# Volume, Surface Area for Rectangular &Triangular Pri

## Summary

Measure and use formulas to find volume and surface area of right rectangular and triangular prisms

## Main Core Tie

Mathematics Grade 7

Strand: GEOMETRY (7.G) Standard 7.G.6

## Materials

TI-73's
Set of Geosolids for each team, 100 Linking Cubes for each team
Net and Centimeter Paper prism, tape (or glue sticks for the net)
A 1x3x8 and a 2x3x4 prism made with Linking Cubes for demonstrating
Spinner with three equal parts and transparencies with problems for Spin-To-Win Game
Worksheets: Classifying Solids, Prism Bases and Faces, Linker Cube Surface and Volume Comparisons
Journal: Three-Dimensional Vocabulary foldables, Math 7 Class Reference Sheets

## Background for Teachers

Enduring Understanding (Big Ideas):
volume and surface area
Essential Questions:

- What is the shape for each of the faces or surfaces of a three-dimensional shape? How can the area for each face or surface be found?
- How can formulas for surface area of right rectangular and triangular prisms help me finding the surface areas?
- How are the units of measurement for area different from those used for volume?
- What information is essential in finding volume?

Skill Focus:
Find volume and surface area
Vocabulary Focus:
Rectangular prism, triangular prism, face, base, lateral face, base area, volume, surface area.
Ways to Gain/Maintain Attention (Primacy):
Manipulatives, sketches, predicting, journaling, calculators, music, game, cooperative groups.

## Instructional Procedures

Starter:
Find the:

- Perimeter and the area of a rectangle with length of 5 cm and width of 8 cm.
- Area for a triangle with base of 8cm and height of 5cm.
- Area for a circle with radius of radius of 4 cm.
- Write the scientific notation for 4, 500, 000

Lesson Segment 1: What is a right rectangular prism? A Triangular Prism?
Sorting is an excellent way for students to begin to identify attributes of geometric figures. The following activity will help students review ideas from past year's cores and to scaffold their understanding for volume and surface area.
Give teams of students a set of Geometric solids. Using the Classifying Solids worksheet as a guide,

have student teams sort the three dimensional objects in the set. Have them write their information on the worksheet. As teams report on their classification rules, help them use the vocabulary terms like faces, parallel faces, bases, edges, and vertices.
Then, showing models and having students hold up examples from their Geosolids set build a discussion to help students fill in the information on the " Geometry Words For Three-dimensional Shapes" Foldable.
To help students remember the type of units needed for measuring geometric shapes, have them make and complete the foldable for Units of Measure For Geometric Objects.
Lesson Segment 2: What is the shape for each of the faces, bases or surfaces of a three-dimensional shape? What information is essential in finding the surface area? How can the area for each face and the total surface be found?
Have students take out rectangular prisms from Geo-Solids. Review vocabulary by asking a team member to point to a base, then to point to a face. Ask another team member to show an edge where the length could be measured, then to show where the width could be measured, then show where the height could be measured. Ask another team member to show the team how many faces and bases the prism has. (Demonstrate which faces are the bases and which are the lateral faces or lateral surface.) If we want to find the area for the entire surface, we need to know what shape each face is and how many faces there are. Have the students use the solids to complete the attached " Prism Bases and Faces" worksheet.
If we could find the area for each of the faces of a prism, we would be able to find the area of the entire surface by adding these face areas together. Have students look on their Math 7 Class Reference Sheet and write the formulas for each face on the prisms from the Prism Bases and Faces worksheet. They can write the formula beside the face it applies to. When there are more than one of the same size face, the students can use an arrow to show they would use the same formula.

1. Rectangular Prism
   -Use Linking Cubes have students build a 3 x 2 x 4 right rectangular prism. Show students how to build the 3 x 2 (length x width) first, and then how to stack up 4 layers for the height. Describe surface area as the number of squares to cover all the faces. Have students count the squares.
   Q. Think-Team-Share: Is their a faster way to find the area of all the surfaces than actually counting every square? Discuss how opposite faces are congruent. Direct them to look at the formula for surface area of a rectangular prism. Have them use the dimensions for this prism in the formula.
2. Triangular Prism
   - Have students cut and fold the net for the triangular prism. They can count the dimensions. Ask them to count the squares for each face to find the total number of squares needed for the surface area.
   Q, Think-Team-Share: Is their a faster way to find the area of all the surfaces than actually counting every square? They should see that we can double the area of one triangle, then multiply each side of the triangular base by the length. Have students use the formula from the class reference sheet with the dimensions of the net to find the surface area using the formula.

Lesson Segment 3: How are the units of measurement for surface area different from those used for volume? What information is essential in finding volume? How can we find the volume of a prism?
As we are told in the song (sing it again), volume is measured with cubes. Tell students if they can find the base area, then stack up the bases, they can find the volume.
As you demonstrate and discuss the following volumes, have students sketch, label, write the formulas and find the volumes on an assignment paper.

1. Rectangular Prism
   : Using the 3 x 2 x 4 Linking Cubes prism that has been built, explain that volume is the number of cubes needed. Have student count the number of cubes.

Q. Think-Team-Share: Is there a faster way to find the total number of cubes than actually counting every. Show them how to use the formula from their Class Reference Sheet. V = *lw*h* (or Base area x height). Have students locate the formula for volume of a right rectangular prism on their class Reference Sheet and write the formula on their paper using the dimensions of the prism to compute the volume.

2. Triangular Prism
   - Use the centimeter paper net. Cut out the bases and fold the rectangular faces to form the lateral area. Have students cover one triangular base with centimeter cubes as best they can and ask how they would estimate the number of cubes in the triangular prism. They could stack the Base area to the height of the lateral faces. Tell them this will be challenging to count because some of the cubes will be only part of a cube, and stacking is sometimes difficult. They could multiply the Base area estimate by the height instead. How many layers (height of prism) are there? Have them estimate the total number of cubes. Then have them look at the formula for volume on the Class Reference Sheet. Ask students to use the dimensions of the net to compute the volume using the formula ( V = Bh where B is the area of the triangular base and h is the height of the prism)

Lesson Segment 4: Practice finding surface area and volume

Comparing Rectangular Prisms

Give students the worksheet, " Linker Cube Volume and Surface Area Comparisons" and a bag of 100 Linking Cubes. Do a round robin reading to read all the questions for this worksheet. Show them a 1x3x8 rectangular prism and a 2x3x4 rectangular prism that you have made previously. Both prisms have a volume of 24 cubic units. Have the student write the hypothesis as indicated on the top of the worksheet for whether or not the surface area will be the same if the volumes are the same. Remind students to build the base area or l x w first and then stack layers for the h. Have pairs at each team work together to build one of the prisms. Then, the team sets the prisms in the center of the desks and discusses the number of cubes needed for volume and the number of squares needed for the area of all the surfaces. Give about 10 minutes for them to build and discuss each set of prisms. Discuss questions and answers for # 1-6 as a class.

Spin To Win Game

Materials needed: overhead spinner divided into three sections and labeled 1, 2, 3. Transparency problem for each team.

Directions: Cut each transparency containing the three shapes (attached) into three parts. Give each team one of the parts of the transparency. Ask each team to use their journal notes and class reference sheet, and calculators to find the volume or the surface area as directed on their transparency. They should all record this on an assignment sheet. Each person on the team must be prepared to explain how they found the answer.

Divide the class in half-Team 1 and Team 2. Have a person from one team come to the overhead to show the class their transparency. The class members work with their teams to find the answer, recording the problem on their assignment paper. The person at the overhead then calls on a person from the other side of the room to explain how to find the answer. That person comes to the overhead to show how. If he/she explains correctly, they get to spin the spinner. Spinning a 1 earns the team 1 point. Spinning a 2 earns the team 2 points. Spinning a 3 earns the team 3 points AND subtracts 1 point from the other team. If the person asked cannot explain cannot correctly, the student who you selected to bring the transparency up to show the class explains the problem and gets to spin the spinner for points for their half of the class.

The side with the most points when all the problems have been presented wins. Students should use the reference sheets, journal and calculators to avoid tedium and to be able to use the reference sheet effectively for the CRT later in the year.

Assign text practice as needed.

## Assessment Plan

Performance tasks, questions, observation

## Bibliography

This lesson plan was created by Linda Bolin.

## Authors

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