Brockton High School
Content: Math II
Week of: May 18 to May 24, 2020

Greetings Math II Students! We hope you are safe and well with your families!
This assignment is for the week, use your time wisely. **You do not have to complete this in one sitting**. Here is the lesson plan for this week:

Goals for this week: Module 3 on Mathia
Learning Objectives: Students will be able to: 1. Investigate proportionality using trigonometric ratios, arc length of circles, and volume of 3D shapes. *(Standards* G.C.1, G.C.5, G.SRT.6, G.SRT.8)
Literacy Objectives: Students will be able to: 1. to compute, interpret and explain numbers 2. to read, break down, and solve a word problem 3. to explain and/or interpret relationships of space and time *(https://www.bpsma.org/schools/brockton-high-school/about-us/mission-literacy-charts)*

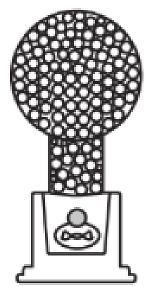
Carnegie Learning (use with Carnegie Resources provided below) Carnegie Learning (Log-in through Clever)	
Instructional Video Links: Please watch at least one of these videos to help guide you. • Introduction to Trigonometry • Finding sides using trig ratios • Finding angles using trig ratios • Finding arc length of a circle • Volume of cylinders, Cones, and Spheres • Volume and Surface Area of Pyramids	**Printable Resources**: • Skills Practice: Module 2 topic 2 Trigonometry • Module 2 topic 3 Building Volume and Surface Area formulas for Pyramids, cones, and Spheres\ • Module 2 Topic 3 All circles great and small See Below
Practice Activities: On-Line: All students now have access to an on-line program called Mathia! • Mathia- If you are already in Mathia, please continue to work in the program. • If you are new to Mathia: Please see the log-in information below.	**Key Terms**: • **Sine:** The ratio of the opposite side over the hypotenuse • **Cosine:** The ratio of the adjacent side over the hypotenuse • **Tangent:** The ratio of the opposite side over the adjacent side • **Unit circle:** A circle whose radius is 1 unit • **Arc length:** A portion of a circles circumference $(\text{circumference})\left(\frac{\text{measure of arc}}{360}\right)$ • **Circumference:** The distance around a circle($2\pi r$)

	• **Radian:** Unit used to measure angles (one radian= $\frac{180}{\pi}$ degrees • **Sector:** A portion of a circle bounded by two radii and one of the arcs they intercept • **Volume:** The number of cubic units that will completely fill the interior of a solid • **Surface area:** The sum of all the areas of the polyhedron's faces • **Lateral Face:** A face of a polyhedron that is not part of the base • **Height:** The perpendicular distance between the two bases • **Vertex of a solid:** A point where multiple edges meet • **Radius:** The distance from the center of a circle to a point on the circle

Extension Activities:

Stretch

A gumball machine is shown in the figure. The diameter of the sphere with gumballs on the top of the machine is 12 inches. The cylinder with gumballs under the sphere is 6 inches in diameter and 7 inches tall. If a gumball is 1 inch in diameter, approximately how many gumballs will fit in this machine? Use 3.14 for π and assume that due to the spacing of the gumballs, only 75% of the total capacity for gumballs will be used.



Log-in Information

1. Log-in to Clever
2. Under Math, click on MATHia
3. Username: 6-digit BHS school ID # @bpsma.org
   Password: Date of birth bps 1920
   Example: Student (Michael) with ID #:123456
   Date of birth: January 1st, 2000
   Username: 123456@bpsma.org
   Password: 01012000bps1920

Additional Support

Email:

- Please email your math teacher with specific questions.

Office Hours:

- Click here for teacher Office hours!

TRIGONOMETRIC RATIOS

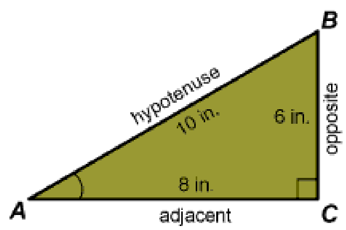
The Tangent Ratio

Definition:

In a right triangle, the tangent of an angle is equal to the ratio of the length of the side opposite the angle to the length of the side adjacent to the angle.

Example:

In triangle *ABC*, the length of the side opposite angle *A* is 6 inches, and the length of the adjacent to angle *A* is 8 inches. Therefore, the tangent of angle *A*, or tan *A*, is



$$\frac{\text{length of side opposite } \angle A}{\text{length of side adjacent to } \angle A} = \frac{6 \text{ in.}}{8 \text{ in.}} = \frac{3}{4} .$$

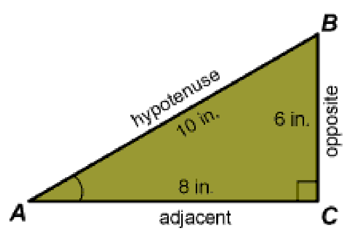
The Sine Ratio

Definition:

In a right triangle, the sine of an angle is equal to the ratio of the length of the side opposite the angle to the length of the hypotenuse.

Example:

In triangle *ABC*, the length of the side opposite angle *A* is 6 inches, and the length of the hypotenuse is 10 inches. Therefore, the sine of angle *A* or sin *A*, is



$$\frac{\text{length of side opposite to } \angle A}{\text{length of hypotenuse}} = \frac{6 \text{ in.}}{10 \text{ in.}} = \frac{3}{5} .$$

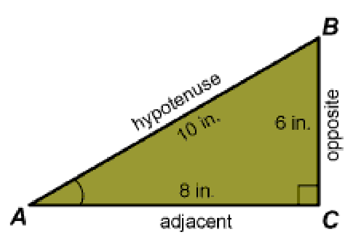
The Cosine Ratio

Example:

In triangle *ABC*, the length of the side adjacent to angle *A* is 8 inches, and the length of the hypotenuse is 10 inches. Therefore, the cosine of angle *A*, or cos *A*, is

:ent to

$$\frac{\text{length of side adjacent to } \angle A}{\text{length of hypotenuse}} = \frac{8 \text{ in.}}{10 \text{ in.}} = \frac{4}{5} .$$



A helpful acronym for remembering the definitions of the trigonometric ratios is:

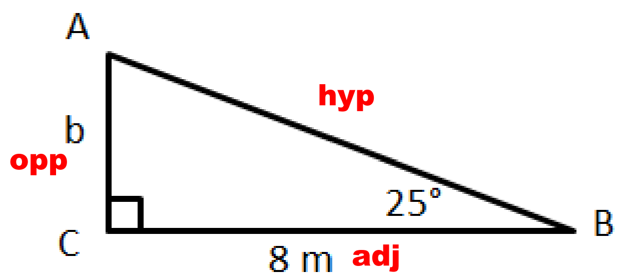
SOH - CAH - TOA

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

These trigonometric ratios can also be used to find missing side and angle measures in a right triangle.

Example: Finding an Unknown Length

Find the value of **b** in the right triangle below.



1) Label the sides of the triangle (opposite, adjacent, hypotenuse).

2) Determine which trigonometric ratio to use.

The opposite and adjacent sides are labeled, so tangent will be used.

3) Write the equation for the trig ratio, substituting the known values.

$$\tan\theta = \frac{opp}{adj} \rightarrow \tan 25^\circ = \frac{b}{8}$$

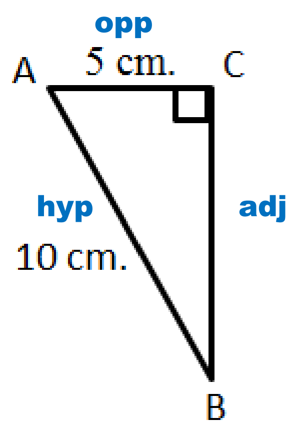
4) Cross multiply to solve the equation.

$$8\tan 25^\circ = b \rightarrow b = 3.73\ m$$

(To find the value of tan *25°*, use a calculator or a table of trigonometric ratios.)

Example: Finding an Angle Measure

Find the measure of angle B in triangle ABC below.



1) Label the sides of the triangle (opposite, adjacent, hypotenuse).

2) Determine which trigonometric ratio to use.

The opposite side and hypotenuse are labeled, so sine will be used.

3) Write the equation for the trig ratio, substituting the known values.

$$\sin\theta = \frac{opp}{hyp} \rightarrow \sin B = \frac{5}{10}$$

4) Use the inverse sine to find the angle measure.

$$B = \sin^{-1}\left(\frac{5}{10}\right) \rightarrow B = 30^\circ$$

Topic 2
TRIGONOMETRY

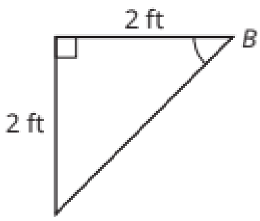
Skills Practice

Name ______________________________ Date ______________

I. Calculating Trigonometric Ratios

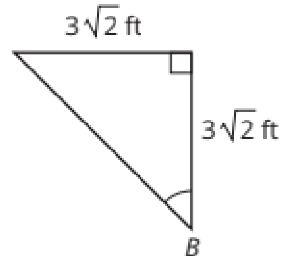
Calculate the tangent of the indicated angle in each triangle. Write your answers in simplest form.

1.



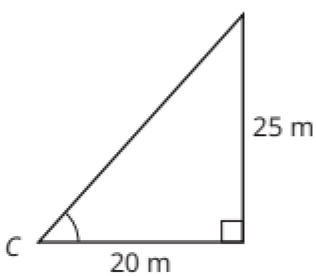
tan B =

2.



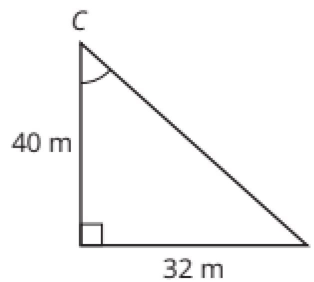
tan B =

3.



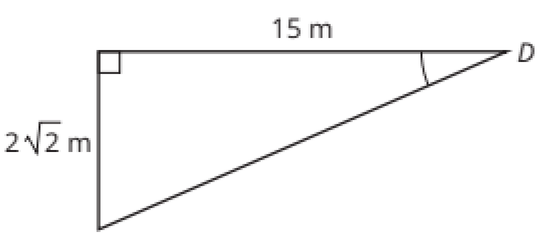
tan C =

4.



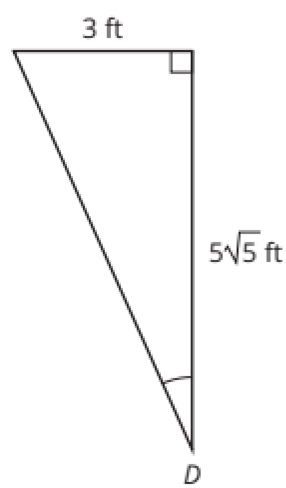
tan C =

5.



tan D =

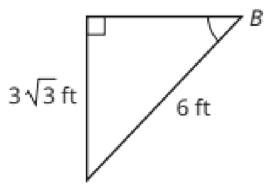
6.



tan D =

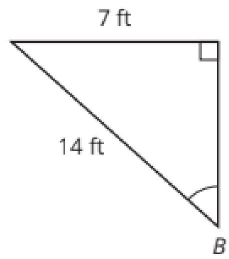
Calculate the sine of the indicated angle in each triangle. Write your answers in simplest form.

1.



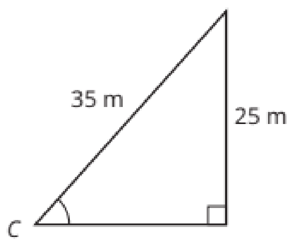
sin B =

2.



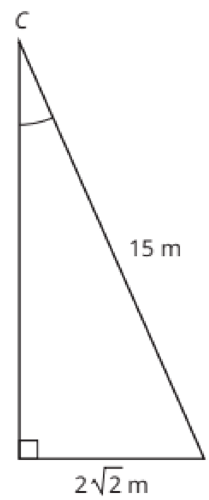
sin B =

3.



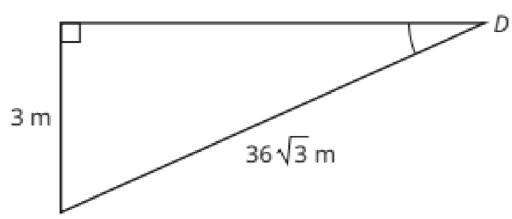
sin C =

4.



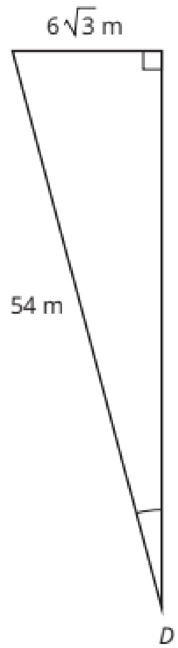
sin C =

5.



sin D =

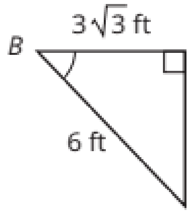
6.



sin D =

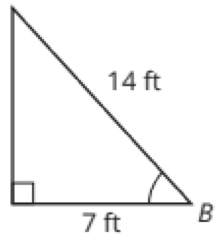
Calculate the cosine of the indicated angle in each triangle. Write your answers in simplest form.

1.



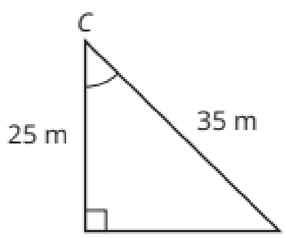
$\cos B =$

2.



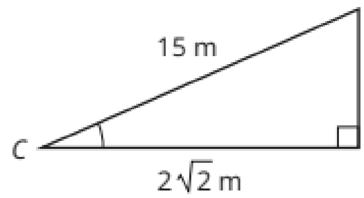
$\cos B =$

3.



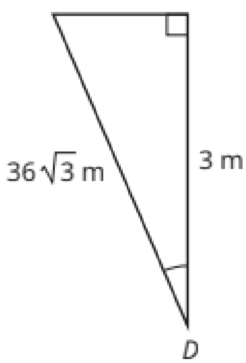
$\cos C =$

4.



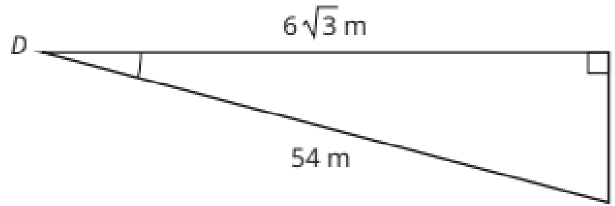
$\cos C =$

5.



$\cos D =$

6.

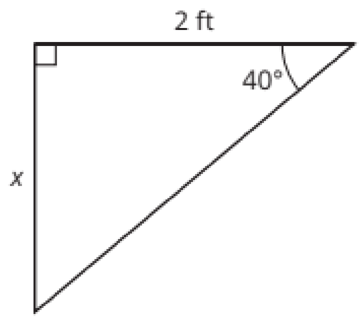


$\cos D =$

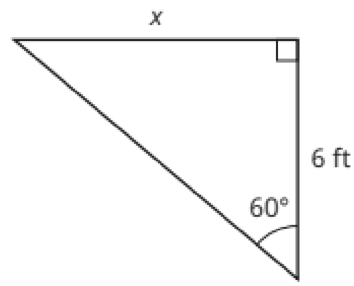
II. Determining Unknown Lengths Using Trigonometric Ratios

Calculate the missing length of each triangle. Round your answers to the nearest hundredth.

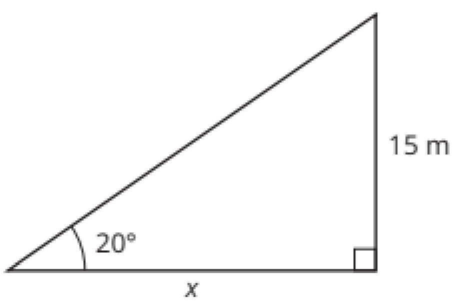
1.



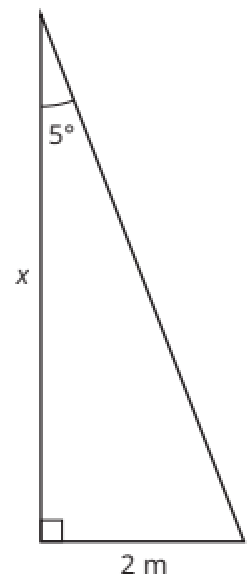
2.



3.

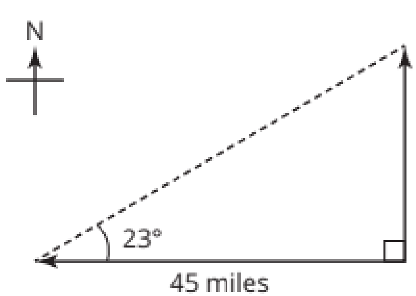


4.

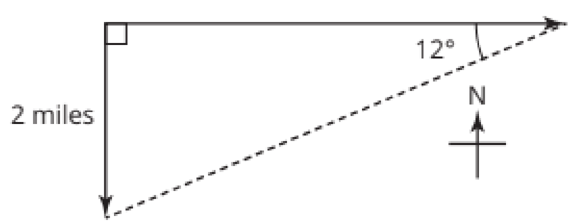


B. Solve each problem. Round your answers to the nearest hundredth.

1. A boat travels in the following path. How far north did it travel?



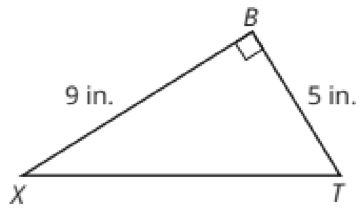
2. During a group hike, a park ranger makes the following path. How far west did they travel?



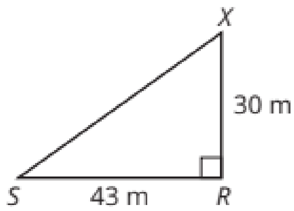
III. Determining Unknown Angle Measures Using Trigonometric Ratios

Calculate the measure of angle X for each triangle. Round your answers to the nearest hundredth.

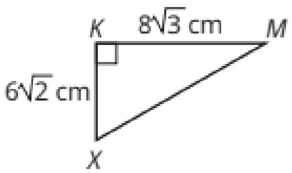
1.



2.



3.



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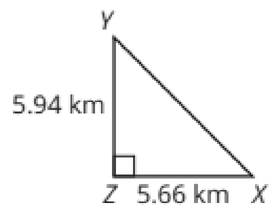
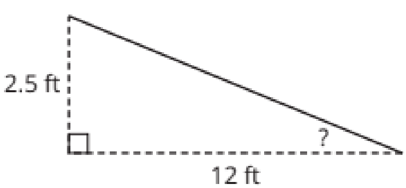
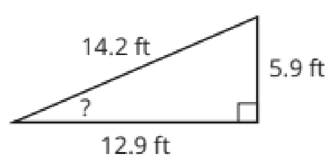


Solve each problem. Round your answers to the nearest hundredth.

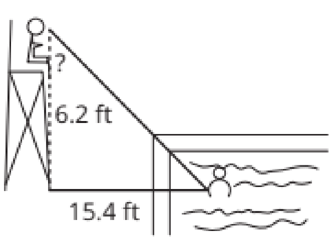
1. A moving truck is equipped with a ramp that extends from the back of the truck to the ground. When the ramp is fully extended, it touches the ground 12 feet from the back of the truck. The height of the ramp is 2.5 feet. Calculate the measure of the angle formed by the ramp and the ground.



2. A park has a skateboard ramp with a length of 14.2 feet and a length along the ground of 12.9 feet. The height is 5.9 feet. Calculate the measure of the angle formed by the ramp and the ground.



3. A lifeguard is sitting on an observation chair at a pool. The lifeguard's eye level is 6.2 feet from the ground. The chair is 15.4 feet from a swimmer. Calculate the measure of the angle formed when the lifeguard looks down at the swimmer.



4. A surveyor is looking up at the top of a building that is 140 meters tall. His eye level is 1.4 meters above the ground, and he is standing 190 meters from the building. Calculate the measure of the angle from his eyes to the top of the building.

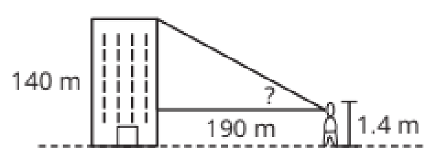


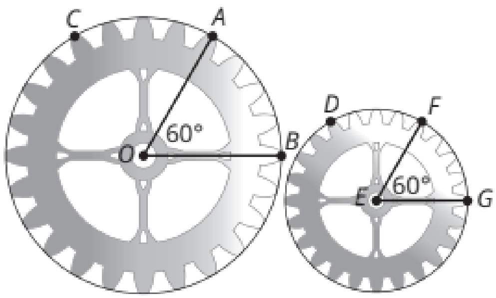
Table of Trigonometric Ratios

Angle	Sine	Cosine	Tangent
1°	.0175	.9998	.0175
2°	.0349	.9994	.0349
3°	.0523	.9986	.0524
4°	.0698	.9976	.0699
5°	.0872	.9962	.0875
6°	.1045	.9945	.1051
7°	.1219	.9925	.1228
8°	.1392	.9903	.1405
9°	.1564	.9877	.1584
10°	.1736	.9848	.1763
11°	.1908	.9816	.1944
12°	.2079	.9781	.2126
13°	.2250	.9744	.2309
14°	.2419	.9703	.2493
15°	.2588	.9659	.2679
16°	.2756	.9613	.2867
17°	.2924	.9563	.3057
18°	.3090	.9511	.3249
19°	.3256	.9455	.3443
20°	.3420	.9397	.3640
21°	.3584	.9336	.3839
22°	.3746	.9272	.4040
23°	.3907	.9205	.4245
24°	.4067	.9135	.4452
25°	.4226	.9063	.4663
26°	.4384	.8988	.4877
27°	.4540	.8910	.5095
28°	.4695	.8829	.5317
29°	.4848	.8746	.5543
30°	.5000	.8660	.5774
31°	.5150	.8572	.6009
32°	.5299	.8480	.6249
33°	.5446	.8387	.6494
34°	.5592	.8290	.6745
35°	.5736	.8192	.7002
36°	.5878	.8090	.7265
37°	.6018	.7986	.7536
38°	.6157	.7880	.7813
39°	.6293	.7771	.8098
40°	.6428	.7660	.8391
41°	.6561	.7547	.8693
42°	.6691	.7431	.9004
43°	.6820	.7314	.9325
44°	.6947	.7193	.9657
45°	.7071	.7071	1.0000

Angle	Sine	Cosine	Tangent
46°	.7193	.6947	1.0355
47°	.7314	.6820	1.0724
48°	.7431	.6691	1.1106
49°	.7547	.6561	1.1504
50°	.7660	.6428	1.1918
51°	.7771	.6293	1.2349
52°	.7880	.6157	1.2799
53°	.7986	.6018	1.3270
54°	.8090	.5878	1.3764
55°	.8192	.5736	1.4281
56°	.8290	.5592	1.4826
57°	.8387	.5446	1.5399
58°	.8480	.5299	1.6003
59°	.8572	.5150	1.6643
60°	.8660	.5000	1.7321
61°	.8746	.4848	1.8040
62°	.8829	.4695	1.8807
63°	.8910	.4540	1.9626
64°	.8988	.4384	2.0503
65°	.9063	.4226	2.1445
66°	.9135	.4067	2.2460
67°	.9205	.3907	2.3559
68°	.9272	.3746	2.4751
69°	.9336	.3584	2.6051
70°	.9397	.3420	2.7475
71°	.9455	.3256	2.9042
72°	.9511	.3090	3.0777
73°	.9563	.2924	3.2709
74°	.9613	.2756	3.4874
75°	.9659	.2588	3.7321
76°	.9703	.2419	4.0108
77°	.9744	.2250	4.3315
78°	.9781	.2079	4.7046
79°	.9816	.1908	5.1446
80°	.9848	.1736	5.6713
81°	.9877	.1564	6.3138
82°	.9903	.1392	7.1154
83°	.9925	.1219	8.1443
84°	.9945	.1045	9.5144
85°	.9962	.0872	11.4301
86°	.9976	.0698	14.3007
87°	.9986	.0523	19.0811
88°	.9994	.0349	28.6363
89°	.9998	.0175	57.2900

ACTIVITY 1.2 Determining Arc Length

Consider the large gear represented by circle O, containing a central angle, $\angle AOB$, whose measure is equal to $60°$; a minor arc, $\overset{\frown}{AB}$; and a major arc, $\overset{\frown}{ACB}$, as shown. Consider the small gear represented by circle E, containing a central angle, $\angle FEG$, whose measure is equal to $60°$; a minor arc, $\overset{\frown}{FG}$; and a major arc, $\overset{\frown}{FDG}$, as shown.



1. Compare the two gears.

a. Is the length of the radii in the large gear proportional to the length of the radii in the small gear? Explain your reasoning.

b. Determine the degree measure of the minor arc in each circle.

c. What is the ratio of the degree measure of the minor arc to the degree measure of the entire circle for each of the two gears?

2. Explain why Casey is incorrect.

> Casey
> The two minor arcs, $\overset{\frown}{AB}$ and $\overset{\frown}{FG}$, on the gears have the same measure, which is $60°$. So, the two arcs are the same length.

In a circle, the degree measure of an arc is equal to the measure of the central angle. **Arc length** is a linear measurement that represents a portion of the circumference of a circle. To determine the arc length of the minor arc, you need to know the circumference of the circle, which requires knowing the radius of the circle.

The length of an arc is different from the degree measure of the arc.

3. If the length of the radius of the large gear, or $\overline{OB}$, is equal to 4 centimeters, determine the circumference of circle *O*.

4. Use the circumference of circle *O* determined in Question 3 and the ratio determined in Question 1, part (c) to solve for the length of the minor arc.

5. If the length of the radius of the small gear, or $\overline{EF}$, is equal to 2 centimeters, determine the circumference of circle *E*.

6. Use the circumference of circle *E* determined in Question 5 and the ratio determined in Question 1, part (c) to solve for the length of the minor arc.

To determine arc length, s, you multiplied the circumference of the circle by a fraction representing the portion of the circumference determined by the central angle measure, m.

$$\text{arc length} = \frac{\text{central angle measure}}{360^\circ}(\text{circumference})$$

$$s = \frac{m}{360^\circ}(2\pi r)$$

Arc length is directly proportional to the circumference.

There is a proportional relationship between the measure of an arc length and the circumference of the circle.

$$\frac{\text{arc length}}{\text{circumference}} = \frac{\text{central angle measure}}{360^\circ}$$

$$\frac{s}{2\pi r} = \frac{m}{360^\circ}$$

Worked Example

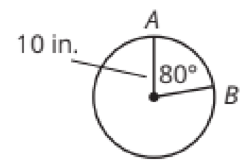
You can apply the formula $s = \frac{m}{360^\circ}(2\pi r)$ to determine the length of an arc for a circle with a radius of 10 inches and central angle of 80°.

$$s = \frac{m}{360^\circ}(2\pi r)$$

$$\text{m}\,\widehat{AB} = \frac{80^\circ}{360^\circ}(2\pi(10))$$

$$\text{m}\,\widehat{AB} = \frac{2}{9}(20\pi)$$

$$\text{m}\,\widehat{AB} = \frac{40}{9}\pi$$



The measure of $\widehat{AB}$ is $\frac{40}{9}\pi$, or approximately 14 inches.

Store

7. Determine the arc length of an entire circle with each given radius.

a. 1 inch

b. *r* units

$$s = \frac{m}{360^\circ} \cdot 2\pi r$$

$$s = \frac{m}{180^\circ} \cdot \pi r$$

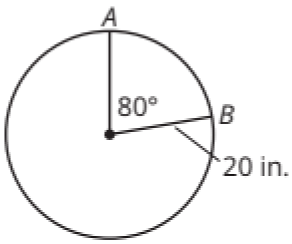
$$\frac{s}{r} = \frac{\pi}{180^\circ} \cdot m$$

The relationship also implies that the ratio of the arc length to the radius, $\frac{s}{r}$, is directly proportional to m, the measure of the central angle.

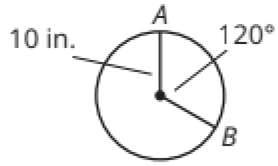
8. What is the constant of proportionality in this proportional relationship?

9. **Use the formula that compares the ratio $\frac{s}{r}$ to calculate the length of the minor arc *AB* in each circle. Express your answer in terms of π.**

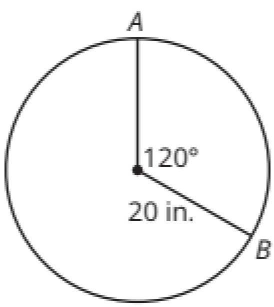
a.



b.

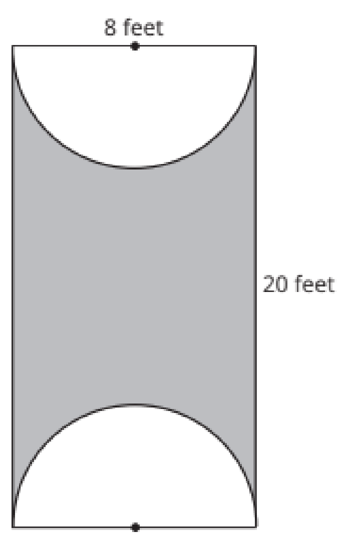


c.



d. Compare the worked example and part (a), as well as parts (b) and (c). In each pair, the central angle is the same but the radius has been doubled. What effect does doubling the radius have on the length of the arc? Justify why this relationship exists.

10. **Two semicircular cuts were taken from the rectangular region shown. Determine the perimeter of the shaded region in feet.**



Consider the diagram of tree rings shown. Let the radius of the small tree ring (small circle) be r and the radius of the larger tree ring (large circle) be $10r$.

11. Compare the tree rings.

a. How does the length of the minor arc in the small tree ring compare to the length of the minor arc in the large tree ring?

b. If the length of the minor arc in the small tree ring is equal to 3 inches, what is the length of the minor arc in the large tree ring?

c. If $m\angle A = 20°$ and the length of the minor arc of the small tree ring is 3 inches, determine the circumference of the large tree ring.

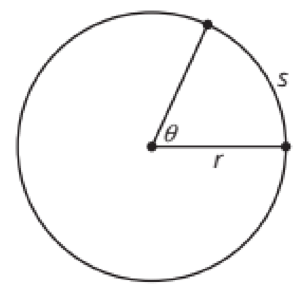
ACTIVITY 1.4

Measuring Angles and Arcs Using Radians

So far you have described the measures of angles and arcs using degrees and determined the arc length intercepted by a central angle as a linear measurement.

Let's investigate another unit of angular measure called a *radian.* One **radian** is defined as the measure of a central angle whose arc length is the same as the radius of the circle. The radian measure, θ, of a central angle is the ratio of the length of the intercepted arc to the radius of a circle.

You read the symbol θ as "theta."



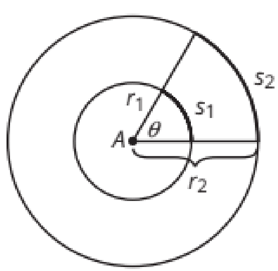
$$\theta = \frac{s}{r}$$

The length of the intercepted arc of the central angle is proportional to the radius. The radian measure of the angle is the constant of proportionality.

$$s = \theta r$$

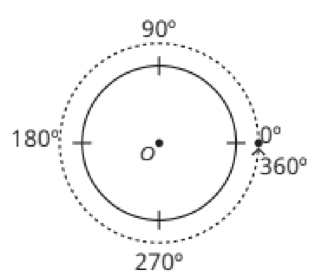
The central angle of one radian of a unit circle produces an arc length of 1.

1. Use the fact that all circles are similar to show that the length of the arc intercepted by an angle is proportional to the radius. Identify the constant of proportionality.



You know that the arc measure of an entire circle is 360° and has an arc length of $2\pi r$ units.

2. What is the radian measure of an entire circle?



3. Write the equivalent radian measure for each degree measure.

The degree measure and radian measure are related by the equations $360° = 2\pi$ radians and $180° = \pi$ radians.

The formulas you can use to convert from radians to degrees and degrees to radians are shown.

Radians to Degrees: $x \text{ radians} \cdot \frac{180°}{\pi \text{ radians}}$

Degrees to Radians: $x \text{ degrees} \cdot \frac{\pi \text{ radians}}{180°}$

Worked Example

You can convert from degrees to radians and from radians to degrees.

Convert 60° to radians.

$60°\left(\frac{\pi}{180°}\right) = \frac{\pi}{3}$

Convert $\frac{\pi}{3}$ to degrees.

$\frac{\pi}{3}\left(\frac{180°}{\pi}\right) = 60°$

The decimal approximation is not used to convert between radians and degrees.

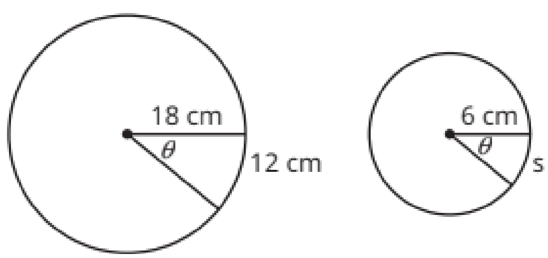
4. Write an equivalent equation to show each relationship.

a. 1° and radians

b. 1 radian and degrees

Store

5. Determine the unknown arc length. Explain your reasoning.



6. **The measure of a central angle is 120°. The length of the radius is 20 centimeters. Determine the arc length using each equation.**

   a. $s = \frac{\text{measure of angle}}{360^\circ} \cdot 2\pi r$

   b. $s = \theta r$

   c. **Compare your answers in part (a) and part (b).**

7. **If $\theta = \frac{\pi}{2}$ and $r = 4$, solve for the length of the intercepted arc.**

8. **If $r = 2$ and the intercepted arc length is 5, what is the measure of the central angle?**

9. **Describe the similarities and differences between radians and degrees.**

10. **Which unit do you prefer to use? Explain your reasoning.**

GETTING STARTED

Short Stack

You have stacked congruent two-dimensional figures to create solid figures. Now let's investigate how stacking similar figures can create solid figures also.

1. Imagine you stack similar circular pancakes on top of each other so that each layer of the stack is composed of a slightly smaller pancake than the previous layer.

a. Identify the name of the solid formed by this stack of pancakes.

b. Relate the dimensions of a single pancake to the dimensions of the solid.

2. Imagine you stack similar square pancakes on top of each other so that each layer of the stack is composed of a slightly smaller pancake than the previous layer.

a. Identify the name of the solid formed by this stack of pancakes.

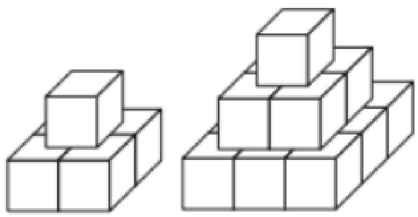
b. Relate the dimensions of a single pancake to the dimensions of the solid.

ACTIVITY 4.1

Building the Pyramid Volume Formula

Let's think about how to derive the formula for the volume of a pyramid. The diagrams show two pyramids—one with two layers and one with three layers.

1. Use centimeter cubes to construct these pyramids. Then answer the questions and explain your reasoning.



a. Describe the two-dimensional shape of the top surface of each layer of cubes.

b. Explain why the two-dimensional surfaces of the cube layers represent similar figures.

c. What is the volume of each pyramid?

d. For each of the two pyramids, determine the volume of a prism that has the same base.

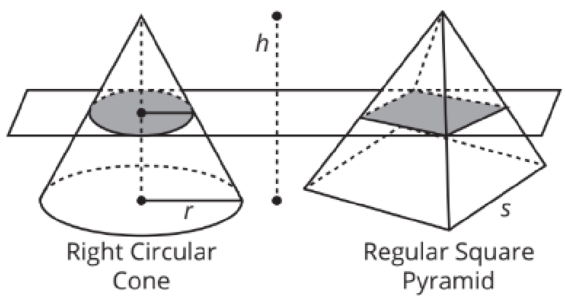
ACTIVITY 4.2 Building the Cone Volume Formula

Remember:

Cavalieri's Principle states that if a plane cross-section parallel to the given plane has the same area in both solids, then the volumes of the solids are equal.

You have learned that the formula for the volume of a cone, like the formula for the volume of a pyramid, is $V = \frac{1}{3}Bh$. You can use Cavalieri's Principle to understand why the volume formulas for the two different solids are the same.

Consider the cone and pyramid shown. Their bases have equal area.



1. **If the length of the radius of the base of the cone is *r*, what is the area of its base?**

2. **If the side length of the base of the square pyramid is *s*, what is the area of its base?**

3. **You are given that the areas of the bases are equal. Set the areas equal to each other and rewrite the equation in terms of the side length of the base of the square pyramid.**

ACTIVITY 4.4

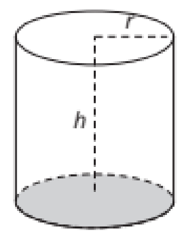
Surface Area

In the previous activity, you explored the different volume created by rolling a piece of paper in two different ways. The cylinders that you created had the same *lateral surface area*. The **lateral surface area** of a three-dimensional figure is the sum of the areas of its lateral faces. The **total surface area** of a three-dimensional figure is the sum of the areas of its bases and lateral faces.

Remember:

A lateral face of a three-dimensional figure is a face that is not a base.

1. Consider the right cylinder shown.



a. Sketch the bases and lateral faces of the cylinder. Include the dimensions.

b. Determine the area of each face.

c. Use your sketch to write the formulas for the total surface area and lateral surface area of the cylinder. Explain your reasoning.

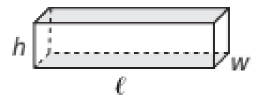
Recall that the width of the lateral face of a cylinder is equal to the circumference of the base.

2. A cylindrical paint roller has a diameter of 2.5 inches and a length of 10 inches.

a. Apply the formula to determine the lateral surface area of the paint roller.

b. Apply the formula to determine the total surface area of the paint roller.

3. **Consider the right rectangular prism shown. Its bases are shaded.**



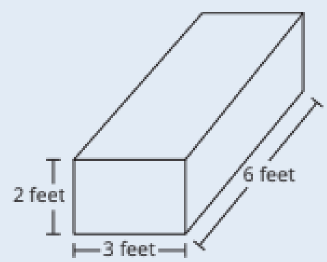
a. **Sketch the bases and lateral faces of the prism. Include the dimensions of each.**

b. **Determine the area of each face.**

For right rectangular prisms, you can call any pairs of opposite faces "bases."

c. **Use your sketch to write the formulas for the total surface area and lateral surface area of the right rectangular prism. Explain your reasoning.**

4. **David says that the lateral surface area of a right rectangular prism can change, depending on what the bases of the prism are. He calculates 3 different lateral surface areas, L, for the prism shown.**

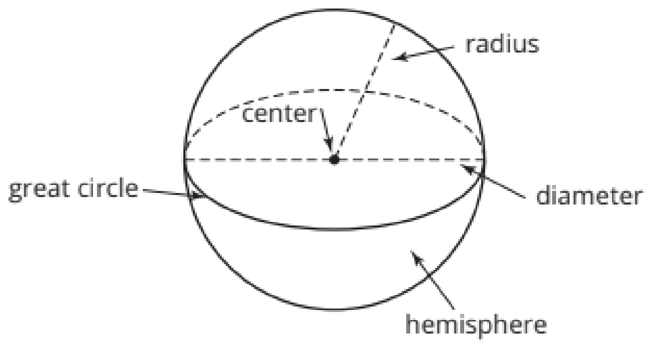


$L_1 = 36$ ft^2 $\quad$ $L_2 = 60$ ft^2 $\quad$ $L_3 = 48$ ft^2

Is David correct? Explain your reasoning.

ACTIVITY
4.5 Spheres

Recall that a circle is the set of all points in two dimensions that are equidistant from the center of the circle. A sphere can be thought of as a three-dimensional circle.



The volume of a sphere is given by the equation $V = \frac{4}{3}\pi r^3$, where r represents the radius of the sphere.

1. Determine the volume of each sphere with the given radius length.

a. 2.2 in.

b. 4 cm

c. $\frac{1}{2}$ yd

d. 4.4 in.

A **sphere** is the set of all points in three dimensions that are equidistant from a given point called the center.

The **radius of a sphere** is a line segment drawn from the center of the sphere to a point on the sphere.

The **diameter of a sphere** is a line segment drawn between two points on the sphere passing through the center.

A **great circle of a sphere** is a cross section of a sphere when a plane passes through the center of the sphere.

A **hemisphere** is half of a sphere bounded by a great circle.

Assignment

Write

Describe a similarity and a difference between each term.

1. lateral surface area and total surface area
2. radius of a sphere and diameter of a sphere

Remember

The volume formula for a cone is $V = \frac{1}{3}\pi r^2 h$, where r is the radius of the base and h is the height of the cone. The volume formula for a pyramid is $V = \frac{1}{3}Bh$, where B is the area of the base and h is the height of the pyramid.

The lateral surface area of a three-dimensional figure is the sum of the areas of its lateral faces. The total surface area of a three-dimensional figure is the sum of the areas of its bases and lateral faces. The volume formula for a sphere is $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. The formula for the total surface area of a sphere is $SA = 4\pi r^2$, where r is the radius of the sphere.

Practice

1. The Luxor Hotel in Las Vegas is a replica of the Great Pyramid at Giza. The Luxor's base is a square with a side length of 600 feet. Each lateral face has a slant height of 460 feet, and the hotel is 350 feet tall.
   a. What is the volume of the Luxor Hotel?
   b. What is the lateral surface area of the Luxor Hotel?
2. Your municipality is replacing the storage tanks in the community. Which plan provides the greater total capacity?
   Plan 1: Install one cylindrical tank that is 150 feet tall and has a radius of 50 feet.
   Plan 2: Install two cylindrical tanks that are 75 feet tall. One cylindrical tank has a radius of 30 feet, and one tank has a radius of 25 feet.
   Use 3.14 for π. Round your answers to the nearest tenth, if necessary.
3. A traffic cone has a radius of 9 inches and a height of 30 inches. What is the volume of this traffic cone? What is its lateral and total surface area if the slant height of the traffic cone is approximately 31 inches?
4. Today's deal at the ice cream shop is a mini cone with one scoop of ice cream.
   a. A mini ice cream cone has a diameter of 3.5 centimeters and a height of 6 centimeters. How much ice cream fits in the cone?
   b. One scoop of ice cream has the same diameter as the cone, 3.5 centimeters. What's the volume of 1 scoop of ice cream?
5. A soccer ball has a circumference of 70 centimeters at its widest point. What is the volume and total surface area of the soccer ball?