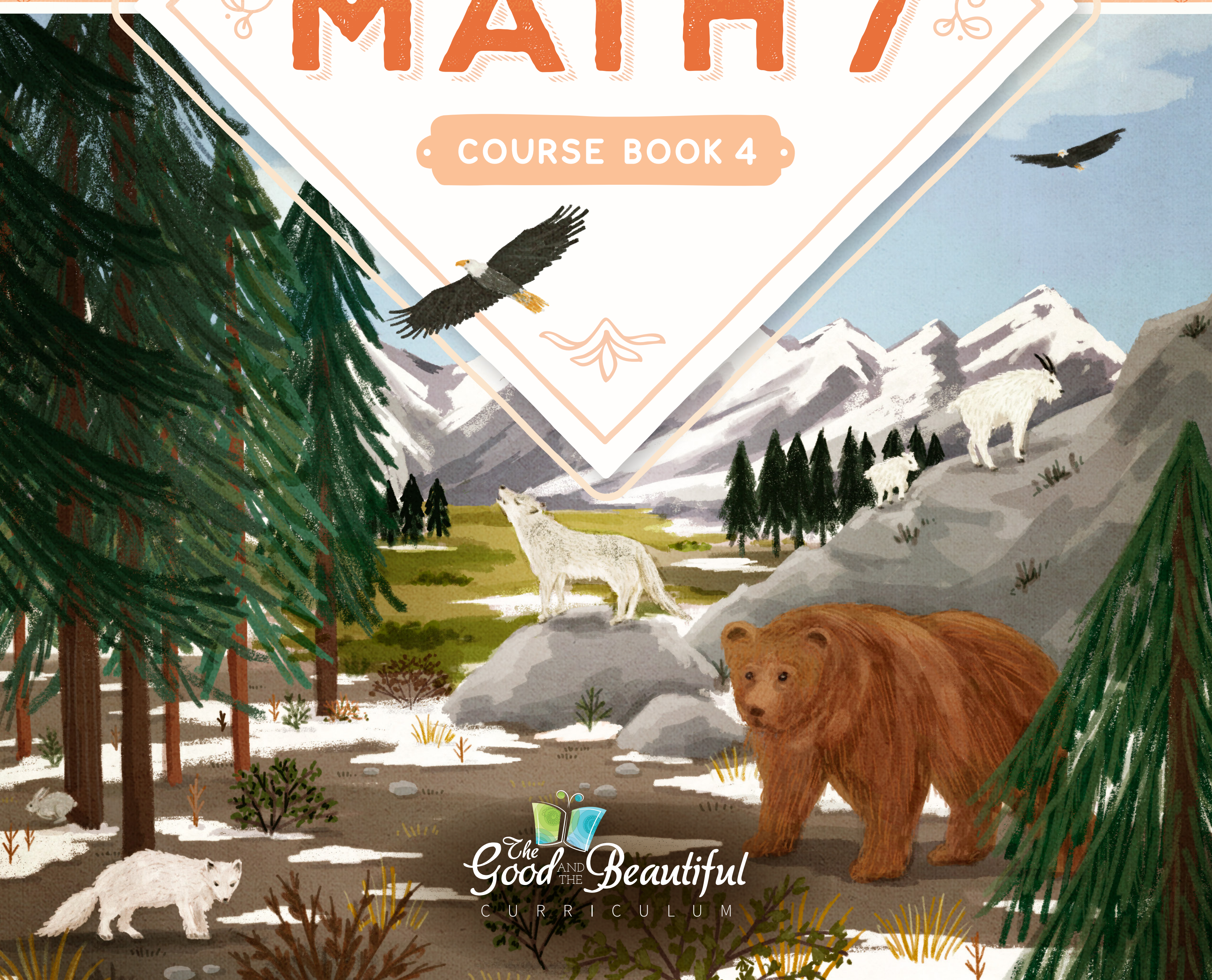
LESSONS
91–120

UNIT
4

Simply Good and Beautiful

MATH 7

COURSE BOOK 4



The Good and the Beautiful
CURRICULUM

COURSE BOOK 4

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LESSONS 91–120

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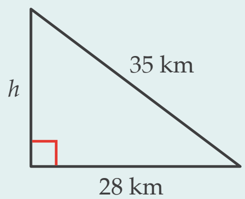
Geometric Solids

WARM-UP

Use the triangle for Parts A and B.



a. Find h.

$h =$ ______

b. Find the area of the triangle.

Area: ___________

LESSON

Use the app to watch the video lesson. Complete problems when instructed during the video in the Video Notes section. Optionally, read the Lesson Overview in place of the video or after the video if more instruction is needed.

VIDEO NOTES

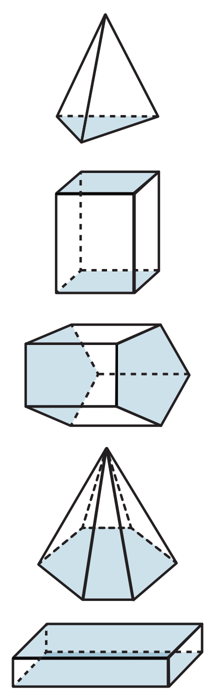
Square

Rectangular

Triangular

Pentagonal

Hexagonal



Prism

Pyramid

Cross section: the ___________ formed by cutting straight through a ___________

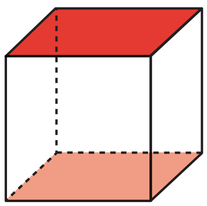
LESSON OVERVIEW

Three-dimensional figures are often referred to as geometric solids, and they have special properties. A ***polyhedron*** (plural: polyhedra) is a three-dimensional figure with polygons as faces. A ***face*** of a polyhedron is a flat surface on the solid. An ***edge*** is a line segment formed where two faces meet, and a ***vertex*** is a point where two or more edges meet. (The plural of vertex is vertices.)

A special type of polyhedron is a prism. A ***prism*** is a solid with two congruent, parallel bases and flat sides. Prisms are often named for the shape of their bases. All non-base faces of a prism are rectangles. Some examples of prisms are below.

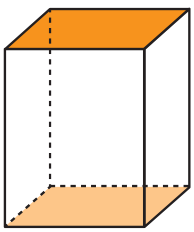
Cube

Each face is a square.



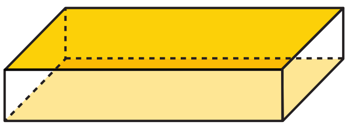
Square Prism

The bases are squares. All other faces are rectangles.



Rectangular Prism

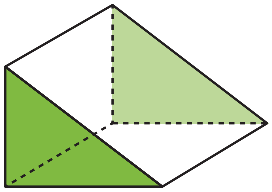
The bases are rectangles. All other faces are also rectangles.



Note: Cubes, square prisms, and rectangular prisms all have 6 faces, 12 edges, and 8 vertices.

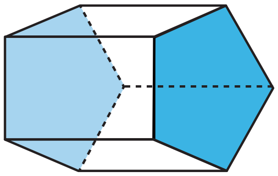
Triangular Prism

The bases are triangles. All other faces are rectangles.



Pentagonal Prism

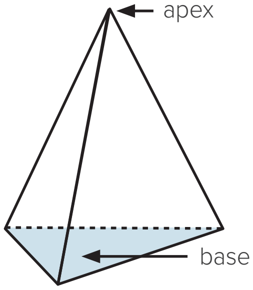
The bases are pentagons. All other faces are rectangles.



Another special type of polyhedron is a pyramid. A ***pyramid*** is a solid with one base and flat sides. A pyramid is often named for the shape of its base. All non-base faces of a pyramid are triangles. The apex of a pyramid is the vertex where all the triangular faces meet.

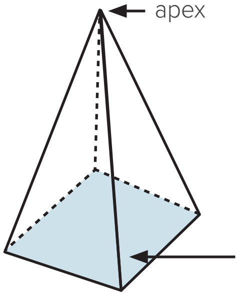
Triangular Pyramid

The base is a triangle. All other faces are triangles.



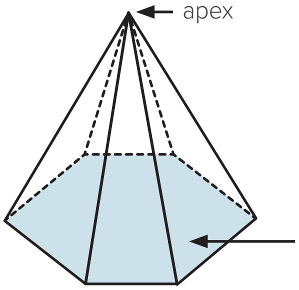
Square Pyramid

The base is a square. All other faces are triangles.



Hexagonal Pyramid

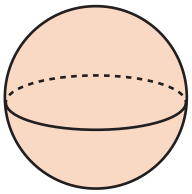
The base is a hexagon. All other faces are triangles.



The ancient Egyptians built square pyramids. Pyramids are also found in art and modern architecture, like the entrance to the Louvre Museum in France.

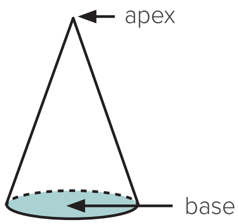
Below are examples of geometric solids that are not polyhedra.

Sphere



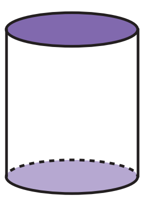
A ***sphere*** is a geometric solid that is not a polyhedron because the surface of a sphere is not made from polygons. Every point on the surface of a sphere is the same distance from the center of the sphere. Examples of spheres include bowling balls and oranges.

Cone



A ***cone*** has a circular base and a curved surface. The tip of a cone is called the apex. The height of a cone is the distance from the center of the base to the apex. Some cone-shaped objects are traffic cones and ice cream cones.

Cylinder



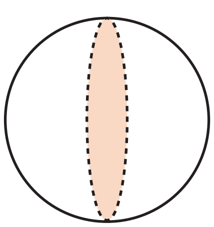
A ***cylinder*** is a solid with two circular bases that are congruent and parallel. An example of a cylinder is a metal can or a plumbing pipe.

Cross Sections

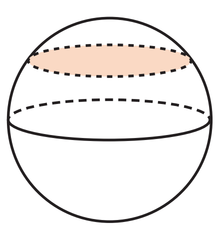
A cross section is the shape formed by cutting straight through a solid. The same solid can have cross sections of different shapes. A cross section that is parallel to the base of a polyhedron will be the same shape as the base. Look at the cross sections of various geometric solids below. The shape of each cross section is listed below the solid.

Cross Sections of a Sphere

Every cross section of a sphere is a circle.



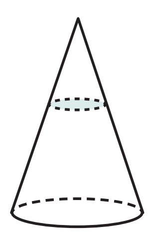
circle



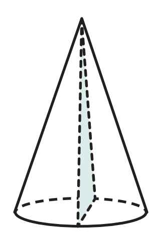
circle

Cross Sections of a Cone

The horizontal cross section of a cone is a circle. The vertical cross section through the apex is a triangle.



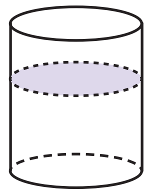
circle



triangle

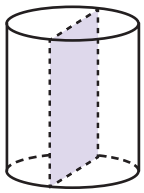
Cross Sections of a Cylinder

Cross sections parallel to the bases are circles.



circle

Cross sections perpendicular to the bases are rectangles.

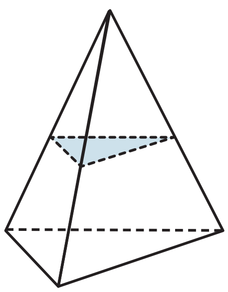


rectangle

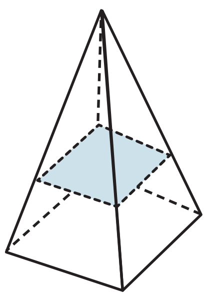
Cross Sections of Pyramids

Below are just a few examples of possible vertical and horizontal cross sections for a triangular pyramid, square pyramid, and hexagonal pyramid.

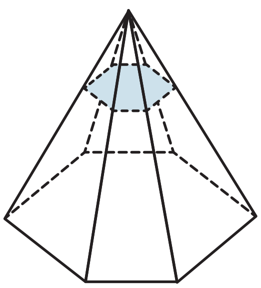
Horizontal cross sections (parallel to the base):



triangle

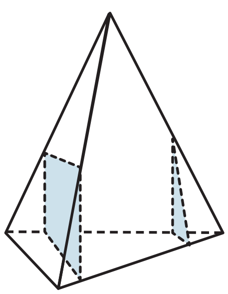


square

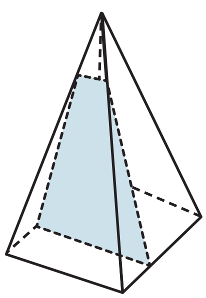


hexagon

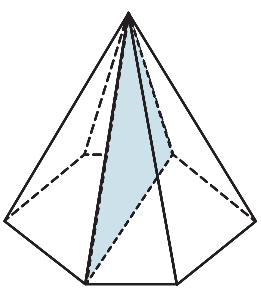
Vertical cross sections (perpendicular to the base):



trapezoid or triangle



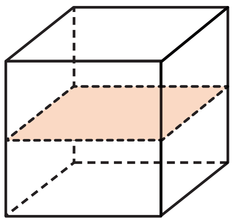
trapezoid

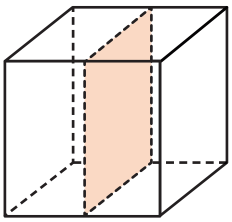


triangle

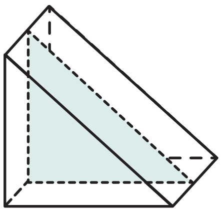
Cross Sections of Prisms

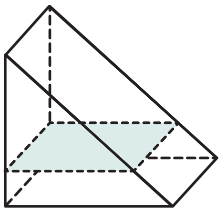
In a cube, like the one below, cross sections parallel to the bases and cross sections perpendicular to the bases are squares.





In a triangular prism, cross sections parallel to the bases are triangles. Cross sections perpendicular to the bases are rectangles.



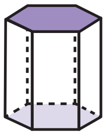
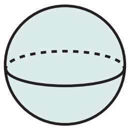
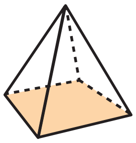
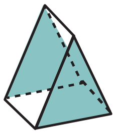
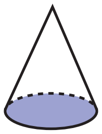
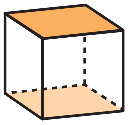
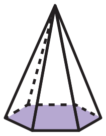
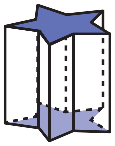
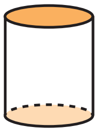


PRACTICE

1. Fill in the table with the general name for each geometric solid. Choose from the word bank below.

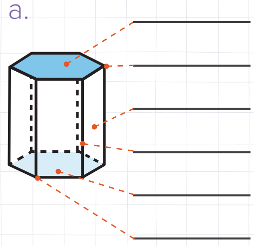
Word Bank:

sphere	prism	cone
pyramid	cylinder	

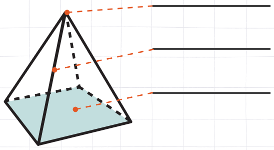
Solid	Name
	
	
	
	
	
	
	
	
	

2. For each shape, write whether the indicated part is a *face*, *edge*, *vertex*, or *apex*.

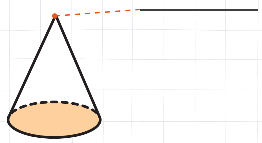
a.



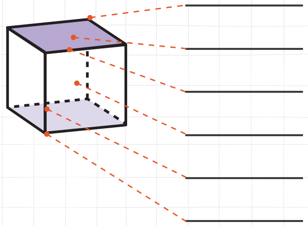
b.



c.

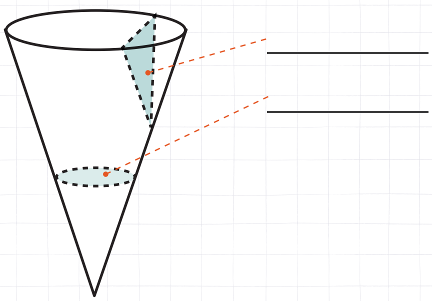


d.

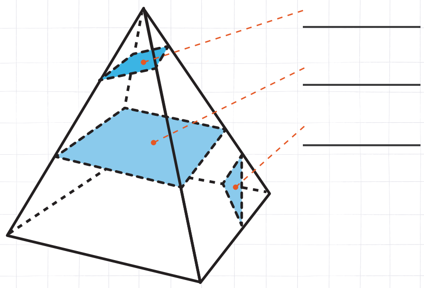


3. Identify the shape of the indicated cross sections in each solid.

a.



b.



4. For each geometric solid listed below, draw an example of the solid below the name. Then find its name in the word search.

Rectangular Prism

Cylinder

Cube

Square Pyramid

Sphere

Triangular Pyramid

Square Prism

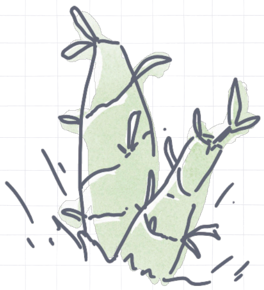
Cone

Pentagonal Prism

For fun, here are some additional words to find in the word search:

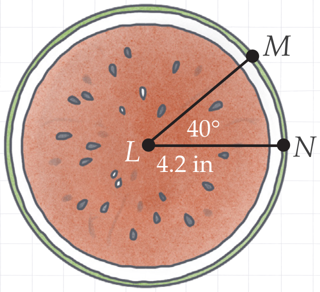
VERTEX
EDGE
FACE
APEX

P	T	R	I	A	N	G	U	L	A	R	P	Y	R	A	M	I	D	A	U
B	E	T	F	D	D	J	D	K	Z	V	R	E	F	O	V	M	Q	P	Q
H	Z	N	C	P	M	A	V	D	B	E	F	Q	E	D	U	X	L	E	C
U	M	N	T	O	G	N	W	X	P	G	V	M	N	C	A	E	L	X	Y
W	M	J	R	A	N	S	O	Y	M	D	L	L	W	F	G	X	O	I	B
T	B	S	L	E	G	E	S	C	L	U	Y	E	F	T	Q	B	O	T	C
V	C	V	U	I	C	O	T	T	Z	O	K	D	P	U	T	S	L	A	Y
Z	E	U	X	E	R	T	N	M	G	K	D	G	B	O	I	F	N	B	L
M	X	R	I	H	F	L	A	A	S	L	W	E	U	L	U	D	C	E	I
E	W	I	T	X	F	S	S	N	L	W	L	Q	D	V	I	V	S	Y	N
Q	U	K	Z	E	Y	T	Q	S	G	P	Q	A	U	E	M	S	T	E	D
O	F	R	B	W	X	O	G	U	B	U	R	S	P	H	E	R	E	F	E
H	J	I	Y	S	D	R	R	I	A	X	L	I	V	U	J	Y	T	C	R
K	B	C	C	K	P	Y	I	V	L	R	I	A	S	Q	G	T	R	G	P
S	M	I	U	D	A	D	D	Z	R	F	E	X	R	M	Z	L	Q	X	Y
A	P	S	B	B	J	J	P	Y	M	W	A	P	P	P	M	I	H	B	G
Z	A	M	B	R	E	P	Z	T	I	V	Z	C	R	D	R	L	N	M	P
D	N	Z	D	I	M	R	H	B	P	M	U	S	E	I	U	I	X	I	X
R	L	R	N	A	S	V	B	P	J	C	X	R	G	R	S	Z	S	R	Z
M	L	S	Q	U	A	R	E	P	Y	R	A	M	I	D	M	M	M	M	L



REVIEW

1. Use the image below to answer the questions. When necessary, round to the nearest tenth.



a. What is the area of the watermelon slice (entire circle)? L84

$A \approx$ ____________

b. If the watermelon slice is cut into wedges the size of sector *MLN*, how many wedges can be cut from the slice? L92

______ wedges

c. The outside edge of the watermelon slice is called the rind. What is the length of the rind on the wedge represented by sector *MLN*? L92

✦ Hint: Find the length of $\overset{\frown}{MN}$.

____

2. Lewis borrowed $3,000 from his aunt to pay for graduate school. Four years after borrowing the money, he wants to pay it back with 2.5% simple interest. How much interest will he pay? L49

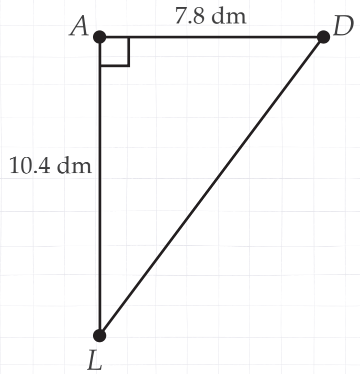
✦ Hint: The simple interest formula is $I = Prt$.

____

3. What is the length of *LD* in the figure below? L81

✦ Hint: Use the Pythagorean Theorem.

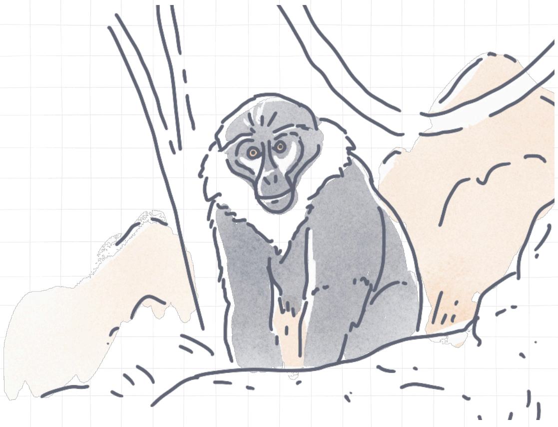
____



4. After helping her dad build a shed, Janet found three leftover pieces of wood that were 6 in, 9 in, and 1 ft long. Can a triangle be formed from the pieces of wood? L71

✦ Hint: First convert all dimensions to the same units. To form a triangle, the sum of any two sides must be greater than the third side.

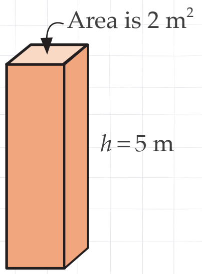
____



PRACTICE

1. Use the height and the given area of the base to find the volume of each solid.

Hint: See the Key Information box in the Lesson Overview.

a. 

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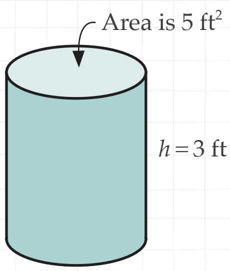
b. 

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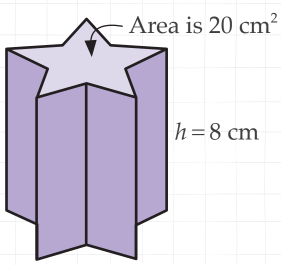
c. 

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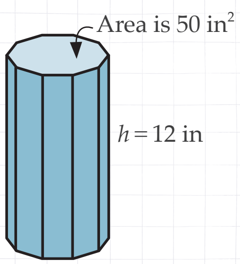
d. 

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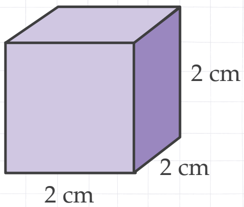
2. Find the volume of each solid below. Round to the nearest hundredth, if needed.

a. 

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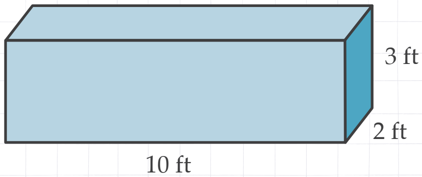
b. 

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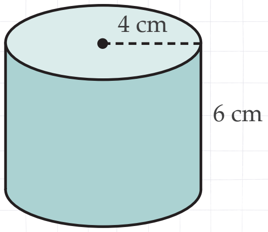
c. 

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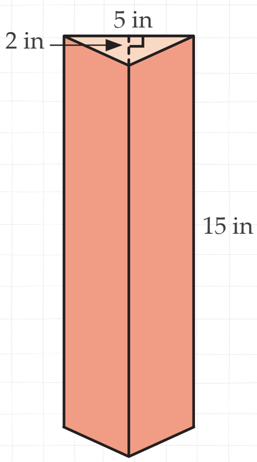
d. 

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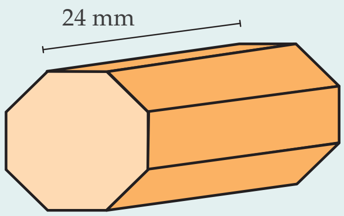
Volume of Other Geometric Solids

WARM-UP

Find the volume of the octagonal prism below if the area of the base of the prism is 50 mm^2. Remember, the volume of a prism is found by multiplying the area of the base by the height.



Volume: ______________

LESSON

Use the app to watch the video lesson. Complete problems when instructed during the video in the Video Notes section. Optionally, read the Lesson Overview in place of the video or after the video if more instruction is needed.

VIDEO NOTES

Traffic Cone

Area of the circle:

$A = \pi(\_\_\_\_)^2$

$A = \_\_\_\_\_\_ \pi$

Area: ________ in^2

Volume of the cone:

$V = \frac{1}{3}(\_\_\_\_)(\_\_\_\_)$

Volume: ________ in^3

Metronome

Area of the triangle:

$A = \frac{1}{2}(\_\_\_\_)(\_\_\_\_)$

Area: ________ cm^2

Volume of the pyramid:

$V = \frac{1}{3}(\_\_\_\_)(\_\_\_\_)$

Volume: ________ cm^3

Cannonball

Volume of the sphere:

$V = \frac{4}{3}\pi(\_\_\_\_)^3$

$V = \frac{4}{3}\pi(\_\_\_\_)$

$V = \_\_\_\_ \pi$

Volume: ________ in^3

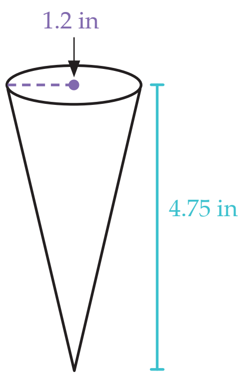
LESSON OVERVIEW

Volume is used in things like cooking, baking, medicine, and engineering. Every three-dimensional shape has volume. The volume of different solids can be found using formulas. Volume is expressed in cubic units.

Volume of a Cone

The volume of a cone is found using the formula $V = \frac{1}{3}Bh$, where B is the area of the base and h is the height of the cone. The height of a cone is the distance from the apex to the base.

Example 1: An office waiting room has a water tank with small cone-shaped cups. Below is an image with measurements. Find the volume of the cup to the nearest hundredth.



To use the volume formula, calculate the area of the base first.

Area of Base (B):

The base of a cone is a circle.

$$A = \pi r^2$$
$$A = \pi(1.2)^2$$
$$A = 1.44\pi$$
$$A \approx 4.52$$

The area of the circle is approximately 4.52 in^2. This is the value of B in the volume formula.

Volume of Cone:

Use 4.52 for B.

$$V = \frac{1}{3}Bh$$
$$V = \frac{1}{3}(4.52)(4.75)$$
$$V \approx 7.16$$

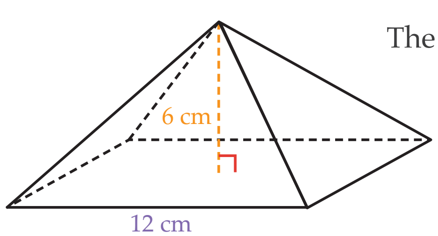
The volume of the cup is about 7.16 in^3.

Fun Fact: This is almost 4 fl oz.

Volume of a Pyramid

The volume of a pyramid is found using the formula $V = \frac{1}{3}Bh$, where B is the area of the base and h is the height of the pyramid. The height of a pyramid is the distance from the apex to the base.

Example 2: Find the volume of the square pyramid.



Area of Base (B):

The base of this pyramid is a square.

$$A = s^2$$
$$A = 12^2$$
$$A = 144$$

The area of the square is 144 cm^2. This is the value of B in the volume formula.

Volume of Pyramid:

Use 144 for B.

$$V = \frac{1}{3}Bh$$
$$V = \frac{1}{3}(144)(6)$$
$$V = 288$$

The volume of the pyramid is 288 cm^3.

Example 3: The Great Pyramid of Giza is the biggest Egyptian pyramid. Find the volume of the pyramid using the original height of about 481 feet and the original base side length of about 756 feet. (The base is square.)

To use the volume formula, calculate the area of the base first.

Area of Base (B):

The base of this pyramid is a square.

$$A = s^2$$
$$A = 756^2$$
$$A = 571536$$

The area of the square is 571,536 ft². This is the value of B.

Volume of Pyramid:

Use 571,536 for B.

$$V = \frac{1}{3}Bh$$
$$V = \frac{1}{3}(571536)(481)$$
$$V \approx 91636272$$

The volume of the pyramid is about 91,636,272 ft³.

Volume of a Sphere

The volume of a sphere is found using the formula $V = \frac{4}{3}\pi r^3$.

Example 4: A spherical glass vase is filled with water beads. Find the volume of the sphere if the radius of the vase is 6 inches.

$V = \frac{4}{3}\pi r^3$ Substitute 6 for the radius.

$V = \frac{4}{3}\pi(6)^3$ First, find 6 cubed.

$V = \frac{4}{3}\pi(216)$

$V = 288\pi$

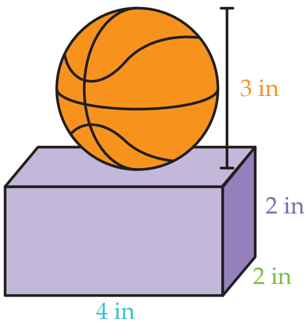
$V \approx 904.78$ The volume of the vase is approximately 904.78 in³.

Fun Fact: This is almost 4 gallons.

Volume of Composite Solids

The volume of composite solids can be found by finding the volume of each three-dimensional figure that makes up the composite solid and adding the volumes together.

Example 5: Calvin has a coin bank that is a square prism base with a basketball on top. Given the measurements below, find the volume of the coin bank.



Volume of Square Prism:

$$V = lwh$$
$$V = 4 \bullet 2 \bullet 2$$
$$V = 16$$

Volume of Sphere:

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(1.5)^3$ Use 1.5 for r since the diameter is 3.

$V = \frac{4}{3}\pi(3.375)$

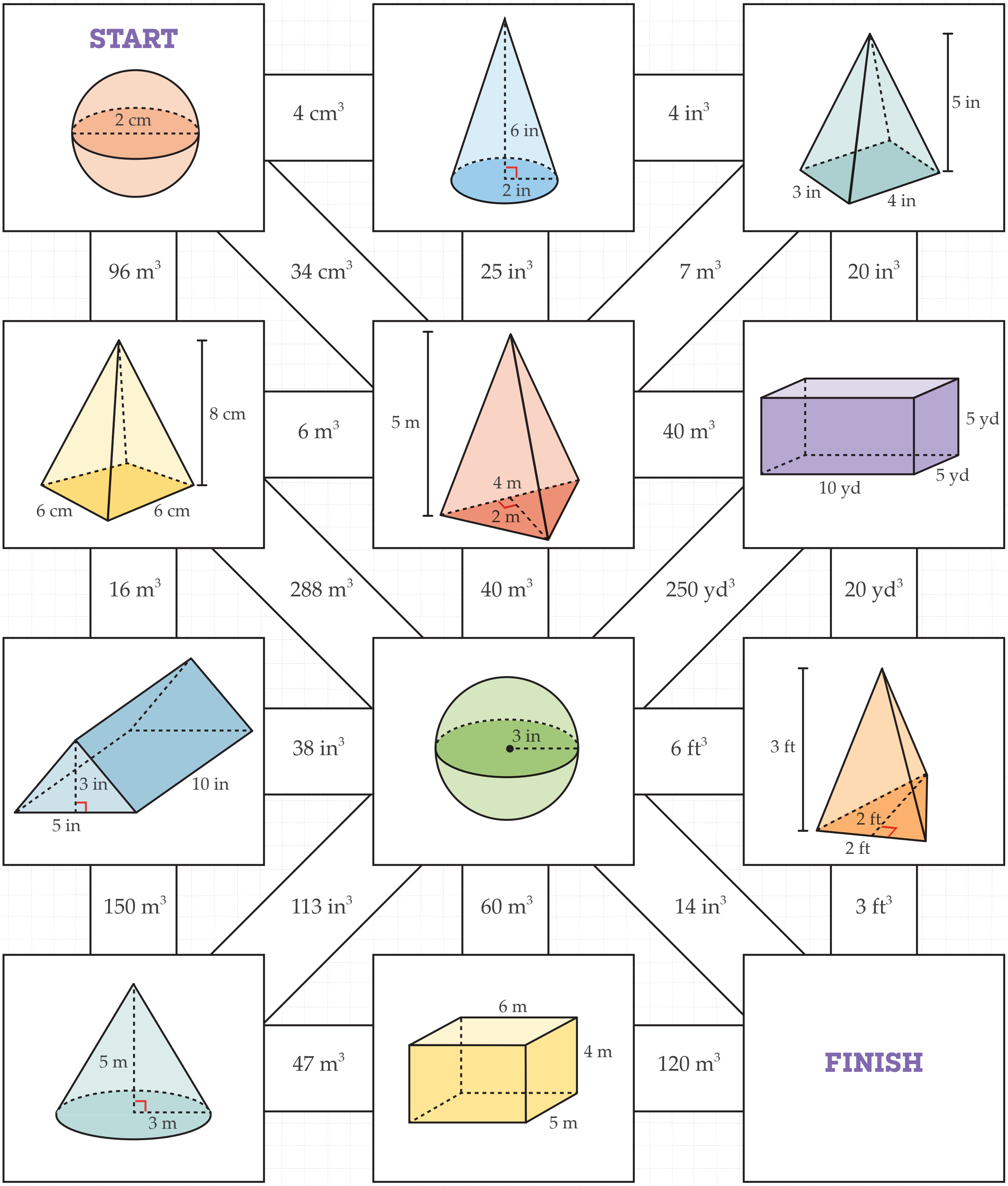
$V = 4.5\pi$

$V \approx 14.14$

Add the two volumes together to find the volume of the composite solid.

$16 + 14.14 = 30.14$ The volume of the coin bank is approximately 30.14 in³.

3. Begin at START. Find the volume of the shapes shown to work your way through the maze. Round each volume to the nearest whole number.



PRACTICE

Cut out the squares below. Simplify the four rational expressions on each square and write the simplified expression on the line provided. Once all expressions have been simplified, match the sides of the squares together if they simplify to the same expression. Each square will match to two other squares.

1. $\frac{6a^2}{a}$ ________________

2. $\frac{6a^2c^2}{3c^2a^2}$ ________________

3. $\frac{4ab^2c^3}{2c^2a^2}$ ________________

4. $\frac{20cab}{15a^2c}$ ________________

5. $\frac{15ca^3}{5a^3}$ ________________

6. $\frac{12a^3b}{9a^4}$ ________________

7. $\frac{14a^3bc}{4a^2c^2}$ ________________

8. $\frac{b^5c^3}{4b^2c^2}$ ________________

9. $\frac{2b^2ca}{3a^2b^2}$ ________________

10. $\frac{6a^2b}{3ab}$ ________________

11. $\frac{9abc}{3ab}$ ________________

12. $\frac{a^2bc^5}{b^2c^6a}$ ________________

13. $\frac{2b^2a}{6c^2ab}$ ________________

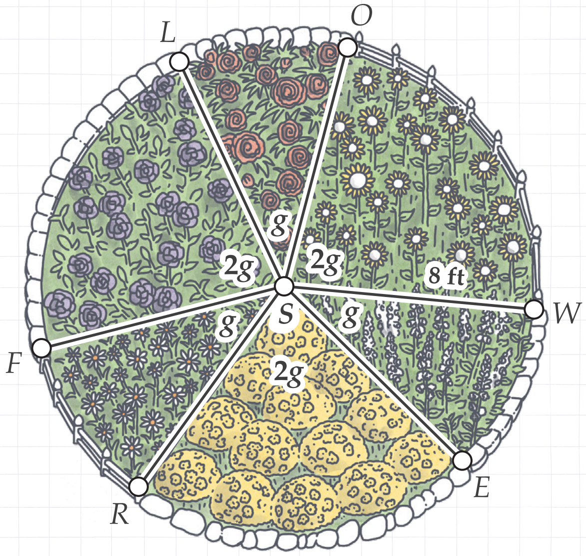
14. $\frac{3b^2ac^2}{b^3c^2a}$ ________________

15. $\frac{6ba^2}{ab}$ ________________

16. $\frac{4ac}{2c}$ ________________

REVIEW

1. Richard is building a circular flower garden according to the design shown below.



a. Write and solve an equation to find the value of g. Then find the measure of each angle. L80

$g =$ ______ $m\angle FSL =$ ______

$m\angle LSO =$ ______

b. Find the area and circumference of the garden rounded to the nearest hundredth. L84

Area: ____________

Circumference: ____________

c. Richard will plant peonies in sector *LSO* and carnations in sector *FSL*. What is the area of each of these sectors? L92

LSO: ____________ *FSL*: ____________

d. Richard is considering placing a different type of border (such as boulders, concrete pavers, wooden pickets, etc.) around each sector of his garden. To calculate how much of each border he will need, Richard must find the arc length of each section. Find the lengths of $\overset{\frown}{FL}$ and $\overset{\frown}{LO}$ to the nearest hundredth. L92

$\overset{\frown}{FL}$: ____________ $\overset{\frown}{LO}$: ____________

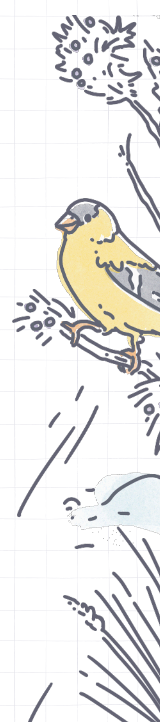
e. Fabulous Flowers, the company from which Richard will buy seeds, completes a quality check on a randomly chosen seed packet from the first 100 packets filled each day. Then they quality check every 50th packet after the randomly chosen packet. L103

Is this sampling method biased or unbiased?

____

Fill in the blanks: This is an example of a

_ _ _ _ _ _ _ _ _ _ sample.



Logic Lesson 4

Vernal Pool Ecosystem

Vernal pools are seasonal wetlands that typically fill with water from melting snow or rain showers in spring and dry up by late summer or early fall. Certain species of animals and plants rely on these temporary pools for survival. In this lesson, you'll learn more about vernal pool ecosystems as you complete several number and logic puzzles.

There is no video or review for this lesson.

Studious Students

Vernal pools vary greatly in size. Some are as small as an ordinary rain puddle. Others resemble a shallow lake, such as California's nearly 100-acre vernal pool named Olcott Lake.

Suppose a group of students from a science club surrounded a small circular vernal pool in order to make observations. The students were evenly spaced, and the seventh student was standing directly opposite the 18th student. How many students were in the group?

✦ Hint: Draw a picture.

_________ students

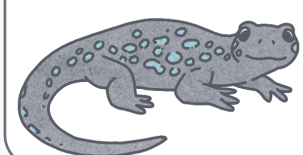
Salamander Surveys

Some amphibians, such as salamanders and frogs, lay eggs in vernal pools. The eggs hatch as the pools fill, and the larvae or tadpoles develop and metamorphose as the water begins to evaporate. By the time the pools dry again, the animals have grown into adults that hop or crawl to new homes in the surrounding land.

Suppose people living near some vernal pools were surveyed regarding which salamander species they had recently seen in the area. If exactly 91.2% of people returned the survey, what is the fewest number of people that could have been surveyed?

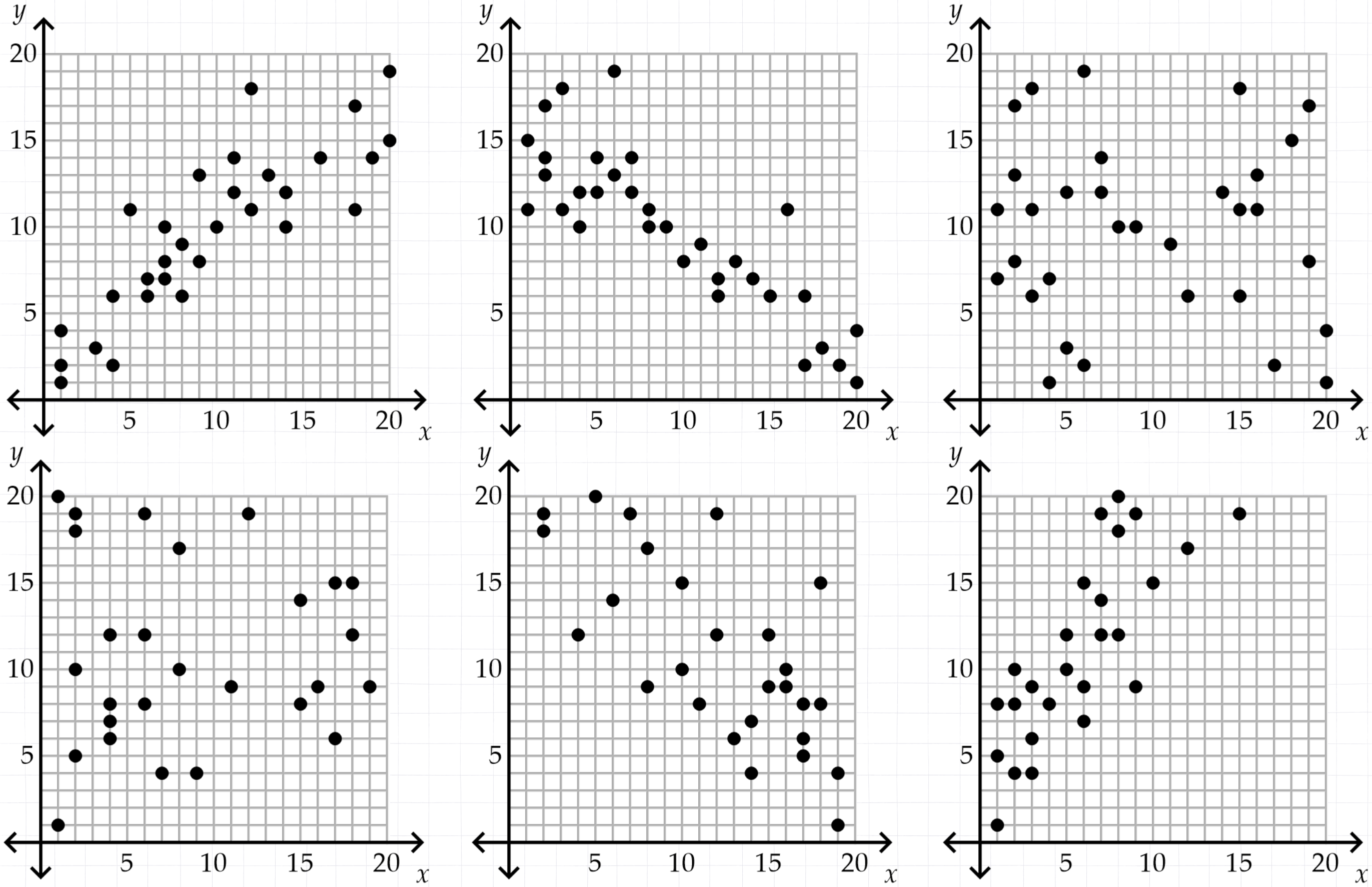
✦ Hint: Rewrite 91.2% as a simplified fraction.

_________ people



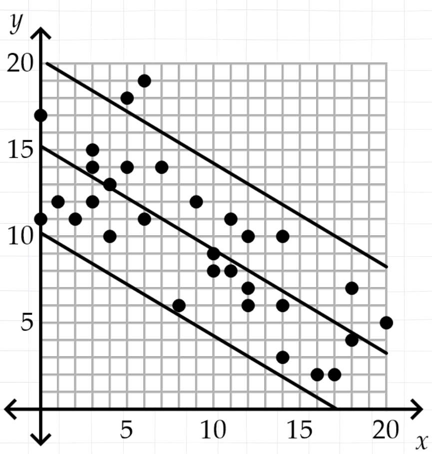
PRACTICE

Use the scatter plots below for Problems 1 through 4.

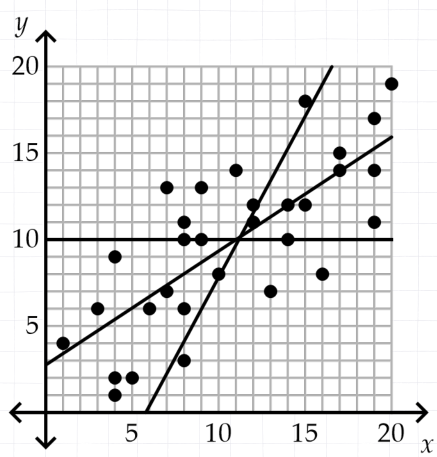


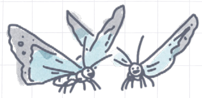
1. Circle any scatter plots that appear to show a positive correlation in yellow.
2. Circle any scatter plots that appear to show a negative correlation in blue.
3. Circle any scatter plots that do not appear to show a correlation in red.
4. For the scatter plots that appear to show a correlation, draw an estimated line of best fit on each graph.
5. Each of the scatter plots below shows three lines. Circle the line that best fits the data.

a.



b.





2. Use the word bank to fill in the blank(s) in each sentence. Then find the missing words in the word search.

a. The ______________ is the middle number of a data set.

b. The __________ of a data set is obtained by adding all the data values and dividing by the number of data values.

c. A graph of data will look ______________ if the mean and median are close to each other.

d. When the mean is ____________ than the median, a graph will be right ____________.

e. If the data has some outliers that are significantly less than the majority of other data values, the graph will be ____________ skewed, and the mean will be _____________ than the median.

f. A box plot of right-skewed data will have a _____________ whisker on the right.

g. The most common data value in a set is the __________.

h. A data set with one mode is called _______________.

i. A _______________ data set will have a graph with two peaks.

WORD BANK

- bimodal
- larger
- left
- less
- longer
- mean
- median
- mode
- skewed
- symmetric
- unimodal

C	M	K	W	C	K	K	O	E	C	C	C	C	I	L	J	A	V	E	U
M	M	R	I	O	W	V	M	G	L	S	A	J	H	S	S	N	E	P	H
B	E	F	P	T	H	P	K	H	V	L	N	K	Q	F	H	R	H	Y	Z
O	Y	V	V	S	R	X	G	X	A	Z	M	T	O	Z	S	T	F	J	W
D	E	V	W	L	Y	O	U	T	J	C	O	L	U	L	N	N	O	N	I
D	G	P	K	V	Z	Z	T	U	L	Q	M	K	O	Y	Q	V	M	U	E
U	C	R	U	K	A	Z	F	W	L	I	E	N	W	N	U	U	E	N	K
N	S	X	S	L	C	Y	V	V	S	D	D	T	G	L	G	I	A	I	D
V	H	K	Y	J	E	S	B	X	Q	N	I	L	J	Z	Q	E	N	M	N
U	W	S	X	K	J	S	O	B	E	I	A	C	T	N	R	F	R	O	R
E	D	D	H	D	R	R	S	N	I	U	N	F	S	U	P	L	Q	D	N
F	F	O	G	E	O	K	B	M	M	G	L	W	T	I	F	W	Y	A	S
S	Y	Q	B	W	Z	Q	U	S	Y	M	M	E	T	R	I	C	L	L	A
F	N	C	J	I	M	O	D	E	X	R	E	O	G	D	B	V	A	Q	K
Y	V	L	K	G	M	E	O	V	U	Y	R	N	O	T	D	C	R	M	I
F	M	B	P	I	F	O	S	K	E	W	E	D	B	Z	I	X	G	P	R
P	L	F	X	I	O	J	D	P	W	T	D	J	P	I	D	L	E	F	T
L	E	W	O	J	H	V	O	A	N	V	C	H	V	J	V	I	R	E	X
L	A	P	A	Q	I	N	Q	G	L	F	F	H	I	K	H	M	W	J	C
A	Q	N	T	N	D	B	M	K	I	J	C	G	H	H	C	G	X	B	X

REVIEW

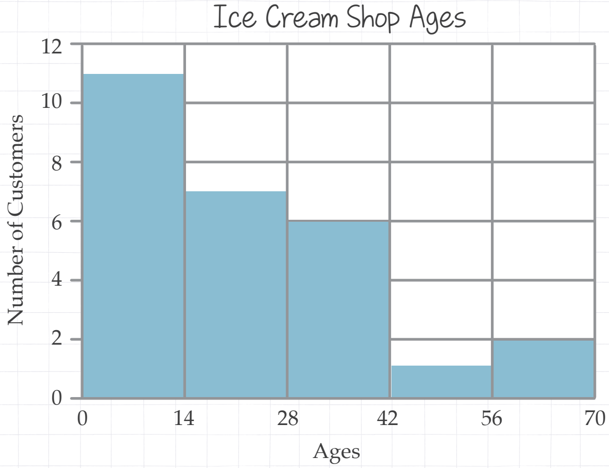
1. The data set below represents the resting heart rate of six high school cross-country runners. Find the mean, median, mode, and range of the data set. L106

Data set: 53, 42, 60, 48, 51, 64

a. Mean: __________ b. Median: __________

c. Mode: __________ d. Range: __________

2. The histogram below represents the ages of customers eating ice cream cones at Ina's Ice Cream Shop.



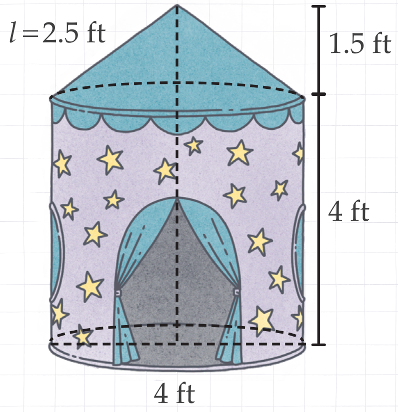
a. Is the histogram *left skewed*, *right skewed*, or *symmetric*? L110

____

b. Based on your answer to Part A, compare the median and mean of the data using <, >, or ≈. L110

mean ◯ median

3. Niya is making a play tent as a gift for her niece's birthday. The design is shown below. The diameter of the tent base is 4 ft. The height of the tent in the center is 5.5 ft, and the height of the cylindrical portion is 4 ft. The height of the cone roof is 1.5 ft. The tent will include a fabric floor.



a. To figure out how much fabric she will need to make the tent, Niya needs to find the surface area of the composite solid. What is the surface area of the tent? Round to the nearest tenth. L96

✦ Hint: The cylinder part of the tent has just one circular base, and the cone portion does not include a base. See Reference Chart for formulas.

____

b. Fabric is typically sold by the square yard. Convert the surface area to square yards. Round to the nearest whole number. L55

____

Sample Space

WARM-UP

Find the probabilities below for one roll of a six-sided die. Write each probability as a fraction in simplest form.

a. What is the probability of rolling a 3? ________

b. What is the probability of rolling a number less than 3? ________

c. What is the probability of rolling an even number? ________

LESSON

Use the app to watch the video lesson. Complete problems when instructed during the video in the Video Notes section. Optionally, read the Lesson Overview in place of the video or after the video if more instruction is needed.

Home School App

VIDEO NOTES

__________ → red, orange, __________

__________ → red, __________, yellow

__________ → __________, orange, yellow

Outcomes:

RR	RO	____
OR	____	OY
____	YO	YY

Probability: $\frac{\square}{9}$ or ______ %

1, ____	2, ____	3, ____	4, ____
1, ____	2, ____	3, ____	4, ____
1, ____	2, ____	3, ____	4, ____
1, ____	2, ____	3, ____	4, ____

Probability: $\frac{2}{\square} = \frac{\square}{\square}$ or ______ %

LESSON OVERVIEW

When finding the likelihood of more than one event occurring, it can help to see all the possible outcomes visually. A ***sample space*** is the set of all possible outcomes of a probability experiment. There are many ways to represent the sample space, including lists, tree diagrams, and tables. Representing the sample space is an important part of understanding and calculating probabilities.

Organized Lists

Writing the sample space in a list makes it easier to count the desired outcomes and total outcomes.

Example 1: Suppose two tiles are randomly drawn from a bag containing the five tiles shown below. Find the probability of drawing the triangle tile and circle tile.

Make a list of the possible combinations when drawing two of the five tiles. Start by pairing one shape with all other shapes. Then pair another shape with the three shapes it has not been paired with, and so on, until all possible pairings are listed. This helps to ensure no possible outcome is missed. The sample space is represented below with a list.

circle - star	star - triangle	triangle - pentagon	pentagon - heart
circle - triangle	star - pentagon	triangle - heart	
circle - pentagon	star - heart		
circle - heart			

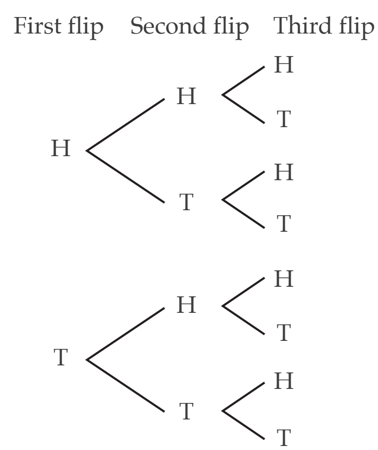
There are 10 possible outcomes when drawing two of the five tiles. Drawing the triangle and the circle is one of these 10 outcomes (highlighted above).

The probability of drawing the triangle and circle is $\frac{1}{10}$, or 10%.

Tree Diagrams

A tree diagram can be used to find all possible outcomes for a repeated event, like flipping a coin. In a tree diagram, the outcomes of each event are in separate columns.

Example 2: Find the probability of flipping a coin three times and getting heads at least twice.



A tree diagram is shown to the right. A list of the possible outcomes can be made from a tree diagram. Start at the top and work down through all the options for each flip.

HHH	HHT	HTH	HTT
THH	THT	TTH	TTT

There are 8 possible outcomes. There are 4 outcomes for flipping at least two heads (highlighted above).

The probability of flipping at least two heads is $\frac{4}{8} = \frac{1}{2}$, or 50%.

Tables

A table is especially useful for probabilities with several possible outcomes.

Example 3: Find the probability of rolling a 5 and a 4 when rolling a pair of dice.

The table below shows the possible outcomes of rolling two dice. There are 36 possible outcomes.

First Roll → / Second Roll ↓	1	2	3	4	5	6
1	1, 1	2, 1	3, 1	4, 1	5, 1	6, 1
2	1, 2	2, 2	3, 2	4, 2	5, 2	6, 2
3	1, 3	2, 3	3, 3	4, 3	5, 3	6, 3
4	1, 4	2, 4	3, 4	4, 4	5, 4	6, 4
5	1, 5	2, 5	3, 5	4, 5	5, 5	6, 5
6	1, 6	2, 6	3, 6	4, 6	5, 6	6, 6

There are two outcomes for rolling a 5 and a 4 (highlighted above). The purple die could land on 5 and the blue die could land on 4, or the purple die could land on 4 and the blue die could land on 5.

The probability of rolling a 5 and 4 is $\frac{2}{36} = \frac{1}{18}$, or $5.\overline{5}\%$.

6. a. Are the experimental probabilities after 10 rolls equal to the theoretical probabilities? ______

b. Are the experimental probabilities after 40 rolls equal to the theoretical probabilities? ______

c. Why does experimental probability sometimes differ from theoretical probability?

____

____

7. Add the frequencies found in Problems 2 and 3 together and record the total frequencies in the table below. This table represents rolling the die 50 times.

Roll	Frequency
1	
2	
3	
4	
5	
6	

Find the experimental probability of rolling each number out of 50 rolls.

	Fraction:	Percent:
1.	______	______
2.	______	______
3.	______	______
4.	______	______
5.	______	______
6.	______	______

8. Fill in the table representing the sample space of rolling two dice. Some examples are given.

First Roll → / Second Roll ↓	⚀	⚁	⚂	⚃	⚄	⚅
⚀	1, 1					
⚁					5, 2	
⚂						
⚃		2, 4				
⚄						
⚅						

Unit 4 Review

Complete this Unit Review to prepare for the Course Assessment. There is no video, lesson, or practice. Because Unit Reviews include practice for an entire unit, they may take longer than regular lessons, and students may decide to take two days to finish.

Round all answers to the nearest hundredth, unless otherwise specified.

Posey, Toby, and Winston held a summer Bible camp for the younger children in their neighborhood.

Scale Factor with Area
Lesson 91

1. Winston and Toby decided to pass flyers out to all their neighbors. They created a 4-in by 6-in design and then enlarged each dimension by a scale factor of 2.

   a. What was the area of the initial design?

   ____

   b. What are the dimensions of the flyer?

   ______ and ______

   c. What is the area of the flyer?

   ____

   d. By what factor did the area of the design increase?

   ______

Polynomials
Lessons 99–102

2. With a lot of facial expressions, Posey read Bible stories that the children enjoyed. Simplify the mathematical expressions below.

   a. $x^2y + 3x - 2x^2y - 1 - x$

   ____

   b. $ab^2(b - 2a)$

   ____

   c. $\dfrac{4n^2m}{6nm^2}$

   ____

3. Use the GCF to factor the expression below.

   $12x^2y + 8xz$

   ____

Population and Sampling Methods
Lesson 103

4. The week before camp, Toby surveyed neighboring kids about their favorite snacks. He asked the first 15 kids he saw one day at an ice cream shop.

   a. Is this sample random? ______

   b. Is this sample biased? ______

Measures of Central Tendency
Lessons 106, 107

9. As part of an activity about Jesus providing fish for fishermen (Luke 5), some of the children at Bible camp were given fish-shaped crackers as a snack. Older kids received bigger piles of crackers. Ten children counted their crackers. The number of crackers in each pile is shown below.

35, 47, 39, 52, 62, 46, 52, 63, 42, 39

a. What is the mode number of crackers?

✦ Hint: There is more than one mode.

Mode: ___________

b. What is the median number of crackers?

✦ Hint: First, put the data in numerical order.

Median: ___________

c. One child chose not to count his crackers. If the average number of crackers among the 11 children was 48, how many crackers did this last child have?

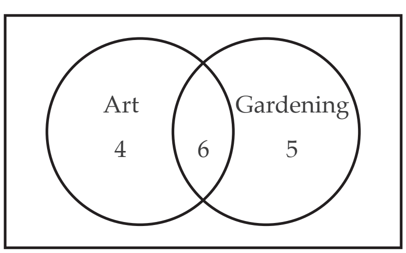
____

Probability
Lessons 111–114

10. 7 of the 15 children at camp were boys, and 8 of the 15 children were under age six. If a random child is chosen, what is the probability (as a fraction) that the child will be age six or older?

_____

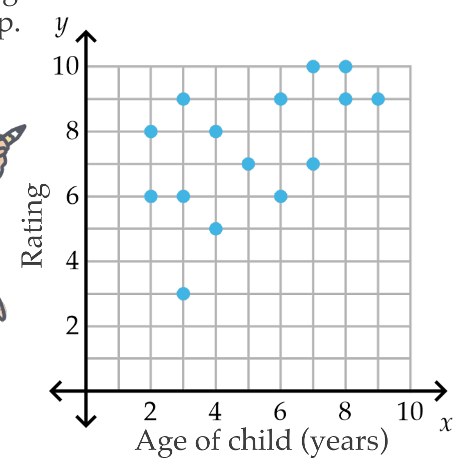
11. The Venn diagram shows how many children participated in activities. What is the probability that a child did just one of the activities, but not both?



_____

Scatter Plots
Lesson 109

12. After the camp, Posey gave out surveys to the families. She created a scatter plot to see if there was a relationship between a child's age and how well he or she rated the camp.



a. What type of correlation is shown on the scatter plot? Circle one.

positive / negative / no correlation

b. Draw a line of best fit on the scatter plot.

Course Review

- ☐ This lesson is a multiple-choice Course Review to prepare for the Course Assessment. There is no video, lesson, or practice.
- ☐ This review may take longer than regular lessons, and students may decide to take two days to finish.
- ☐ Lesson numbers are given for each question so students can review lessons as needed.

Circle the letter of the correct answer for each problem. Simplify all answers and round to the nearest hundredth when necessary.

1. Convert 2.6 to a mixed number. L5

   a. $\frac{13}{5}$ b. $2\frac{6}{10}$ c. $2\frac{3}{5}$ d. $2\frac{1}{6}$

2. The decimal equivalent of $3\frac{2}{7}$ is L4

   a. terminating. b. repeating.

3. The prime factorization of 132 is L2

   a. $2 \bullet 3 \bullet 11$. b. $4 \bullet 3 \bullet 11$.
   c. $11 \bullet 12$. d. $2 \bullet 2 \bullet 3 \bullet 11$.

4. Evaluate $3^2\left(1-2\bullet(-4)\right)$. L21

   a. 81 b. –63 c. 54 d. –42

5. Evaluate $\dfrac{\frac{3}{4}-\frac{1}{2}}{2}$. L22

   a. $\frac{1}{2}$ b. $\frac{1}{8}$ c. 1 d. $\frac{1}{4}$

6. Evaluate the expression $3a+b^2$ when $a=2$ and $b=5$. L24

   a. 16 b. 31 c. 19 d. 5

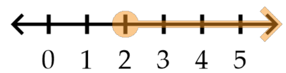
7. Solve $2t-1=1.8$ for t. L33

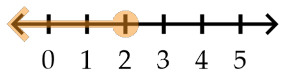
   a. 5.6 b. 0.9 c. 0.4 d. 1.4

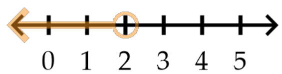
8. Solve $-\frac{2}{3}(p+1)=4$ for p. L35

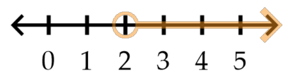
   a. –7 b. –5 c. 7 d. 5

9. Graph the solutions to $4x \geq x+6$. L39

   a. 

   b. 

   c. 

   d. 

10. A fruit basket contains three oranges for every two apples. The basket contains 30 pieces of fruit. How many oranges does it contain? L42

    a. 10 b. 18 c. 12 d. 15

11. Which of the following proportions shows the relationship 6 is to 4 as x is to 6? L41

    a. $\frac{6}{4}=\frac{x}{6}$ b. $6 \bullet 4 = x \bullet 6$ c. $\frac{6}{6}=\frac{4}{x}$

12. Convert $\frac{3}{8}$ to a percent. L5, L46

    a. 0.125% b. 0.375%
    c. 12.5% d. 37.5%

Course Assessment

- This assessment covers concepts taught in Math 7. Problems are designed to assess multiple skills. Read the instructions carefully and do not rush through the problems.
- Students may use the Reference Chart for the assessment. Lesson numbers are given by each problem so you can review lessons for any answers that are incorrect.
- Calculators may be used where needed on the entire assessment.

1. Simplify the fraction using prime factorizations. L2, L3

   $\frac{224}{672}$

   ______

2. Convert the fractions to decimals. L5

   a. $\frac{1}{8}$ ______ b. $\frac{3}{200}$ ______

3. Convert the decimals to fractions. L5

   a. 0.145 b. 0.08

   ______ ______

4. Evaluate the exponential expressions. L13, L14

   a. 5^3 b. $\left(\frac{1}{2}\right)^3$ c. 3^{-4}

   ______ ______ ______

5. Evaluate the expressions. L21, L22

   a. $\left(5+11^2\right)\div 3$ ______

   b. $6 \bullet 4 - 19 + 2^3$ ______

6. Simplify the expressions. L23

   a. $17z - 4z + 16 + 13$ ______

   b. $4t^2 + 3s - 7t^2 + 5s$ ______

7. Evaluate the expressions when $a = 3$ and $b = -5$. L24

   a. $\frac{10a}{3b}$ b. $3a - 4b$

   ______ ______

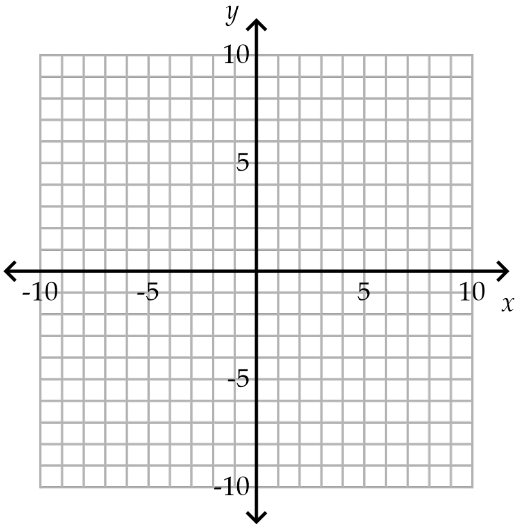
8. Tanner and his brother Tony raise dairy cows. Let m represent the number of gallons of milk Tanner's cow produces in a day, and let k represent the number of gallons Tony's cow produces in a day. Write an expression to represent how many gallons the family will get from the cows in 30 days. L25, L26

   ______

19. Fill in the table by substituting into the equation, and then use the table to graph the equation. L65, L70

$y = x^2 + 2$

x	y
–2	
–1	
0	
1	
2	



20. Fill in the coordinates of the image if the preimage is reflected over the x-axis. L72

Preimage	$(-4,2)$	$(-9,2)$	$(-4,7)$	$(-9,7)$
Image				

21. The table below represents a function. Identify the rule of the function and fill in the missing value in the table. L69

x	y
0	4
1	5
2	
3	7
4	8

Rule: ___________

Missing Value: ___________

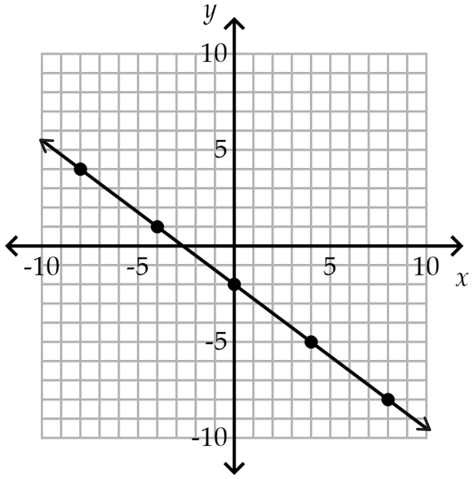
22. Write the letter of the equation that matches the line graphed below. L66–68

a. $y = \frac{1}{3}x + 8$

b. $y = 2x - 3$

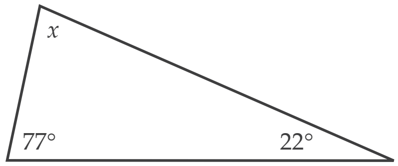
c. $y = -x + 6$

d. $y = -\frac{3}{4}x - 2$



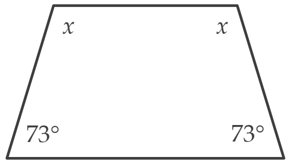
____

23. Find the measure of the missing angle in the triangle. L71



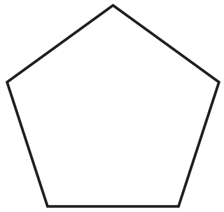
$x =$ ______

24. Find the measure of the missing angles in the isosceles trapezoid. L77



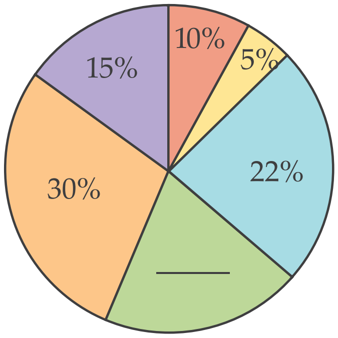
$x =$ ______

25. Calculate the sum of the interior angles of the pentagon by splitting the shape into the fewest number of triangles possible. L76



____

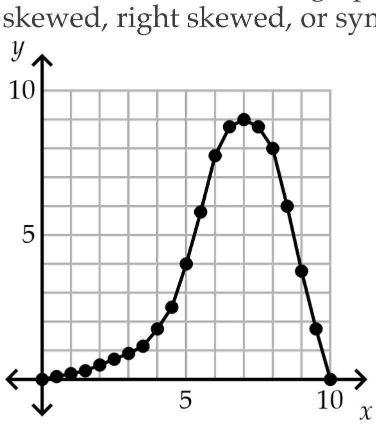
41. Fill in the missing percent in the circle graph below. L104



42. Find the probability (as a fraction) of getting a window seat on an airplane if the seats are randomly assigned and 60 of the 180 seats are window seats. L111

____

43. Determine whether the graph is left skewed, right skewed, or symmetric. L110



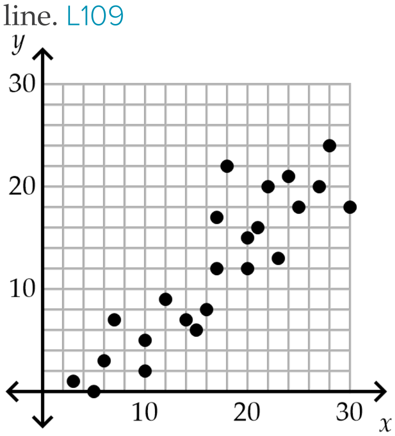
Circle one:

left skewed

right skewed

symmetric

44. Determine the correlation in the scatter plot. Write *positive*, *negative*, or *no correlation* on the line. L109



____

45. Determine if the following events are mutually exclusive. Write *yes* or *no* on the line. L112

a. Event 1: ordering french fries at a restaurant

Event 2: ordering onion rings at the same restaurant

____

b. Event 1: winning a race

Event 2: losing the same race

____

46. Write the data in numerical order. Then find the mean, median, mode, and range of the data set. L106

7, 7, 8, 10, 11, 11, 9, 9, 63,
15, 13, 11, 13, 12, 15, 14

Numerical order: ____________________

____

Mean: ______ Median: ______

Mode: ______ Range: ______

47. For the data set in Problem 46, is the mean or median a better measure of center? L107

Circle one: *mean* / *median*

Why? ____________________________

____

Enrichment: Patterns with Divisibility

SUPPLIES: 20–30 small objects

Counting manipulatives are needed for this lesson. Any small objects may be used (beans, cereal pieces, buttons, etc.). Do not use more than 30 manipulatives.

This is an enrichment lesson. Mastery is not expected at this level. There is no video, practice, or review. A calculator may be used for this entire lesson.

Divisibility by 3

Avoid using long division to answer questions. Instead, use the manipulatives and rely on patterns to answer the questions about divisibility.

1. How many groups of 3 can be made with 10 items? How many are left over?

   Groups: _____ Remaining: _____

2. How many groups of 3 can be made with 2 tens (two groups of 10)? How many are left over?

   Groups: _____ Remaining: _____

   How does this answer relate to the answer for Question 1?

   ____

3. How many will be left over after making groups of 3 out of 3 groups of 10? Why is this?

   Remaining: _____

   Why?

   ____

   ____

4. How many will be left over after making groups of 3 out of 7 groups of 10? Why is this?

   Note: Do not use manipulatives for problems with more than 30 items.

   Remaining: _____

   Why?

   ____

   ____

5. Are there any remaining when 72 is split into groups of 3? Why is this?

   Remaining: _____

   Why?

   ____

   ____