6th Grade-Lesson 11/Mrs. Faour

Volume with Fractional Edge Lengths and Unit Cubes

Classwork

Opening Exercise

Which prism holds more cubes? How many more cubes does the prism hold?

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Example 1

A box with the same dimensions as the prism in the Opening Exercise is used to ship miniature dice whose side lengths have been cut in half. The dice are cubes. How many dice of this size can fit in the box?

Example 2

A cube was used to fill the prism.

How many cubes does it take to fill the prism?

What is the volume of the prism?

How is the number of cubes related to the volume?

Exercises

1. Use the prism to answer the following questions.
   1. Calculate the volume.
   2. If you have to fill the prism with cubes whose side lengths are less than , what size would be best?
   3. How many of the cubes would fit in the prism?
   4. Use the relationship between the number of cubes and the volume to prove that your volume calculation is correct.
2. Calculate the volume of the following rectangular prisms.
3. A toy company is packaging its toys to be shipped. Each small toy is placed inside a cube-shaped box with side lengths of . These smaller boxes are then placed into a larger box with dimensions of   
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   1. What is the greatest number of small toy boxes that can be packed into the larger box for shipping?
   2. Use the number of small toy boxes that can be shipped in the larger box to help determine the volume of the shipping box.
4. A rectangular prism with a volume of cubic units is filled with cubes twice: once with cubes with side lengths of unit and once with cubes with side lengths of unit.
   1. How many more of the cubes with -unit side lengths than cubes with -unit side lengths are needed to fill the prism?
   2. Why does it take more cubes with-unit side lengths to fill the prism than it does with cubes with -unit side lengths?

1. Calculate the volume of the rectangular prism. Show two different methods for determining the volume.

Problem Set

1. Answer the following questions using this rectangular prism:
   1. What is the volume of the prism?
   2. Linda fills the rectangular prism with cubes that have side lengths of . How many cubes does she need to fill the rectangular prism?
   3. How is the number of cubes related to the volume?
   4. Why is the number of cubes needed different from the volume?
   5. Should Linda try to fill this rectangular prism with cubes that are long on each side? Why or why not?
2. Calculate the volume of the following prisms.
3. A rectangular prism with a volume of cubic units is filled with cubes twice: once with cubes with -unit side lengths and once with cubes with -unit side lengths.
   1. How many more of the cubes with -unit side lengths than cubes with -unit side lengths are needed to fill the prism?
   2. Finally, the prism is filled with cubes whose side lengths are unit. How many -unit cubes would it take to fill the prism?
4. A toy company is packaging its toys to be shipped. Each toy is placed inside a cube-shaped box with side lengths of . These smaller boxes are then packed into a larger box with dimensions of .
   1. What is the greatest number of toy boxes that can be packed into the larger box for shipping?
   2. Use the number of toy boxes that can be shipped in the large box to determine the volume of the shipping box.
5. A rectangular prism has a volume of cubic meters. The height of the box is meters, and the length is meters.
   1. Write an equation that relates the volume to the length, width, and height. Let represent the width, in meters.
   2. Solve the equation.