



Formula Wars!

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Math
Grades 9–12



Introduction

Students will be playing a game called Formula Wars to practice finding the volume of cylinders, pyramids, cones, and spheres quickly and accurately. Students will look critically at two shapes and determine their relationship in terms of volume.

Learning Objectives

Students will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems ([Common Core State Standards: Math HSG.GMD.A.3](#))

Materials Needed

- Notebooks/journals/paper
- Four pieces of paper, each labeled either cylinder, pyramid, cone, and sphere
- Tape
- Pictures of cylinders, pyramids, cones, and spheres (optional)

Procedure

1. Ask students to brainstorm the definition of volume. Give students roughly one minute of think time before asking them to discuss ideas with a partner. Students should pair and share responses for two minutes. Then, ask some students to share their definition of volume with the class. The teacher should reinforce correct responses and correct any responses that do not appropriately define volume. Tell students that they will be determining the volume of four new shapes today: cylinder, pyramid, cone, and sphere.
2. For this brief activity, you will need to label four corners of the classroom. Each corner should have a piece of paper taped on the wall with the written name of each shape (i.e. cylinder, pyramid, cone, or sphere). (Corners should not display the actual shapes.) Students must practice correctly identifying the shapes. On the board, display or draw one of the shapes (without labeling it). Ask students to walk to the corner of the room that matches that particular shape. This activity should provide quick, additional practice in distinguishing between the new shapes. If desired, have small groups of students (or individual students) identify the shape at hand instead of allowing the entire class to respond. This activity is meant to be a quick way of teaching/reviewing the shapes and capture student attention.

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3. Introduce the formulas needed to determine the volume of each shape. [Here is a video](#) that is wonderful for teaching the volume of cylinders, pyramids, cones, and spheres. It is rather lengthy at 25 minutes long, but it teaches the processes excellently. Students should write down the volume formulas for each shape. As a class, complete examples for each formula before proceeding to the next activity.
4. Now, it is time to play Formula Wars! Divide the class into groups of four. For this activity, you will display a shape and its dimensions on the board. Once the shape is revealed, groups must race to determine its volume. The first group to raise their hands and give the correct answer earns a point. Students should practice finding the volume of various shapes for roughly 20-30 minutes. The winning group may earn a prize of your choice. Prize examples include extra credit points, candy, etc.
5. To close the lesson, show students [the following video](#) and stop the video at 0:55 seconds. The video presents a word problem requiring students to compare and relate the volume of a sphere and a cone. Students must solve the problem individually and turn in their work before leaving class. If time remains, students may watch the remainder of the video to see the correct steps in solving the word problem. (If students are unable to watch the rest of the video, you may use it at the start of the next day's lesson.)

Evaluation

This lesson serves as an introduction to volume of cylinders, pyramids, cones, and spheres. Throughout the entirety of the lesson, students are practicing finding the volume of the various shapes while working with others. Because of this, individual student evaluation occurs during the closing activity. Students must be able to use their new knowledge of volume to determine whether or not the volume of a sphere will fit inside a cone. Students will be evaluated on their ability to do the following:

- Determine the volume of the sphere
- Determine the volume of the cone
- Determine if the cone can hold the sphere's volume or overflow