Fifth Grade: Module 5

DUVAL Math Parent Tips

DUVAL COUNTY PUBLIC SCHOOLS

Addition and Subtraction with Volume and Area

In this module, students work with two and three dimensional figures. Volume is introduced to students through concrete exploration of cubic units and culminates with the development of the volume formula for right rectangular prisms. The second half of the module turns to extending students' understanding of two dimensional figures.

What Came Before this Module: Students learned to multiply fractions and decimal fractions and began work on fraction division, working from concrete to abstract representations.

What Comes After this Module: In Module 6, students begin to explore the coordinate plane, working from the familiar number line toward plotting points and creating lines and patterns.

Fifth Grade, Module 5

Special points of interest:

- ✓Words to Know
- ✓Concepts of Volume
- ✓Area of Rectangular figures with Fractional Side Lengths
- ✓Mathematical Practices
- ✓Homework Helpline

Words to Know

- **Base**: one face of a three-dimensional solid—often thought of as the surface upon which the solid rests
- **Bisect:** divide into two equal parts
- **Cubic Units**: cubes of the same size used for measuring
- **Height:** adjacent layers of the base that form a rectangular prism
- **Hierarchy**: series of ordered groupings of shapes
- **Unit Cube**: cube whose sides all measure 1 unit
- **Volume of a Solid**: measurement of space or capacity

Unit Cubes

Questions?

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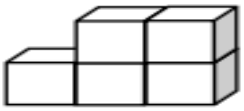
Concepts of Volume

Students will :

- ***Explore volume by building with and counting unit cubes.***
- ***Find the volume of a right rectangular prism by packing with cubic units and counting.***
- ***Compose and decompose right rectangular prisms using layers.***

1. The following solids are made up of 1-cm cubes. Find the volume of each figure, and write in the chart below.

A. 

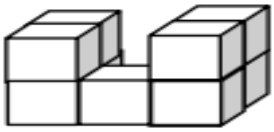
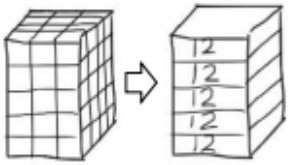
B. 

Figure	Volume	Explanation
A	5 cm^3 or 5 cubic cm	I counted the cubes.
B	9 cm^3 or 9 cubic cm	I counted 4 cubes on the right and then multiplied by 2 to include the cubes of the left side and then added the cube in the middle.

There are 3 different approaches to finding the volume of a rectangular prism. Using the prism below let's look at the three approaches. The prism

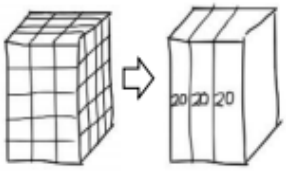
Approach 1: We could think of drawing horizontal lines to show the 5 layers of 12 cubes each. This resembles layers of cake.



$12\ cm^3 + 12\ cm^3 + 12\ cm^3 + 12\ cm^3 + 12\ cm^3 = 60\ cm^3$

5 x 12 cubic centimeters = $60\ cm^3$

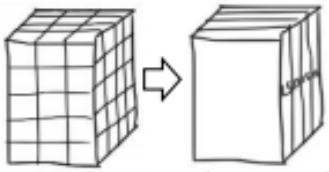
Approach 2: We could think of drawing vertical lines to show 3 layers of 20 cubes each. This resembles bread slices.



$20\ cm^3 + 20\ cm^3 + 20\ cm^3 = 60\ cm^3$

3 x 20 cubic centimeters = $60\ cm^3$

Approach 3: We could think of drawing both a horizontal and a vertical line to show the front and back layers. There are 4 layers of 15 cubes each. This resembles books standing up.



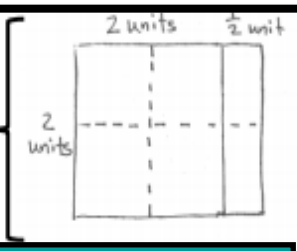
$15\ cm^3 + 15\ cm^3 + 15\ cm^3 + 15\ cm^3 = 60\ cm^3$

4 x 15 cubic centimeters = $60\ cm^3$

Area of Rectangular Figures with Fractional Side Lengths

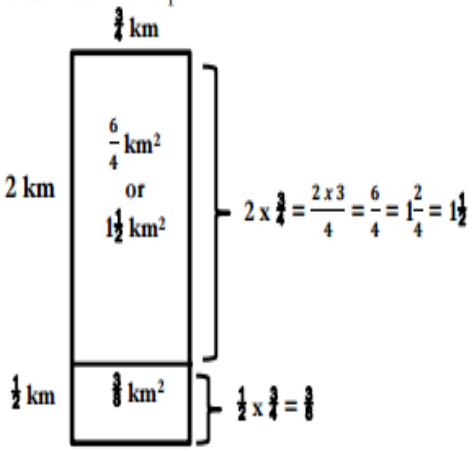
Students work on solving real world problems involving area of figures with fractional side lengths using visual models and/or equations.

Example of tiling



Tiling is a strategy used to find area of rectangle by covering the entire figure with square units and fractional parts of square unit.

Problem: Find the area of a rectangle that measures $\frac{3}{4}$ km x $2\frac{1}{2}$ km. Draw an area model if it helps.



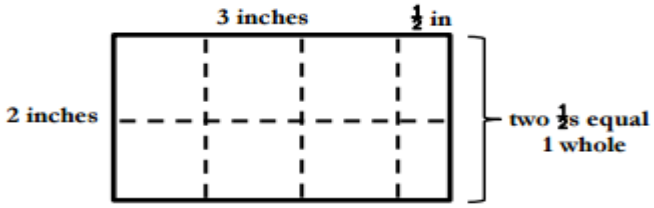
$1\frac{1}{2} + \frac{3}{8} = 1 + \frac{4}{8} + \frac{3}{8}$

$= 1\frac{7}{8}$

The area of the rectangle is $1\frac{7}{8}$ km².

The drawing below resembles an area model used in earlier modules when students multiplied whole numbers and decimal fractions. Now the area model has fractional parts.

The $3\frac{1}{2}$ is thought of as $3 + \frac{1}{2}$. Using **tiling**, each whole square represents 1 square inch. To represent $\frac{1}{2}$ inch, the whole square is cut in half and only half is showing in the model. There are 6 whole squares and two $\frac{1}{2}$s.



The area of one tile is 7 square inches. Since there are 6 tiles, the area of the whole mosaic is 42 square inches or 42 in² (6 x 7).

Algorithm using the distributive property:

$3\frac{1}{2} \times 2 = (3 + \frac{1}{2}) \times 2$

$= (3 \times 2) + (\frac{1}{2} \times 2)$

$= 6 + 1$

$= 7$

Algorithm without using the distributive property; the mixed number is changed to an improper fraction:

$3\frac{1}{2} \times 2 = \frac{7}{2} \times 2 = \frac{7 \times 2}{2} = \frac{14}{2} = 7$

Standards for Mathematical Practice

Mathematical Practices Addressed in this Module:

MP.1 **Make sense of problems and persevere in solving them.** Students work toward a solid understanding of volume through the design and construction of a three-dimensional sculpture within given parameters.

MP.2 **Reason abstractly and quantitatively.** Students make sense of quantities and their relationships when they analyze a geometric shape or real life scenario and identify, represent, and manipulate the relevant measurements. Students decontextualize when they represent geometric figures symbolically and apply formulas.

MP.3 **Construct viable arguments and critique the reasoning of others.** Students analyze shapes, draw conclusions, and recognize and use counterexamples as they classify two-dimensional figures in a hierarchy based on properties.

MP.4 **Model with mathematics.** Students model with mathematics as they make connections between addition and multiplication as applied to volume and area. They represent the area and volume of geometric figures with equations (and vice versa), and represent fraction products with rectangular areas. Students apply concepts of volume and area and their knowledge of fractions to design a sculpture based on given mathematical parameters. Through their work analyzing and classifying two-dimensional shapes, students draw conclusions about their relationships and continuously see how mathematical concepts can be modeled geometrically.

MP.6 **Attend to precision.** Mathematically proficient students try to communicate precisely with others. They endeavor to use clear definitions in discussion with others and their own reasoning. Students state the meaning of the symbols they choose, including using the equal sign (consistently and appropriately). They are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school, students have learned to examine claims and make explicit use of definitions.

MP.7 **Look for and make use of structure.** Students discern patterns and structures as they apply additive and multiplicative reasoning to determine volumes. They relate multiplying two of the dimensions of a rectangular prism to determining how many cubic units would be in each layer of the prism, as well as relate the third dimension to determining how many layers there

Grades K-5 Homework Help
Duval County Parent Helpline

Tuesday and Thursday Evenings (see dates to the right)

6:00 p.m. – 8:00 p.m

Grades K-5 Homework Help

You can access this help on your home computer so that we can demonstrate the mathematics on a white board or call in via telephone.

By Telephone: (571)-392-7703 PIN: 731 439 616 412

By Web: click here

Want to help your child at home with DUVAL Math?

Every Tuesday and Thursday evening, we are offering a Homework Helpline! You can access using a home computer or call in via telephone. Use the link below to access more information!

http://www.duvalschools.org/Page/17877