

Lesson Topic: Surface Area of Rectangular Prisms **Grade:** 7 **Subject:** Math 7

Student Teacher: Jordan Hunt

Virginia Standards of Learning Objective

- Standard 7.5b
- Strand: Measurement
- Grade Level 7
 - “Solve practical problems involving the volume and surface area of rectangular prisms and cylinders.”

Lesson Objective

- By the end of this lesson the students will be able to define surface area, find the surface area of a rectangular prism using the correct formula, recognize when to use the formula to find surface area, and be able to distinguish between when to use the surface area formula and when to use the volume formula.
- The students will demonstrate their understanding of the lesson in a few ways:
 - Applying the surface area formula when given different rectangular prisms in different problems, including word problems
 - Independent Practice
 - Ticket to leave
 - Homework assignment

Task Analysis

- Essential understandings, knowledge, and skills:
 - Determine if a practical problem involving a rectangular prism or cylinder represents the application of volume or surface area.
 - Solve practical problems that require finding the surface area of a rectangular prism.
 - Find the surface area of a rectangular prism.
- Do the students know what a rectangular prism is?
 - Yes, the students know what a rectangular prism is.
- Do the students know what a cylinder is?
 - Yes, the students know what a cylinder is.
- Do students know what volume is?
 - Yes, students should have a deep understanding of volume and how to apply the volume formula when given a rectangular prism or cylinder.
- Do the students know what surface area is?

- No, the students do not know how to define surface area. They should be familiar with the term area, though.

Key Terms (Teacher Input)

- Rectangular Prism- A rectangular prism is a solid figure that has two parallel and congruent sides, or bases, that are rectangles.
- Net- Cutting a 3D object along its edges, opening it up, and laying it flat. The result is a 2D figure called a net.
- Area- The number of square units needed to cover a surface enclosed by a geometric figure.
- Surface Area- The sum of the areas of all the surfaces (faces) of a three-dimensional figure.

Sequence of Lesson

- *Anticipatory Set:*
 - First thing, students will take the quiz on volume.
 - Students are accustomed to looking at the board to see what they will be doing at the very beginning of class and start on it immediately. So, there will be a PowerPoint up on the board that reads “Please clear your desk, have a pencil out, and wait for instructions.”
 - Each student will receive a “frame of reference” sheet. In the center of the frame will be the words “surface area”.
 - Instruct the students to individually jot down words or phrases that come to mind when they hear “surface area”. These words will go in the “mat” area of the frame (be sure to point to the place on the frame that is the “mat”). Give them 1 minute and 30 seconds to do this and ring the bell.
 - Next, on the actual frame, instruct the students to write why they thought of the words they put in the “mat” area. They will write what background knowledge led them to the words and phrases they wrote about surface area. Give them another 1 minute and 30 seconds to do this and then ring the bell again.
 - When students are finished with their frames, they will discuss their individual “frames of reference” with their elbow buddy. Again, give them 1 minute and 30 seconds to do this, then ring the bell.
- *Teacher Input*

- After the students are finished discussing, turn on the PowerPoint and use popsicle sticks with names on them to randomly call on students. (The first slide of the PowerPoint says “what is surface area?”)
 - Ask these key questions:
 - What was the first thing you thought of when you saw the word?
 - This should prompt them to say area.
 - What is area? What is it measured in?
 - This should prompt the students to state the definition of area and to say units squared. Help the students to remember this if they do not come up with it on their own.
 - What is the formula to find **area**?
 - Encourage students to look at their formula sheet that they were given in a previous lesson.
 - Students should give the formula for area of a square, rectangle, triangle and circle.
 - What is the difference between these shapes and the shapes we are dealing with in this unit?
 - Students should say something along the lines of “these shapes are 2D, we are dealing with 3D shapes.” Again, lead the discussion and lead them to this discovery.
 - So, using your background knowledge and knowing that these shapes are 3D, what do you think **surface area** is?
 - Students should say something close to the definition of surface area and this will begin the PowerPoint and next activity.
- The next slide of the PowerPoint specifies that we will be discussing the surface area of a **rectangular prism**. It is an overview of what was discussed using our frames of reference. Remind students to fill in their notes outline as we go through the PowerPoint and that everything they need to fill in is written in *red*.
 - Hand out the rectangular prism **net** work sheet. (If possible, cut the net out beforehand to save time in class)
 - Hand out crayons/markers and instruct students to color in the sides with matching numbers the same color. (See worksheet)
 - Then, instruct students to fold the net on the solid lines. Walk around the class to help students who may have trouble. This should only take about 5 minutes.
 - The next slide has key questions on it. Looking at their rectangular prism, or box, they just made, they will answer these questions.

Have students discuss each question with an elbow buddy for one minute, ring the bell, and use popsicle sticks to call on students to record answers on the board. The key questions are:

- How many sides does this rectangular prism have?
 - Students should agree that there are 6 sides.
- Are any of the sides congruent?
 - Students should say yes, there are 3 pairs of congruent sides.
- What shape are the individual sides?
 - Students should say rectangles.
- How do you find the area of a rectangle?
 - Students should be able to look at the formula sheet and respond with $l \times w$.
- The next slide will help further develop the formula for finding surface area of a rectangular prism.
 - There are three boxes that all represent the same box, each box represents one of the three pairs of congruent sides. The pair is highlighted on each box.
 - On the first box, using SmartBoard technology, pull out the bottom of the box. Relate this to the boxes the students have in front of them too. Ask students how to find the area of that rectangle. Students should say $l \times w$. Then, ask “aren’t there two of that same size rectangle?” Students should say yes. Then, we multiply that formula by 2 since there are two of the same rectangles: $2 \times l \times w$.
 - The second box highlights the front and back of the box, again relate it to the box the students have in front of them. Pick up a student’s box to show them what the front and back would be. Using SmartBoard technology, pull the front of the box out to the side and ask how to find the area of that rectangle. Students should say $l \times h$. Then, ask “aren’t there two of that same size rectangle?” Students should say yes. Then, we multiply that formula by 2 since there are two of the same rectangles: $2 \times l \times h$.
 - Now, note that we have found the area of four sides of our prism, and to find the surface area we need to find the area of every side and add them up. So, the last two sides we have are the two sides of the box. Again, relate this to the box the students have in front of them. Using SmartBoard technology, pull the right side of the

box out and ask how to find the area of that rectangle. Students should say $w \times h$. Then, ask “aren’t there two of that same size rectangle?” Students should say yes. Then, we multiply that formula by 2 since there are two of the same rectangles: $2 \times w \times h$.

- Now, state, “Now that we have found the area of every side of the rectangle, we can add them together to find surface area.” Write this down on the SmartBoard and ask students to locate the formula for finding surface area of a rectangular prism on their formula sheet and ask if the formulas match up. Students should say yes. Instruct students to write this formula on their notes outline.
- The class just developed the formula for finding surface area of a rectangular prism!
- *Modeling*
 - The next two slides of the PowerPoint introduce very basic problems involving finding the volume of a rectangular prism. Walk the students through these problems. (Use SmartBoard to model)
- *Check for Understanding*
 - The next two slides present word problems involving finding volume of rectangular prisms. (Use SmartBoard to model)
 - As teacher goes through these problems, the students should become more involved. Use a method to randomly call on students to answer various questions, i.e. what is the width of this box, what is the height of this box, why is this question asking me to find surface area?
 - Also, use yellow, red, and green index cards for students to hold up representing how well they understand the material being presented.
- *Guided Practice*
 - The next slide asks the students to get whiteboards. The next 4 slides will contain questions that the students will work out on their whiteboard and when they are done, they will hold it up and show their answers. The teacher will check the whiteboards and simply say yes or no. The teacher should offer advice to the students who did not get the right answer. The student can then try again and hold up the board. If a student is repeatedly getting the wrong answer, make sure to give that student one on one help during independent practice.

- The majority of the students should feel comfortable with the topic by the 4th question (judging by their answers on the whiteboard), so move on to independent practice.
- *Independent practice*
 - After students put whiteboards away, form groups by skill level.
 - Before this lesson, the teacher should be sure to form groups by skill level. Each group should have students that are considered above average, average, and below average.
 - To form the groups in class, the teacher should hand each student a colored rectangle. Each color represents a different group. The teacher should designate an area of the room for each group. Then, students should quickly and quietly form groups. Give students a time limit to make the groups.
 - Now, hand each group two wrapped presents (this should be done ahead of time by the teacher) and sticky notes. The groups are all responsible for finding the length, width, and height of the present and record it on the sticky note. Then, each group should find out at least how much wrapping paper was needed to wrap the present, otherwise known as the surface area. This should go on the sticky note as well. Be sure to pull up the last slide on the PowerPoint which states these directions.
 - When students are finished, they should stick the sticky note to the present and these will be displayed in class on a shelf.
- *Differentiation*
 - Bodily/Kinesthetic learners will like being able to make their own rectangular prism with the nets and the whiteboard practice.
 - Auditory learners will most likely learn best from listening to the lesson and recognizing what they need to fill in on their notes outline. They will also like being given key questions to talk about with partners.
 - Working in groups during independent practice will appeal to interpersonal learners whereas intrapersonal learners will more likely enjoy working out problems on their own on whiteboards.
 - Developing the formula for surface area of a rectangular prism using SmartBoard technology will appeal most to visual learners.
 - Logical/mathematical learners will most likely enjoy developing the formula rather than just being told what it is.

- *Closure*
 - Students will demonstrate what they have learned with a ticket to leave. On the ticket to leave, ask the students to write, in their own words, what surface area of a rectangular prism is. Also ask them to record the formula on this ticket to leave.
 - Ask students to hand their cardstock to the teacher as they leave the classroom. Ask students to also hand in their nets that they made.

- *Assessment*
 - The pre-assessment will be the frame of reference. This will tell the teacher what the students already know about area.
 - Formative assessments will be given throughout the lesson in the form of whiteboard practice and independent practice.
 - The ticket to leave will also serve as a form of informal assessment; to see how deep of an understanding they have of the concepts discussed in class.
 - For homework, students will be asked to use the data they found in their finding volume of rectangular prisms homework to find the surface area of those same rectangular prisms. (See homework worksheet and quickly describe its format.)

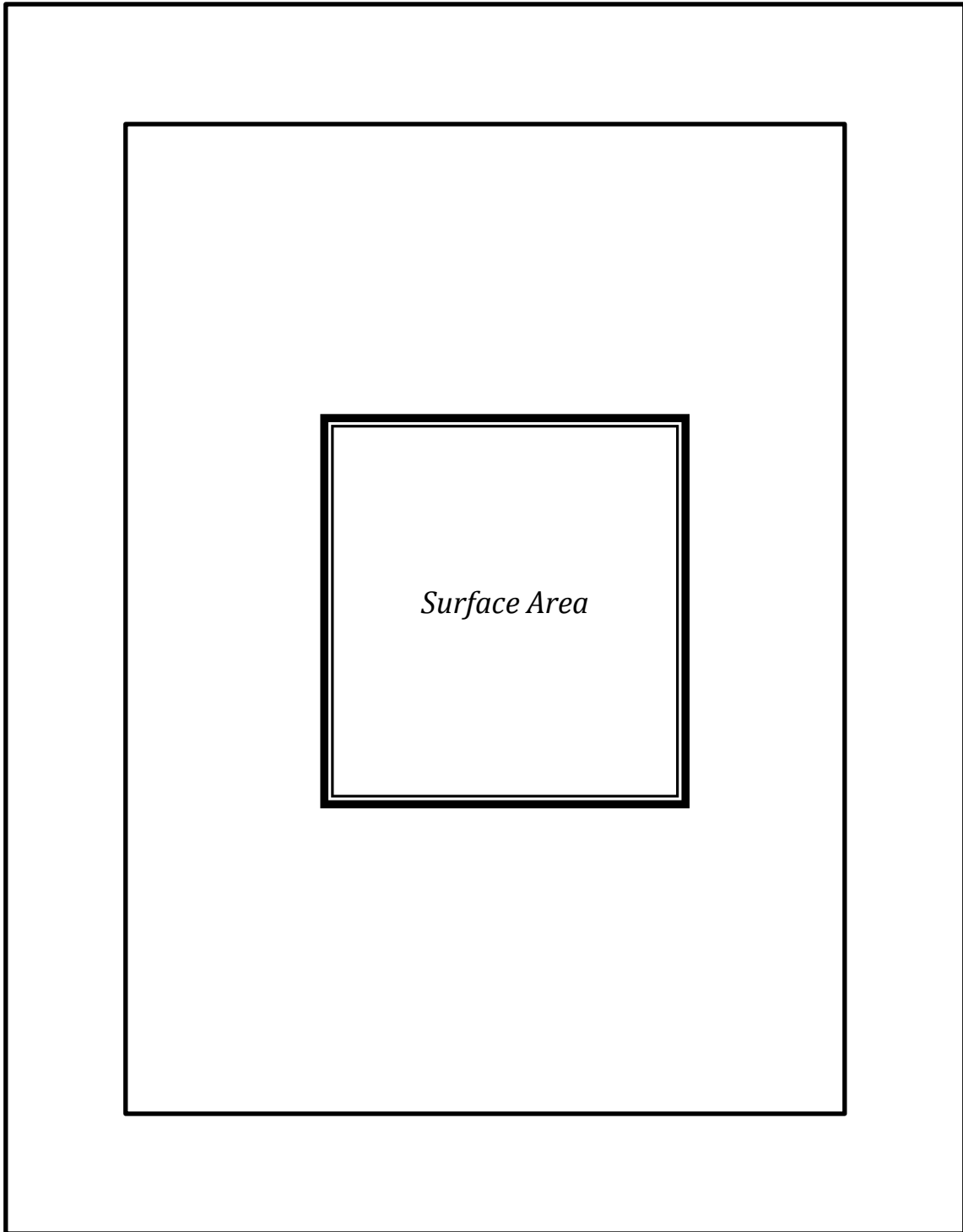
- *Materials*
 - Volume Quiz
 - Frames of reference
 - Rectangular prism nets
 - PowerPoint
 - Notes Outline
 - Red, yellow, and green index cards
 - Whiteboards, markers, rags
 - SOL formula sheet
 - Presents
 - Rulers
 - Sticky notes
 - Homework Worksheet

- *Technology Integration*
 - Utilizing SmartBoard technology will be the most important part of this lesson. It will give the students a very good visual rather than just trying to describe how to find the formula.

- *Reflection*

Name: _____ Date: _____ Block: _____

Frame of Reference



Math 7

Name: _____

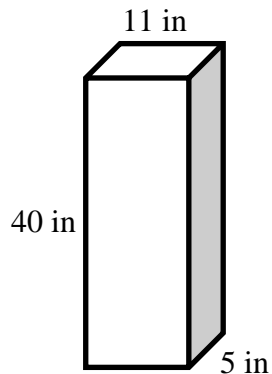
Notes- *S.A. of Rectangular Prisms*

Date: _____ Block: _____

- The surface area of a rectangular prism is the _____ of the areas of all of the faces/sides of the rectangular prism.
- We calculate the surface area when we are trying to decide how much fabric, paper, paint, etc. we need to _____ a rectangular prism.
- Surface area is always measured in _____.
- Formula for finding the surface area of a rectangular prism: _____.

EXAMPLES

Find the surface area of this rectangular prism:



How much wrapping paper will it take to wrap a box that is 2 inches tall, 10 inches long, and 6 inches wide?

Name: _____ Date: _____ Block: _____

Remember when you found three objects that were rectangular prisms and then found its volume for homework? Using the data from that homework assignment, you can find the surface area of those same rectangular prisms! So, copy down what the rectangular prism was, then the length, width, and height, then find its surface area using the formula.

Formula for finding S·A· of a rectangular prism: _____

<i>Rectangular Prism</i>	<i>Length</i>	<i>Width</i>	<i>Height</i>	<i>Surface Area</i>