14tan(8x) - 12$

Explanation:

The standard period of a tangent function is π radians. In other words, it completes its entire cycle of values in that many radians. To alter the period of the function, you need to alter the value of the parameter of the trigonometric function. You multiply the parameter by the number of periods that would complete in π radians. With a period of 16π, you are multiplying your parameter by 16. Now, half of this would be a period of 8π. Thus, you will have a function of the form:

$$f(x) = a * tan(8x) + b$$

Since a and b do not alter the period, these can be anything.

Therefore, among your options, $f(x) = 14tan(8x) - 12$ is correct.

Josh is at the state fair when he decides to take a helicopter ride. He looks down at about a 35 ° angle of depression and sees his house. If the helicopter was about 250 ft above the ground, how far does the helicopter have to travel to be directly above his house?

$\sin 35° = 0.57$ $\cos 35° = 0.82$ $\tan 35° = 0.70$

Possible Answers:

205.00 ft

357.14 ft

438.96 ft

304.88 ft

142.50 ft

Correct answer:

357.14 ft

Explanation:

The angle of depression is the angle formed by a horizontal line and the line of sight looking down from the horizontal.

This is a right triangle trig problem. The vertical distance is 250 ft and the horizontal distance is unknown. The angle of depression is 35°. We have an angle and two legs, so we use $\tan \Theta = \text{opposite} \div \text{adjacent}$. This gives an equation of $\tan 35° = 250/d$ where d is the unknown distance to be directly over the house.

Consider a right triangle with an inner angle x $(x < 90^{\circ})$.

If

$$\cos x = \frac{3}{5}$$

and

$$\sin x = \frac{4}{5}$$

what is $\tan x$?

Possible Answers:

$\frac{1}{5}$

5

$\frac{4}{3}$

1

$\frac{3}{4}$

Correct answer:

$\frac{4}{3}$

Explanation:

The tangent of an angle x is defined as

$$\tan x = \frac{\sin x}{\cos x}$$

Substituting the given values for $\cos x$ and $\sin x$, we get

$$\frac{4/5}{3/5} = 4/3$$

A laser is placed at a distance of 47 feet from the base of a building that is 23 feet tall. What is the angle of the laser (presuming that it is at ground level) in order that it point at the top of the building?

Possible Answers:

33.45°$

60.70°$

63.92°$

29.30°$

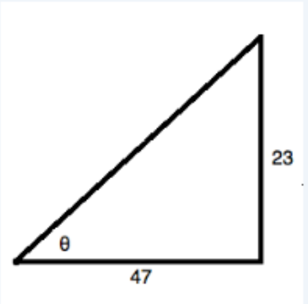
26.08°$

Correct answer:

26.08°$

Explanation:

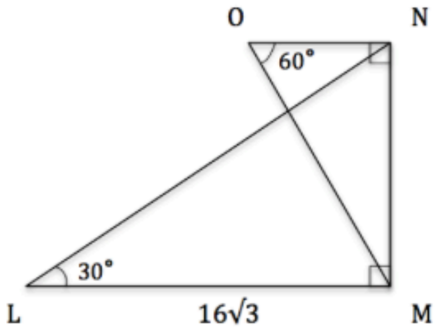
You can draw your scenario using the following right triangle:



Recall that the tangent of an angle is equal to the ratio of the opposite side to the adjacent side of the triangle. You can solve for the angle by using an inverse tangent function:

$\Theta = tan^{-1}(\frac{23}{47}) = 26.07535558394878$ or 26.08° 26.08°$.

For the triangles in the figure given, which of the following is closest to the length of line NO?



Possible Answers:

9

10

8

7

6

Correct answer:

9

Explanation:

First, solve for side MN. Tan(30°) = MN/16√3, so MN = tan(30°)(16√3) = 16. Triangle LMN and MNO are similar as they're both 30-60-90 triangles, so we can set up the proportion LM/MN = MN/NO or 16√3/16 = 16/x. Solving for x, we get 9.24, so the closest whole number is 9.