Grade 6

Traveling and Shopping

Mathematics Lesson Day 3

"Lotsa Blocks Toy Company"

Rationale

- The intent of this lesson is to prepare students for the Common Core State Standards by familiarizing them with solving finding the volume of right rectangular prisms to solve real-world problems.

Goal

- To be able to solve real-world problems involving finding the volume of a right rectangular prism with fractional edge lengths.

Standards

- **6.G.2** 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 formula V = l x w x h and V = b x h to find volumes of right rectangular prisms with fractional edge lengths in the contest of solving real-world and mathematical problems.
- **MP.1** Make sense of problems and persevere in solving them
- **MP.3** Construct viable arguments and critique the reasoning of others
- **MP.4** Model with mathematics

Objectives

- Students will be able to find the volume of a right rectangular prism with fractional edge lengths by modeling the problem with boxes of various sizes and unit cubes.
- Students will be able to find the volume of right rectangular prisms with fractional side lengths by applying the volume formulas that they derived.

Materials

- Unit cubes
- A variety of rectangular prism boxes such as a tissue box, crackers box and cereal box. (You should have enough boxes for each group of 4 students to have one)
- Lotsa Blocks Toy Company handout (1 per student)

Procedure

- Put students in groups of 4.
- Distribute unit cubes and an empty box (such as a cereal or tissue box) to each group.
- Have the groups of students find the volume of the box in unit cubes by filling the box with cubes with no gaps. Students will be asked to find a rule that would work for finding volume of prisms without having to fill the space with cubes.

- Go through the two formulas, V = l x w x h and V = bh. Point out that the first formula and the second formula are two ways of representing the same thing. Discuss that in the V= bh formula, it recognizes that you can count the number of layers of equal area are in a prism.
- Collect the boxes but allow the students to keep the unit cubes in case they would like to use them to model volume. Distribute pages 1 and 2 of the Lotsa Block Toy Company handout.
- Have the students work individually or with a partner to complete the Lotsa Block Toy Company handout.

Teacher & Teacher's Assistant Observation During the Group Activity

- Confirm that any student who is utilizing the formula, V = bh recognizes that b stands for the area of the base. Sometimes students confuse base for width of the base and miscalculate the volume.
- Make sure that when the students are using blocks to model volume that they are packing the blocks in with no spaces.

Assessment

- Students will demonstrate their understanding of finding volume of a right rectangular prism with fractional side lengths by completing the Lotsa Blocks Toy Company handout.

Follow Up

- Challenge the students to consider how to find the volume of a box of cylinders of equal size. Students should be encouraged to draw a picture of the bottom layer of cylinders. Some students may believe that the gaps matter but really what is important is to recognize that the diameter of each can determines the length and width of the box necessary.
- For additional practice finding the volume by filling boxes with cubes, the students can visit go to http://illuminations.nctm.org/ActivityDetail.aspx?ID=6 on the computer and practice virtually.

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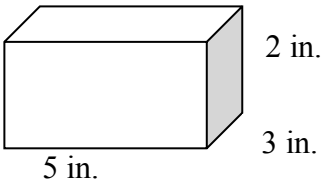
Lotsa Blocks Toy Company

Your summer job is at the Lotsa Blocks Toy Company. Since you haven't got any sales experience yet, they are starting you on inventory. You unpack boxes and make sure the correct number of items are in the box.

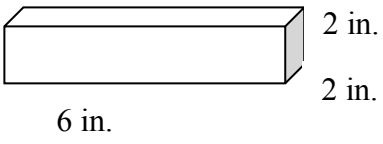
1. The Cubit game comes packaged in a cube-shaped tin that is ½ foot by ½ foot by ½ foot. How many Cubit game tins will fit into a box with the dimensions 3 ½ feet by 2 ½ feet by 2 feet?

2. You discover that the Tiny Toads toys you ordered were all wrong. They were black toads when you needed the green ones. The Tiny Toads come in tiny cube-shaped boxes that are ½ inch by ½ inch by ½ inch. You have 200 Tiny Toads to ship back. You have two possible boxes. Select the box that will accommodate all 200 boxed Tiny Toads with the least space left over. Explain your choice.

Box A



Box B



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3. A box comes into the store filled with teddy bears. The area of the base of the box is 20 ¼ feet. The height of the box is 1 ½ foot. What is the volume of the box? Show all of your work.

4. A special order telescope was just delivered to Lotsa Blocks Toys. The box is 3 ½ feet by 1 ½ feet by ½ foot. What is the volume of the telescope box?

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Grade 6

Traveling and Shopping Around

Mathematics Lesson Day 4

"Tara's Tent and Teepee Emporium"

Rationale

- The intent of this lesson is to prepare students for the Common Core State Standards by familiarizing them with finding the surface area of various three-dimensional figures by using their nets, decomposed into triangles and rectangles to solve real-world problems.

Goal

- To be able to solve real-world problems involving finding surface area of three-dimensional figures comprised of rectangles and triangles by using their nets

Standards

- **6.G.4** 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.
- **MP.1** Make sense of problems and persevere in solving them
- **MP.4** Model with mathematics
- **MP.5** Use appropriate tools strategically
- **MP.7** Look for and make use of structure

Objectives

- Students will be able to identify the net of a cube and will physically test the net to confirm whether they or not they are correct.
- Students will be able to use nets of three-dimensional figures, made up of triangles and rectangles to find the surface area of the figures.

Materials

- 2 pieces of blank paper
- 3 colored pencils or crayons
- Scissors
- 1 set of Net Cards per group of 4 students (preferably printed on card stock)
- Graph paper

Procedure

- Have students draw a rectangular prism on their piece of paper. Have the students create a color key for faces, vertices and edges. Then, have the students color their prism according to the key. For example, I might make all the vertices on my prism green, then outline the edges in red and color the faces of the prism yellow.

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- After the students have colored in their prism, project the following web site onto a screen. http://learni.st/learnings/14723-surface-area-interactive-practice?board_id=1672 On the top of the web page, there is a cube. Click on vertices, edges and faces to highlight each of the features as a quick review. Next, ask the students if they know what the net of a geometric figure is. Scroll down to the next picture under the label "II Nets". There is a picture of a cube. In the bottom left hand corner, there is a play button. Click on the button to see the net of the cube. Explain that a cube has a variety of possible nets. Pass out the nets cards to each group of 4 students and have them investigate to see whether each net is possible. Encourage groups to cut them up to "prove" that they do or do not form a cube.
- Distribute the Tara's Tent and Teepee Emporium handout to each student. Distribute scissors and scotch tape for those students who will need to have a more hands-on approach to constructing the net of each tent. Students who are able to visualize the net do not have to construct each net.

Teacher & Teacher's Assistant Observation During the Group Activity

- For students having trouble visualizing whether a certain net will form a cube, have the student actually cut the picture out and try to fold it into a cube.
- Students who are having difficulty drawing the nets of the tents, should use graph paper, cut out the shapes using the dimensions and tape them together to be able to better see it.

Assessment

- Students will be able to determine which nets will form cubes during the group activity with net cards.
- Students will demonstrate their ability to find the surface area of figures comprised of rectangles and squares by using nets.

Follow Up

- For more practice identifying the nets of cubes, go to the interactive at http://illuminations.nctm.org/ActivityDetail.aspx?ID=84
- For an extra challenge, have students find the net of a cone and a cylinder.

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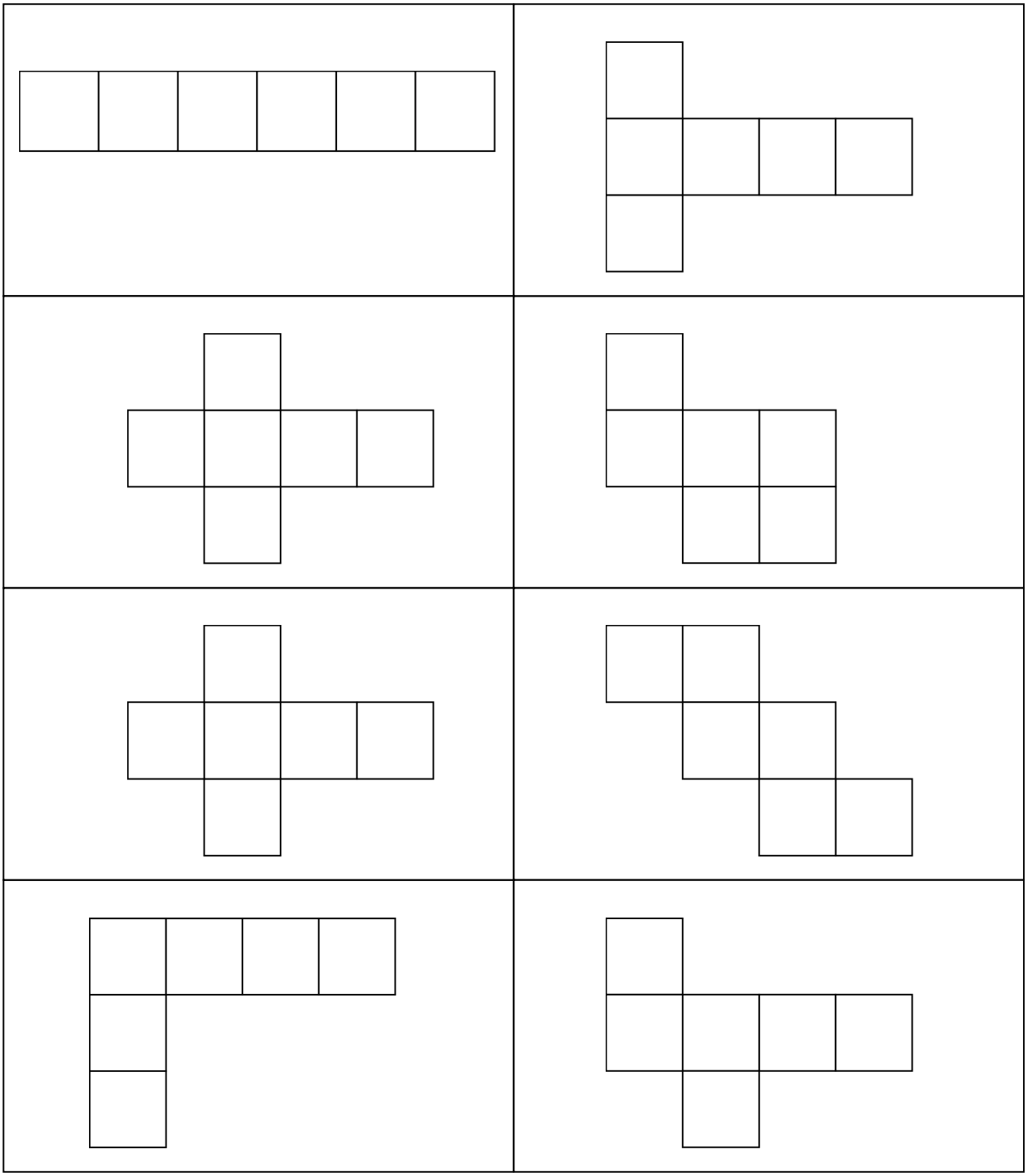
Net Cards



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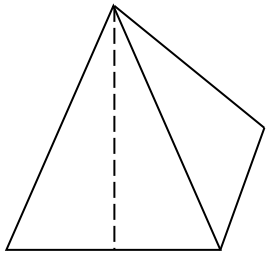
Tara's Tent and Teepee Emporium

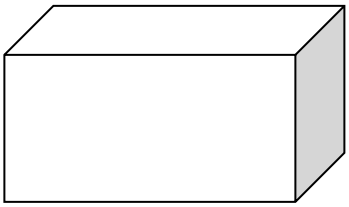
Directions: You have decided to go on your first camping trip. You've got $200 saved to purchase a tent. You head on over to Tara's Tent and Teepee Emporium. The price of the tent is based on the amount of material used.

Style 1



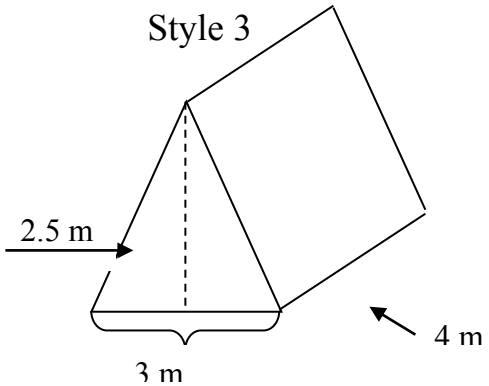
Style 1 is a pyramid-shaped tent with a 4 meter square base. The zipper on the front (see dotted line) is 3 meters long and runs from the top of the tent to the bottom.

Style 2



Style 2 is a rectangular prism-shaped tent with a rectangular base that measures 4 meters by 2 meters. The height of the tent is 2 ½ meters.

Style 3



Style 3 is a triangular prism-shaped tent with a rectangular base. The rectangular base measures 4 m by 3 m. The zipper (see dotted line) is 2 meters long and runs from the top of the ten to the bottom.

For each tent style:

- Draw a picture of the tent's net with all measurements labeled
- Calculate the surface area of each tent. Do not forget to include the bottom of the tent. You do not want to be sleeping on the ground! Show all work.
- Explain which tent, based on total surface area, would be the best option economically.

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