



Unit 9: Coordinates, Area, Volume, and Capacity

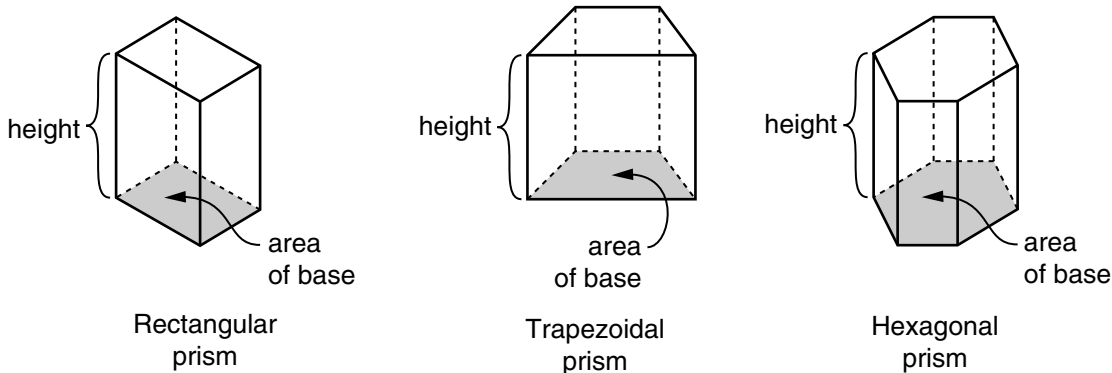
The beginning of this unit will provide your child with practice in naming and locating ordered number pairs on a coordinate grid. Whole numbers, fractions, and negative numbers will be used as coordinates. Your child will play the game *Hidden Treasure* (similar to the commercially available *Battleship™*), which provides additional practice with coordinates. You may wish to challenge your child to a round.

In previous grades, your child studied the perimeters (distances around) and the areas (amounts of surface) of geometric figures. *Fourth Grade Everyday Mathematics* developed and applied formulas for the areas of rectangles, parallelograms, and triangles. In this unit, your child will review these formulas and explore new area topics, including the rectangle method for finding areas of regular and irregular shapes.

Students will also examine how area, perimeter, and angle measurements are affected when a figure is changed by mathematical transformations. These transformations resemble changes and motions in the physical world. In some transformations, figures are enlarged in one or two dimensions; in other transformations, figures are translated (slid) or reflected (flipped over).

In the exploration "Earth's Water Surface," students review locating places on Earth with latitude and longitude. Then they use latitude and longitude in a sampling experiment that enables them to estimate, without measuring, the percent of Earth's surface that is covered by water. In a second exploration, "School's Land Area," students use actual measurements and scale drawings to estimate the land area covered by their school.

The unit concludes with a look at volume (the amount of space an object takes up) and capacity (the amount of material a container can hold). Students develop a formula for the volume of a prism (volume = area of the base * the height). They observe the metric equivalents 1 liter = 1,000 milliliters = 1,000 cubic centimeters, and they practice making conversions between U.S. customary measures (1 gallon = 4 quarts, and so on).

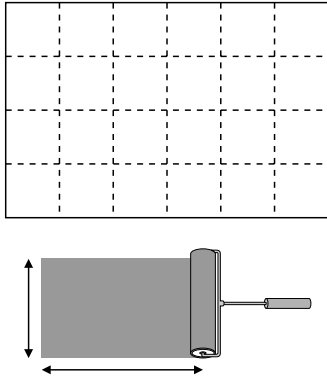


Please keep this Family Letter for reference as your child works through Unit 9.

Vocabulary

Important terms in Unit 9:

area The amount of surface inside a closed boundary. Area is measured in square units, such as square inches and square centimeters.



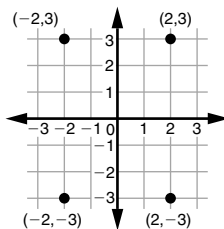
Two ways to model area

axis Either of the two number lines that intersect to form a coordinate grid.

capacity The amount a container can hold, usually in such units as *quart*, *gallon*, *cup*, and *liter*.

coordinate A number used to locate a point on a number line, or one of two numbers used to locate a point on a coordinate grid.

coordinate grid A device for locating points in a plane using ordered number pairs, or coordinates.



Coordinate grid

formula A general rule for finding the value of something. A formula is often written using letters, called *variables*, that stand for the quantities involved. For example, the formula for the area of a rectangle may be written as $A = l * w$, where A represents the area of the rectangle, l represents the length, and w represents the width.

height A measure of how tall something is. In geometry, height is the same thing as altitude.

latitude A measure, in degrees, of the distance of a place north or south of the Equator.

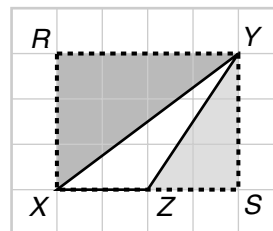
longitude A measure, in degrees, of how far east or west of the prime meridian a place is.

opposite of a number A number that is the same distance from zero on the number line as a given number, but on the opposite side of zero. For example, the opposite of $+3$ is -3 and the opposite of -5 is $+5$.

ordered number pair Two numbers that are used to locate a point on a *coordinate grid*. The first number gives the position along the horizontal axis; the second number gives the position along the vertical axis. Ordered number pairs are usually written in parentheses: $(5, 3)$.

perpendicular Meeting at right angles. Lines, rays, line segments, and planes that meet at right angles are perpendicular. The symbol \perp means "is perpendicular to."

rectangle method A method for finding area in which one or more rectangles are drawn around a figure or parts of a figure.



To find the area of triangle XYZ, subtract the areas of the two darkly shaded triangles from the area of rectangle XRYZ.

transformation Something done to a geometric figure that produces a new figure. The most common transformations are translations (*slides*), reflections (*flips*), and rotations (*turns*).

variable A letter or symbol that represents a number. A variable can represent one specific number or it can stand for many different numbers.

volume The amount of space inside a 3-dimensional object. Volume is usually measured in cubic units, such as cubic centimeters, cubic inches, or cubic feet. Sometimes volume is measured in units of capacity, such as gallons or liters.

Do-Anytime Activities

To work with your child on concepts taught in this unit, try these interesting and rewarding activities:

- 1 Find an atlas or map that uses letter-number pairs to locate places. (For example, an atlas might say that Chattanooga, Tennessee is located at D-9.) Use the letter-number pairs to locate places you have visited or would like to visit.
- 2 Estimate the area of a room in your home. Use a tape measure or ruler to measure the room's length and width, and multiply to find the area. Make a simple sketch of the room, including the length, the width, and the area. If you can, find the area of other rooms, or even of your entire home.

Building Skills through Games

In Unit 9, your child will develop his or her understanding of coordinates and coordinate grids by playing the following games. For detailed instructions, see the *Student Reference Book*.

Hidden Treasure See *Student Reference Book*, page 281

This game for 2 players provides practice using coordinates and coordinate grids. It also offers the opportunity for players to develop good search strategies. Each player will need a pencil and two 1-quadrant playing grids with axes labeled from 0 to 10.

Advanced Hidden Treasure See *Student Reference Book*, page 281

This game is an advanced version of the coordinate game described above. Instead of 1-quadrant grids, players use 4-quadrant grids with axes labeled from -7 to 7 . Practice is extended to coordinates and grids that include negative numbers.

As You Help Your Child with Homework

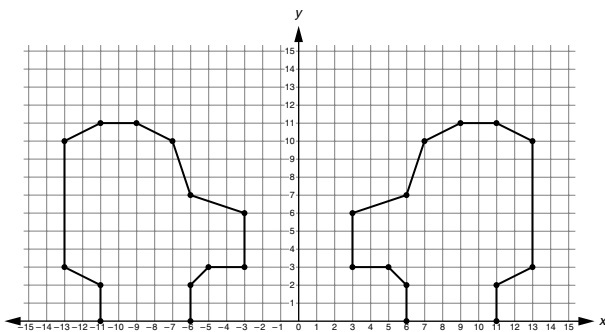
As your child brings assignments home, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of the Study Links in this unit.

Study Link 9.1

2. Rectangular prism
3. a. (11,7)

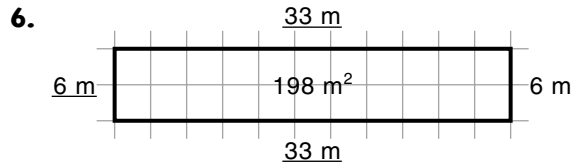
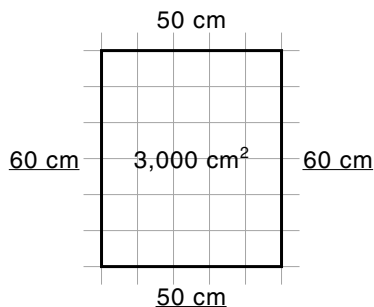
Study Link 9.3

2. The first number
- 3.



Study Link 9.4

1. $12\frac{1}{2}$ hr
2. 114 square feet
3. 80 yd^2
4. 33 ft^2
- 5.



Study Link 9.5

1. 4 cm^2
2. 7.5 cm^2
3. 6 cm^2
4. 16 cm^2
5. 10 cm^2
6. 15 cm^2

Study Link 9.6

1. 4.5 cm^2 ; $\frac{1}{2} * 3 * 3 = 4.5$
2. 7.5 cm^2 ; $\frac{1}{2} * 5 * 3 = 7.5$
3. 3 cm^2 ; $\frac{1}{2} * 2 * 3 = 3$
4. 24 cm^2 ; $6 * 4 = 24$
5. 12 cm^2 ; $4 * 3 = 12$
6. 8 cm^2 ; $4 * 2 = 8$

Study Link 9.7

1. ft^2, yd^2
2. cm^2, in^2
3. cm^2
4. $A = \frac{1}{2} * b * h$; 130 ft^2
5. $A = b * h$; 16 cm^2
6. $A = \frac{1}{2} * b * h$; 77 yd^2
7. $A = b * h$; 76 m^2

Study Link 9.8

1. 15 cm^2 ; 15 cm^3 ; 45 cm^3
2. 8 cm^2 ; 8 cm^3 ; 16 cm^3
3. 9 cm^2 ; 9 cm^3 ; 27 cm^3
4. 14 cm^2 ; 14 cm^3 ; 56 cm^3

Study Link 9.9

1. 72 cm^3
2. 144 cm^3
3. 70 in^3
4. 162 cm^3
5. 45 in^3
6. 140 m^3

Study Link 9.10

2. $A = \frac{1}{2} * 7 * 6$; 21 cm^2
3. $A = 8 * 6$; 48 in^2