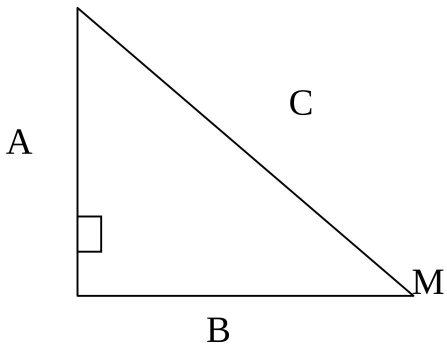
Algebra 2 Honors Trigonometry Notes

Day 1: Intro to Trig (HW Trig WS #1)

Part I: opposite, adjacent, hypotenuse



If you are standing at angle M:

a) Which side (A, B or C) are you OPPOSITE to (i.e. looking across to)? ______.

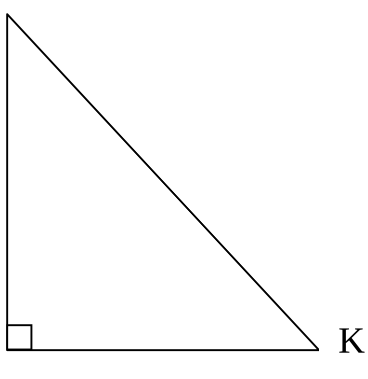
b) Which side is next or ADJACENT to you (other than the hypotenuse) _________.

c) Which is the HYPOTENUSE? ________.

Example 1:

Now you are standing at angle K. Label the OPPOSITE, ADJACENT and HYPOTENUSE on the following triangles.

a)



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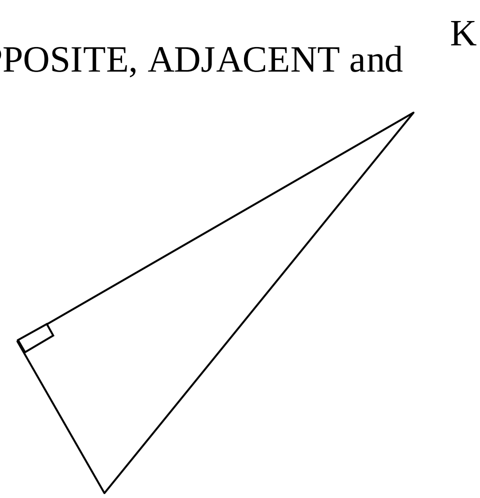


Topic: 2 : SOHCAHTOA

Now we will learn about basic trig functions:

We have 3 basic trig functions, SINE, COSINE, TANGENT. When writing them, we can shorten the name and write sin, cos, tan.

You need to know the following relationship between an angle you are standing at and the opposite, adjacent and hypotenuse sides of a right triangle:

Sine of angle K: sin K = opposite / hypotenuse

Cosine of angle K: cos K = adjacent/hypotenuse

Tangent of angle K: tan K = opposite/adjacent

The trick to memorizing it is SOH-CAH-TOA.
Pronounced: so-ka-to-a.

Stands for:	Sin angle = O/H	->	SOH
	Cos angle = A/H	->	CAH
	Tan angle = O/A	->	TOA

Topic 3: CHOSHACAO

Now let's see if you can figure out the fractions that go with the following additional 3 trig functions:

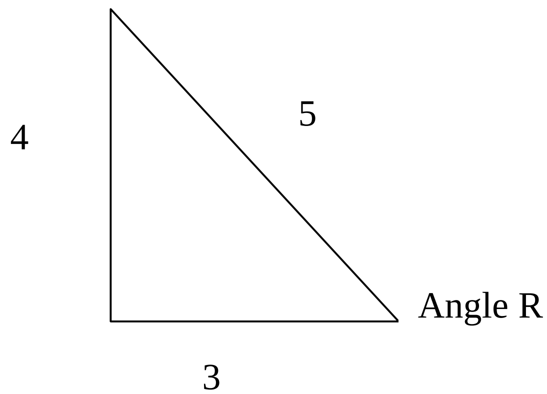
(Hint: Use the acronym CHO – SHA – CAO, to help you figure out what fraction, each trig function is equal to.)

Cosecant:	CSC angle =	________/_________
Secant:	SEC angle =	________/_________
Cotangent:	COT angle =	________/_________

The 6 trig functions all use O, A and/or H of a right triangle.

Example 2:

a) Given the following triangle, find the remaining 5 trig functions. First label the opposite, adjacent and hypotenuse sides as O, A and H on the triangle. (Some of the fractions are already done for you.



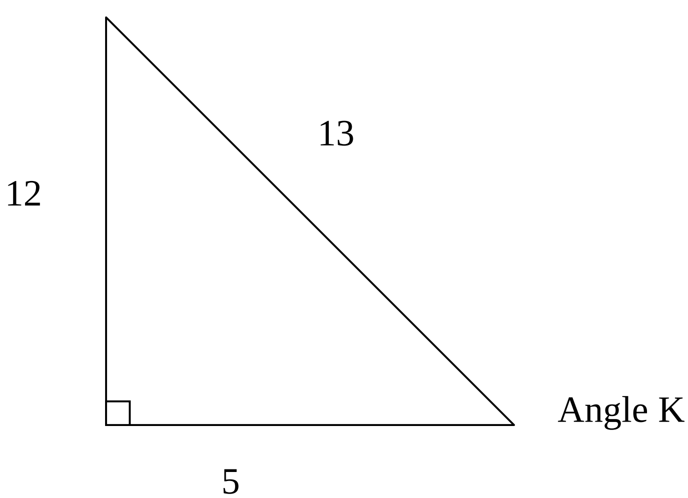
Sin R = O/H = 4/5 CSC R = H/O = /

Cos R = / = / SEC R = = /

Tan R = / = / COT R = A/O = ¾

Example 3:

Given the following triangle, determine the 6 trig function values at angle K:



Sin K = O/H = 12/13

Cos K =

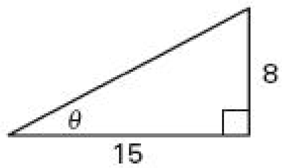
Tan K =

CSC K =

SEC K =

COT K =

Example 4:
Evaluate the six trigonometric functions of the angle θ.

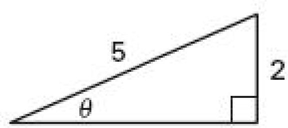


$\sin\theta =$ $\csc\theta =$

$\cos\vartheta =$ $\sec\vartheta =$

$\tan\theta =$ $\cot\theta =$

.



$\sin\theta =$ $\csc\theta =$

$\cos\vartheta =$ $\sec\vartheta =$

$\tan\theta =$ $\cot\theta =$

Day 2: Evaluating and Solving (HW Trig WS #2)

****QUIZ on SOCAHTOA/ CHOSHACAO**

Part I: Evaluating with calculator

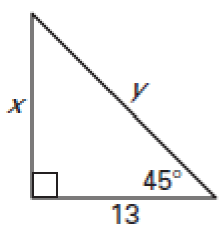
Use a calculator to evaluate the trigonometric function. Round your answers to 2 decimal places.

$\sin 37°$	$\cos 12°$	$\cot 48°$
$\csc 7°$	$\sec 97°$	$\tan 28°$

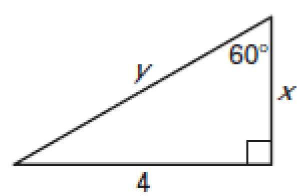
Part 2: Solving using Trig

Find the value of each variable. Round your answers to 2 decimal places.

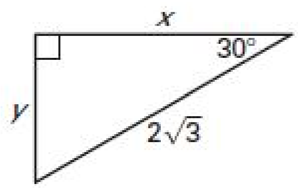
(a)



(b)



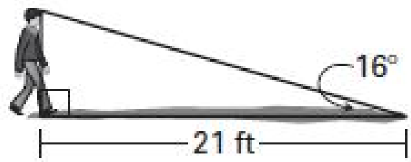
(c)



Part 3: Applications

(a)

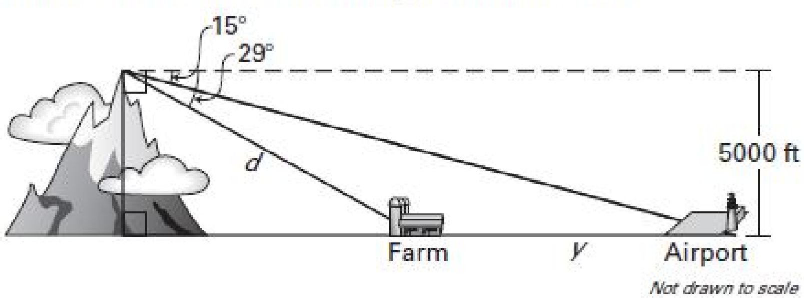
Shadow A person casts the shadow shown. What is the approximate height of the person?



(b)

Mountains A hiker at the top of a mountain sees a farm and an airport in the distance.

a. What is the distance d from the hiker to the farm?



b. What is the distance y from the farm to the airport?

Day 3: Radians and Degrees (HW Trig WS #3)

Part I: radians and degrees

CONVERTING BETWEEN DEGREES AND RADIANS
Degrees to radians
Multiply degree measure by $\frac{\pi \text{ radians}}{180°}$.
Radians to Degrees
Multiply radian measure by $\frac{180°}{\pi \text{ radians}}$.

Example 1:
Convert the degree measure to radians or the radian measure to degrees.

(a) $270°$ (b) $45°$ (c) $30°$

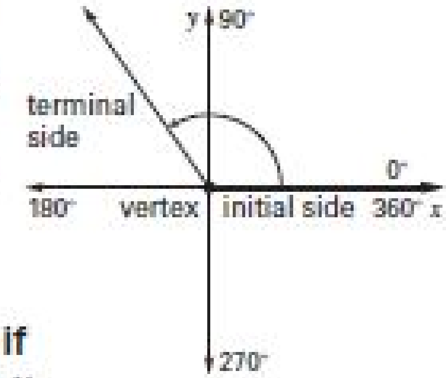
(d) $180°$ (e) $\frac{\pi}{4}$ (f) $\frac{5\pi}{6}$

(g) π (h) $\frac{11\pi}{6}$ (i) $\frac{\pi}{3}$

Part 2: Standard Position

ANGLES IN STANDARD POSITION

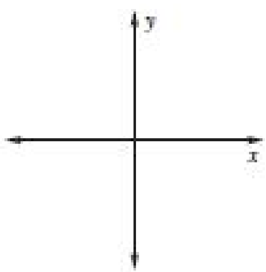
In a coordinate plane, an angle can be formed by fixing one ray, called the ________ side, and rotating the other ray, called the ___________ side, about the _________.



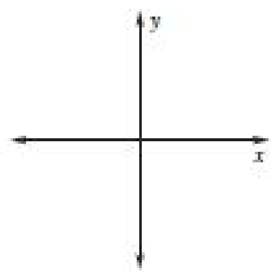
An angle is in standard position if its vertex is at ____________ and its initial side lies on the positive ________.

Draw an angle with the given measure in standard position.

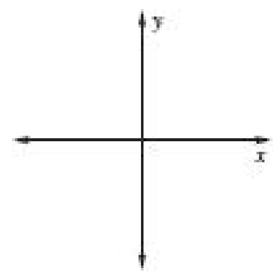
1. $130°$



2. $\frac{5\pi}{4}$



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



Day 4: Standard Form and Coterminal(HW Trig WS #4)

QUIZ on conversion and standard position

Part I: Coterminal Angles

To find coterminal angles: + 360 degrees or -360 degrees or (-2π or $+2\pi$)
Coterminal angles are equivalent angles since they share a terminal side

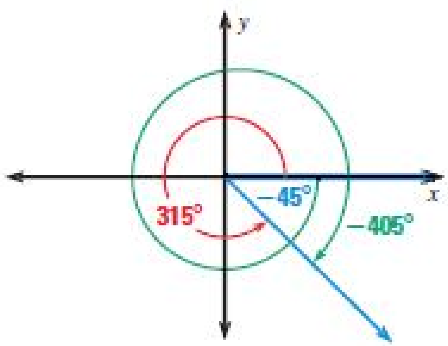
Find one positive angle and one negative angle that are coterminal with (a) −45° and (b) 395°.

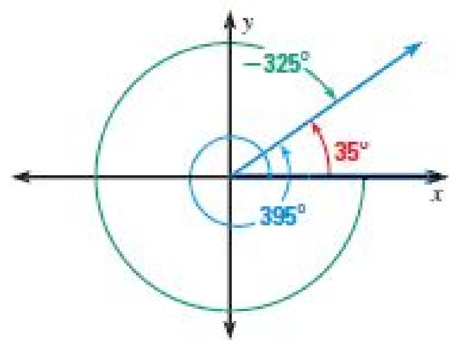
Solution

There are many such angles, depending on what multiple of 360° is added or subtracted.

a. $-45° + 360° = 315°$
$-45° - 360° = -405°$

b. $395° - 360° = 35°$
$395° - 2(360°) = -325°$





Example 1:

Find one positive angle and negative angle that are coterminal with the following angle.

(a) $-60°$

(b) $120°$

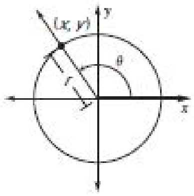
(c) $-\frac{\pi}{3}$

(d) $\frac{3\pi}{4}$

Part 2: Evaluating in Standard Form

GENERAL DEFINITIONS OF TRIGONOMETRIC FUNCTIONS

Let θ be an angle in standard position, and let (x, y) be the point where the terminal side of θ intersects the circle $x^2 + y^2 = r^2$. The six trigonometric functions of θ are defined as follows:



$\sin\theta = \dfrac{\square}{r}$ $\qquad$ $\csc\theta = \dfrac{\square}{y}, y \neq 0$

$\cos\theta = \dfrac{x}{\square}$ $\qquad$ $\sec\theta = \dfrac{\square}{x}, x \neq 0$

$\tan\theta = \dfrac{\square}{x}, x \neq 0$ $\qquad$ $\cot\theta = \dfrac{\square}{y}, y \neq 0$

Example 2:

Use the given point on the terminal side of an angle θ in standard position to evaluate the six trigonometric functions of θ.

1. $(6, 8)$

2. $(-3, 2)$

Evaluate the six trigonometric functions of θ.

3. $\theta = 90^\circ$

4. $\theta = -\pi$

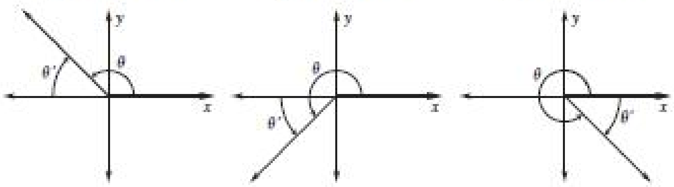
Day 5: Reference Angles (HW Trig WS #5)
****QUIZ 3: coterminals and standard position**

Part 1: Reference Angles

REFERENCE ANGLE RELATIONSHIPS

Let θ be an angle in standard position. The reference angle for θ is the acute angle θ' formed by the terminal side of θ and the x-axis. The relationship between θ and θ' is shown below for nonquadrantal angles θ such that $90° < \theta < 360° \left(\frac{\pi}{2} < \theta < 2\pi\right)$.

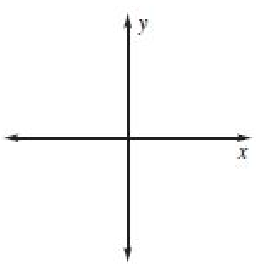
Quadrant II	Quadrant III	Quadrant IV



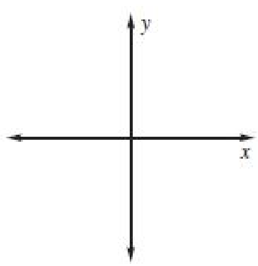
	Quadrant II	Quadrant III	Quadrant IV
Degrees:	$\theta' = 180° - \theta$	$\theta' = \theta - 180°$	$\theta' = 360° - \theta$
Radians:	$\theta' = \pi - \theta$	$\theta' = \theta - \pi$	$\theta' = 2\pi - \theta$

Sketch the angle. Then find its reference angle.

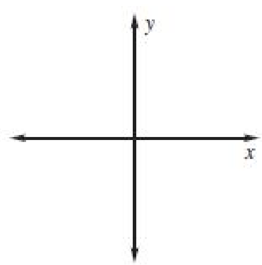
5. 120°



6. 240°



7. −130°



Reference angles are one of the **most important things** in this unit! Next concept, you will have to memorize the ENTIRE UNIT CIRCLE. However, if you learn how to use reference angles, you only have to memorize the FIRST QUADRANT! That's awesome! In this concept, you can use coterminal angles to make your job easier!

A few things about reference angles:

- They are always found between the terminal side and the **Closest X-Axis!**
- They are always **Positive, Acute** angles!

---

1) $-265°$
2) $680°$
3) $190°$
4) $-680°$
5) $265°$
6) $-605°$
7) $345°$
8) $-525°$
9) $420°$
10) $620°$
11) $-\frac{15\pi}{4}$
12) $\frac{5\pi}{4}$
13) $-\frac{35\pi}{9}$
14) $-\frac{17\pi}{18}$
15) $-\frac{37\pi}{12}$
16) $-\frac{10\pi}{3}$
17) $-\frac{71\pi}{18}$
18) $\frac{4\pi}{3}$
19) $\frac{13\pi}{6}$
20) $\frac{7\pi}{4}$

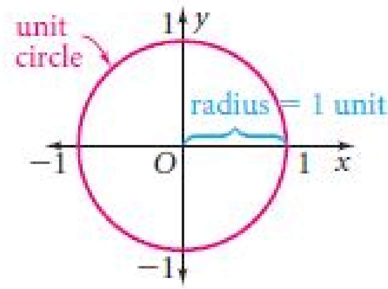
Day 6: The Unit Circle Intro (HW Trig WS #6)

****QUIZ on reference angles**

Part I: The Unit Circle

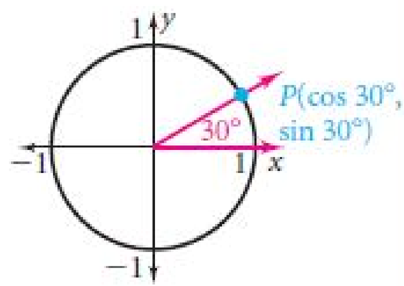
The **unit circle** has a radius of 1 unit and its center at the origin of the coordinate plane. Points on the unit circle are related to periodic functions.

You can use the symbol θ for the measure of an angle in standard position.



Definition — **Cosine and Sine of an Angle**

Suppose an angle in standard position has measure θ. The **cosine of θ** ($\cos\theta$) is the x-coordinate of the point at which the terminal side of the angle intersects the unit circle. The **sine of θ** ($\sin\theta$) is the y-coordinate.

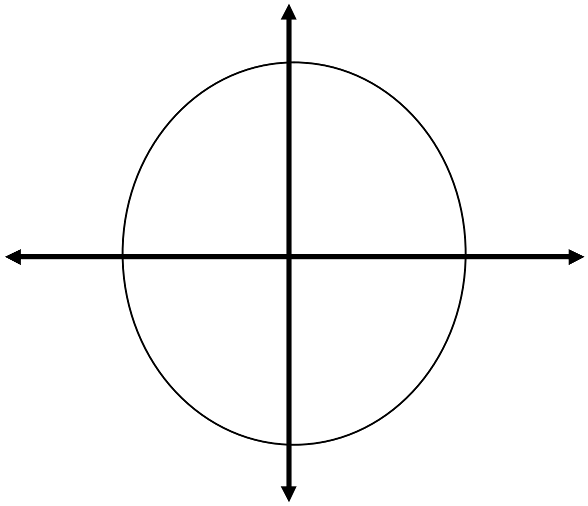


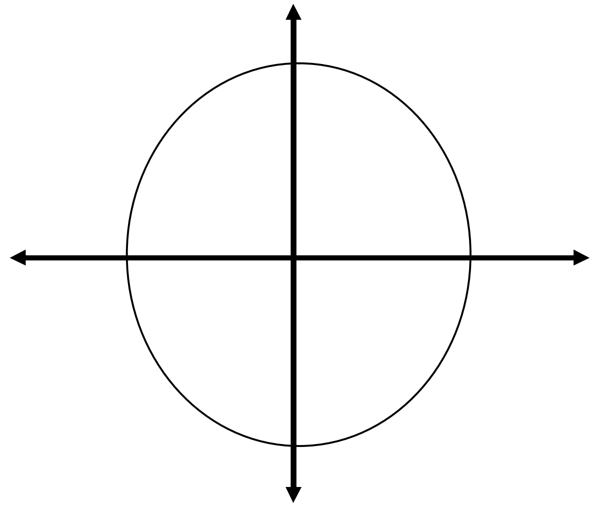
Special Triangles:

30-60-90 → $\frac{1}{2} : \frac{\sqrt{3}}{2} : 1$

45-45-90 → $\frac{\sqrt{2}}{2} : \frac{\sqrt{2}}{2} : 1$

To find the trigonometric functions of a **30-60-90** angle on a unit circle:

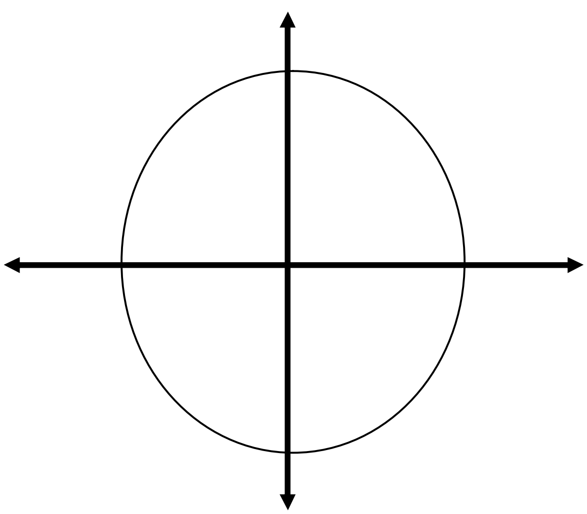




Trigonometric Table

θ (angle)	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$

To find the trigonometric functions of a **45-45-90** angle on a unit circle:



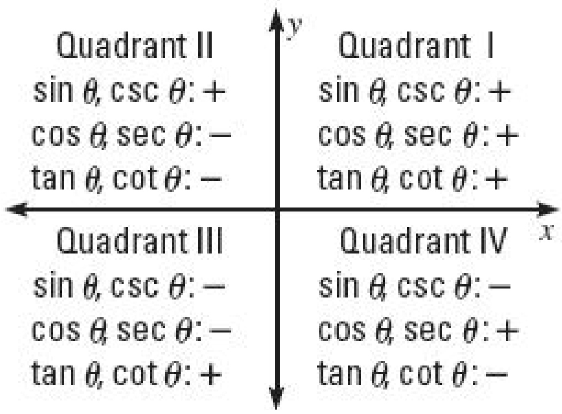
Trigonometric Table

θ (angle)	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$

Day 7: The Unit Circle All Quadrants (HW Trig WS #7)

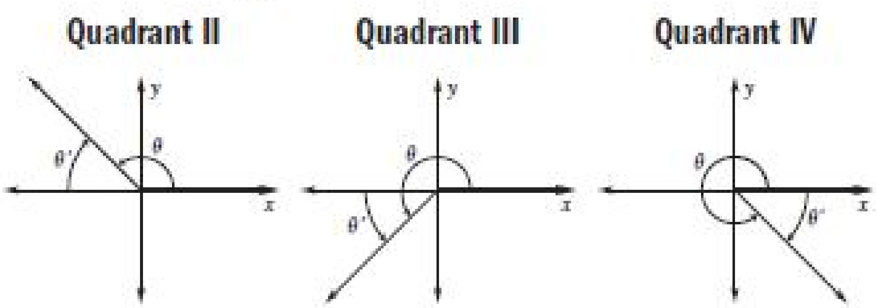
Part I: The Unit Circle (all of it)

You only need to memorize the trig for the first quadrant, use the reference angles to get the answers. ALL STUDENTS TAKE CALCULUS



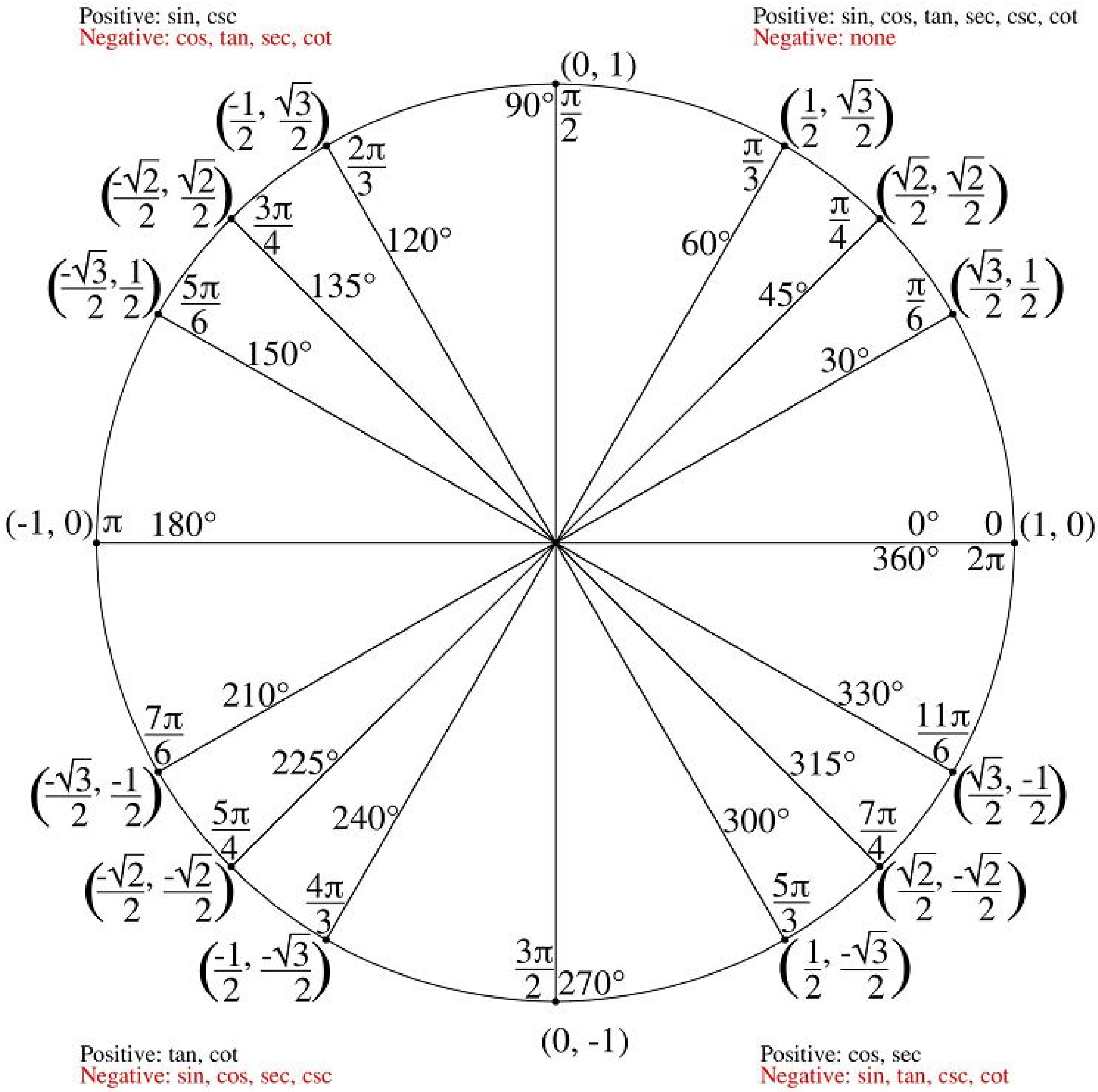
REFERENCE ANGLE RELATIONSHIPS

Let θ be an angle in standard position. The reference angle for θ is the acute angle θ' formed by the terminal side of θ and the x-axis. The relationship between θ and θ' is shown below for nonquadrantal angles θ such that $90° < \theta < 360° \left(\frac{\pi}{2} < \theta < 2\pi\right)$.

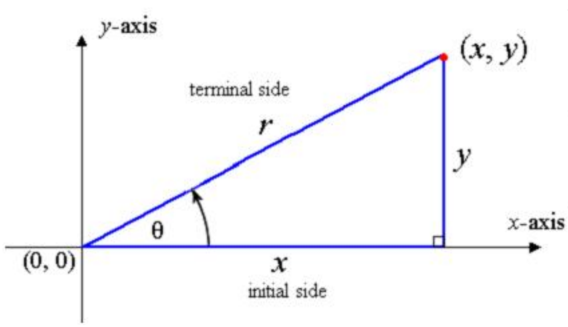


	Quadrant II	Quadrant III	Quadrant IV
Degrees:	$\theta' = 180° - \theta$	$\theta' = \theta - 180°$	$\theta' = 360° - \theta$
Radians:	$\theta' = \pi - \theta$	$\theta' = \theta - \pi$	$\theta' = 2\pi - \theta$

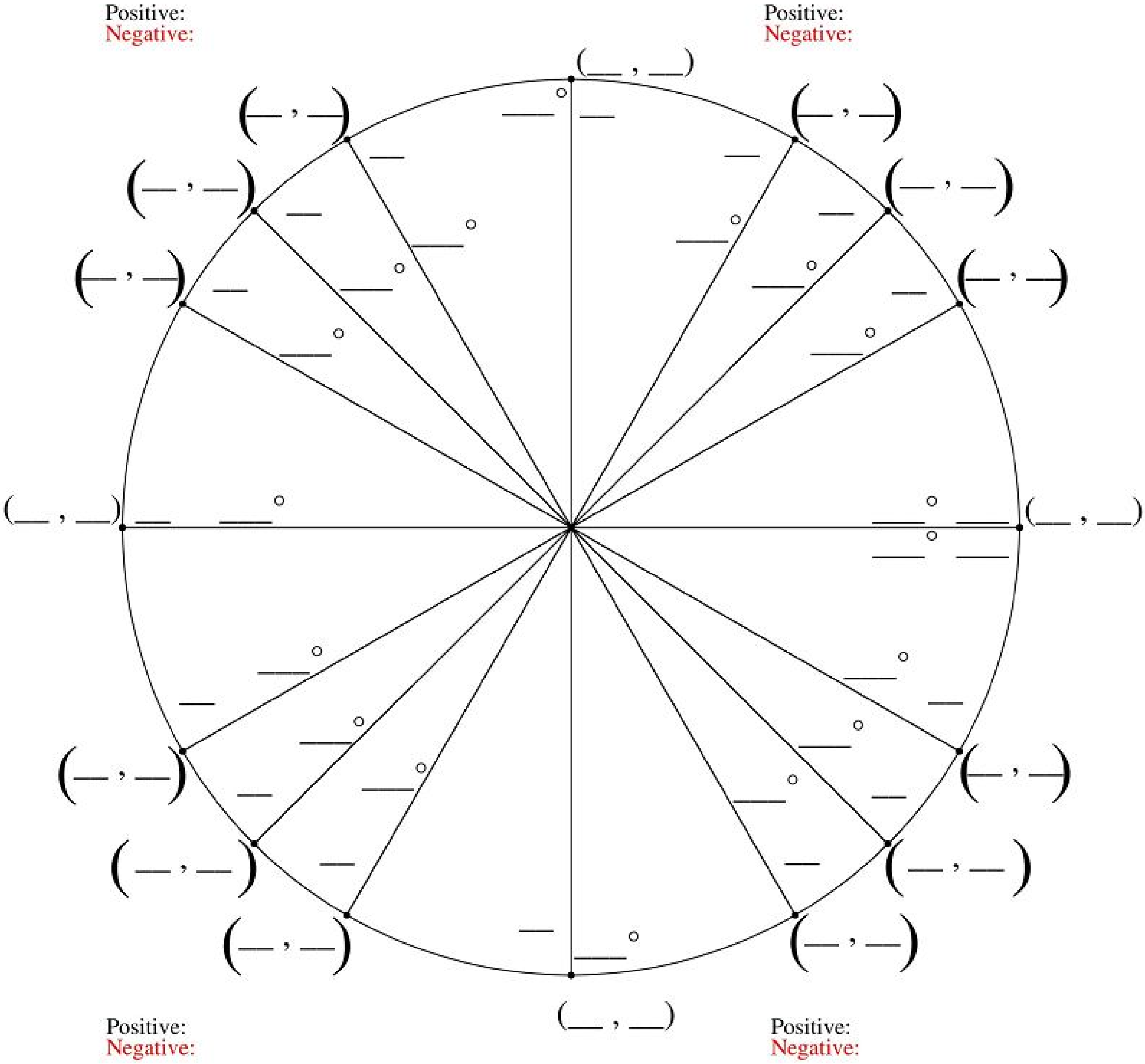
The Unit Circle



How do you find the values on the unit circle?

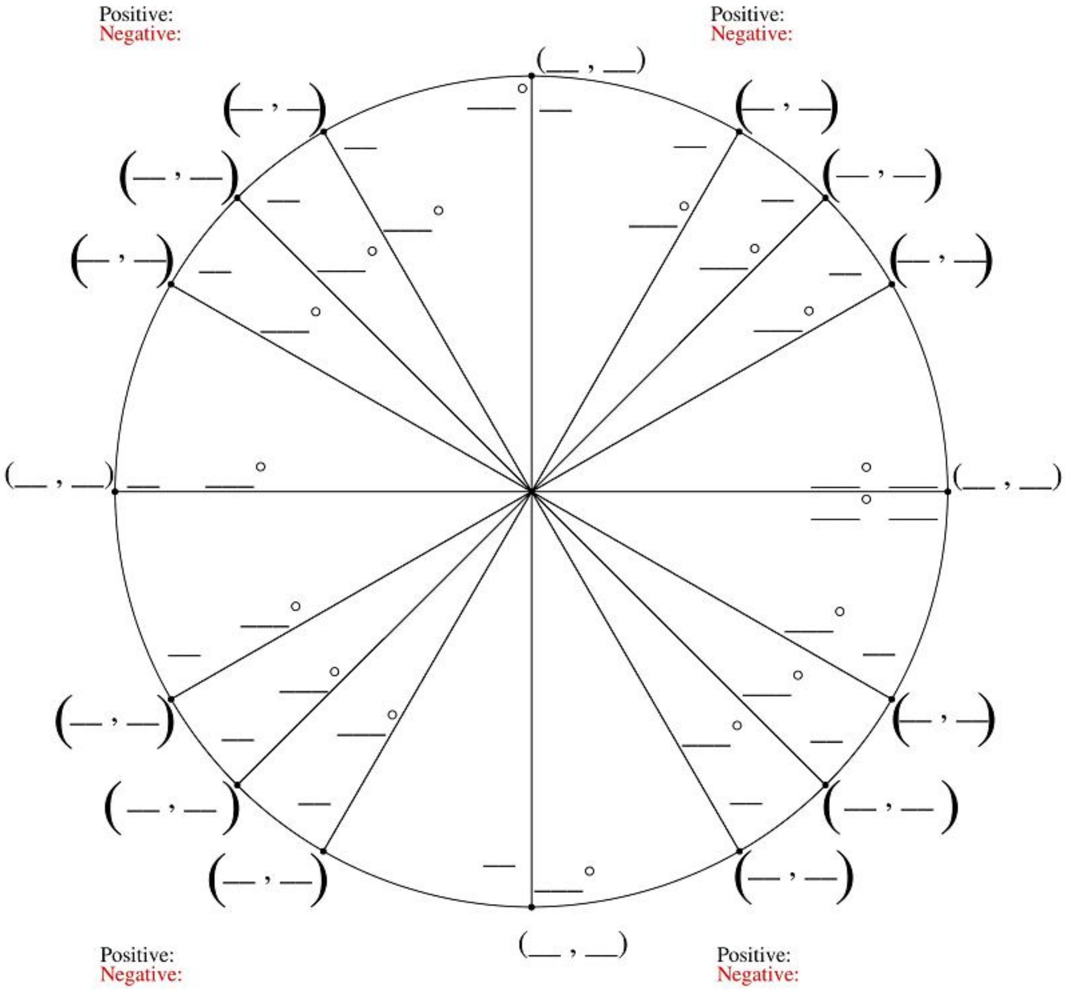


$\sin\theta = \frac{y}{r} = \frac{opp}{hyp}$	$\csc\theta = \frac{r}{y} = \frac{hyp}{opp}$
$\cos\theta = \frac{x}{r} = \frac{adj}{hyp}$	$\sec\theta = \frac{r}{x} = \frac{hyp}{adj}$
$\tan\theta = \frac{y}{x} = \frac{opp}{adj}$	$\cot\theta = \frac{x}{y} = \frac{adj}{opp}$



θ degree	θ radian	sin θ	cos θ	tan θ	cot θ	csc θ	sec θ	(x, y)
0°								
30°								
45°								
60°								
90°								
120°								
135°								
150°								
180°								
210°								
225°								
240°								
270°								
300°								
315°								
330°								
360°								

Day 8: The Unit Circle All Quadrants (HW Trig WS #8)



θ degree	θ radian	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\cot\theta$	$\csc\theta$	$\sec\theta$	(x, y)
0°								
30°								
45°								
60°								
90°								
120°								
135°								
150°								
180°								
210°								
225°								
240°								
270°								
300°								
315°								
330°								
360°								

Day 9: The Unit Circle All Quadrants (HW Trig WS #9)
Day 10: The Unit Circle All Quadrants (HW Trig WS #10)

1) $\tan \frac{5\pi}{2}$
3) $\cos -\frac{14\pi}{3}$
5) $\tan \frac{5\pi}{3}$
7) $\csc \frac{11\pi}{6}$
9) $\sin 540°$
11) $\cot 750°$
13) $\cos 210°$
15) $\sin 780°$
17) $\cos 960°$
19) $\sin 840°$
21) $\tan -660°$
23) $\cot 315°$
25) $\sec -\frac{23\pi}{6}$
27) $\cos 0$
29) $\sec -\frac{13\pi}{6}$
31) $\csc -\frac{21\pi}{4}$
33) $\tan \frac{10\pi}{3}$
35) $\tan \frac{7\pi}{3}$
37) $\cot -\frac{11\pi}{2}$
39) $\sin -1035°$
41) $\cos 135°$
43) $\sin 690°$
45) $\cot -720°$
47) $\cos 390°$
49) $\sec 945°$

#	Ratio	Coterminal side (degrees)	Reference angle	Trig function	ASTC +/- (quadrant)	Set-up (include ordered pair)	value
1	y/x	90°	Quadrant	tan	Quadrant	(0,1) $\frac{1}{0}$	undefined
3	x/r	240°	60°	cos	3rd – T - negative	$\left(-\frac{1}{2},-\frac{\sqrt{3}}{2}\right)$; $\frac{-\frac{1}{2}}{1}$	-1/2
5							
7							
9							
11							
13							
15							
17							
19							
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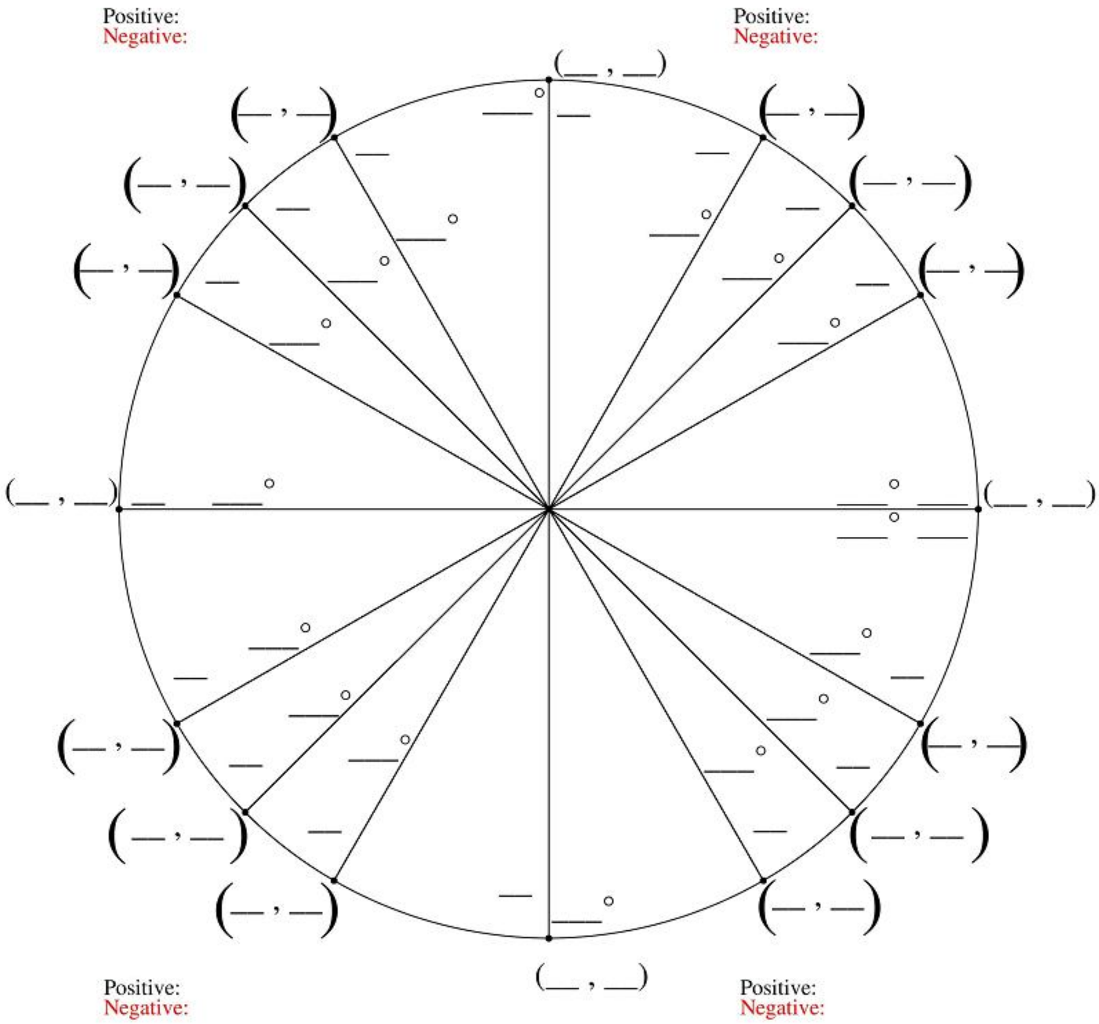
45							
47							
49							



θ degree	θ radian	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\cot\theta$	$\csc\theta$	$\sec\theta$	(x, y)
0°								
30°								
45°								
60°								
90°								
120°								
135°								
150°								
180°								
210°								
225°								
240°								
270°								
300°								
315°								
330°								
360°								

Day 11: The Unit Circle All Quadrants (HW Trig WS #11)
Day 12: Evaluating Inverse Trig Functions (HW Trig WS #12)

Evaluate the expression without using a calculator. Give your answer in both radians and degrees.

1. $\cos^{-1}(-1)$

2. $\tan^{-1}\frac{\sqrt{3}}{3}$

3. $\sin^{-1} 0$

4. $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

5. $\tan^{-1} 1$

6. $\cos^{-1} 2$

Use a calculator to evaluate the expression in both radians and degrees.

7. $\tan^{-1}(-1.7)$

8. $\cos^{-1} 0.24$

9. $\sin^{-1} 0.85$

10. $\tan^{-1}(4.1)$

11. $\sin^{-1}(-0.99)$

12. $\cos^{-1}(-0.1)$

Solve the equation for θ.

13. $\sin\theta = -0.71;\ 270° < \theta < 360°$

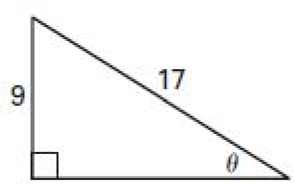
14. $\tan\theta = 1.6;\ 180° < \theta < 270°$

15. $\cos\theta = 0.22;\ 270° < \theta < 360°$

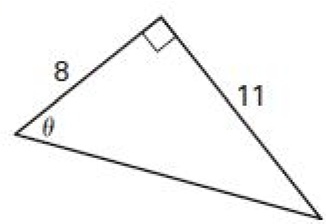
16. $\cos\theta = -0.22;\ 180° < \theta < 270°$

Find the measure of the angle θ.

17.



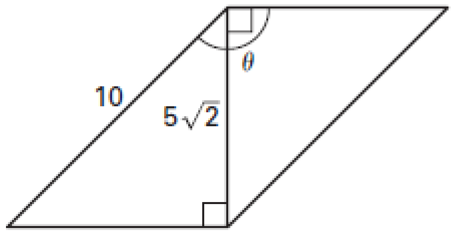
18.



Day 13: Evaluating Inverse Trig Functions (HW Trig WS #13)

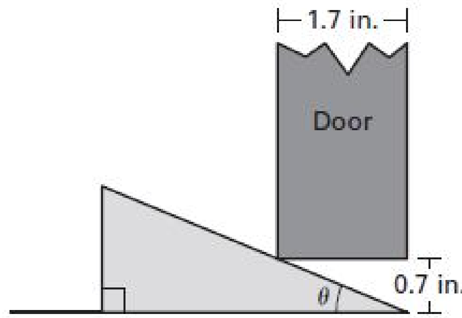
Find the measure of the angle.

A.)



B.)

Carpentry You are making a door stopper from a block of wood. When the door rests against the stopper, you want the corner of the stopper to extend through the width of the door. If the bottom of the 1.7-inch wide door is 0.7 inch off the ground, what is the angle θ of the door stopper?



C.)

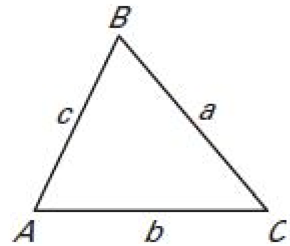
Flight A falcon perched at a height of 100 feet descends straight toward a prey that is 125 feet away. At what angle does it descend? If the falcon ascends along the same path as it descended, at what angle does it ascend?

Day 14: The Law of Sines (HW Trig WS #14)

Part 1:

LAW OF SINES

The law of sines can be written in either of the following forms for $\triangle ABC$ with sides of lengths a, b, and c.



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Example 1 ***Solve a triangle for the AAS or ASA case***

Solve $\triangle ABC$ with $A = 28°$, $B = 102°$, and $a = 8$.

Solution

First find the angle: $C = 180° - 102° - 28° = 50°$.

$\frac{b}{\sin 102°} = \frac{8}{\sin 28°}$ **Write equations.**

$b = \frac{}{}$ **Solve for each variable.**

$b \approx$ ______ **Use a calculator.**

$\frac{8}{\sin 28°} = \frac{c}{\sin 50°}$ **Write equations.**

$c = \frac{}{}$ **Solve for each variable.**

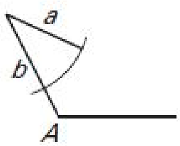
$c \approx$ ______ **Use a calculator.**

In $\triangle ABC$, $C =$ ______, $b \approx$ ______, and $c \approx$ ______.

POSSIBLE TRIANGLES IN THE SSA CASE

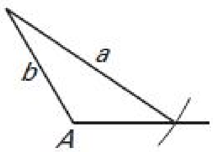
Consider a triangle in which you are given *a*, *b*, and *A*. By fixing side *b* and angle *A*, you can sketch the possible positions of side *a* to figure out how many triangles can be formed. In the diagrams below, note that $h = b \sin A$.

A is obtuse.



$a \leq b$

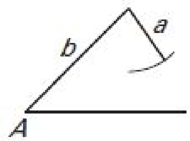
____



$a > b$

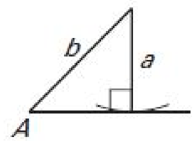
____

A is acute.



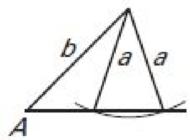
$h > a$

____



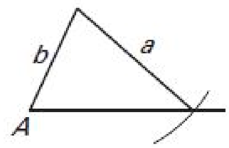
$h = a$

____



$h < a < b$

____



$a > b$

____

Example 2 ***Solve the SSA case with one solution***

Solve $\triangle ABC$ with $A = 94°$, $a = 18$, and $c = 13$.

Make a sketch. Because *A* is ________ and *a* is longer than *c*, ________________ can be formed. Use the law of sines to find *C*.

$\frac{\sin C}{13} =$ ________ **Law of sines**

$\sin C =$ ________ $\approx$ ________ **Multiply each side by ____.**

$C \approx$ ________ **Use inverse sine function.**

You then know that $B \approx$ ________________ = ________.

$\frac{b}{\sin 39.9°} =$ **Law of sines**

$b =$ ____________ **Multiply each side by sin ______.**

$b \approx$ ______ **Use a calculator.**

In $\triangle ABC$, $C \approx$ ______, $B \approx$ ______, and $b \approx$ ______.

1. $C = 14°$, $B = 117°$, $b = 21$

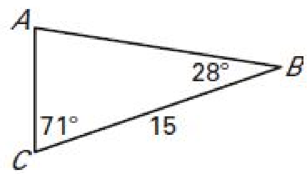
2. $A = 56°$, $a = 24$, $b = 16$

3. $B = 122°$, $b = 5$, $a = 8$

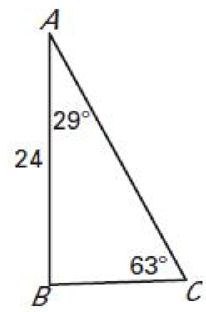
Day 15: The Law of Sines (HW Trig WS #15)

Solve $\triangle ABC$.

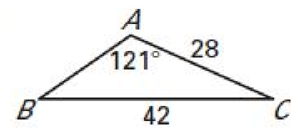
1.



2.



3.



Solve $\triangle ABC$. (*Hint:* Some of the "triangles" have no solution and some have two solutions.)

4. $A = 72°, B = 35°, c = 21$

5. $A = 95°, C = 35°, c = 18$

Solve $\triangle ABC$. (*Hint:* Some of the "triangles" have no solution and some have two solutions.)

6. $A = 105°, a = 11, b = 13$

7. $B = 10°, C = 23°, a = 15$

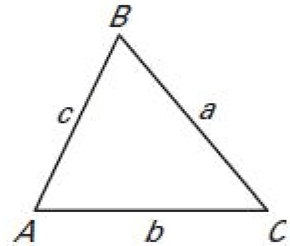
8. $A = 60°, B = 32°, b = 26$

9. $C = 49°, a = 24, c = 19$

Day 16: The Law of Cosines (HW Trig WS #16)

LAW OF SINES

The law of sines can be written in either of the following forms for $\triangle ABC$ with sides of lengths a, b, and c.



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Example 1 ***Solve a triangle for the AAS or ASA case***

Solve $\triangle ABC$ with $A = 28°$, $B = 102°$, and $a = 8$.

Solution

First find the angle: $C = 180° - 102° - 28° = 50°$.

$\frac{b}{\sin 102°} = \frac{8}{\sin 28°}$ **Write equations.**

$b = \frac{}{}$ **Solve for each variable.**

$b \approx$ ______ **Use a calculator.**

$\frac{8}{\sin 28°} = \frac{c}{\sin 50°}$ **Write equations.**

$c = \frac{}{}$ **Solve for each variable.**

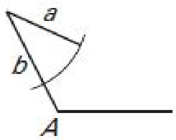
$c \approx$ ______ **Use a calculator.**

In $\triangle ABC$, $C =$ _____, $b \approx$ ______, and $c \approx$ ______.

POSSIBLE TRIANGLES IN THE SSA CASE

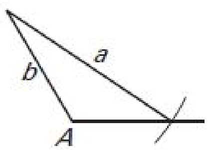
Consider a triangle in which you are given a, b, and A. By fixing side b and angle A, you can sketch the possible positions of side a to figure out how many triangles can be formed. In the diagrams below, note that $h = b \sin A$.

A is obtuse.



$a \le b$

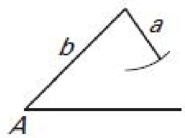
____



$a > b$

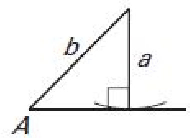
____

A is acute.



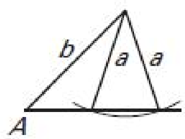
$h > a$

____



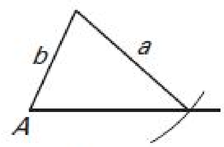
$h = a$

____



$h < a < b$

____



$a > b$

____

Example 2 ***Solve the SSA case with one solution***

Solve $\triangle ABC$ with $A = 94°$, $a = 18$, and $c = 13$.

Make a sketch. Because A is ________ and a is longer than c, ______________ can be formed. Use the law of sines to find C.

$\frac{\sin C}{13} = \frac{}{\_\_\_\_\_\_}$ **Law of sines**

$\sin C = \frac{}{\_\_\_\_\_\_} \approx$ ________ **Multiply each side by ____.**

$C \approx$ ______ **Use inverse sine function.**

You then know that $B \approx$ ______________ = ______.

$\frac{b}{\sin 39.9°} =$ **Law of sines**

$b = \frac{}{\_\_\_\_\_\_}$ **Multiply each side by sin ______.**

$b \approx$ ______ **Use a calculator.**

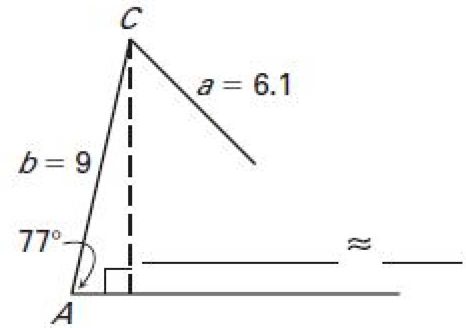
In $\triangle ABC$, $C \approx$ ______, $B \approx$ ______, and $b \approx$ ______.

Day 17: The Law of Cosines (HW Trig WS #17)

Example 3 ***Examine the SSA case with no solution***

Solve $\triangle ABC$ with $A = 77°$, $a = 6.1$, and $b = 9$.

Solution



Begin by drawing a horizontal line. On one end form a 77° angle (A) and draw a segment ___ units long ($\overline{AC}$ or b). At vertex C, draw a segment _____ units long (a). You can see that ___ needs to be at least __________ ≈ _____ units long to reach the horizontal side and form a triangle. So, it is _____________ to draw the indicated triangle.

Checkpoint Solve $\triangle ABC$.

1. $C = 14°$, $B = 117°$, $b = 21$

2. $A = 56°$, $a = 24$, $b = 16$

3. $B = 122°$, $b = 5$, $a = 8$

Example 4 ***Solve the SSA case with two solutions***

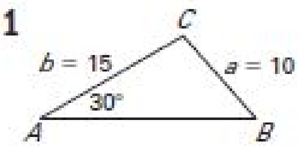
Solve $\triangle ABC$ with $A = 30°$, $a = 10$, and $b = 15$.

Solution

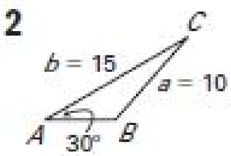
First make a sketch. Because

$b \sin A =$ __________ $=$ _____, and $7.5 < 10 < 15$ $(h < a < b)$, two triangles can be formed.

Triangle 1



Triangle 2



Use the law of sines to find the possible measures of B.

$\frac{\sin B}{15} = \frac{\quad}{\_\_\_\_\_\_}$ **Law of sines**

$\sin B = \frac{\quad}{\_\_\_\_\_\_\_\_} =$ ______ **Evaluate.**

There are two angles B between 0° and 180° for which $\sin B =$ ______. One is acute and the other is obtuse. Use your calculator to find the acute angle: $\sin^{-1} 0.75 \approx$ ______.

The obtuse angle has ______ as a reference angle, so its measure is __________ $=$ _______. Therefore, $B \approx$ _______ or $B \approx$ _______.

Now find the remaining angle C and side length c for each triangle.

Triangle 1

$C \approx$ ________________

$=$ ________

$\frac{c}{\sin 101.4°} = \frac{\quad}{\_\_\_\_\_\_\_\_}$

$c = \frac{\quad}{\_\_\_\_\_\_\_\_\_\_}$

$\approx$ ______

In Triangle 1, $B \approx$ _______, $C \approx$ _______, and $c \approx$ ______.

Triangle 2

$C \approx$ ________________

$=$ ______

$\frac{c}{\sin 18.6°} = \frac{\quad}{\_\_\_\_\_\_\_\_}$

$c = \frac{\quad}{\_\_\_\_\_\_\_\_\_\_}$

$\approx$ _____

In Triangle 2, $B \approx$ _______, $C \approx$ _______, and $c \approx$ _____.

Day 18: Graphing Sine, Cosine, and Tangent Functions (HW Trig WS #18)

CHARACTERISTICS OF $y = \sin x$ AND $y = \cos x$

1. The domain of each function is _________________.
2. The ________ of each function is $-1 \le y \le 1$. Therefore, the minimum value of each function is $m = -1$ and the maximum value is $M = 1$.
3. The ____________ of each function's graph is half the difference of the maximum M and the minimum m, or $\frac{1}{2}(M - m) = \frac{1}{2}[1 - (-1)] = 1$.
4. Each function is periodic, which means that its graph has a ____________ pattern, called a cycle. The horizontal length of each cycle is called the _________.
5. The x-intercepts of $y =$ _______ occur when $x = 0, \pm\pi, \pm 2\pi, \pm 3\pi, \ldots$.
6. The x-intercepts of $y =$ _______ occur when $x = \pm\frac{\pi}{2}, \pm\frac{3\pi}{2}, \pm\frac{5\pi}{2}, \pm\frac{7\pi}{2}, \ldots$.

AMPLITUDE AND PERIOD

The amplitude and period of the graphs of $y = a \sin bx$ and $y = a \cos bx$, where a and b are nonzero real numbers, are:

_____________ $= |a|$ _________ $= \frac{2\pi}{|b|}$

Notice how changes in a and b affect the graphs of $y = a \sin bx$ and $y = a \cos bx$. When the value of a increases, the amplitude increases. When the value of b increases, the period decreases.

Example 1 ***Graph sine and cosine functions***

Graph (a) $y = 2 \sin x$ and (b) $y = \frac{3}{2} \cos \pi x$.

Solution

a. The amplitude is $a =$ ___ and the period is

$\frac{2\pi}{b} = \frac{}{} =$ ___.

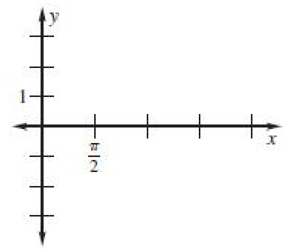
Intercepts: $(0, 0)$; $\left(\frac{1}{2} \cdot 2\pi, 0\right) =$ ______; $(2\pi, 0)$

Maximum:

$\left(\frac{1}{4} \cdot 2\pi, 2\right) =$ ______

Minimum:

$\left(\frac{3}{4} \cdot 2\pi, -2\right) =$ ______



b. The amplitude is $a =$ ___ and the period is

$\frac{2\pi}{b} = \frac{}{} =$ ___.

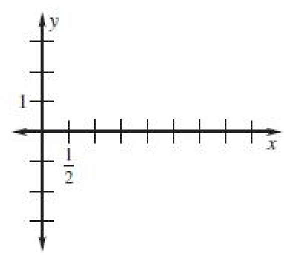
Intercepts: $\left(\frac{1}{4} \cdot 2, 0\right) =$ ______; $\left(\frac{3}{4} \cdot 2, 0\right) =$ ______

Maximums:

$(0,$ ___ $)$; $(2,$ ___ $)$

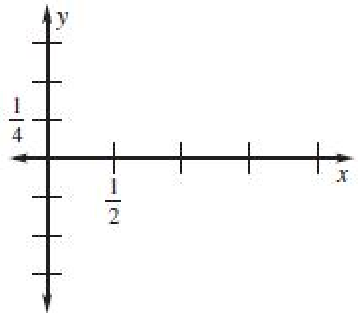
Minimum:

$\left(\frac{1}{2} \cdot 2,\ \_\_\_\right) = \left(\ \_\_\_\ \right)$

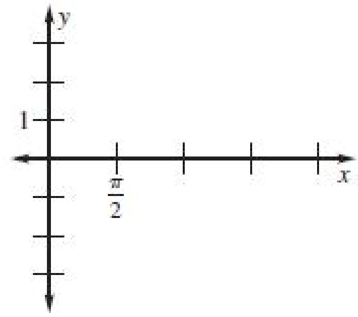


Checkpoint Graph the function.

1. $y = \frac{1}{4} \sin 2\pi x$



2. $y = 3 \cos x$



Example 2 ***Model with a sine function***

Write a sine function with an amplitude of 3 and a frequency of 1000.

Solution

Find the values of a and b in the equation $y = a \sin bx$.

The amplitude is 3, so $a = 3$. Use the frequency to find b. The frequency is the reciprocal of the period.

$1000 = \frac{b}{2\pi}$

So, $b =$ ________.

The equation is ____________________.

Checkpoint **Write a sine function with the given amplitude and frequency.**

3. amplitude = 4 frequency = 1500	**4.** amplitude = 1.5 frequency = 500

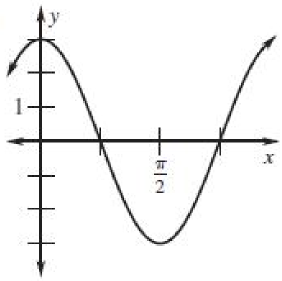
Match the function with its graph.

1. $y = 3\sin 2x$

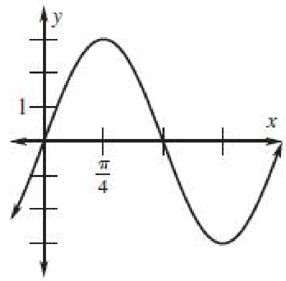
2. $y = 3\sin \frac{1}{2}x$

3. $y = 3\cos 2x$

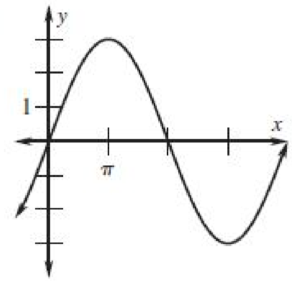
A.



B.



C.



Day 20: Graphing Sine, Cosine, and Tangent Functions (HW Trig WS #20)

CHARACTERISTICS OF $y = a \tan bx$

The period and vertical asymptotes of the graph of $y = a \tan bx$, where a and b are nonzero real numbers, are:

The period is $\frac{\pi}{|b|}$.

The vertical asymptotes are at odd multiples of $\frac{\pi}{2|b|}$.

Example 3 ***Graph a tangent function***

Graph one period of the function $y = 2\tan x$.

Odd multiples of $\frac{\pi}{2}$ are values such as these:

$\pm 1 \cdot \frac{\pi}{2} = \pm\frac{\pi}{2}$

$\pm 3 \cdot \frac{\pi}{2} = \pm\frac{3\pi}{2}$

$\pm 5 \cdot \frac{\pi}{2} = \pm\frac{5\pi}{2}$

Solution

The period is $\frac{\pi}{b}$ = ____ = ____.

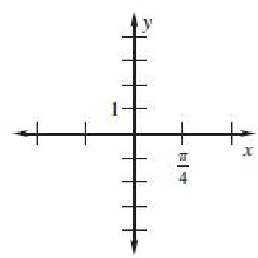
Intercept: ________

Asymptotes: $x = \frac{\pi}{2b}$ = ______ = ____

$x = -\frac{\pi}{2b}$ = ________ = ______

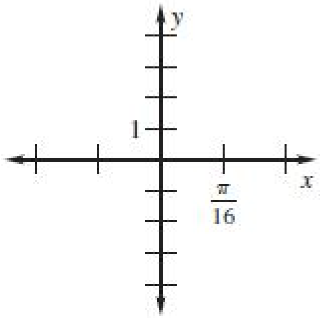
Halfway points: $\left(\frac{\pi}{4b}, a\right)$ = __________ = ________

$\left(-\frac{\pi}{4b}, -a\right)$ = ______________ = ___________



Checkpoint Graph the function.

5. $y = \tan 4x$



6. $y = \tan \pi x$