

Lesson Update and CRT Addendum	
Lesson/Activity Title: Solid Rocket Boosters	ID: 2-104
Product Number:	Grade: 9-11
URL: https://spacemath.gsfc.nasa.gov/Algebra1/6Page38.pdf	
Subject: Volume and area of circle and cylinder, time, distance, speed, modeling.	
Summary: In this activity students compare exposed surface area of a circular disc to a cylindrical cutout to determine thrust efficiency of solid rocket boosters. This activity (#28 in packet) Should be used in conjunction with Solid Rocket Boosters II (Activity 88).	
Materials for Lesson: No extensive materials beyond common classroom technology.	

Review and Recommendations	
ALIGNMENT TO STANDARDS	
NGSS	N/A for this particular activity.
Common Core State Standards in Mathematics	6.RP, 6.NS, 6.EE, 6.G, 7.RP, 7.NS, 7.EE, 7.G, 8.EE, 8.G
CULTURAL RESPONSIVE TEACHING (CRT) RECOMMENDATIONS	
5E Lesson/Description	
1. Engage	<p>Teacher will review/elicit students' knowledge of applying the formulas for circumference and area of circle as well as surface area and volume of a cylinder. Student's interest should be used to build interest and mathematical/scientific meaning.</p> <p>Encourage students to use multiple modes to demonstrate knowledge and understanding.</p> <p>Explore the idea of updating existing technology as opposed to inventing completely novel solutions. (NASA's Space Launch System, SLS, and Shuttle program's Solid Rocket Boosters, SRB)</p>
2. Explore	<p>Provide opportunities for complex mathematical/scientific thinking and to analyze scientific problems.</p> <p>Allow students to explore alternative approaches to doing mathematics.</p>

<p>3. Explain</p>	<p>Require justifying and/or explaining concepts or procedures. The teacher should actively elicit mathematical and scientific contributions.</p>
<p>4. Expand/Enhance</p>	<p>Present content and language /literacy objectives: Without giving away what students will be discovering, both language and content objectives are presented to the students at the beginning of the lesson. The tasks do not build on each other. It is important for the teacher to build background on solid rocket boosters and how they function, by using appropriate visuals or videos or by using real objects to illustrate what the inside of a rocket booster looks like so that students can better understand the problems. The teacher should attend to multiple meanings; use the student’s native language and encourage multiple modes of communication. Measurements should be provided in the first paragraph and in each problem could be illustrated in the figures. Simplify the language used and be consistent with the various terms used making the task easier to comprehend. The explicit teacher vocabulary should be included in the instructional guide. Mathematics/science terms that may need explicit attention include: thrust, tip to ground, diameter, cylindrical volume, cylinder, surface area, burn rate, burn depth, mass rate. Students could extend this activity by building model shapes to try to expose the greatest surface area. Biological analogues could be found and explored, i.e.: the human brain’s gyrus and sulcus, and the cristae of the mitochondria in eukaryotic cells.</p>
<p>5. Evaluate</p>	<p>Evaluation is included in each activity.</p>

Additional Resources:

http://www.nasa.gov/returntoflight/system/system_SRB.html

https://www.nasa.gov/sites/default/files/atoms/files/8690sls_solid_rocket_booster_fact_sheetfinal03072015_508.pdf

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