6th Grade – Unit 8
Applications of Geometry

In this unit, students utilize their previous experiences in shape composition and decomposition in order to understand and develop formulas for area, volume, and surface area.

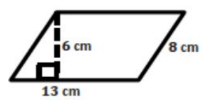
Key Words

iangle – a polygon with three gles and three sides.
titude of a Triangle – a rpendicular segment from a vertex a triangle to the line containing e opposite side.
ise of a Triangle – the side of a iangle opposite of the rpendicular segment drawn from a rtex.
rallelogram – a quadrilateral with th pairs of opposite sides rallel.
apezoid – a quadrilateral with one ir of parallel sides.
oordinate Plane – formed by a rizontal number line called the axis and a vertical number line lled the y-axis.
oordinate – a set of numbers, or a ngle number, that locates a point a line, or on a plane or in space.
lume – the volume of a ree-dimensional figure is the mber of cubic units needed to fill e space inside the figure.
rface Area of a Prism – the rface area of a prism is the union all its faces.
ism – a three-dimensional figure th two parallel congruent faces at are polygons. These faces are lled bases. A prism is named for e shape of its base.
ibe – a right rectangular prism all whose edges are equal length.

Area of Parallelograms

Calculate the area of each parallelogram. The figures are not drawn to scale.

1.



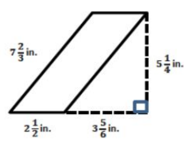
Solution:

$A = bh$

$= 13\ cm(6\ cm)$

$= 78\ cm^2$

2.



Solution:

$A = bh$

$= 2\frac{1}{2}\ in.\left(5\frac{1}{4}\ in.\right)$

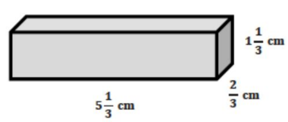
$= \frac{5}{2}\ in.\left(\frac{21}{4}\ in.\right)$

$= \frac{105}{8}\ in^2$

$= 13\frac{1}{8}\ in^2$

Finding the Volume of Right Rectangular Prisms with Fractional Side Lengths

1. Calculate the volume of the prism below.



Solution:

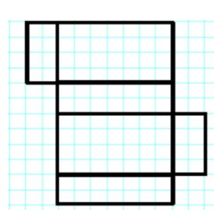
$V = l\,w\,h$

$V = \left(5\frac{1}{3}\ cm\right)\left(\frac{2}{3}\ cm\right)\left(1\frac{1}{3}\ cm\right)$

$V = \frac{16}{3}cm \times \frac{2}{3}cm \times \frac{4}{3}cm$

$V = \frac{128}{27}cm^3$

Calculate the surface area of the rectangular prism. Assume each box in the grid represents a 1ft x 1ft square.



How can I help at home?

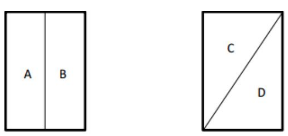
- ★ Ask your child what they learned in school and ask them to show you an example.
- ★ Ask your child to explain t difference between a parallelogram and a rectangle.
- ★ Ask your student to expla the relationship between a triangle and a rectangle, especially when it comes t area..
- ★ Ask your student to expla the difference between a two-dimensional and three-dimensional figure.
- ★ Look for three-dimensiona prisms outside and identif what type of prism they are.
- ★ Challenge your student to determine possible dimensions for a right rectangular prism with a volume of 34 cubic centimeters. At least one measurement must be a fraction or decimal. (One possible solution: 6 ⅘ cm x 2 ½ cm x 2 cm)

Common Core Standards

★ Solve real-world and mathematical problems involving area, surface area, and volume.
- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real world and mathematical problems.
- Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
- Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Sample Problems

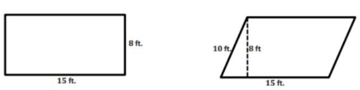
1. Elania has two congruent rugs at her home. She cut one vertically down the middle, and she cut diagonally through the other one.



After making the cuts, which rug (labeled A, B, C, or D) has the larger area? Explain.

All of the rugs are the same size after making the cuts. The vertical line goes down the center of the rectangle, making two congruent parts. The diagonal line also splits the rectangle in two congruent parts because the area of the right triangles formed is exactly half the area of the given rectangle.

Do the rectangle and the parallelogram below have the same area? Explain why or why not.



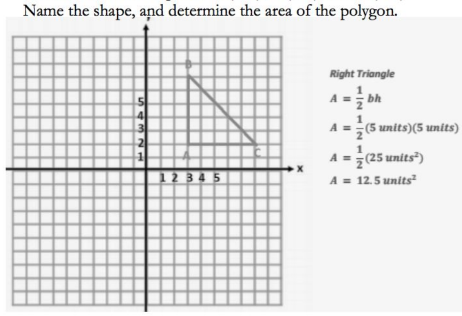
Yes the rectangle and parallelogram have the same area because if we cut off the right triangle on the left side of the parallelogram, we can move it over to the right side and make the parallelogram into a rectangle. At this time, both rectangles would have the same dimensions; therefore, their areas would be the same.

A = bh

A = 15 ft(8 ft)

A = 120 ft^2

Plot and connect the points A (3, 2), B (3, 7), and C (8, 2). Name the shape, and determine the area of the polygon.



2. If the area of a triangle is $\frac{9}{16}$ ft^2 and the height is $\frac{3}{4}$ ft., write an equation that relates the area to the base, b, and the height. Solve the equation to determine the base.

$A = \frac{1}{2}bh$

$\frac{9}{16}\ ft^2 = \frac{1}{2}b\ (\frac{3}{4}\ ft)$

$\frac{9}{16}\ ft^2 = (\frac{3}{8}\ ft)b$

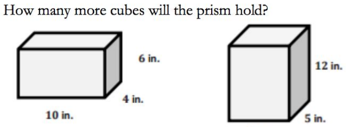
$\frac{9}{16}\ ft^2 \div \frac{3}{8}\ ft = (\frac{3}{8}\ ft)b \div \frac{3}{8}\ ft$

$\frac{3}{2}\ ft = b$

$1\frac{1}{2}\ ft = b$

The length of the base is $1\frac{1}{2}$ ft.

1. Which prism will hold more 1 in x 1 in x 1 in cubes? How many more cubes will the prism hold?



V = lwh
V = 10 in x 4 in x 6 in
V = 240 in^3

V = lwh
V = 8 in x 5 in x 12 in
V = 480 in^3

The prism with 480 in^3 holds the most 1 in x 1 in x 1 in cubes. It holds 240 more cubes than the smaller prism.

Problem to Try at Home

A toy company is packaging its toys to be shipped. Some of the very small toys are each placed inside a cube-shaped box with side lengths of ½ inch. These smaller boxes are then packed into a shipping box with dimensions of: 12 in x 4 ½ in x 3 ½ in. How many small toys can be packed into the larger box for shipping?

Coming Up Next...

Students will move from simply representing data into analysis of data. Students will begin to think and reason statistically, first by recognizing a statistical question as one that can be answered by collecting data. Students will learn that the data collected to answer a statistical question has a distribution that is often summarized in terms of center, variability, and shape. Students will also see and represent data distributions using dot plots, histograms, and box plots.