SUPERMARKET BOXES

Containers come in many different shapes such as cans, bottles and boxes. Which ones are prisms? Look at a selection of prisms and non-prisms.

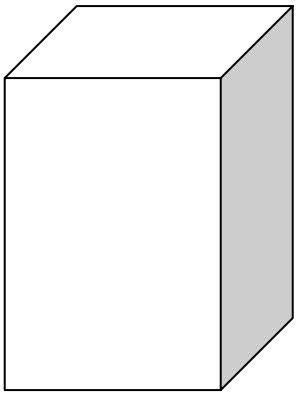
1. What is necessary for a shape to be a prism?

2. What determines whether a rectangular prism is also a square prism or a cube? Write in words or use a graphic organizer/concept map.

3. What are some characteristics of a rectangular prism? Use **all** of the following terms:

   - Faces
   - Edges
   - Vertices
   - Congruent
   - Right Angles
   - Parallel

4. Using your box, measure the height, the width and the depth in centimeters. Record that information below. Remember to label your work.



5. Calculate the surface area of each face. Record this information. Then find the total surface area for your box. Label carefully and use appropriate units.

6. Demonstrate how to find the volume of your box. Use appropriate units.

7. Talk to 3 other students in your class. Record your information and their information in the table, below:

Name	Height	Width	Depth	Total Surface Area	Volume
My Box					

Do all of these values seem reasonable? Why or why not?

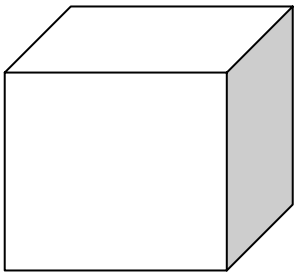
Check with your teacher at this point.

_____
Teacher OK

8. Tape your box shut so that there are six solid faces. Cut along some of the edges to open up your box to form a net composed of six rectangles. Make a sketch below. Label all dimensions. (attach a separate sheet with the sketch.)

9. Work with 1, 2 or 3 other students. Discuss the net using geometry terms (see question #3). What do you see? Make 4 interesting observations using correct vocabulary.

10. For a rectangular prism to also be a cube, the edges must be _____?



Complete the table, below. Some information has been given for each cube. Find the missing information.

Cube	Edge Length	Surface Area	Volume
A	10 cm	cm^2	cm^3
B		cm^2	8,000 cm^3
C		1,350 cm^2	cm^3

11. What was the volume of your box?
(Use the result from question #6). _____

Suppose a cube has the same volume as your box. Demonstrate how to find the edge length of that cube to the nearest millimeter.

The length of the cube's edge is _____.

Is your answer reasonable? Why or why not?

Check with your teacher at this point. _____
Teacher OK

12. Using **only** the cardboard from your net, construct a cube with the **same** volume as your original box. You may have to piece some sides together. **Do not** throw away any of the cardboard. The surface area of your cube plus the left over cardboard, if any, should be the same as the original surface area of your net.

After constructing the cube, take any left over cardboard and tape it together to form one or more rectangles.

Draw a sketch of your cube and a sketch of the left over cardboard. Include dimensions.

13. Find the area of the left over cardboard. Show your work.

14. What percent of cardboard was left over? Collect data for your box and for the boxes of the same classmates used in question 7.

Student Name	Original Surface Area	Surface Area of Cube	Area of left over cardboard	Percent of left over cardboard
My Box				

15. Why does a cube use a different amount of cardboard than the original box?

Check with your teacher at this point.

_____
Teacher OK

16. Based on one of the cubes in a group of 3 or 4 students. Each person should create one of the following out of poster board:

- Change one dimension and double the volume.
- Change two dimensions and double the volume.
- Change all three dimensions and double the volume.
- Change all three dimensions and reduce the volume to 1/2.
- Create a cylinder with the same volume.
- Create a square pyramid with the same volume.

Identify which shape you are building:

17.

A. If sheets of cardboard for box construction are 2 meters wide, how many of your original nets (from question #8) can be placed in a 4 meter length? Show your work.

B. If you used a net from the cube you created in question 12, how many could be placed on the same piece of cardboard? Show your work.

C. If a company wanted to make 1 million boxes, would there be a significant difference in the amount of cardboard used by the original boxes compared to a cubic box? Show your work.

18. Why don't we have more cube boxes in our grocery stores?

When food box designers were asked about their considerations in creating cereal boxes, some of their criteria were:

- Children need to be able to handle the box.
- There needs to be enough room on the box to clearly display the name of the product and important consumer information.
- The size of the box needs to look like a good value to the customer.
- When we ship the boxes, they need to fit into a larger container that's easily handled by one person.
- We ship in sets of 48 boxes in rectangular containers. We don't want wasted space in the containers.

Using these statements, draw some conclusions about the ideal size and shape of food boxes. Use complete sentences.