

Teacher Resources

Missiles on Target with Geometry

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Introduction: Geometry teachers who are looking for a short application activity to generate curiosity and interest in 3-dimensional geometry can guide their students through a quick look at the U. S. Navy's fleet ballistic missiles (FBMs). Not only will the students learn a bit of history of applied technology used to win the Cold War, they will quickly recognize how cylinder volume is important in estimating solid propellant rocket motor capacity of the various stages of a submarine ballistic missile.

Learning Objectives:

This activity is appropriate for 8-12 grade mathematics students.

Students will learn to make estimations based on a model.

In this activity students will come to understand the enormous size of a submarine ballistic missile by determining how many familiar objects (3 x 5 index cards) it takes to cover one stage of the missile.

Students will also recognize 3-dimensional geometric shapes used in real life along with the geometric formulas that apply.

Students will discuss real-life considerations in modern ship building and how mathematics can help.

National Mathematics Standards:

G-MG-1 Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects (e. g. modeling a missile stage as a cylinder).

G-MG-2 and G-GMD-3 Explain surface area and volume formulas and use them to solve problems. Apply concepts of density based on area and volume in modeling situations (e. g. missile per cubic foot).

G-GMD-4 Visualize relationships between two-dimensional and three-dimensional objects.

8.G-9 Know the formulas for volumes of cylinders and use them to solve real-world and mathematical problems.

Wisconsin State Standards:

W-4 Model with mathematics.

W-5 Use appropriate tools strategically.

W-6 Attend to precision.

Teacher Help

This presentation is designed on power point, but each slide can be copied as a transparency if needed. Pausing for class discussion, this activity should take 30-45 minutes. Do not reveal the answers until the students have had an opportunity to discuss the questions.

The first slide contains a hyperlink action button for exploring submarine launched ballistic missiles. After launching the hyperlink, click the “play video” button.

When constructing a model of stage one with index cards, students should realize that the circumference of the cylinder is approximately the same as the height of the cylinder. Students should tape their cards together in such a way that the circumference is approximately the same as the height. To do this activity you will need a 3 x 5 index card for each student.

Use a table to record the student team’s names, and their estimates of the number of cards needed to cover the lateral area of the first stage. Have a contest for the team that comes closest to the actual number. The estimate should be a result of discussion, do not allow guesses. Students need to have an understanding of surface area before the activity.