STEMTeach KU

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— THE UNIVERSITY OF KANSAS —

LESSON PLAN TEMPLATE – C&T 291

Group Members: _____KP Preut and Willa Kelpe_____   Lesson #: 3_____   Draft #: 3_____

Date Lesson will be Taught: 4/28   Time of Lesson: 9:26-10:16_____   Length of Lesson: 50 min._____

Host Teacher: __Mrs. Clarkson__   Grade Level: ___7____   School: Liberty Memorial Central Middle School

LESSON OBJECTIVES (Students will be able to…)
● Students will be able to calculate the surface area of prisms. ● Students will be able to calculate the volume of prisms.

ALIGNED STANDARDS
7.G.5. Investigate the relationship between three-dimensional geometric shapes; (2017)
7.G.5a. Generalize the volume formula for prisms and cylinders ($VV = BBh$ where B is the area of the base and h is the height). (2017)
7.G.5b. Generalize the surface area formula for prisms and cylinders ($SSSS = 2BB + PPh$ where B is the area of the base, P is the perimeter of the base, and h is the height (in the case of a cylinder, perimeter is replaced by circumference)). (2017)

NECESSARY MATERIALS
Attach any handouts to the end of this lesson plan.

- 25 Explore WS
- 20 cube nets
    - 6 folded into 3D shapes
- 18 rectangular prism nets
    - 6 folded into 3D shapes
- 18 triangular prism nets
    - 6 folded into 3D shapes
- 18 square prism nets
    - 6 folded into 3D shapes
- 25 Summative Assessments
- 25 Rulers
- 1 cardboard box (for Elaborate Option 1)

SAFETY AND PRECAUTIONS
- Be respectful of your classmates. - When looking around the room for objects, be respectful of other students' belongings and personal space. - Use the rulers appropriately. Only use it to measure, do not hit others/yourself/object with the rulers.

CLASSROOM MANAGEMENT STRATEGIES
State at least 4 classroom management strategies that will be utilized in your lesson.
- Providing students with name tents - Teachers will only provide materials for making the shapes when needed. They will be collected once students are finished. - -Students will be asked to put away their phones and remove their headphones. - -While students are working, teacher will walk around and engage with students to prevent off-task behaviors

DIFFERENTIATION STRATEGIES
Identify at least 2 differentiation strategies that will be utilized in your lesson. State the element (content, process, product, learning environment) that is being modified and the difference (readiness, interest, learning profile) that justifies the modification.

- If a group finishes then they will be given a third shape for explore.
    - This is a change of content based on readiness.
- In elaborate, students will have two options. Option one is to work on a guided review over volume. Option 2 is working independently or in small groups to find volume of objects in the classroom.
    - This is a change of process based on readiness.

ENGAGE	Estimated Time: 5 minutes
What the teacher does and what the students will be directed to do:	Critical questions the teacher will ask the students. What questions will guide this part of the lesson? *How might the students answer?*

- Teacher will greet students and ask them to pick up their name tent.
    - If they no longer have one, paper to make a new one will be provided.
- Teacher will display a picture of a net figure on the board and then ask the students what shape they think it would be. This is in the powerpoint for the lesson.
    - The students will then be asked to go stand on one side of the room depending on which 3D shape they think the net creates
- The teacher then will display 1 more shape and the students will do the same for that
- Ask students for a thumbs up thumbs down if they thought visualizing the nets was easy.
	How did you choose which 3D shape the net went with?
	
	  ● *It goes with the one that has the same number of sides*
	  ● *Well the net has a triangle so that I choose the one with a triangle in it*
	
	Was that easy or hard to determine which shape it was?
	
	  ● *Easy because I can visualize the shape in my head*
	  ● *Hard because the shapes don't look the same.*

- If there is confusion, go over strategies for identifying what nets go with the 3D shapes.	

EXPLORE	Estimated Time: 15 minutes
What the teacher does and what the students will be directed to do:	Critical questions the teacher will ask the students. What questions will guide this part of the lesson? *How might the students answer?*

- Instruct students that they will be working in their table groups
   - if needed teacher will move students around so there are 6 groups that are even
- Give each group 2 cube nets and the net folded up in a 3D shape
- Teacher will ask the students what the difference between surface area and volume is.
- Teacher walks through the cube example with students
   - Ask students how to find the area of a square
   - Walk through finding the area and then explain adding the 6 sides' area of the cube together to find surface area
   - Ask how they would think they would find the volume
   - explain that it is the area of the base times the height
- Ask to show a fist to five on how confident they feel on finding the surface area and volume
   - Ask students what questions they have.
   - If a majority of the students hold up a 1-3, we will do the rectangular prism example together as well.
- Before starting, review area of a triangle
- Pass out the rectangular prism and the triangular prism to every group
   - Students will get 8 minutes to complete this
- If a group finishes early then they will be given another net to work on.
	What is the difference between surface area and volume?
	● Surface area is the outside of the shape, volume is the inside
	● Surface area is the area of every surface added together, volume is base times the width times the height.
	● They are the same thing.
	
	How do we find the area of a square?
	● *Multiply the sides to get the area*
	● *Length time width*
	● *base time height*
	● *Add the side lengths together.*
	
	Now how do we find the volume of the cube then?
	
	● *Take the area time the height of the whole 3D object*
	● *Maybe you add the area of all the faces together*
	● *Add length, width, and height.*
	
	Area of a Triangle?
	● *½ bh*
	● *multiply the side length by three cause there are three sides*
	● *Multiple the bottom length by the height.*
	● *Multiple the base and height and divide by two.*

EXPLAIN	Estimated Time:10
What the teacher does and what the students will be directed to do:	Critical questions the teacher will ask the students. What questions will guide this part of the lesson? *How might the students answer?*

- A student from each group will write the answers they got for surface area and volume
   - If answers are consistent, we will move on to the next section.
   - If there are different answers, the teacher will go through the process on the board.
- Teachers will ask students to give a thumbs up or thumbs down for how comfortable they feel finding surface area and volume.
   - Teachers will encourage students to ask any questions they have.
   - Student's answers will be used in the Elaborate section to determine what option they complete.
	How did you find the surface area?
	  ● *I found the area of all the smaller shapes in the the net then added them together*
	  ● *I multiplied all the side lengths together*
	
	How did you find the volume?
	  ● *I took the area of the "base" and multiplied it by the height of the 3D shape*
	  ● *i think it is the same as the surface area*

ELABORATE	Estimated Time: 10
What the teacher does and what the students will be directed to do:	Critical questions the teacher will ask the students. What questions will guide this part of the lesson? *How might the students answer?*

● Based on their response to the thumbs up/thumbs down, students will be given two options for this section.
  ○ Students who put their thumbs down will be directed to choose Option 1.
  ○ Students who put their thumbs up will be directed to choose Option 2.
● Students will be directed to keep their worksheets with them. They will use the back of the worksheet to complete the Elaborate section.
● Students working on option 1 will be asked to move to the side of the room nearest the windows. Students working on option two will be asked to move to the remaining seats. These students will also be moving around the room to find objects and calculate their volume.
 	
● Option 1: Volume review with real world example
  ○ Teacher will work with these students as a group.
  ○ Teacher will show the students a box that is a cube.
	How might we think about finding the area of a square?
	  ● *Well if you divide the sides by their length then you can count all the units*
	  ● *multiply the side lengths together*
	
	Now thinking about surface area, how do you find that?
	  ● *It is the same as the total area of the net. You add all of the areas up*
	
	How are you going to find the area of a triangular prism you found in the classroom?
	  ● *Find the area of the triangle and multiple it by the height*

- ■ Teacher will open the box and go over that volume is the space the box can hold.
  - ○ Teacher will go over what base, length, and height are
  - ○ Teacher will go over how to find the volume of the box.

- ● Option 2: Finding volume of classroom objects
  - ○ Teachers will direct students to work independently or in a group of 2-3.
  - ○ Teacher will direct students to find an object and find its volume.
    - ■ Teachers will direct students to be respectful of everyone's belongings and personal space when moving around the room.
    - ■ Teacher will direct students to use the rulers appropriately.
  - ○ Students should find an object, measure it, and calculate the volume.
    - ■ Fill out the back of their worksheet with this information.
 - ○ Teacher will circulate around the room and help students.

EVALUATE – FORMATIVE ASSESSMENTS
Identify the formative assessments that will be used to evaluate student learning throughout the lesson. State what content is being measured, how it is being measured, and when in the lesson the assessment is occurring.
● Thumbs up thumbs down after engage section asking if it was hard to visualize the 3D Shapes. ● Teachers will ask students to give a thumbs up or thumbs down for how comfortable they feel finding surface area and volume in the explain section.   ○ Use these results to determine what Elaborate option they should choose. ● Ask to show a fist to five on how confident they feel on finding the surface area and volume in the Explain

| EVALUATE – SUMMATIVE ASSESSMENT	Estimated Time for Summative Assessment: 10
Include a blank copy of the summative assessment, as well as a completed key/grading guide of the summative assessment.	

Summative Assessment

Name:_____

1. Find the surface area and volume of the prism and show your work.

3 cm

3 cm

7 cm
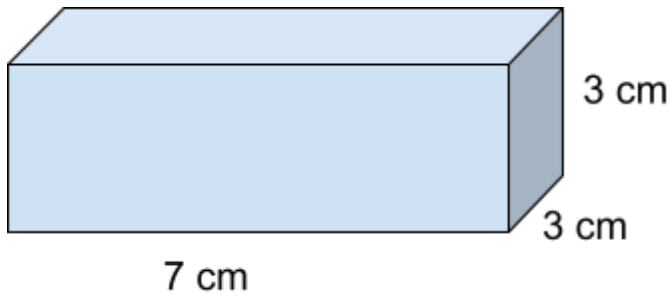
Surface Area: _____   Volume: _____

2. Find the volume of the prism and show your work.

4.7 cm

4 cm

7 cm

5 cm
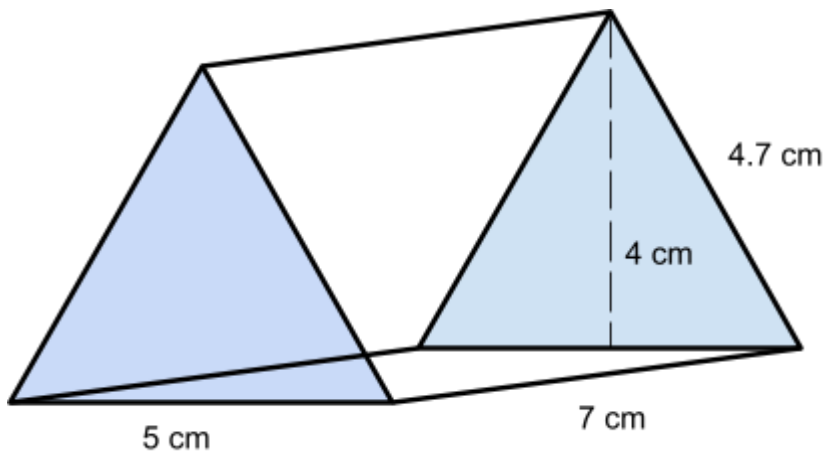
Surface Area: _____   Volume: _____

Summative assessment key:

1. 4 points
- Surface area:
    - 1 point correct answer: 102 cm^2
    - 1 point showing work
- Volume:
    - 1 point correct answer: 63cm^3
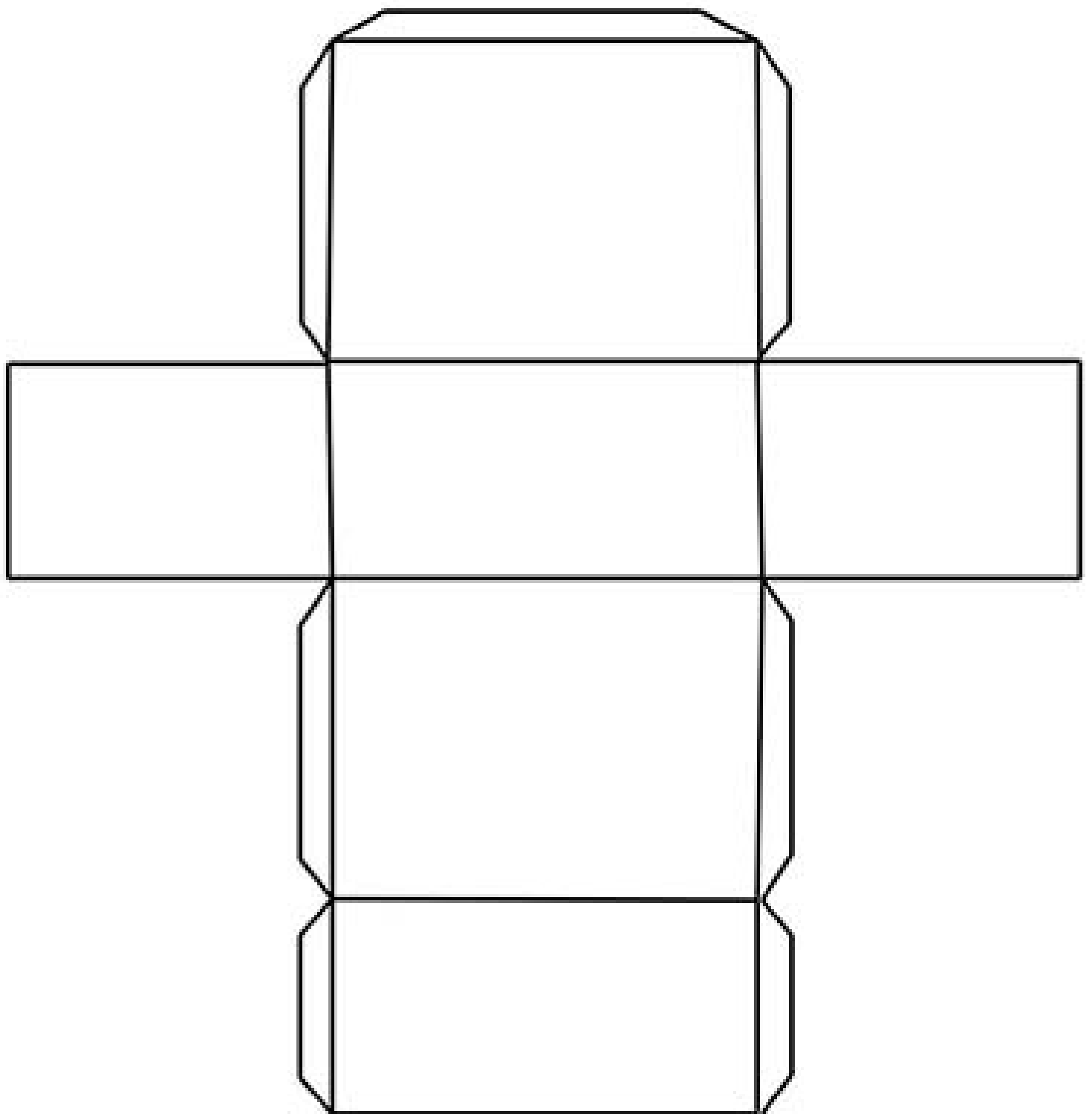   - 1 point showing work
2. 4 points
- Surface area:
    - 1 point correct answer: 118.7 cm^2
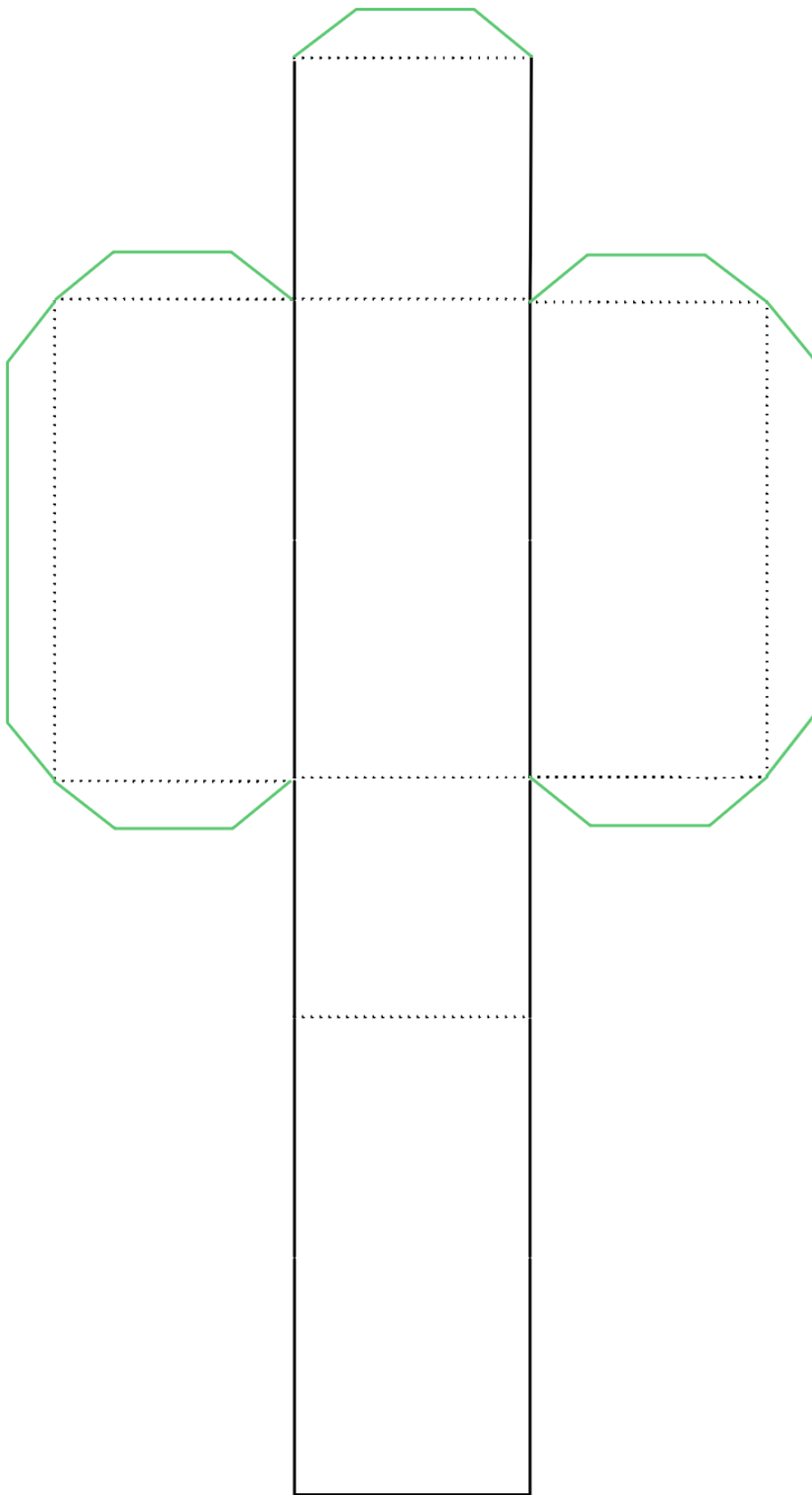   - 1 point showing work
- Volume
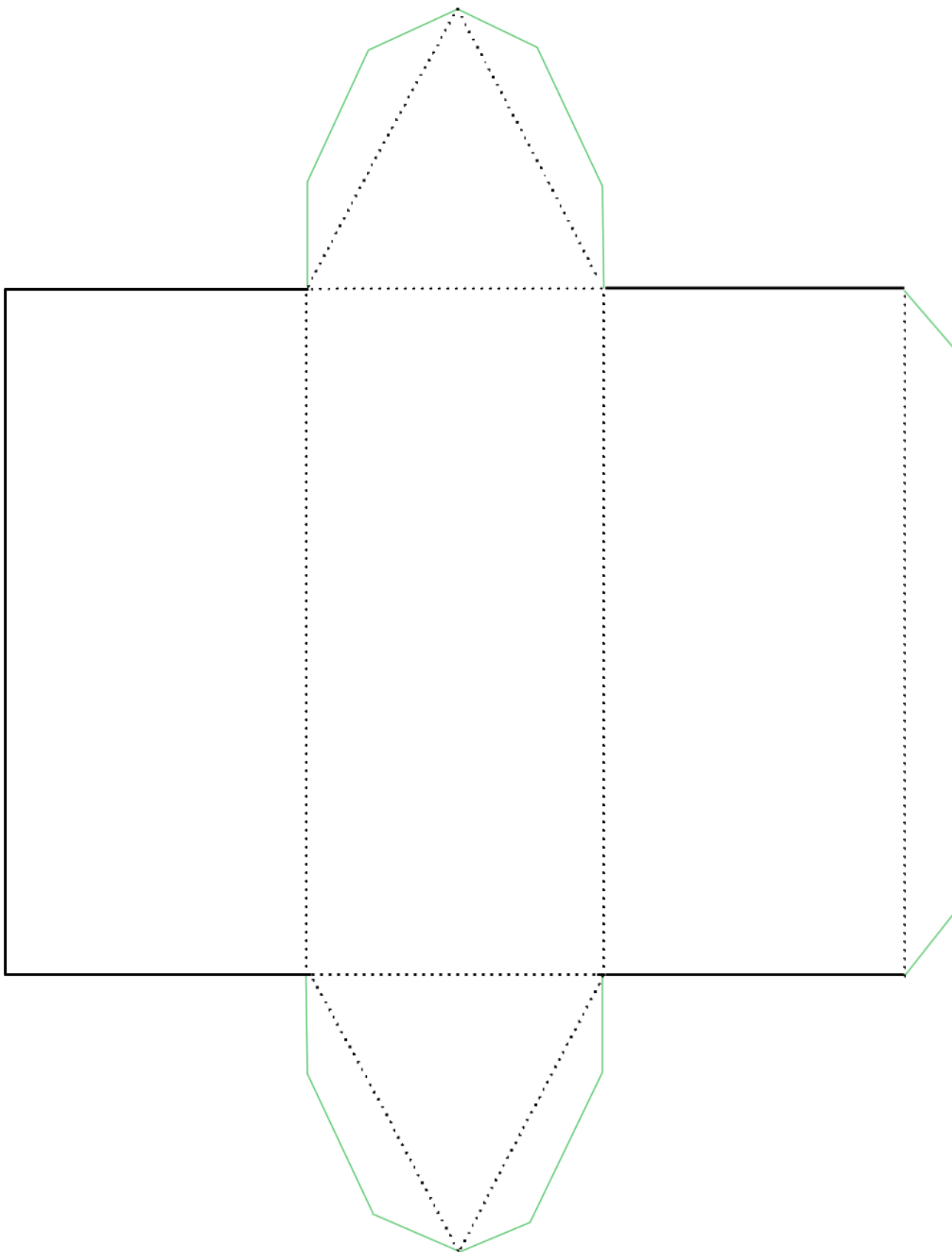   - 1 point correct answer: 70 cm^3
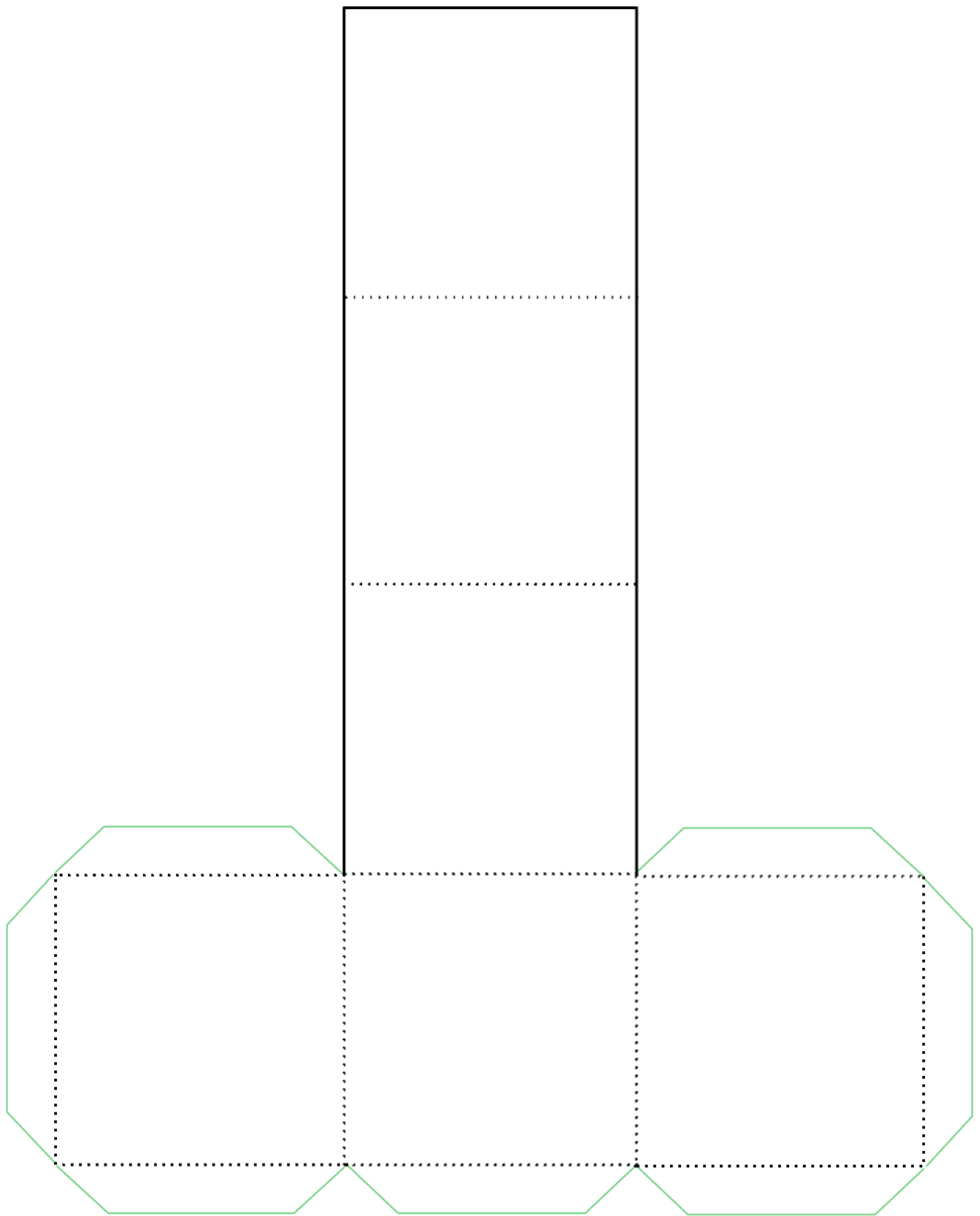   - 1 point showing work

Rectangular Prism

Rectangular Prism (square base)

Triangular Prism

Cube

WORKSHEET

Name:_____

	Surface Area	Volume
Cube (We did this together. Use it as an example!) (This one's pink)		
Rectangular Prism (This one's orange)		
Triangular Prism (This one's green)		
Square Prism (If you get done early!) (This one's blue)		

Name of object	Volume