Lesson Topic: Surface Area of Cylinders  Grade: 7  Subject: Math 7  
Student Teacher: Jordan Hunt

Virginia Standards of Learning Objective
- Standard 7.5a & 7.5b
- Strand: Measurement
- Grade Level 7
  a) “Describe volume and surface area of cylinders.”
  b) “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 find the surface area of a cylinder 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:
  o Applying the surface area formula when given different cylinders in different problems, including word problems
  o Independent Practice
  o Ticket to leave
  o Homework assignment

Task Analysis
- Essential understandings, knowledge, and skills:
  o Determine if a practical problem involving a rectangular prism or cylinder represents the application of volume or surface area.
  o Solve practical problems that require finding the surface area of a cylinder.
  o Find the surface area of a cylinder.
- Do the students know what a rectangular prism is?
  o Yes, the students know what a rectangular prism is.
- Do the students know what a cylinder is?
  o Yes, the students know what a cylinder is.
- Do students know what volume is?
  o 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?
Yes, students know what surface area. They learned this in the previous lesson finding the surface area of a rectangular prism.

**Key Terms (Teacher Input)**

- **Cylinder:** A cylinder is a three-dimensional figure with two parallel and congruent circular bases.
- **Surface Area:** The sum of the areas of all the surfaces (faces) of a three-dimensional figure.

**Sequence of Lesson**

**Anticipatory Set:**
- Before immediately starting to talk about surface area of cylinders, students will have a warm-up to complete on the board. It is five questions that have to do with finding the surface area of a rectangular prism. This will activate prior knowledge, allow students to review that they have learned in previous lessons, and start thinking about surface area again.
  - This warm-up will automatically make a noise and change slides every one minute and thirty seconds.
  - Students will work on this warm-up individually and once students are done, the teacher will use popsicle sticks to randomly call on students to come up to the board to give their answers.

**Teacher Input**
- When the warm-up is over, give each student a can, paper, scissors, and a small amount of tape. These should be cans that the teacher has provided for them. Soda cans, soup cans, any kind of can will do.
  - Tell the students that their goal is to cover the can completely and to try not to overlap the paper and they can only use as much tape as the teacher has given them.
  - Have students turn to their elbow buddies and discuss how they might be able to do this. Give students one minute to do this. Use a timer and ring a bell when time is up.
  - Now, have students get to work. Allow students to work on covering their cans for five minutes, then ring the bell. Also, allow students to discuss things with their elbow buddies as they work on covering the can.
- When five minutes is up, ask students to raise their hands if they came up with a successful way to cover the can completely without overlapping any paper. Call on a student who has his/her hand raised and ask him/her to come up in front of the class to explain what he/she did.
- Continue to call on volunteers until someone presents the idea of cutting two circles, taping them to the base and then one big rectangle to tape to the curved surface.
- This introductory activity will lead to the PowerPoint on finding surface area of cylinders.
  - Hand out the notes outline, have students keep their cans on their desk to reference throughout the lesson and start the PowerPoint.
    - The first slide introduces the lesson.
    - The second slide provides a quick reminder of what surface area is and relates it to a cylinder.
    - The third slide requires student input as the teacher guides.
      - Each student will have two cotton balls on their desk today. By the end of class, each student should have all of their cotton balls on the floor. This is because every time a student contributes to the discussion, answers a question, etc., the student will push one ball of the desk. Make sure students are aware of this because at the end of class, the teacher will note anyone who still has cotton balls on their desk.
      - Read each question aloud, allow students to discuss answers with their elbow buddy, then ring the bell when students should stop discussing and volunteer a comment or answer.
      - The teacher should record ideas on the board and relate to the activity the students did when they covered their cans.
    - The fourth slide, utilizes SmartBoard technology to develop the formula for finding surface area of a cylinder.
      - Using SmartBoard technology, the teacher should pull the label out of the can and ask, in the context of the can, how would we find the area of this rectangle? With help and prompting from the teacher, the students should come up with $2\pi r \times h$.
      - Then, the teacher should pull the top of the soup can out, again using SmartBoard technology, and ask how to find the area of this shape. Students should respond by saying $\pi r^2$. If the class doesn’t recognize that there are two circles, note that and remind students what surface area means.
      - By using this virtual can, students have come up with the formula for finding surface area of a cylinder! $S.A. = 2\pi r^2 + 2\pi r \times h$. Ask students to locate this formula on their formula sheet.
- Modeling
The next three slides of the PowerPoint introduce very basic problems involving finding the surface area of a cylinder. Walk the students through these problems. By the third slide, ask if anyone would like to volunteer to come work this problem out on the board for the class. (Use SmartBoard to model)

The next slide is a word problem that students will fill in on their notes outline. Be sure to mention this to students. The fifth problem is a problem involving finding the volume of a cylinder. It is important that students recognize when to find volume and when to find surface area. Be sure to stress this to students.

Check for Understanding

Throughout modeling and guided practice, the teacher should ask students to hold up their cards at different times throughout the lesson. These cards are red, green, and yellow. Green meaning they get everything and would be comfortable doing it on their own, red meaning they don’t understand the material at all, and yellow meaning they are getting there, but don’t quite have it yet.

As the teacher, take note of those who hold up red and yellow cards and be sure to check on them during independent practice.

Guided Practice

The tenth slide asks students to get whiteboards, markers and rags.

The next four slides students will work on by themselves as a problem is shown on the board. The students will work out the problems on the boards, check with their elbow buddy to see if their answers match up and if their answers do not match up, they can work out the problem together.

Once elbow buddies are confident with their answers, they should hold up their whiteboards for the teachers to check answers. The teacher should offer advice on how to get the correct answer for those pairs who didn’t get the question right.

Independent practice

For homework, students will have the opportunity to be creative. They will make up their own word problems on finding surface area of a cylinder. If possible, students can type their word problem and use clipart and such to make it creative. Or, the students can choose to write and draw.

Directions for this assignment will be on the last slide of the PowerPoint.
- The teacher should award a homework grade for this assignment. The student should be awarded full credit for creating a word problem and being creative. Should the student only write the word problem, the student should be awarded half credit.

- Students should also make sure to solve their own word problems. Next class the students will swap word problems with their elbow buddies as a warm-up activity.

- **Differentiation**
  - Bodily/Kinesthetic learners will like having their own cans to hold. They will also like having the opportunity to come up to the board throughout the lesson.
  - 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 discussing questions and problems with elbow buddies.
  - Working with elbow buddies through this lesson will appeal interpersonal learners whereas intrapersonal learners will more likely enjoy working out problems on their own on whiteboards and their homework assignment.
  - Developing the formula for surface area of a cylinder 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 and deciding what the most effective way to cover a can would be.

- **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 cylinder is. Also ask them to record the formula on this ticket to leave.
  - Ask students to hand their tickets to leave to the teacher as they leave the classroom. Ask students to also hand in their nets that they made.
  - Students should also expect a quiz on surface area.

- **Assessment**
  - The pre-assessment will be the warm-up activity. This will give a good indication as to how well students understand the concept of surface area.
  - Formative assessments will be given throughout the lesson in the form of whiteboard 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 complete their independent practice. This is the assignment in which students create their own word problems.

The short quiz will serve as a summative assessment on surface area.

**Materials**
- Warm-up
- Cans, paper, scissors, tape
- PowerPoint
- Notes Outline
- Cotton balls
- Red, green, and yellow cards
- Whiteboards, markers, rags
- SOL formula sheet

**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 of finding surface area of a cylinder.

**Reflection**
Math 7

Notes - S.A. of Cylinders

- The surface area of a cylinder is the __________ area of the surfaces of the cylinder.

- We calculate the surface area when we are trying to decide how much fabric, paper, paint, etc. we need to __________ a cylinder.

- Surface area is always measured in __________________________.

- Formula for finding the surface area of a cylinder: ________________.

EXAMPLES

Find the surface area of this cylinder:

How much sheet metal is required to make a cylindrical trash can with a diameter of 2 feet and a height of 4.25 feet?