Geometry of Three-Dimensional Figures

1. The Mulligatawny Soup Company will market their product in a cylindrical can that holds 500 mL of soup.

    a) Use a calculator to help you determine a possible radius and height for the can.

    b) Construct a model of your can. Hint: If the material is not waterproof, use plastic wrap to wrap each piece of the net.

    c) Show that the model will hold 500 mL of liquid.

    d) The company mathematician reports that the can will have a minimum surface area if the height equals the diameter. Determine the height and diameter of such a can.

    e) Compare the surface area of the can in part d) with the surface area of your can. How do they compare? Does the comparison support the mathematician's claim?

    For an interactive activity to adjust the height and the radius of a cylinder, follow the web links on the same page where you found this file on the *MathLinks 8* Online Learning Centre.

2. There are many pyramids in Egypt. One of these is the rhomboidal pyramid called the Bent Pyramid at Dashur. Use the Internet or the library to research this rhomboidal pyramid. Record its dimensions and find out why it is called the rhomboidal pyramid. Make a net for this shape. Use the net to construct a scale model of the rhomboidal pyramid.

    For information about pyramids including the rhomboidal pyramid, follow the web links on the same page where you found this file on the *MathLinks 8* Online Learning Centre.

3. Some of the nets used to make 3-D figures are very complicated. Use the Internet or the library to find the net for a soccer ball. This shape is called a *truncated icosahedron*.

a) Print the net for a soccer ball.

b) Cut out the net and assemble the model of the ball.

c) Compare the model of the ball to a real soccer ball. What kinds of geometric figures are used to make up the faces?

d) This three-dimensional shape also turns up in the world of carbon chemistry in the form of a molecule known as a *buckyball*. Write a brief report on some features of a buckyball molecule, and why it is important in chemistry.

For information about truncated icosahedrons and the net of a soccer ball, follow the web links on the same page where you found this file on the *MathLinks 8* Online Learning Centre.

For information about the buckyball and truncated icosahedrons, follow the web links on the same page where you found this file on the *MathLinks 8* Online Learning Centre.

4. Use linking cubes to investigate the volume of a pyramid with a square base.

a) Build the smallest "step" pyramid possible using linking cubes. Each "step" must move in one cube and up one cube. The last step consists of a single cube. Determine the base length, height, and volume of the pyramid. Hint: Start at the top of the pyramid and work down.

b) Build the next smallest "step" pyramid possible. Determine the base length, height, and volume of the pyramid.

c) Continue building pyramids until you run out of cubes.

d) Organize your results in a table. Extend the patterns in the table. Try to deduce the formula for the volume of the pyramid. Research to find the actual formula and compare your formula to the actual formula.

For a photograph of a step pyramid, follow the web links on the same page where you found this file on the *MathLinks 8* Online Learning Centre.

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