

Mathematics: The Language of STEM

Angry Birds Volume Fun! - Part 1

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****NOTE - This is Part 1 of a two part Unit. See Part 2 for the follow up lesson.****

CONTENT AND TASK DECISIONS

Grade Level(s): 7th & 8th Grade Mathematics

Description of the Task: Students will use three-dimensional Angry Birds constructed from nets to understand that when you alter the length of a side of a shape it will affect the volume and/or surface area of that shape. Students will also create additional three-dimensional shapes by creating their own nets by using varying measurements.

Indiana Mathematics Content Standards:

7.GM.5 - Understand the formulas for area and circumference of a circle and use them to solve realworld and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.

7.GM.6 - Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms.

8.GM.2 - Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres.

Indiana Mathematics Process Standards:

PS.1 - Make sense of problems and persevere in solving them.

PS.4 - Model with mathematics.

PS.5 - Use appropriate tools strategically.

PS.6 - Attend to precision.

PS.8 - Look for and express regularity in repeated reasoning.

Mathematics Content Goals: Students will understand how to calculate and find the surface area and volume of various three-dimensional figures.

Language Objectives: In small groups students will discuss and record the surface area and volume of various three-dimensional figures using models/figures and charts.

ELD Standard 3 - English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

Materials:

- Pre-created nets of Angry Birds
- Activity Worksheet (explaining students' tasks)

- Angry Birds blank calculation chart
- ISTEP+ Reference Sheet
- Construction paper
- Glue
- Tape
- Popsicle sticks (as an extension activity)
- Cardboard (as an extension activity)
- Any other supplies students may need

THE LESSON

Before:

Start out the lesson by having a video playing (to provide background knowledge for all) of a demonstration of the game Angry Birds (as you take attendance).

<https://www.youtube.com/watch?v=BG9mplKbVwg>

Ask students: “How many of you have heard of Angry Birds before this video?” “How would you like to create your own version of Angry Birds?”

- First let’s recall from our review yesterday... What is surface area? What is volume? What do they represent? How are they different? (I would recommend a discussion/review on the day before this to gauge how much the students recall and need review. You may need to reteach the formulas and do a few problems together to prepare them for this lesson. I would provide them with the ISTEP+ reference sheet to help support their learning and serve as a visual.)
- Today you are going to be getting into groups of 4 to create your very own Angry Birds. Over the course of this unit you will be calculating the area of the base, the volume, and the surface area of each 3D figure.
- You will use the chart given to record your findings. Please also mark your observations throughout this project in your journals. If you feel comfortable and prefer, you are more than welcome to start a Google doc within your groups for ongoing discussion and share it with me.

During:

During this phase of the lesson the students will begin working off of the activity sheet included. They will complete the first two tasks during Days 1 & 2 of the unit.

PART 1 (most likely Day 1) - Using the templates/nets given, students will construct 3D angry birds and pigs in the shapes of cones, prism, cubes, and pyramids.

“Now you are going to get in groups of 4. Each group member will have a different Angry Bird net already cut out for you. One member will have a cone, one will have a prism, one will have a cube, and one will have a pyramid. You will each construct your figure using the tape and supplies provided.”

If they would prefer to trace the nets onto construction paper for a more colorful bird, then embrace their creativity. A lot of discussion comes even just from the creativity of

the birds and pigs. As an extension activity for those that finish early they can decorate their figures to resemble actual angry birds and pigs.

PART 2 (most likely Day 2) - I would start the new day with this Prezi to lay out the objectives and expectations for students: <https://prezi.com/m/fadyni89ridm/angry-birds-3d-nets-surface-area-and-volume/> Students will now identify the base shape and calculate the area of the base in each 3D figure using formulas from the ISTEP+ reference sheet and prior knowledge of learned material. Students will record their findings in the chart given/attached. Students can also use the app Notability as a support to help assist with their processing. They can enter text or do sketches to help find the area of each figure. Students would still be seated in their groups to help facilitate a community of learners that learn and help each other. This would serve as a built in support. It is important for the teacher to roam around the room ensuring all students are on task and understanding the focus of the task. Some specific questions the teacher could ask to help focus students would be...

- How does the base of the shape affect the area of the shape?
- Why do you think that?
- Can you justify that the area of the shape is correct?
- How?

As an extension for students who have finished early you could encourage them to think about what would happen to the area if you changed the base. What if you increased the base? What if you decreased the base? How would that affect the overall bird? Would that be better or worse for knocking down a tower?

After:

In this portion of the lesson, students would share out their findings for each of the 3-D shapes. They would have to prove and justify why their findings were correct with that of their peers. This is where students would jigsaw and meet with a member that had the SAME shape from each of the different groups to compare their findings. Ultimately this is where students would discuss and ensure that they indeed found the correct answers. Students would need to challenge and find solutions if there are group members that don't necessarily agree on the correct answer. On the other side of that, students also would need to justify that their solution is in fact correct. This is where students learn the best. Plan for plenty of time for this discussion to take place. The teacher, again, will serve more as a facilitator who roams around actively listening to each of the groups and how they are justifying their responses.

At the end, as a class discussion, I would ask the students some questions located in the "Assessment" and "Ask" portions of this lesson plan to help make connections, see patterns, and make generalizations.

Another tool that can be used during this time to help students visually see volume and surface area would be the use of multi-link cubes or Unifix cubes. The visual of the cubes could quickly and easily help students see the difference between surface area and volume using the cubes.

ASSESSMENT

Observe:

It is important for the teacher to roam around the room ensuring all students are on task and understanding the focus of the task. The teacher will serve more as a facilitator who roams around actively listening to each of the groups and how they are justifying their responses.

The teacher would specifically be looking for students to understand that the base shape and area affect the volume and surface area.

Ask: Specific questions you will ask students to assess their learning.

1. What did you notice when you increased the sides?
2. What patterns did you see?
3. If you were to gift wrap this shape (like a Christmas present), would it take more wrapping paper or less wrapping paper? Why do you think that? How do you know? Can you justify your answer?
4. When the length of one side increases/decreases, how does it affect the volume and/or surface area? How do you know? Can you justify your answer?

Suggested Timeline for Angry Birds Unit:

Day 1 - Task 1 on Activity Sheet

Day 2 - Task 2 on Activity Sheet

Day 3 - Task 3 on Activity Sheet

Optional Extension of Unit:

Day 4 - Tasks 4 & 5 on Activity Sheet with Discussion