LESSON PLAN MATH

Grade 6

Marlins: Sixth Grade Math Lesson Plan

<table>
<tr><td rowspan="2" style="writing-mode:vertical">VISION-SETTING</td><td>**OBJECTIVE.**
What is your objective?</td><td>**KEY POINTS.**
What knowledge and skills are embedded in the objective?</td></tr>
<tr><td>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.

SWBAT find the volume and surface area of a right rectangular prism.</td><td>Volume is the amount of space contained in a solid figure.
The volume of a solid figure can be found by packing the figure with unit cubes and counting the total number of unit cubes that can be contained by the figure.
The volume of a solid figure can also be found by applying the formula V = l x w x h, where "l" is the length, "w" is the width, and "h" is the height of the figure.
The surface area of a solid figure is the sum of the areas of each of the figure's sides.</td></tr>
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ASSESSMENT.
Describe, briefly, what students will do to show you that they have mastered (or made progress toward) the objective.

Students will solve real world problems related to volume.

<table>
<tr><td rowspan="2" style="writing-mode:vertical">DETERMINING METHODS</td><td>**OPENING (10 min.)**
How will you communicate *what* is about to happen?   How will you communicate *how* it will happen?
How will you communicate its *importance*?   How will you communicate *connections* to previous lessons?
How will you engage students and capture their interest?</td><td>**MATERIALS.**</td></tr>
<tr><td>Show students a right rectangular prism that is transparent, and a right rectangular prism of the same size that is opaque (or covered in paper). Ask students to compare and contrast the two shapes. Explain that the transparent rectangular prism represents volume, the amount of space contained by a solid figure. We can see the space inside the rectangular prism—that is the figure's volume. The opaque rectangular prism represents surface area, or the sum of the areas of each of the figures sides. This prism has six sides, so to calculate surface area, I would need to find the area of each side (each piece of white paper, for example) and add them together.</td><td>Right rectangular prisms</td></tr>
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INTRODUCTION OF NEW MATERIAL (15 min.)
How will you explain/demonstrate all knowledge/skills required of the objective, so that students begin to actively internalize key points?
Which potential misunderstandings do you anticipate? How will you proactively mitigate them?   How will students interact with the material?

	Chart paper (or White Board) and markers

Volume is the amount of space contained in a solid figure. I can find the volume of a rectangular prism using 2 methods.

The first method I am going to use requires unit cubes. We can use unit cubes to find the volume of a rectangular prism by stacking the cubes together, leaving no space in between the cubes, until we have a model of the solid figure. I will demonstrate this stacking method by building a rectangular prism with dimensions 10 x 3 x 2 like this. To find the volume, all I need to do is count the number of unit cubes I used to build my figure. (Model and record volume).

The second method I am going to show you for calculating volume of a rectangular prism is much quicker. We can use the formula volume equals length times width times height, or V = l x w x h. If I plug in our dimensions to the formula, I get V = 10 x 3 x 2. First, I will multiply 10 x 3 = 30. Then I will multiply 30 x 2 to find the volume, 60 cubic units. I used 2 methods to find the volume, and got the same answer using both methods, so I can be very certain of my answer.

Surface area is different from volume. Instead of the amount of space contained inside a figure, surface area is the sum of the areas of each of the figure's sides. To find the surface area of a rectangular prism, we would need to add the areas of all six of the prism's sides. I can draw a prism like this, and label our length (10), width (3), and height (2). I'm going to use these dimensions to find the area of each side, then I will add up all the areas to calculate the surface area. (10 x 3 = 30; 10 x 2 = 20; 3 x 2 = 6; 10 x 3 = 30; 10 x 2 = 20; 3 x 2 = 6; S.A. = 30 + 20 + 6 + 30 + 20 + 6 = 112 sq. units).

GUIDED PRACTICE (15 min.)
How will students practice all knowledge/skills required of the objective, with your support, such that they continue to internalize the key points?
How will you ensure that students have multiple opportunities to practice, with exercises scaffolded from easy to hard?

We are going to practice finding volume using both of the methods I have shown you. First, we are going to find volume by stacking unit cubes in the shape of a solid figure. Distribute unit cubes. Guide students to stack cubes to create a figure with the following dimensions: 3 ft. x 4 ft. x 2 ft. Explain that since our dimensions are given in feet, each unit cube will represent 1 cubic foot for this problem. Build the figure, then count the unit cubes to see how many cubic feet it contains.	Unit cubes, Image of aquarium, paper, pencils

Now, let's use our second method to find the volume of the same figure. Remember our formula for volume is V = l x w x h. We can plug in our dimensions to solve for the volume. 3 x 4 x 2. First, let's multiply 3 x 4. What do we get? (12). Now let's multiply 12 x 2. What do we get? (24). Notice how we solved this problem in two ways, and both times we got the same answer. The volume of the solid figure with dimensions 3 ft. x 4 ft. x 2 ft. is equal to 12 cubic feet.
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Now let's find the Surface Area. Remember, surface area is the sum of all the areas of all six sides. Let's start with the front: 3 x 2 = 6. Next, the top: 3 x 4 = 12. And the right side: 4 x 2 = 8. The back is the same as the front: 3 x 2 = 6; the bottom is the same as the top: 3 x 4 = 12; and the left is the same as the right: 4 x 2 = 8. So, the surface area is 6 + 12 + 8 + 6 + 12 + 8 = 52 sq. units.
Let's consider a real world problem now, and see if we can answer it using the same methods. The Miami Marlins ballpark has a giant fish aquarium behind home plate. Show image

Marlins staff need to know the volume of the aquarium so they know how much water it can hold. The dimensions of the aquarium are 20 ft. x 4 ft. x 4 ft. First, lets build a model using unit cubes. For this question, we are going to need to work in groups so that we have enough cubes. One person in your group is responsible for building the figure. The rest are there to supervise and to keep count of the cubes used. Guide students to build the figure according to the dimensions provided, then count the total number of cubes used.

Now let's find the volume of the aquarium using our formula. V = 20 x 4 x 4. First, we multiply 20 x 4. (80). Then, we multiply 80 x 4. What do we get? 320. So the volume is 320 cubic feet, and the aquarium can hold 320 cubic feet of water.
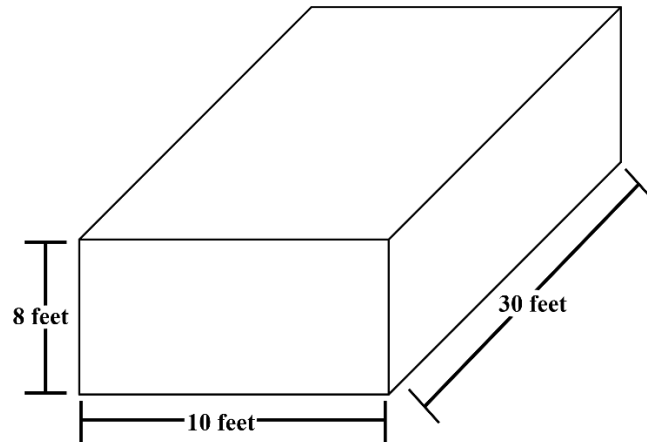Now let's find the Surface Area. Remember, surface area is the sum of all the areas of all six sides. Let's start with the front: 20 x 4 = 80. Next, the top: 20 x 4 = 80. And the right side: 4 x 4 = 16. The back is the same as the front: 20 x 4 = 80; the bottom is the same as the top: 20 x 4 = 80; and the left is the same as the right: 4 x 4 = 16. So, the surface area is 80 + 80 + 80 + 80 + 16 + 16 = 352 sq. units.

INDEPENDENT PRACTICE (15 min.) How will students independently practice the knowledge and skills required of the objective, such that they solidify their internalization of the key points prior to the lesson assessment?	
You are going to use what you've learned today to help you answer some questions from the Miami Marlins independently. Show image of the Miami Marlins dugout. Ask students to identify the space and explain what it is used for at the ballpark. Students will be answering questions about the dugout during their independent practice.	Image of dugout
Lesson Assessment: Once students have had an opportunity to practice independently, how will they attempt to demonstrate mastery of the knowledge/skills required of the objective?	
1. Find the volume of the Miami Marlins dugout by building a model using unit cubes and the scale: 1 unit cube = 1 cubic foot. 2. Find the volume of the Miami Marlins dugout using the formula V = l x w x h. 3. The Miami Marlins are thinking about air conditioning their dugout. The air conditioner they want to use can cool up to 60 cubic feet. Should they invest in the air conditioner? Why or why not? 4. Find the surface area of the Miami Marlins dugout. 5. The Miami Marlins are thinking of repainting their dugout. They want to paint the four walls, ceiling, and floor. They have 10 gallon of paint. Each gallon can cover up to 20 sq. ft. Do they have enough paint to cover the surface area of the dugout?	
CLOSING (5 min.) How will students summarize and state the significance of what they learned?	
Ask students to think of other times when they might need to find volume to find solutions to real world problems.	

Sixth Grade – Math
Activity: Finding the Volume and Surface of a Rectangular Prism

1. Find the volume of the Miami Marlins dugout using the formula V = l x w x h.

2. The Miami Marlins are thinking about conditioning their dugout. The air conditioner they want to use can cool up to 60 cubic feet. Should they invest in the air conditioner? Why or why not?

3. Find the surface area of the Miami Marlins dugout.

4. The Miami Marlins are thinking of repainting their dugout. They want to paint the four walls, ceiling, and floor. They have 10 gallons of paint. Each gallon can cover up to 20 sq. ft. Do they have enough paint to cover the surface area of the dugout?