MS 113 In-class Problems

October 14, 2024

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Chapter 5 Section 1

360 is divisible by many numbers:

$$1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24,$$

$$30, 36, 40, 45, 60, 72, 90, 120, 180, 360$$

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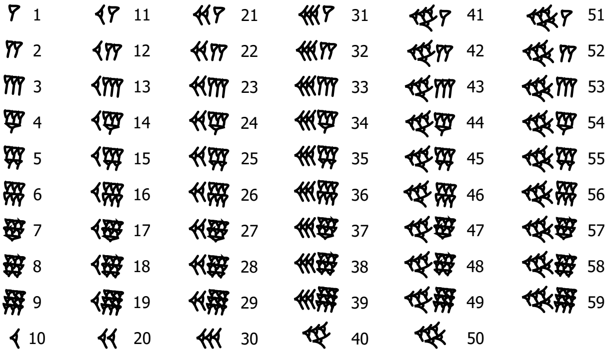

DMS

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So

$$\begin{aligned} 1^{\circ} &\equiv 60' \\ 1' &\equiv 60'' \\ 1^{\circ} &\equiv 3600'' \end{aligned}$$

Minute $<$ **Middle French** *minute* $<$ **post-classical Latin** *minuta* or *minutum*.

Second $<$ **French** *seconde* $<$ **medieval Latin** *secunda*.

"St Augustine refers to *minuta* and to *minutae minutarum* 'minutes of minutes', i.e. seconds ... as terms in use by *mathematici*."

"... used elliptically for *secunda minuta*, lit. 'second minute', i.e. the result of the second operation of sexagesimal division; the result of the first such operation (now called 'minute' simply) being the 'first' or 'prime minute' or 'prime"'

Oxford English Dictionary, s.v. "minute (n.1)," March 2024, https://doi.org/10.1093/OED/1094508711.
Oxford English Dictionary, s.v. "second (n.1)," December 2023, https://doi.org/10.1093/OED/7821975804.

Convert 6 ft to inches.

Convert 3 min to seconds.

Convert $3\,\frac{\text{ft}}{\text{min}}$ to $\frac{\text{in}}{\text{s}}$.

Convert 2° to minutes.

Convert $3'$ to seconds.

Etymology of angle adjectives

right
: Seems to be influenced from classical Latin *rect* meaning to be 90°.

acute
: From Latin *acūtus* meaning sharp.

obtuse
: From classical Latin *obtūsus* meaning blunt, dull, stupid. So most likely dull in comparison with acute's meaning of sharp.

reflex
: Not sure, but one meaning of classical Latin *reflexus* is curved back. So maybe this?

Gradian

$$1 \ \ \mathsf{grad} \equiv \frac{1}{400} \ \ \mathsf{rev}$$

Gradian

$$1 \quad \text{grad} \equiv \frac{1}{400} \quad \text{rev}$$

So

$$400 \ \text{grad} \equiv 1 \quad \text{rev} \equiv 360^\circ$$

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Therefore a right angle:

$$90^\circ \equiv 100 \ \text{grad}$$

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It's the original proposed unit of measure for angles in the metric system (which became SI), but was replaced with radians. (The metric system was proposed during the French revolution.)

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Mostly used in surveying and lasers in USA.

Find the gradian measure of the angle with the given degree measure.

$$135^\circ$$

Find the gradian measure of the angle with the given degree measure.

$$180^\circ$$

Find the degree measure of the angle with the given gradian measure.

$$300 \text{ grad}$$

Find the degree measure of the angle with the given gradian measure.

$$50 \text{ grad}$$

Dimensional Analysis - a little bit

Suppose you have a rectangle with length $l = 2$ in and width $w = 5$ in.

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Can the following be the formula for the area of the rectangle?

$$A = w$$

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$$A = w$$

Why not?

Dimensional Analysis - a little bit

Suppose you have a rectangle with length $l = 2$ in and width $w = 5$ in.

Can the following be the formula for the area of the rectangle?

$$A = w$$

Why not?

What about

$$A = lwh?$$

Why or why not?

Find the radian measure of the angle with the given degree measure.

$$45^\circ$$

Find the radian measure of the angle with the given degree measure.

$$-30^\circ$$

Find the radian measure of the angle with the given degree measure.

$$60^\circ$$

Find the radian measure of the angle with the given degree measure.

$$90^\circ$$

Find the radian measure of the angle with the given degree measure.

$$180^\circ$$

Find the radian measure of the angle with the given degree measure.

$$270^\circ$$

Find the radian measure of the angle with the given degree measure.

$$360^\circ$$

Find the degree measure of the angle with the given radian measure.

$$\frac{7\pi}{4}$$

Find the degree measure of the angle with the given radian measure.

$$\frac{5\pi}{6}$$

Find the degree measure of the angle with the given radian measure.

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

Find the degree measure of the angle with the given radian measure. (Round your answer to one decimal place.)

$$6$$

Find the degree measure of the angle with the given radian measure. (Round your answer to one decimal place.)

$$1$$

Find the degree measure of the angle with the given radian measure. (Round your answer to one decimal place.)

$$-2.3$$

Danger

When writing an angle if you do not write the degree symbol it is interpreted as a radian!

So 2 is 2 rad and 2° is 2 deg.

Error correcting frame.

Starting at $\dfrac{\pi}{2}$ count to 2π beyond it by $\dfrac{\pi}{2}$ths.

Starting at $\frac{\pi}{3}$ count to 2π beyond it by $\frac{\pi}{2}$ths.

Starting at $\frac{\pi}{6}$ count to 2π beyond it by $\frac{\pi}{6}$ths.

The measure of an angle in standard position is given. Find two positive angles and two negative angles that are coterminal with the given angle.

$$45^\circ$$

The measure of an angle in standard position is given. Find two positive angles and two negative angles that are coterminal with the given angle.

$$-30^\circ$$

The measure of an angle in standard position is given. Find two positive angles and two negative angles that are coterminal with the given angle.

$$400^\circ$$

The measure of an angle in standard position is given. Find two positive angles and two negative angles that are coterminal with the given angle.

$$\frac{3\pi}{4}$$

The measure of an angle in standard position is given. Find two positive angles and two negative angles that are coterminal with the given angle.

$$5$$

The measures of two angles in standard position are given. Determine whether the angles are coterminal.

$$70^\circ, 430^\circ$$

The measures of two angles in standard position are given. Determine whether the angles are coterminal.

$$\frac{5\pi}{6}, \frac{19\pi}{6}$$

Find an angle between 0° and 360° that is coterminal with the given angle.

$$-1190^\circ$$

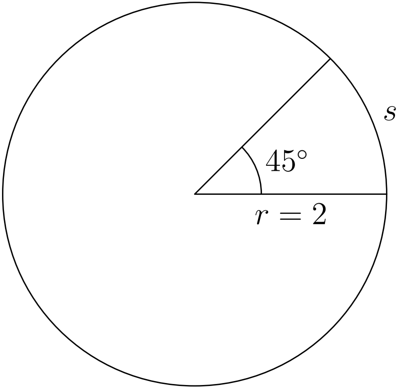
Find an angle between 0 and 2π that is coterminal with the given angle.

$$\frac{21\pi}{4}$$

Find an angle between 0 and 2π that is coterminal with the given angle.

$$7$$

Find the length s of the circular arc.



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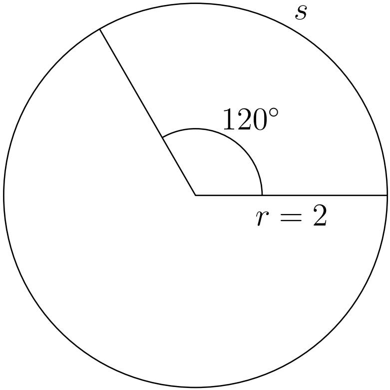

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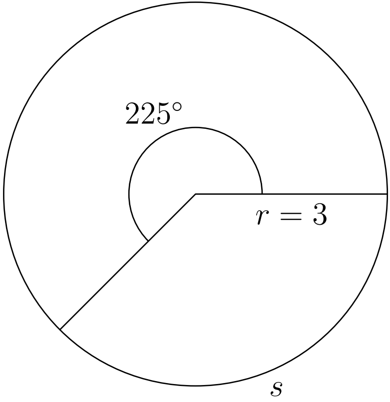

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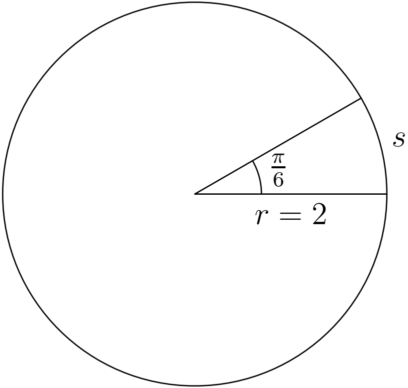
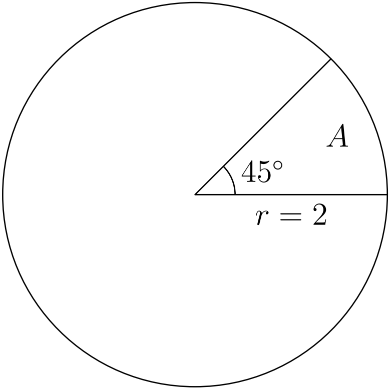


Find the area A of the sector.



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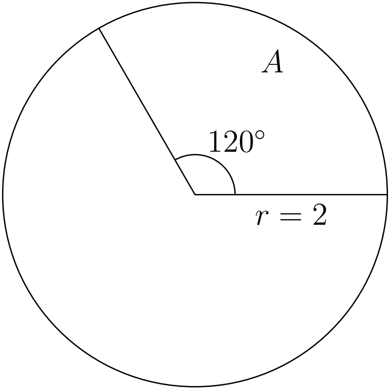
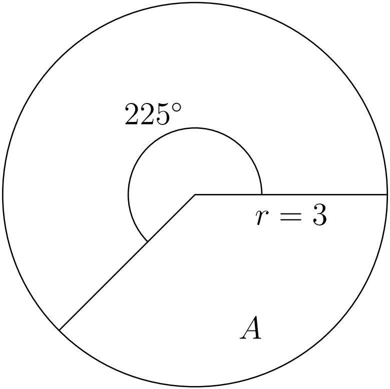


Find the area A of the sector.



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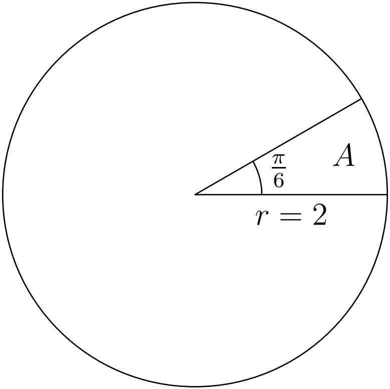
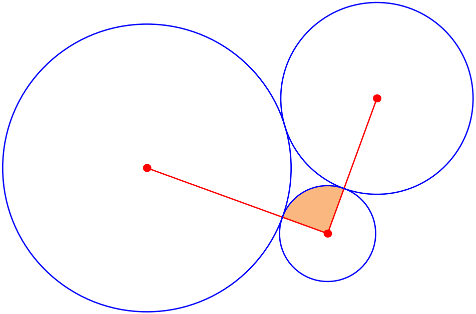


- If the central angle is $\theta = \dfrac{\pi}{2}$ and the arc length is $s = 3$, find the radius r.

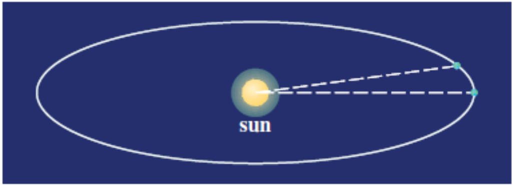
- If the radius is $r = 5$ and the arc length is $s = 10$, find the central angle θ.

- If the central angle is $\theta = \pi$ and the sector area is $A = 6\pi$, find the radius r.

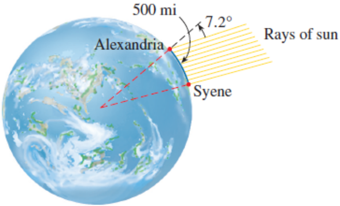
5.1.071 Three circles with radii 1, 2, and 3 ft are externally tangent to one another, as shown in the figure. Find the area of the sector of the circle of radius 1 that is cut off by the line segments joining the center of that circle to the centers of the other two circles.



5.1.079 Find the distance that the earth travels in two days in its path around the sun. Assume that a year has 365 days and that the path of the earth around the sun is a circle of radius 93 million miles.



5.1.080 The Greek mathematician Eratosthenes (ca. 276–195 B.C.) measured the circumference of the earth from the following observations. He noticed that on a certain day the sun shone directly down a deep well in Syene (modern Aswan). At the same time in Alexandria, 500 mi north (on the same meridian), the rays of the sun shone at an angle of 7.2° to the zenith.



1. Find the radius of the earth. (Round to nearest ten miles.)
2. Find the circumference of the earth.

Chapter 5 Section 2

Definition 1 (Trigonometry)

[from: modern Latin (1595) $<$ Greek (triangle) $+$ (-metry)]

You are doing trigonometry if

1. you can find a standard quantitative measure of the inclination of one line to another.
2. you have a capacity for calculating the lengths of line segments.

from THE MATHEMATICS OF THE HEAVENS AND THE EARTH, Glen van Brummelen

What is the equation for a circle centered at the origin (h, k) and a radius of r?

What is the equation for a circle centered at the origin (h, k) and a radius of r?

Given a circle with center $C(0, 0)$ and radius $r = 5$:
What is the equation?

What is the equation for a circle centered at the origin (h, k) and a radius of r?

Given a circle with center $C(0, 0)$ and radius $r = 5$:
What is the equation?

$$x^2 + y^2 = 25$$

What is the equation for a circle centered at the origin (h, k) and a radius of r?

Given a circle with center $C(0, 0)$ and radius $r = 5$:
What is the equation?

$$x^2 + y^2 = 25$$

Is the point $(3, 4)$ on the circle?

What is the equation for a circle centered at the origin (h, k) and a radius of r?

Given a circle with center $C(0, 0)$ and radius $r = 5$:
What is the equation?

$$x^2 + y^2 = 25$$

Is the point $(3, 4)$ on the circle?

Given a circle with center $C(0, 0)$ and radius $r = 13$:

$$x^2 + y^2 = 169$$

If $y = 12$, find x.

Things you should know

- Pythagorean theorem

Things you should know

- Pythagorean theorem
- Similar triangles

Things you should know

- Pythagorean theorem
- Similar triangles
- Sum of the interior angles of a triangle

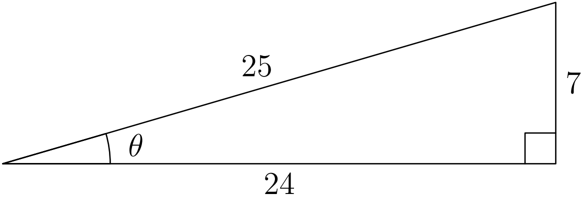
Things you should know

- Pythagorean theorem
- Similar triangles
- Sum of the interior angles of a triangle
- Leg length/angle size correspondence

-fixes and stems

trigonometry	triangle + -metry (measure)
isosceles	iso- (same) + sceles (leg)
equilateral	equi- (equal) + lateral (side)

5.2.004 Find the exact values of the six trigonometric ratios of the angle θ in the triangle.



a) $\sin\theta =$

b) $\cos\theta =$

c) $\tan\theta =$

d) $\csc\theta =$

e) $\sec\theta =$

f) $\cot\theta =$

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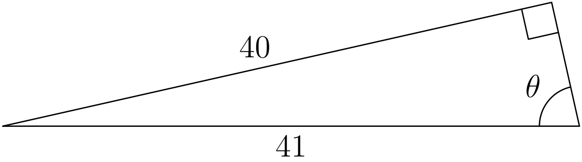

a) $\sin\theta =$

b) $\cos\theta =$

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d) $\csc\theta =$

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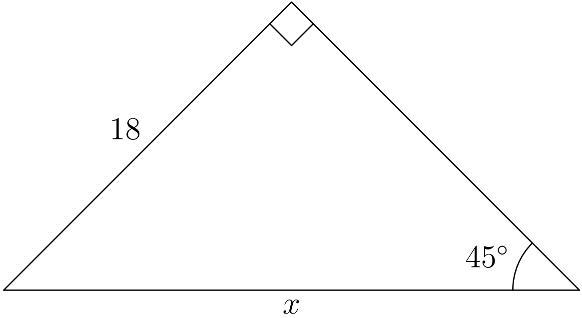
f) $\cot\theta =$

5.2.016 Find the side labeled x.



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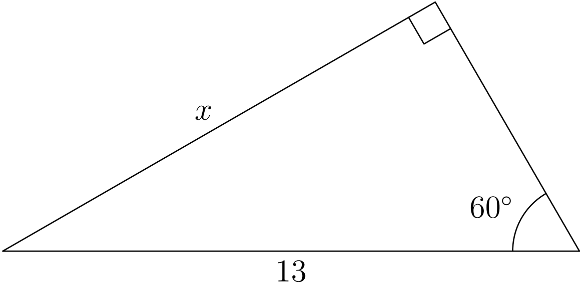
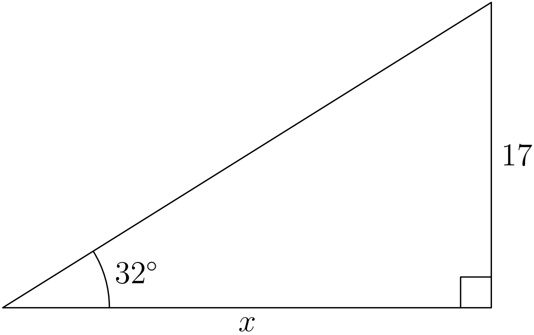
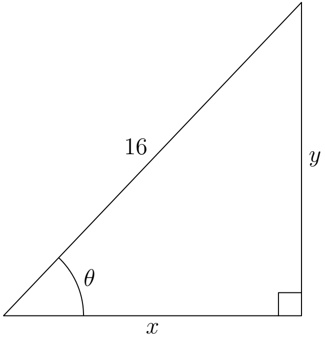


5.2.019 Find the side labeled x. State your answer rounded to 5 decimal places.



5.2.021 Express x and y in terms of trigonometric ratios of θ.
(Express your answer in terms of θ only.)



5.2.023 Sketch a triangle that has acute angle θ.

$$\tan(\theta) = \frac{4}{7}$$

Then find

a) $\sin\theta =$

b) $\cos\theta =$

5.2.026 Sketch a triangle that has acute angle θ.

$$\tan(\theta) = \sqrt{3}$$

Then find

a) $\sin\theta =$

b) $\cos\theta =$

5.2.029 Evaluate the expression without using a calculator.

$$\sin\left(\frac{\pi}{3}\right) + \cos\left(\frac{\pi}{3}\right)$$

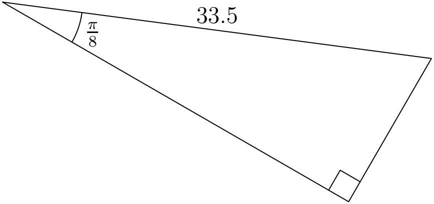
5.2.032 Evaluate the expression without using a calculator.

$$(\sin(30^\circ))^2 + (\cos(30^\circ))^2$$

5.2.035 Evaluate the expression without using a calculator.

$$\left(\cos\left(\frac{\pi}{4}\right)+\sin\left(\frac{\pi}{6}\right)\right)^2$$

5.2.041 Solve the right triangle.

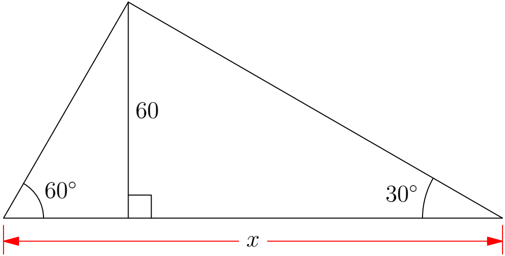


1. Find the length of the side opposite to the given angle. (Round your answer to two decimal places.)

2. Find the length of the side adjacent to the given angle. (Round your answer to two decimal places.)

3. Find the other acute angle.

5.2.047 Find x rounded to one decimal place.



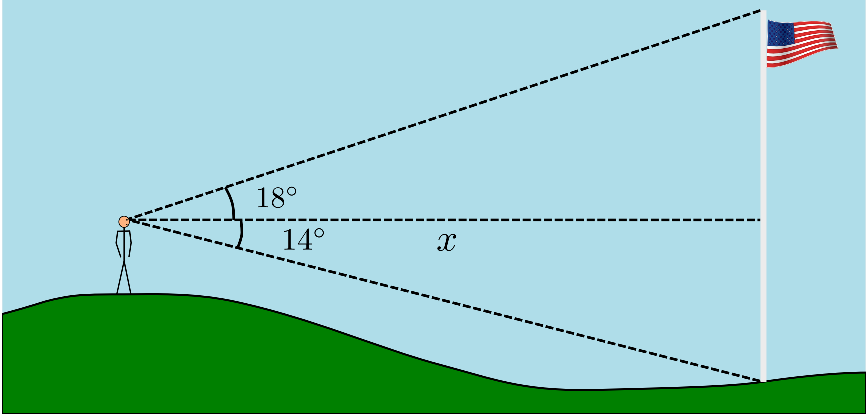

YO DAWG I HEARD YOU LOVE TRIANGLES
SO WE PUT A TRIANGLE IN YOUR TRIANGLE SO YOU CAN LOVE TRIANGLES WHILE YOU LOVE TRIANGLES
quickmeme.com

5.2.053 The angle of elevation to the top of a very tall Building is found to be 7° from the ground at a distance of 1 mi from the base of the building. Using this information, find the height of the building. (Round your answer to the nearest foot.)

5.2.056 From the top of a 170 ft lighthouse, the angle of depression to a ship in the ocean is 27°. How far is the ship from the base of the lighthouse? (Round your answer to the nearest foot.)

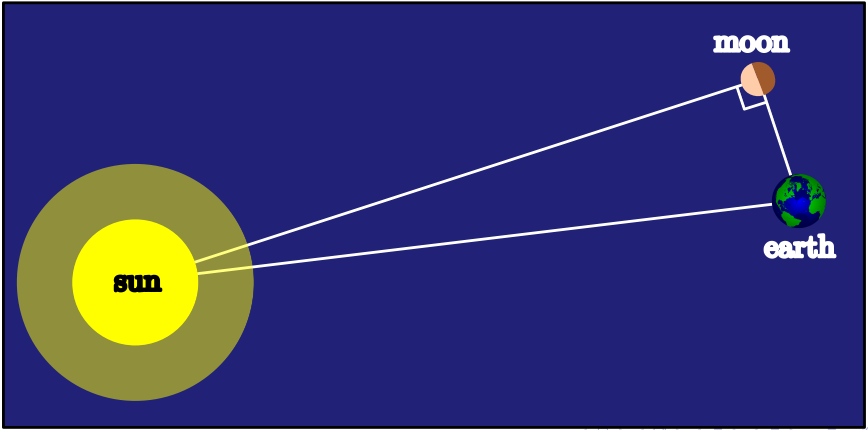
5.2.058 A 450 ft guy wire is attached to the top of a communications tower. If the wire makes an angle of 70° with the ground, how tall is the communications tower? (Round your answer to the nearest foot.)

5.2.060 A woman standing on a hill sees a flagpole that she knows is 35 ft tall. The angle of depression to the bottom of the pole is $14°$, and the angle of elevation to the top of the pole is $18°$. Find her distance x from the pole. (Round your answer to one decimal place.)



5.2.062 An airplane is flying at an elevation of 5150 ft, directly above a straight highway. Two motorists are driving cars on the highway on opposite sides of the plane. The angle of depression to one car is 32°, and that to the other is 57°. How far apart are the cars? (Round your answer to the nearest foot.)

5.2.067 When the moon is exactly half full, the earth, moon, and sun form a right angle (see the figure). At that time the angle formed by the sun, earth, and moon (using the earth as its vertex) is measured to be 89.85°. If the distance from the earth to the moon is $240,000$ mi, estimate the distance from the earth to the sun. (Round your answer to one decimal place.)



Chapter 5 Section 3

5.3.039 Find the quadrant in which θ lies from the information given.

$$\sec(\theta) > 0 \text{ and } \tan(\theta) < 0$$

5.3.047 Find the values of the trigonometric functions of θ from the information given.

$$\sin\theta = -\frac{15}{17}, \quad \theta \text{ in Quadrant IV}$$

1. $\cos\theta =$
2. $\tan\theta =$
3. $\csc\theta =$
4. $\sec\theta =$
5. $\cot\theta =$

5.3.052 Find the values of the trigonometric functions of θ from the information given.

$$\cot\theta = \frac{1}{2}, \quad \sin\theta < 0$$

1. $\sin\theta =$
2. $\cos\theta =$
3. $\tan\theta =$
4. $\csc\theta =$
5. $\sec\theta =$

5.3.005 Find the reference angle for the given angle.

1. $100^\circ =$

2. $220^\circ =$

3. $280^\circ =$

5.3.007 Find the reference angle for the given angle.

1. $215^\circ =$

2. $460^\circ =$

3. $-95^\circ =$

5.3.009 Find the reference angle for the given angle.

1. $\dfrac{7\pi}{10} =$

2. $\dfrac{11\pi}{8} =$

3. $\dfrac{10\pi}{3} =$

5.3.014 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

1. $\sin 240^\circ =$

2. $\cos 240^\circ =$

3. $\tan 240^\circ =$

5.3.026 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

$$\cos\frac{4\pi}{3} =$$

5.3.029 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

$$\csc\left(-\frac{\pi}{6}\right) =$$

5.3.023 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

1. $\tan 840° =$

2. $\sin 840° =$

3. $\cos 840° =$

5.3.031 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

$$\sec\left(\frac{17\pi}{4}\right) =$$

1. $\sin\left(\frac{17\pi}{4}\right) =$

2. $\cos\left(\frac{17\pi}{4}\right) =$

3. $\tan\left(\frac{17\pi}{4}\right) =$

5.3.055 If $\theta = \dfrac{\pi}{3}$, find the value of each expression.

1. $\sin(2\theta) =$

2. $2\sin(\theta) =$

5.3.056 If $\theta = \dfrac{\pi}{3}$, find the value of each expression.

1. $\sin^2(\theta) =$

2. $\sin(\theta^2) =$

Chapter 6 Section 1

6.1.001

1. The unit circle is the circle centered at what point and with what radius?

2. The equation of the unit circle is?

3. Suppose the point $P(x, y)$ is on the unit circle. Find the missing coordinate.
   3.1 $P(1, \_\_)$
   3.2 $P(\_\_, 1)$
   3.3 $P(-1, \_\_)$
   3.4 $P(\_\_, -1)$

6.1.002

1. If we mark off a distance t along the unit circle, starting at $(1, 0)$ and moving in a counterclockwise direction, we arrive at the *reference, quadrant, terminal* point determined by t.

2. What are the terminal points determined by $\frac{\pi}{2}, \pi, \frac{-\pi}{2}, 2\pi$?

$$\frac{\pi}{2}\text{:}\quad (x, y) = (\_\_, \_\_)$$

$$\pi\text{:}\quad (x, y) = (\_\_, \_\_)$$

$$-\frac{\pi}{2}\text{:}\quad (x, y) = (\_\_, \_\_)$$

$$\pi\text{:}\quad (x, y) = (\_\_, \_\_)$$

6.1.004 Show that the point is on the unit circle.

$$\left(-\frac{7}{25}, -\frac{24}{25}\right)$$

6.1.010 Find the missing coordinate of P, using the fact that P lies on the unit circle in the given quadrant.

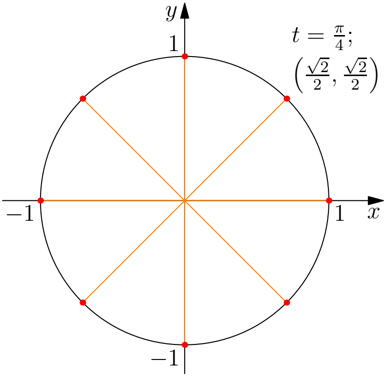
Coordinates	Quadrant
$P\left(\_\_\_\_, -\frac{15}{17}\right)$	IV

6.1.016 The point P is on the unit circle. Find $P(x, y)$ from the given information.

The y-coordinate of P is $-\dfrac{3}{5}$, and the x-coordinate is positive.

$$P(x, y) = \left(\underline{\qquad}, \underline{\qquad} \right)$$

6.1.021



t	Terminal Point
0	$\left(\_\_\_\_, \_\_\_\_\right)$
$\frac{\pi}{4}$	$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
	$\left(\_\_\_\_, \_\_\_\_\right)$
	$\left(\_\_\_\_, \_\_\_\_\right)$
	$\left(\_\_\_\_, \_\_\_\_\right)$
$\vdots$	$\vdots$
2π	$\left(\_\_\_\_, \_\_\_\_\right)$

6.1.024 Find the terminal point $P(x, y)$ on the unit circle determined by the given value of t.

$$t = -3\pi$$

$$P(x, y) = \left(\underline{\hspace{2em}}, \underline{\hspace{2em}}\right)$$

6.1.028 Find the terminal point $P(x, y)$ on the unit circle determined by the given value of t.

$$t = \frac{5\pi}{6}$$

$$P(x, y) = \left(\_\_\_\_, \_\_\_\_\right)$$

6.1.033 Find the terminal point $P(x, y)$ on the unit circle determined by the given value of t.

$$t = -\frac{5\pi}{4}$$

$$P(x, y) = \left(\underline{\hspace{2cm}}, \underline{\hspace{2cm}}\right)$$

Chapter 5 Section 3 Part Deux and Chapter 6 Section 2

5.3.003

1. If θ is in standard position, then the reference angle $\overline{\theta}$ is the acute angle formed by the terminal side of θ and the $\underline{x\text{-axis, } y\text{-axis}}$. So the reference angle for $\theta = 100^\circ$ is $\overline{\theta} = \_\_\_\_\_\_\_^\circ$, and that for $\theta = 210^\circ$ is $\overline{\theta} = \_\_\_\_\_\_\_^\circ$.

2. If θ is any angle, the value of a trigonometric function of θ is the same, except possibly for sign, as the value of the trigonometric function of $\overline{\theta}$. So $\sin(100^\circ) = \sin(\_\_\_\_\_\_\_^\circ)$, and $\sin(210^\circ) = -\sin(\_\_\_\_\_\_\_^\circ)$.

5.3.025 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

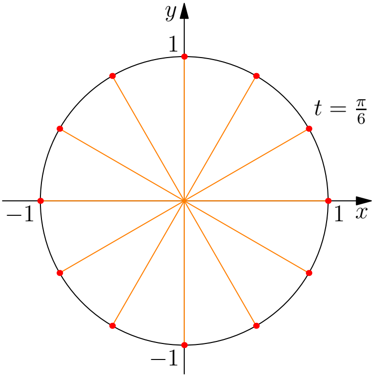
$$\sin\left(\frac{3\pi}{2}\right)$$

5.3.035 Find the exact value of the trigonometric function. (If an answer is undefined, enter UNDEFINED.)

$$\tan\left(\frac{5\pi}{2}\right)$$

6.2.004 Find $\sin(t)$ and $\cos(t)$ for the values of t whose terminal points are shown on the unit circle in the figure. t increases in increments of $\frac{\pi}{6}$.

t	$\sin(t)$	$\cos(t)$
0		
$\frac{\pi}{6}$		
$\frac{\pi}{3}$		
$\frac{\pi}{2}$		
$\frac{2\pi}{3}$		
$\frac{5\pi}{6}$		
$\vdots$	$\vdots$	$\vdots$
2π		



6.2.006 Find the exact value of the trigonometric function at the given **real number**.

1. $\sin\left(\frac{5\pi}{3}\right) =$

2. $\cos\left(\frac{11\pi}{3}\right) =$

3. $\tan\left(\frac{5\pi}{3}\right) =$

6.2.023 Find the value of each of the six trigonometric functions (if it is defined) at the given real number t. Use your answers to complete the table. (If an answer is undefined, enter UNDEFINED.)

$$t = 0$$

t	$\sin t$	$\cos t$	$\tan t$	$\csc t$	$\sec t$	$\cot t$
0						

6.2.028 The terminal point $P(x, y)$ determined by a real number t is given. Find $\sin(t)$, $\cos(t)$, and $\tan(t)$.

$$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$$

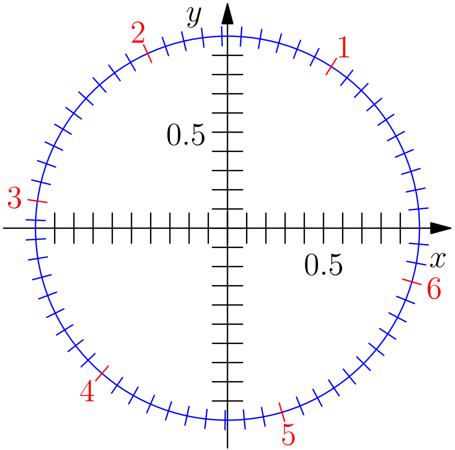
1. $\sin(t) =$

2. $\cos(t) =$

3. $\tan(t) =$

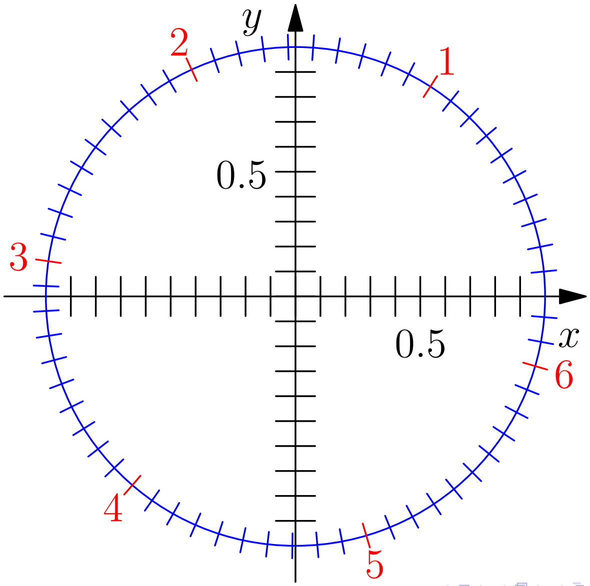
6.2.037 Find an approximate value of the given trigonometric function by using the figure and a calculator.

$$\sin(1)$$

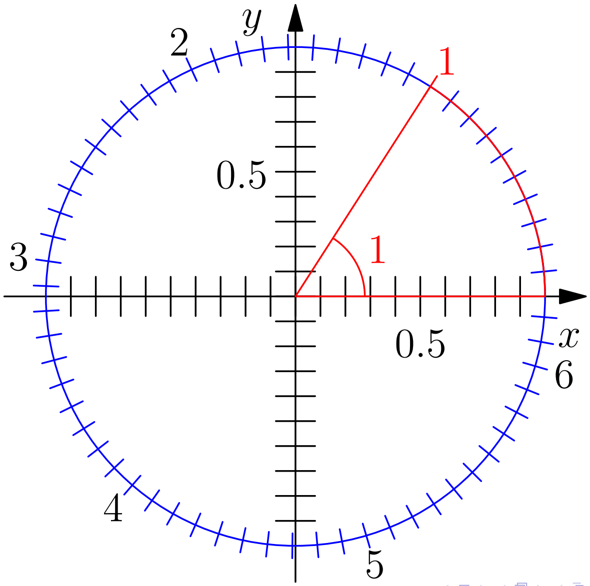


1. the figure (Round your answer to one decimal place.)
2. a calculator (Round your answer to four decimal places.)

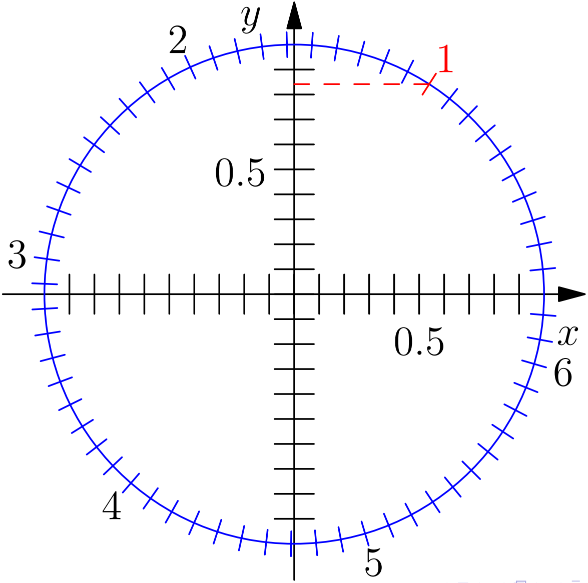
6.2.037 b Find $\sin(1)$:



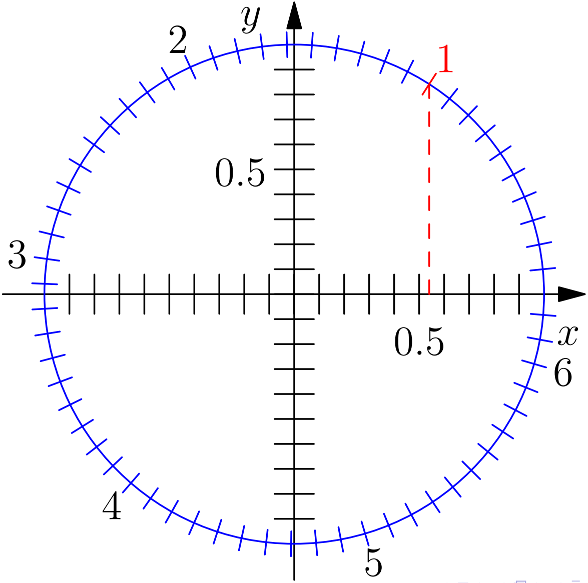
6.2.037 c Find $\sin(1)$: $\theta = 1$



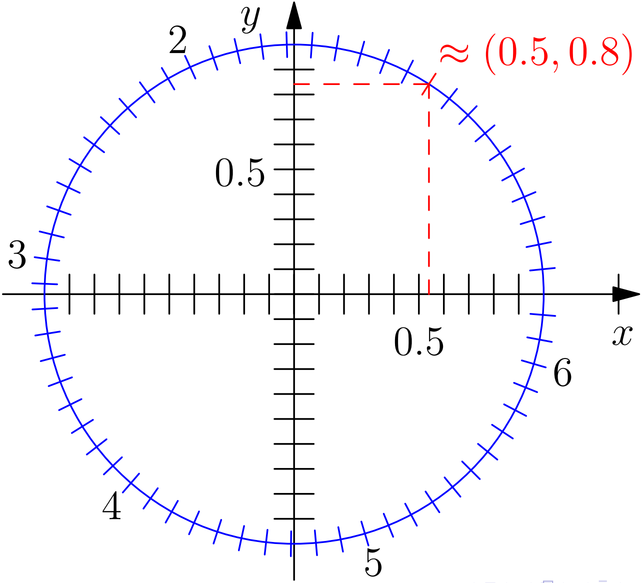
6.2.037 d Find $\sin(1) =$



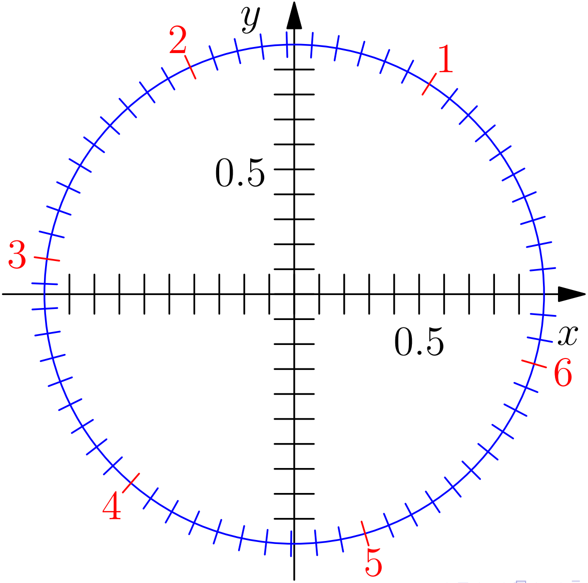
6.2.037 e Find $\cos(1) =$



6.2.037 f Find $(\cos(1), \sin(1)) \approx (0.5, 0.8)$:



6.2.038 Find $\cos(0.3)$:



5.3.041 Write the first trigonometric function in terms of the second for θ in the given quadrant.

$$\tan(\theta), \cos(\theta); \quad \theta \text{ in Quadrant II}$$

$\tan(\theta) =$

5.3.043 Write the first trigonometric function in terms of the second for θ in the given quadrant.

$$\cos(\theta), \sin(\theta); \quad \theta \text{ in Quadrant II}$$

$\cos(\theta) =$

5.3.044 Write the first trigonometric function in terms of the second for θ in the given quadrant.

$$\sec(\theta), \sin(\theta); \quad \theta \text{ in Quadrant I}$$

$\sec(\theta) =$

6.2.045 Find the sign of the expression if the terminal point determined by t is in the given quadrant.

$$\sin(t)\cos(t), \quad \text{Quadrant II}$$

- positive
- negative

5.3.004 The area $\mathcal{A}$ of a triangle with sides of lengths a and b and with included angle θ is given by the formula

$$\mathcal{A} =$$

So the area of the triangle with sides 4 and 7 and included angle $\theta = 30^\circ$ is

5.3.057 Find the area of a triangle with the given description. (Round your answer to one decimal place.)

a triangle with sides of length 7 and 8 and included angle 76°

5.3.059 Find the area of a triangle with the given description. (Round your answer to one decimal place.)

an equilateral triangle with side of length 10

6.1.059 Suppose that the terminal point determined by t is the point

$$\left(\frac{4}{5}, \frac{3}{5}\right)$$

on the unit circle. Find the terminal point determined by each of the following.

a) $\pi - t$

$(x, y) = (\_\_\_\_, \_\_\_\_)$

b) $-t$

$(x, y) = (\_\_\_\_, \_\_\_\_)$

c) $\pi + t$

$(x, y) = (\_\_\_\_, \_\_\_\_)$

d) $2\pi + t$

$(x, y) = (\_\_\_\_, \_\_\_\_)$

Chapter 6 Section 3 Unshifted

Graph $y = \sin t$

Graph $y = \sin 2t$

Graph $y = -2 \sin t$

Graph $x = \cos t$

Graph $x = 3\cos\left(\frac{1}{2}t\right)$

Chapter 5 Section 4

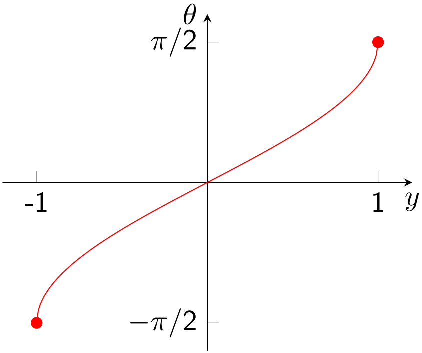
Calculator Buttons

The inverse trigonometric functions are labeled in one of three possible ways on your calculator[1]:

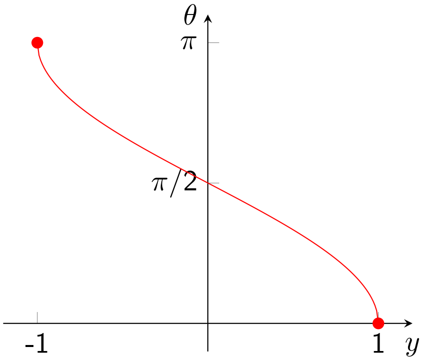
Function	Group 1	Group 2	Group 3
$\sin^{-1}\theta$	asin	arcsin	$\sin^{-1}$
$\cos^{-1}\theta$	acos	arccos	$\cos^{-1}$
$\tan^{-1}\theta$	atan	arctan	$\tan^{-1}$

[1] These are the only labels that I've ever seen.

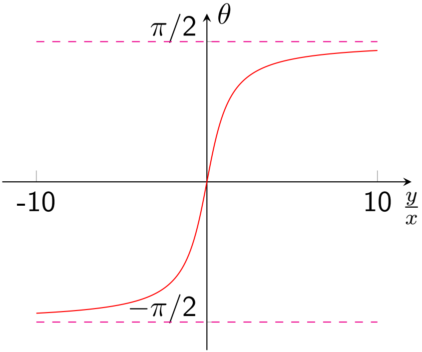
$$\theta = \sin^{-1} y$$



$$\theta = \cos^{-1} x$$



$$\theta = \tan^{-1} \frac{y}{x}$$



5.4.006 Find the exact value of each expression, if it is defined. Express your answer in radians. (If an answer is undefined, enter UNDEFINED.)

1. $\sin^{-1}(0)$

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

3. $\tan^{-1}(0)$

5.4.008 Find the exact value of each expression, if it is defined. Express your answer in radians. (If an answer is undefined, enter UNDEFINED.)

1. $\sin^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$

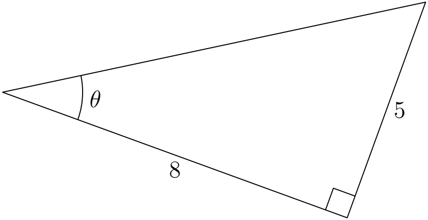
2. $\cos^{-1}\left(-\dfrac{1}{2}\right)$

3. $\tan^{-1}(-\sqrt{3})$

5.4.011 Use a calculator to find an approximate value (in radians) of the expression rounded to five decimal places, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\cos^{-1}\left(\frac{1}{8}\right)$$

5.4.019 Find the angle in degrees, rounded to one decimal.



5.4.024 Find all angles θ between 0° and 180° satisfying the given equation. Round your answer to one decimal place. (Enter your answers as a comma-separated list.)

$$\cos\theta = \frac{3}{8}$$

5.4.028 Find all angles θ between 0° and 180° satisfying the given equation. Round your answer to one decimal place. (Enter your answers as a comma-separated list.)

$$\sin\theta = \frac{2}{9}$$

5.4.030 Find the exact value of the expression.

$$\cos\left(\tan^{-1}\left(\frac{12}{5}\right)\right)$$

5.4.032 Find the exact value of the expression.

$$\csc\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$$

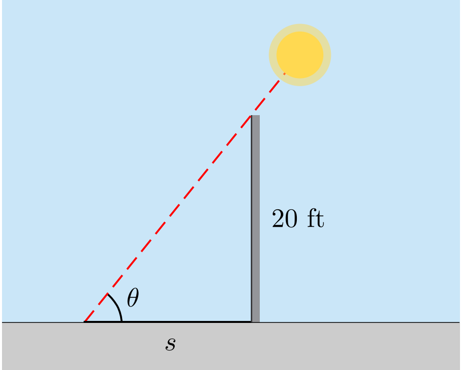
5.4.033 Find the exact value of the expression.

$$\tan\left(\sin^{-1}\left(\frac{12}{13}\right)\right)$$

5.4.035 Rewrite the expression as an algebraic expression in x.

$$\cos(\sin^{-1}(x))$$

5.4.042 A 20 ft pole casts a shadow as shown in the figure.



1. Express the angle of elevation θ of the sun as a function of the length s of the shadow.
   $\theta =$

2. Find the angle θ of elevation of the sun when the shadow is 35 ft long. (Round your answer to one decimal place.)
   $\theta =$

Chapter 6 Section 5

6.5.003 Find the exact value of each expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

1. $\sin^{-1}(1) =$

2. $\sin^{-1}\left(\dfrac{\sqrt{3}}{2}\right) =$

3. $\sin^{-1}(2) =$

6.5.006 Find the exact value of each expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

1. $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right) = \cos^{-1}\left(\frac{1}{\sqrt{2}}\right) =$

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

3. $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right) =$

6.5.008 Find the exact value of each expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

1. $\tan^{-1}(0) =$

2. $\tan^{-1}(-\sqrt{3}) =$

3. $\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right) = \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) =$

6.5.014 Use a calculator (in radian mode) to find an approximate value of the expression correct to five decimal places, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\cos^{-1}\left(\frac{2}{9}\right)$$

6.5.027 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\sin\left(\sin^{-1}\left(\frac{8}{3}\right)\right)$$

6.5.028 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\tan\left(\tan^{-1}\left(\frac{7}{2}\right)\right)$$

6.5.030 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\sin\left(\sin^{-1}\left(-\frac{1}{8}\right)\right)$$

6.5.032 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\cos^{-1}\left(\cos\left(\frac{\pi}{3}\right)\right)$$

6.5.033 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\sin^{-1}\left(\sin\left(\frac{3\pi}{4}\right)\right)$$

6.5.042 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\sin^{-1}\left(\sin\left(\frac{11\pi}{4}\right)\right)$$

6.5.045 Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\cos\left(\sin^{-1}\left(\frac{1}{2}\right)\right)$$

6.5.A Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$$

6.5.B Find the exact value of the expression, if it is defined. (If an answer is undefined, enter UNDEFINED.)

$$\tan^{-1}\left(\tan\left(\frac{7\pi}{4}\right)\right)$$

Chapter 5 Section 5

5.5.A Solve the triangle given: $A = 46°$, $B = 20°$, $c = 65$.

5.5.B Solve the triangle given: $C = 68^\circ$, $b = 12$, $c = 12$.

5.5.C Solve the triangle given: $A = 125^\circ$, $a = 20$, $c = 45$.

5.5.D Solve the triangle given: $B = 25^\circ$, $b = 25$, $c = 30$.

Chapter 5 Section 6

5.6.A Solve the triangle given: $A = 39^\circ$, $b = 18$, $c = 36$.

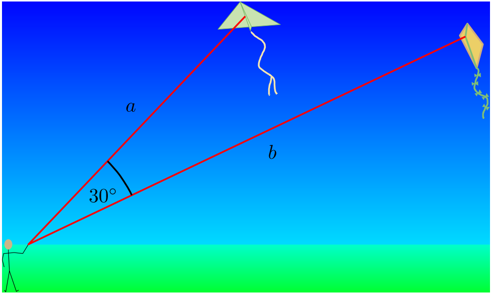

I CHOSE TO JUST WING IT THE FIRST TIME,
I CHOSE... POORLY
makeameme.org

5.6.A *Correctly* solve the triangle given: $A = 39^\circ$, $b = 18$, $c = 36$.

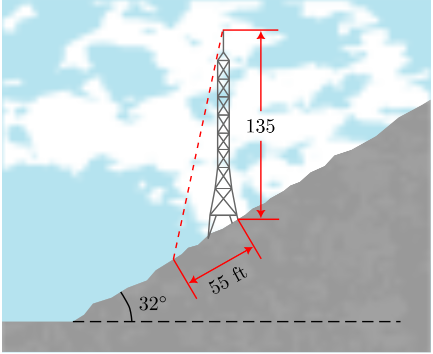
5.6.B Solve the triangle given: $a = 10$, $b = 12$, $c = 16$.

5.6.47 A triangular field has sides of lengths 22, 37, and 41 yd. Find the largest angle. (Round your answer to the nearest degree.)

5.6.49 A boy is flying two kites at the same time. He has a = 350 ft of line out to one kite and b = 440 ft to the other. He estimates the angle between the two lines to be 30°. Approximate the distance between the kites. (Round your answer to the nearest foot.)



5.6.050 A 135 ft tower is located on the side of a mountain that is inclined 32° to the horizontal. A guy wire is to be attached to the top of the tower and anchored at a point 55 ft downhill from the base of the tower. Find the shortest length of wire needed. (Round your answer to the nearest foot.)



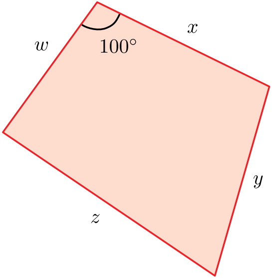
5.6.029 Find the area A of the triangle whose sides have the given lengths.

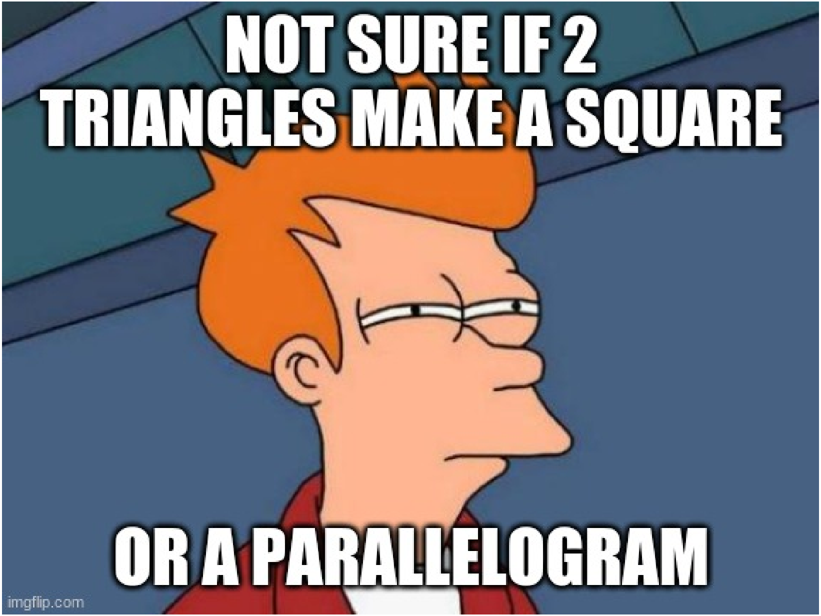
$$a = 10, b = 6, c = 8$$

5.6.030 Find the area A of the triangle whose sides have the given lengths. (Round your answer to three decimal places.)

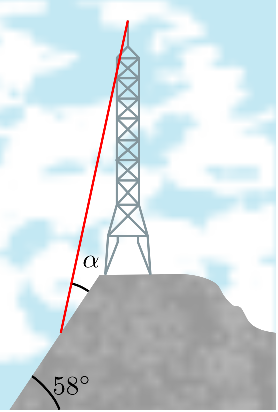
$$a = 1, b = 8, c = 8$$

5.6.035 Find the area of the shaded figure, rounded to two decimals. (Assume $w = 3$, $x = 4$, $y = 5$, and $z = 6$.)




NOT SURE IF 2
TRIANGLES MAKE A SQUARE
OR A PARALLELOGRAM
imgflip.com

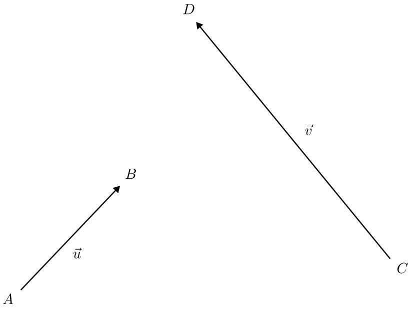
5.5.038 A communications tower is located at the top of a steep hill, as shown. The angle of inclination of the hill is 58°. A guy wire is to be attached to the top of the tower and to the ground, 175 m downhill from the base of the tower. The angle α in the figure is determined to be 8°. Find the length of cable required for the guy wire. (Round your answer to the nearest meter.)



5.5.035 The bell tower of the cathedral in Pisa, Italy, leans 5.6° from the vertical. A tourist stands 107 m from its base, with the tower leaning directly toward her. She measures the angle of elevation to the top of the tower to be 28.6°. Find the length of the tower to the nearest meter.

Chapter 9 Section 1

9.1.001 (a)



A vector in the plane is a line segment with an assigned direction.
The vector $\vec{u}$ has initial point ___ and terminal point ___.

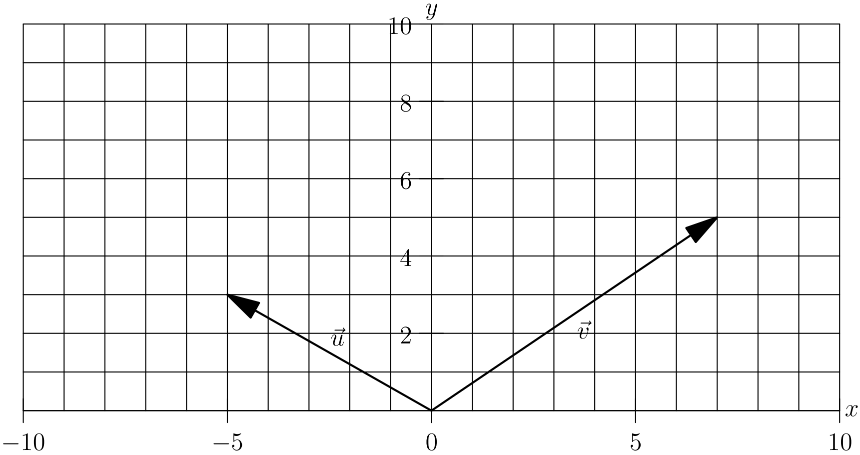
Sketch the vectors $\vec{u}$ and $\vec{u} + \vec{v}$.

Definition 2 (Coordinate system)

A coordinate system is a system that uses one or more numbers, or coordinates, to uniquely determine the position of the points or other geometric elements on a manifold.

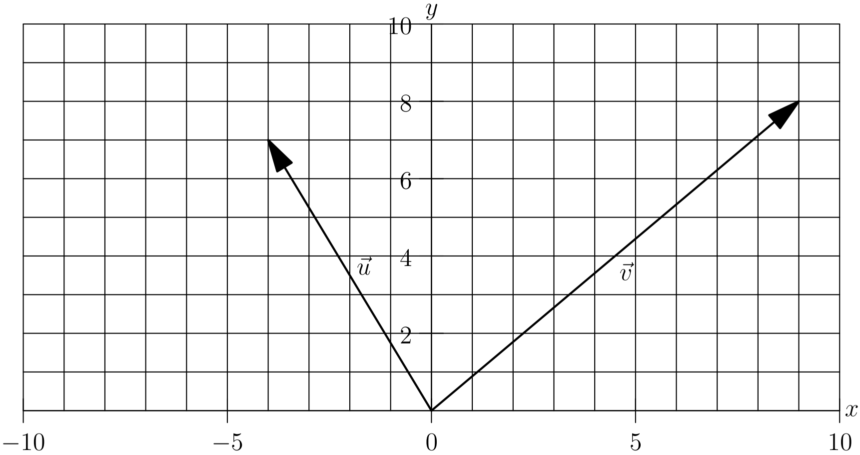
Error correcting frame

9.1.003 Sketch the vector indicated.



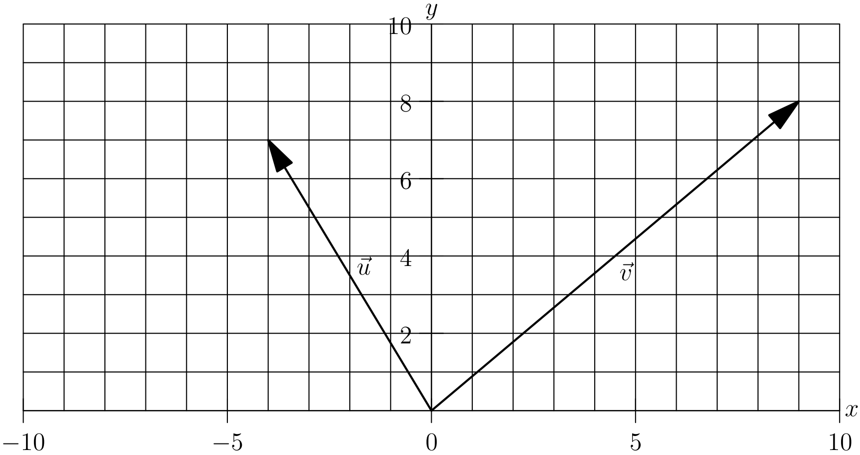
$2\vec{u}$

9.1.004 Sketch the vector indicated.



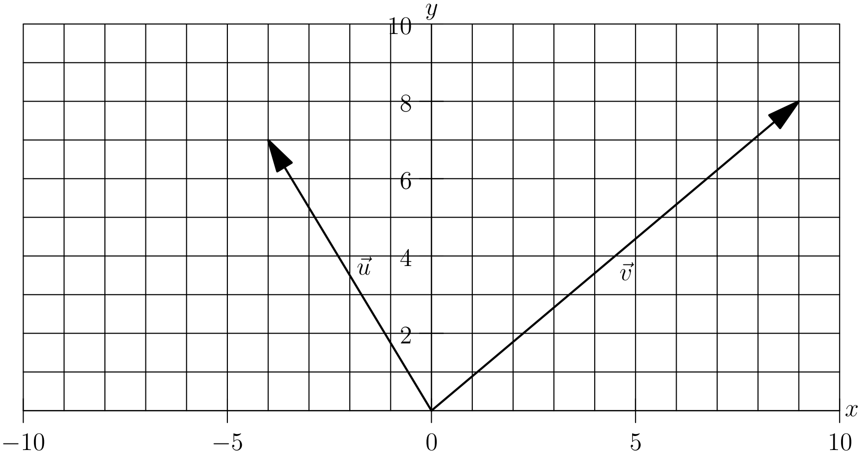
$-\vec{v}$

9.1.005 Sketch the vector indicated.



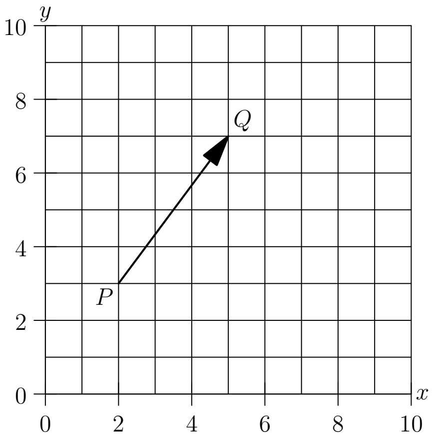
$\vec{u} + \vec{v}$

9.1.006 Sketch the vector indicated.



$\vec{u} - \vec{v}$

9.1.009 Express the vector $\vec{v}$ with initial point P and terminal point Q in component form. (Assume that each point lies on the gridlines.)



$\vec{v} =$

9.1.013 Express the vector $\vec{v}$ with initial point P and terminal point Q in component form.

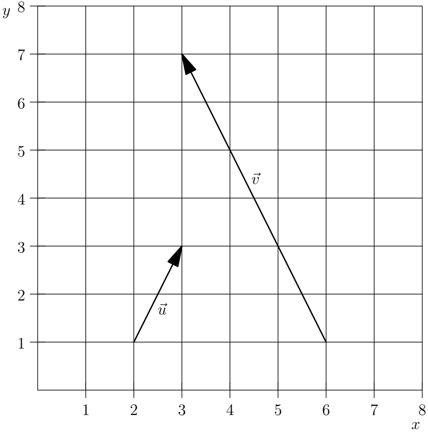
$$P(6,3), \quad Q(8,9)$$

9.1.019 Sketch the given vector with initial point $(4, 6)$.

$$\vec{u} = \langle 3, 2 \rangle$$

And find the terminal point.

9.1.001 (b)



A vector in a coordinate plane is expressed by using components. The vector $\vec{u}$ has initial point $(x, y) = (\_\_\_\_, \_\_\_\_)$ and terminal point $(x, y) = (\_\_\_\_, \_\_\_\_)$. In component form we write $\vec{u} = \_\_\_\_\_\_\_\_$ and $\vec{v} = \_\_\_\_\_\_\_\_$. Then $2\vec{u} = \_\_\_\_\_\_\_\_$ and $\vec{u} + \vec{v} = \_\_\_\_\_\_\_\_$.

9.1.023 Sketch representations of the given vector with initial points $(0,0)$, $(2,3)$, and $(-3,5)$.

$$\vec{u} = \langle 3, 4 \rangle$$

9.1.027 Write the given vector in terms of $\hat{\imath}$ and $\hat{\jmath}$.

$$\vec{u} = \langle 1, 3 \rangle$$

9.1.031 For the given vectors $\vec{u}$ and $\vec{v}$. Find (Simplify your answers completely.)

$$\vec{u} = \langle 3, 7 \rangle\,, \quad \vec{v} = \langle 2, 5 \rangle$$

$2\vec{u}=$

$-3\vec{v}=$

$\vec{u} + \vec{v}=$

$3\vec{u} - 4\vec{v}=$

9.1.033 For the given vectors $\vec{u}$ and $\vec{v}$. Find (Simplify your answers completely.)

$$\vec{u} = \langle 0, -7 \rangle, \quad \vec{v} = \langle -3, 0 \rangle$$

$2\vec{u} =$

$-3\vec{v} =$

$\vec{u} + \vec{v} =$

$3\vec{u} - 4\vec{v} =$

9.1.037 For the given vectors $\vec{u}$ and $\vec{v}$. Find (Simplify your answers completely.)

$$\vec{u} = 3\hat{\imath} + \hat{\jmath}, \quad \vec{v} = 4\hat{\imath} - 2\hat{\jmath}$$

$$|\vec{v}| =$$

$$|2\vec{u}| =$$

$$|\vec{u} - \vec{v}| =$$

$$|\vec{u}| - |\vec{v}| =$$

9.1.041 Find the horizontal and vertical components of the vector with the given length and direction, and write the vector in terms of the vectors $\hat{\imath}$ and $\hat{\jmath}$.

$$|\vec{v}| = 22, \quad \theta = 30^\circ$$

9.1.047 Find the magnitude and direction (in degrees) of the vector. (Assume $0^\circ \leq \theta < 360^\circ$. Round the direction to two decimal places.)

$$v = \langle 3, 4 \rangle$$

9.1.052 Find the magnitude and direction (in degrees) of the vector. (Assume $0^\circ \leq \theta < 360^\circ$. Round the direction to two decimal places.)

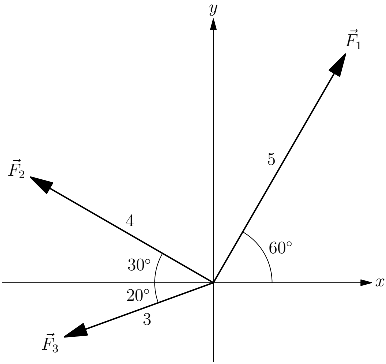
$$v = 3\hat{\imath} + 3\hat{\jmath}$$

9.1.056 A river flows due south at 1.6 mile/hour and a swimmer attempts to cross the river from the west side to the east side. In what direction should the swimmer head, at a velocity of 2 mile/hour, in order to arrive at a landing point due east of his starting point? (Round your answer to one decimal place.)

9.1.067 The forces $\vec{F}_1, \vec{F}_2, \ldots, \vec{F}_n$ acting at the same point P are said to be in equilibrium if the resultant force is zero, that is, if $\vec{F}_1 + \vec{F}_2 + \cdots + \vec{F}_n = 0$.

$$\vec{F}_1 = \langle 3, 4 \rangle, \quad \vec{F}_2 = \langle 4, -7 \rangle$$

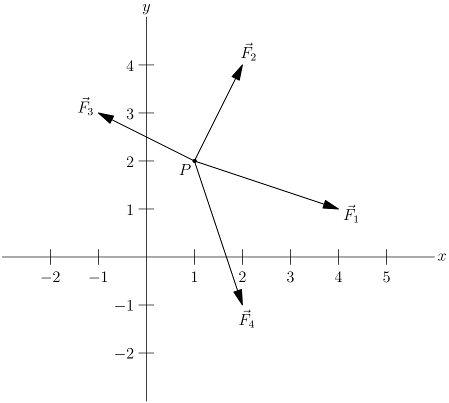
9.1.071 The forces $\vec{F}_1, \vec{F}_2, \ldots, \vec{F}_n$ acting at the same point P are said to be in equilibrium if the resultant force is zero, that is, if $\vec{F}_1 + \vec{F}_2 + \cdots + \vec{F}_n = 0$. (Round your answers to two decimal places.)



1. Find the resultant force acting at P.

2. Find the additional force required (if any) for the forces to be in equilibrium.

9.1.072 The forces $\vec{F}_1, \vec{F}_2, \ldots, \vec{F}_n$ acting at the same point P are said to be in equilibrium if the resultant force is zero, that is, if $\vec{F}_1 + \vec{F}_2 + \cdots + \vec{F}_n = 0$. (Round your answers to two decimal places.)



1. Find the resultant force acting at P.

2. Find the additional force required (if any) for the forces to be in equilibrium.