6.

Algebra and Functions 1.0



2. One cube weighs

as much as _____ squares.

- **1.** One triangle weighs
- In each figure below, the two pans are in perfect balance. Solve these pan-balance problems.



Time



STUDY LINK

Date



Exploring Pan Balances



Find combinations of objects where the weights balance the pans. Record the combinations below using pictures and words.



One nickel weighs about as much as 5 blocks.



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Penny Weights

The materials used to make a penny were changed at the beginning of one of these years: 1981, 1982, or 1983. As a result, the weight of a penny has changed. Your task is to find the year the weight of pennies changed.



- Return the pennies to their correct containers.
 Put ten 1982 pennies in one pan and ten 1983 pennies in the other pan.
 - Do the pans balance? _____

1. Compare 1981 pennies to 1982 pennies.

- 3. I think penny weights changed beginning in the year _____ because
- 4. Why do you think it is better to compare the weights using 10 pennies for each year rather than only 1 penny for each year?

5. Why do you think they changed the materials used to make a penny?

LESSON





Time

Time



Pan-Balance Problems

In each figure below, the two pans are in perfect balance. Solve these pan-balance problems.





Fill in the missing numbers to make true sentences.

 6. ______ = (7 + 45) / 2 7. $((28 / 7) + 12) / 8 = ______

 8. <math>((14 * 3) + 14) - 6 = ______
 9. ______ = <math>(3 - 3) * ((34 / 2) * 115)$

Measuring Time

Franz buys two sandglasses from an antique dealer. However, when he gets home he realizes the sand in the sandglasses does not measure 1 hour. The first sandglass measures a nine-minute interval, and the other sandglass measures a thirteen-minute interval.

Franz wants to make a special cleaning solution to clean his new sandglasses. The solution needs to boil for 30 minutes. Can Franz use his sandglasses to measure 30 minutes from the time the solution starts to boil?

Explain your solution by describing what Franz should do.





Time

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Date



Date

Time

Name

in out

- 2. Work with a partner to complete the table. Take turns: one partner enters an *in* value, and the other partner follows the rule to enter an out value.
- **3.** Write the rule as an algebraic expression.
- 4. Think of a rule for the "What's My Rule?" table. Then use your rule to complete 3 rows in the table. Have your partner find the rule and complete the table.
- **5.** Write your rule in words and as an algebraic expression.
 - **a.** Rule in words:
 - **b.** Rule as an algebraic expression:
- 6. What are important things to remember when writing rules or making a "What's My Rule?" table for a partner to find the rule?

LESSON



1. Write a rule in words for the "What's My Rule?" table.

in out



Time

Date

Time



Representing Rates

Complete each table below. Then graph the data and connect the points.

 a. Cherry tomatoes cost \$2.50 per pound. Rule: Cost = \$2.50 * number of pounds

Weight (lb) (w)	Cost (\$) (2.50 * w)
1	
3	
	15.00
10	



- b. Plot a point to show the cost of 8 pounds.How much would 8 pounds of cherry tomatoes cost? _____
- **c.** Would you use the graph, the rule, or the table to find out how much 50 pounds of cherry tomatoes would cost? Explain.
- **2. a.** Chantel is planning a trip to drive across the country. Her car uses 1 gallon of gasoline every 24 miles.
 Rule: distance = 24 * number of gallons

Gasoline (gal) (g)	Distance (mi) (24 * g)
1	
4	
	168
13	



- Plot a point to show the distance the car would travel on 6 gallons of gasoline. How many miles would it go?
- **c.** Would you use the graph, the rule, or the table to find out how far the car would travel on 9 gallons of gasoline? Explain.



Solving Rate Problems

Rate describes a relationship between two quantities with different units. Rate tells how many of one type of thing there are for a certain number of another type of thing. Rates are often expressed with phrases that include the word *per.* For example, miles per hour, cost per ounce, or books per student.

One example of rate is speed. A basic formula is distance = rate * time. Multiplication can be used for many different problems involving rates. For example, distance = rate * gallons, total cost = rate * ounces, or total books = rate * students.

To solve a problem using a formula, first replace variables with the known values.

Example:

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Maribel can travel 5 miles per hour on her skateboard. How far will she travel in 2 hours?

distance = rate * time	d	=	r	*	t	
distance = 5 miles per hour $*$ 2 hours	10	=	5	*	2	
distance = 10 miles						

Maribel can travel 10 miles.

Use the formula to solve the following problem.

1. Samuel's go-kart can travel 357 miles on 14 gallons of gas. His go-kart travels how many miles per gallon?

distance = rate * gallons of gas	d	=	r	*	g
distance = miles per gallon * 14 gallons of gas		=		*	
rate =					

2. Samuel's go-kart can travel _____ miles per gallon of gas.

Explain your solution.



Date

Time

5

0

18

4. Rule: _

Date

19

3

12



1

5. Rule: _____ **6.** Make up your own.

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in	out	in	out	in	out
4	2	1	1		
12	6	2	3		
16	8	3	5		
2		4			
	$3\frac{1}{2}$	5			
310			19		

0.3

1

2

Complete each table below. Write the rule in words or as a formula. On the

back of the page, graph the data in Problems 4 and 5.

Nam	ne	Date	Time
STUD 10	Cricket Formulas	5	
In 18 "The temp chirp follo	897, the physicist, A. E. Dolbear, publis e Cricket as a Thermometer." In it he cla peratures can be estimated by counting bs made by crickets and then by using the wing formula: side temperature (°F) = $\frac{(number of cricket)}{(number of cricket)}$	hed an article titled aimed that outside the number of that number in the $\frac{1}{4}$ + 50	218
1. V	Write a number model for the formula. $_$	·	
2. A	According to this formula, what is the es outside temperature if you count 80 chir	stimated ps in a minute?	
C te	Other cricket formulas exist. The followin o work particularly well with field cricket	ng formula is supposed is:	
C	Dutside temperature ($^{\circ}F$) = (number of	chirps in 15 seconds) + 37	
3. V	Write a number model for the formula		
4. A	According to this formula, what is the es emperature if you counted 35 chirps in	timated outside 15 seconds?	
5. (Compare the two formulas. If you count vhat is the estimated outside temperatu	30 chirps in 15 seconds, re for each formula?	
а	First formula:		
b	Second formula:		
F	Practice		
6. 7	$7 - 2\frac{2}{5} = $	7. $1\frac{1}{2} + 2\frac{2}{3} + 3\frac{3}{4} + \frac{1}{12} = $	
8. ($\left(\frac{2}{3} * \frac{2}{3}\right) - \frac{2}{9} =$	9. $\frac{12}{9} \div \frac{1}{3} = $	

LESSON

10.5



Complete the "What's My Rule?" tables. Record the rule on the lines provided, and graph the data from the tables.

in (<i>x</i>)	out ((2 * <i>x</i>) + 3)	
1		
2		
3		
	15	
8		
	3	





Algebra and Functions 1.0, 1.1, 1.5

Date

Time

Interpreting Tables and Graphs

Natasha is 12 years old and runs an average of 6 yards per second. Derek is 8 years old and runs about 5 yards per second. Natasha challenged Derek to an 80-yard race and told him she would win even if he had a 10-yard head start.

1. Complete the table showing the distances Natasha and Derek are from the starting line after 1 second, 2 seconds, 3 seconds, and so on.





2. Use the table to write rules for the distance covered by Natasha and Derek.

Natasha's Rule: ______

3. Graph the results of the race between Natasha and Derek on the grid above. Label each line.

4. a. Who wins the race?

b. What is the winning time? _____

c. At what time in the race did Natasha take the lead?

STUDY LINK

0•6





Interpreting Table Data



There are a number of choices when making a graph from table data.

- The type of graph is determined by the type of data represented.
- The title and labels for the graph are often the easiest to recognize from the table.
- Deciding on the scale to use for the y-axis of a line graph is more of a challenge. The intervals in the data can guide the choice of a scale.
- 1. Make a graph for each of the tables below.

Tab	le 1		Tab	le 2
Pinto bean p average of 1.5 i	Exter	rior colors vie theate	s of cars in the er parking lot	
Day Plant Height (in.)		Exteri	or Color	Percent
0	0	Sil	ver	25%
1	1.5	Ye	llow	5%
2	3.0	Bla	ack	25%
3	4.5	R	ed	10%
4	6.0	B	lue	25%
5	7.5	W	hite	10%





2. On the back of this page, explain why you chose which graph to use for each table.

Time

STUDY LINK **Mystery Graphs**

Create a mystery graph on the grid below. Be sure to label the horizontal and vertical axes. Describe the situation that goes with your graph on the lines provided.



Reminder: Look for examples of ratios and bring them to school.





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Exploring Silhouettes



Objects and actions can often be recognized from their shapes, called silhouettes. For each of the silhouettes below, write a description of the object or activity.



Date

2 3

-5

-6

-8

X

When you plot the values of a table as coordinates on a grid and connect the points, the resulting figure 10 -9 can be called a line graph. -8 -7 For each graph on the grid to the right: • Find the coordinates of four points that lie on -3 2 the graph. -10-9 -8 -7 -6 -5 -4 10 • Write the four points in the "What's My Rule?" table. -3 Write the rule for the table. Check that your rule works for all the points on the graph. -10 1. Rule for Graph A: _____

Making Tables from Graphs





8 9 10

y

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•

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Analyzing Graph Errors

For each graph below, describe a possible error in the graph.

 The students in Ms. Wyn's fifth-grade class took a favorite color survey. About the same number of people voted for red, blue, and green. Orange and yellow got about the same number of votes, but the votes were a lot less than the other three colors. They made a bar graph of their results.

Describe at least one error in the Favorite Colors graph. Explain how you know this is an error.

2. There are 26 students in Ms. Wyn's class. They wanted to find the mean number of books that students had read in their class. They found out that half the class had read five or fewer books and the other half had read more than 15 books. The mode for the class was 19 books. They made a line plot of their results.



Books We Have Read

Describe at least one error in the Books We Have Read graph. Explain how you know this is an error.

Favorite Colors







a. What is the circumference of the tire?

About _____ inches

b. About how far will Will's bicycle travel if the wheels go around exactly once?

About _____ inches

Sofia measured the circumference of her bicycle tire. She found it was 66 inches. What is the diameter of the tire?

About _____ inches





Date

Time



Can Your Body Pass through an Index Card?

- **1.** Fold a 5-inch-by-8-inch index card in the middle, along the 5-inch width of the card.
- 2. Hold the halves of the folded card together. Cut the card as shown by the lines in Diagram A. Some cuts start at the fold and go almost to the edge of the card. Other cuts start at the edge and go almost to the fold. Be sure the first and last cuts start at the fold. Cuts should alternate between starting at the fold and starting at the edge.
- **3.** Open the card. Cut along the fold from *X* to *Y* as shown in Diagram B. Be careful not to cut to the edges of the card.



4. Pull the card apart carefully. You'll have a paper ring. Is it large enough for your body to pass through?

Try This

Use another 5-inch-by-8-inch index card. Can you cut out a ring that has a perimeter twice the perimeter of the ring you just made? Explain how you would do it.



Time

 What size h 	at to buy (<i>Hir</i>	<i>nt:</i> The ha	t has to fit a	round a head.)	187 194
	area	circum	Iference	perimeter	
2. How much	frosting cover	s the top	of a round b	irthday cake	
	area	circum	ference	perimeter	(han and
3. The amoun swimming p	t of yard that	will be co	vered by a c	circular inflatable	e
	area	circum	ference	perimeter	
4. The length	of a can label	when you	u pull it off t	ne can	
	area	circum	iference	perimeter	
that best comp 5. The radius	letes each sta of a circle is a	atement. about 4 cn	n. The area	of the circle is a	about $C = \pi * d$
0 12 cm ²	039	cm ²	0 50 cm	1 ² 0 2	5 cm ²
6. The area of	a circle is ab	out 28 squ	uare inches.	The diameter of	of the circle is about
0 3 in.	0 6 in		0 9 in.	01	8 in.
7. The circumf	erence of a ci	rcle is abo	out 31.4 met	ers. The radius	of the circle is about
0 3 m	0 5 m	l	0 10 m	01	5 m
8. Explain hov	v you found y	our answe	er for Proble	m 7.	

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The figure of a circle drawn inside a square is a model that shows how the circumference of the circle is greater than 2 lengths around, but less than 4 lengths. This makes the circumference about 3 times the circle's diameter.

Follow the directions below to make a model that shows how the area of a circle can be found using the formula $A = \pi r^2$.

- 1. Cut along the lines of the circle to cut it into 8 pieces.
- **2.** Arrange and glue the pieces on a sheet of construction paper so they approximate a parallelogram.
- **3.** Use a colored pencil or marker to draw the outline of a parallelogram along the edges of your arranged circle pieces, and mark the measure of the height and the base.

The height of this figure is the same as the radius of the circle.

The base is $\frac{1}{2}$ the circumference of the circle. The circumference is approximately π times the diameter. Since the radius is $\frac{1}{2}$ of the diameter, the measure of $\frac{1}{2}$ the diameter can be written as π times the radius, or πr .

The formula for the area of a parallelogram is A = b * h. In our model, the formula can be written as $A = \pi r * r$, $A = \pi * (r * r)$, or $A = \pi r^2$.

- **4.** Label your figure: $A = \pi * (r * r) = \pi r^2$.
- 5. Describe what you think is the most interesting thing about this model.







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Time



A Model for πr^2

Cut along the dotted lines. Use the pieces for your model of the formula for the area of a circle.



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Date

Circle Formulas

Circumference: $C = \pi * d$ Area: $A = \pi * r^2$ where *C* is the circumference of a circle, *A* is its area, *d* is its diameter, and *r* is its radius.

Measure the diameter of the circle at the right to the nearest centimeter.

1.	Th	e diameter of the circle is								
2.	The radius of the circle is									
3.	The circumference of the circle is									
4.	Th	e area of the circle is								
5.	Ex	plain the meaning of the word <i>circumference.</i>								
6.	a. b.	Use your Geometry Template to draw a circle that has a diameter of 2 centimeters. Find the circumference of your circle								
7.	c. a.	Find the area of your circleUse your Geometry Template to draw a circle that has a radius of $1\frac{1}{2}$ inches.								
	b.	Find the circumference of your circle.								
	c.	Find the area of your circle.								



LESSON



Unit 11: Family Letter

Volume

Unit 11 focuses on developing your child's ability to think spatially. Many times, students might feel that concepts of area and volume are of little use in their everyday lives compared with computation skills. Encourage your child to become more aware of the relevance of 2- and 3-dimensional shapes. Point out geometric solids (pyramids, cones, and cylinders) as well as 2-dimensional shapes (squares, circles, and triangles) in your surroundings.

Volume (or capacity) is the measure of the amount of space inside a 3-dimensional geometric figure. Your child will develop formulas to calculate the volume of rectangular and curved solids in cubic units. The class will also review units of capacity, such as cups, pints, quarts, and gallons. Students will use units of capacity to estimate the volume of irregular objects by measuring the amount of water each object displaces when submerged. Your child will also explore the relationship between weight and volume by calculating the weight of rice an average Thai family of four consumes in one year and by estimating how many cartons would be needed to store a year's supply.

Area is the number of units (usually squares) that can fit onto a bounded surface, without gaps or overlaps. Your child will review formulas for finding the area of rectangles, parallelograms, triangles, and circles and use these formulas in calculating the surface area of 3-dimensional shapes.

The goal of this unit is not to have students memorize formulas, but to help them develop an appreciation for using and applying formulas in various settings. By the end of this unit, your child will have had many experiences using 2- and 3-dimensional geometry.



Please keep this Family Letter for reference as your child works through Unit 11.





Vocabulary

Important terms in Unit 11:

apex In a pyramid or cone, the vertex opposite the base.

base of a parallelogram The side of a parallelogram to which an altitude is drawn. The length of this side.

base of a prism or cylinder Either of the two parallel and congruent faces that define the shape of a prism or a cylinder.

base of a pyramid or

cone The face of a pyramid or cone that is opposite its apex.



calibrate To divide or mark a measuring tool, such as a thermometer, with gradations.

cone A geometric solid with a circular base, a vertex (apex) not in the plane of the base, and all of the line segments with one endpoint at the apex and the other



endpoint on the circumference of the base.

cube A polyhedron with 6 square faces. A cube has 8 vertices and 12 edges.

cylinder A geometric solid with two congruent, parallel circular regions for bases, and a curved face formed by all the segments with an endpoint on each circle that are parallel to the segment with endpoints at the center of the circles.

base base

cylinder

edge A line segment where two faces of a polyhedron meet.



face A flat surface on a polyhedron.

geometric solid The surface or surfaces that make up a 3-dimensional shape, such as a prism, pyramid, cylinder, cone, or sphere. Despite its name, a geometric solid is hollow; it does not contain the points in its interior.

polyhedron

A 3-dimensional shape formed by polygons with their interiors (faces) and having no holes.



prism A polyhedron triangular with two parallel and congruent polygonal

regions for bases and lateral faces formed by all the line segments with endpoints on corresponding edges of the bases. The lateral faces are all parallelograms. Prisms get their names from the shape of their bases.

prism

pyramid A polyhedron made up of any polygonal region for a base, a point (apex) not in the plane of the base, and all of the line segments with one endpoint at the apex and the other on an edge of the base. All the faces



square

octahedron

rectangular

prism

except perhaps the base are triangular. Pyramids get their names from the shape of their base.

regular polyhedron

A polyhedron whose faces are all congruent regular tetrahedron

polygons and in which the same number of faces meet at each vertex.

dodecahedron icosahedron The five regular polyhedrons

cube

sphere The set of all points in space that are a given distance from a given point. The given point is the center of the sphere, and the given distance is the radius.

surface area A measure of the surface of a 3-dimensional figure. vertex

vertex (vertices or vertexes) The point







Do-Anytime Activities

To work with your child on the concepts taught in this unit and in previous units, try these interesting and rewarding activities.

1. Have your child compile a 2- and 3-dimensional shapes portfolio or create a collage of labeled shapes. Images can be taken from newspapers, magazines, photographs, and so on.

2. Explore Kitchen Measures

The most common use of measuring volume is cooking. Work with your child to make a favorite recipe. (Doubling the recipe can be good practice in computing with fractions.) Ask your child to use measuring spoons and cups to find the capacity of various containers. The data can be organized in a table.

Container	Capacity
Coffee mug	$1\frac{1}{4}$ cups
Egg cup	3 tablespoons

Building Skills through Games

In Unit 11, your child will practice operations with whole numbers and geometry skills by playing the following games. Detailed instructions for each game are in the *Student Reference Book* or the journal:

Name That Number See Student Reference Book, page 325. This is a game for two or three players using the Everything Math Deck or a complete deck of number cards. Playing *Name That Number* helps students review operations with whole numbers, including the order of operations.

3-D Shape Sort See Student Reference Book, page 332. This game is similar to Polygon Capture. Partners or 2 teams each with 2 players need 16 Property cards and 12 Shape cards to play. *3-D Shape Sort* gives students practice identifying properties of 3-dimensional shapes.

Rugs and Fences See journal page 380.

This game uses 32 Polygon cards and 16 Area and Perimeter cards and is played by partners. *Rugs and Fences* gives students practice finding the area and perimeter of polygons.



As You Help Your Child with Homework

As your child brings assignments home, you might want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of this unit's Study Links.

Study Link 11+1

- 1. Answers vary.
- **2.** D

1.

Study Link 11+2





pyramid



3a. 30 * 30 * 18 = 16,200 **5.** more; 283,500,000 cm³

2. <

1. 2.8 cm; 4.3 cm; 24.6 cm²; 105.9 cm³

3. >

4. Because both pyramids have the same height, compare the areas of the bases. The base of the square pyramid has an area of $5 * 5 = 25 \text{ m}^2$.

The base area of the triangular pyramid

is $\frac{1}{2}$ * 5 * 5 or $12\frac{1}{2}$ m². **5.** $10\frac{16}{27}$ **6.** $1\frac{11}{21}$ **7.** 600,000 **8.** 25.39

Study Link 11+3

Study Link 11+4

Sample answers:

7. $5\frac{3}{8}$

1. <



Most of the space taken up by a handful of cotton is

Study Link 11+5

air between the fibers.

Study Link 11+6

1. >	2. =	3. <
4. <	5. <	6. =
7. cubic ir	nches	
8. gallons		
9. gallons		
10. millilite	rs	
11. cubic c	entimeters	
12. capacity	y	
43		

13. volume

14. –250 **15.** 137,685

16. $10\frac{2}{5}$ **17.** 0.48

Study Link 11+7

- **1.** 88 in²; Sample answer: I found the area of each of the 6 sides and then added them together.
- **2.** Yes. A 4 in. by 4 in. by $3\frac{1}{2}$ in. box has a volume of 56 in³ and a surface area of 88 in².
- 3. Volume: 502.4 cm³; Surface area: 351.7 cm²
- 4. Volume: 216 in³; Surface area: 216 in²