Name _____ Class _____ Date _____

Chapter 4 Project: Tri, Tri Again

Beginning the Chapter Project

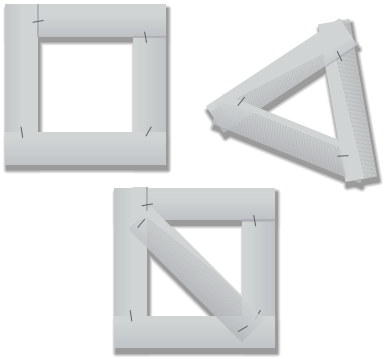
Have you ever wondered how bridges stay up? How do such frail-looking frameworks stretch through the air without falling? How can they withstand the twisting forces of hurricane winds and the rumbling weight of trucks and trains? Part of the answer lies in the natural strength of triangles.

In your project for this chapter, you will explore how engineers use triangles to construct safe, strong, stable structures. You then will have a chance to apply these ideas as you design and build your own bridge with toothpicks or craft sticks. You will see how a simple shape often can be the strongest one.

Activities

Activity 1: Modeling
Many structures have straight beams that meet at joints. You can use models to explore ways to strengthen joints.

- Cut seven cardboard strips approximately 6 in. by $\frac{1}{2}$ in. Make a square frame and a triangular frame. Staple across the joints as shown.



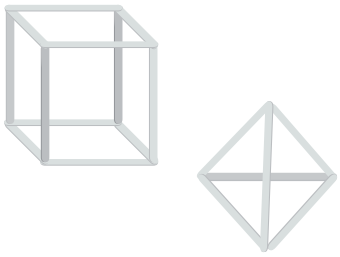
- With your fingertips, hold each model flat on a desk or table, and try to change its shape. Which shape is more stable?
- Cut another cardboard strip, and use it to form a brace for the square frame. Is it more rigid? Why does the brace work?

Activity 2: Observing
Visit local bridges, towers, or other structures that have exposed frameworks. Examine these structures for ideas you can use when you design and build a bridge later in this project. Record your ideas. Sketch or take pictures of the structures. On the sketches or photos, show where triangles are used for stability.

Chapter 4 Project (continued)

Activity 3: Investigating
In the first activity, you tested the strength of two-dimensional models. Now investigate the strength of three-dimensional models.

Use toothpicks or craft sticks and glue to construct a cube and a tetrahedron (a triangular pyramid).



- Which model is stronger?
- Describe how you could strengthen the weaker model.

Use toothpicks or craft sticks and glue to construct a structure that can support the weight of your geometry book.

Finishing the Project

Design and construct a bridge made entirely of glue and toothpicks or craft sticks. Your bridge must be at least 8 inches long and contain no more than 100 toothpicks or no more than 30 craft sticks. With your classmates, decide how to test the strength of the bridge. Record the dimensions of your bridge, the number of toothpicks or craft sticks used, and the weight the bridge could support. Experiment with as many designs and models as you like—the more the better. Include a summary of your experiments with notes about how each one helped you improve your design.

Reflect and Revise
Ask a classmate to review your project with you. Together, check to be sure that your bridge meets all the requirements and that your diagrams and explanations are clear. Have you tried several designs and kept a record of what you learned from each? Can your bridge be stronger or more pleasing to the eye? Can it be built using a more efficient design? Revise your work as needed.

Extending the Project
Research architect R. Buckminster Fuller and geodesic domes. Design and build a geodesic structure, using toothpicks or other materials.

Take it to the NET

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