

STEM What's Inside?

Objectives

In this activity, students will design and build a tower using a maximum of 30 straws. The stability of the structure, which is essentially a building frame, is key to this task.

- Propose and test a solution to a problem.
- Evaluate the effectiveness of a product or design solution.
- Communicate a problem, design, and/or solution.
- Use sketches, diagrams, and lists to represent a problem or a proposed solution.

Materials

non-bending paper or plastic straws; paperclips; rubber bands; scissors; tape; ruler; compass (for measuring angles)

Advance Preparation

- Find pictures of buildings under construction that clearly show the geometry of the frame.

Pre-Activity Discussion

Share the provided background information with students. Then use these discussion ideas to help students prepare for the activity.

- Ask: How is a building's frame like your skeleton? How are they different? *(Possible answer: Both a building's frame and my skeleton provide support. However, the parts of my skeleton come together at joints, which allow my skeleton to move. A building's frame is rigid; it generally is not meant to move.)*
- Have volunteers describe the experience of sitting at a four-legged table that unstable. Discuss why the table rocked and how they may have fixed it. Then discuss why a three-legged table would not have the same problem. *(Possible answer: A four-legged table that rocks has one leg that is shorter than the others. When the other three legs are on the floor, the table rocks toward the shortest leg. A three-legged table is always stable. All three legs, even if they are different lengths, sit firmly on the floor. The table may not be level, but it will not rock.)*

Tell students that in this activity they will design the tallest three-dimensional, free-standing tower they can using 30 straws or less.

Safety Precautions

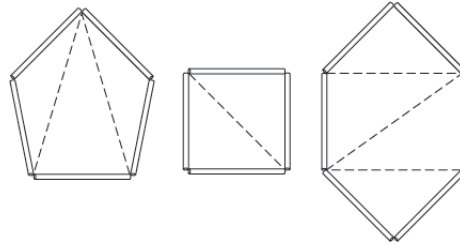
- Remind students to be careful when using scissors.

Tips

- Building a sturdy, wide base is useful for building a tall tower.
- This activity can be done with straws alone by making a 1-inch vertical cut on one end of each straw, pinching the cut end together, and inserting it into the uncut end of another straw.

Teacher Notes

- See below for examples of other shapes that could be used. The dotted lines, which divide each shape into triangles, show where support is needed for each shape to be the most stable.



Post-Activity Discussion

Explain to students that it is common for engineers to modify a prototype many times. They make these modifications in order to develop the correct prototype. Use these ideas to help students draw conclusions about the activity.

- Make a class data table like the one shown on the student page. Ask: What do you notice about the tallest towers? Have students whose towers were the tallest present their prototype and specs to the class. Why might this design have worked better than other designs? (*Students may notice that the shape of the base made a difference in the stability, and therefore the height of the tower; the tallest designs included triangles.*)
- If time allows, have groups of 3–4 students work together to build the tallest tower they can with unlimited straws. As a challenge, provide a weight such as a can of tuna and have students compete to build a tall tower that will support the weight.

Sources

- http://www.northcanton.sparcc.org/~hck/cgi-bin/wq_teacher_page.pl?id=tda1nc&wq=1
- <http://pbskids.org/zoom/activities/sci/strawtower.html>

Answers

Possible answers are shown. Accept all reasonable answers.

1. To build the tallest tower possible with no more than 30 straws
2. To support the walls and roof of the building
3. Rectangles, squares, triangles
4. The reinforcing piece helps stabilize the frame. Without it, the rectangle could rock back and forth.
5. I can cut one piece that will fit across the diagonal.
6. Any polygon that can be divided into triangles
7. Shapes must be stable; maximum of 30 straws; goal is to build the tallest tower; time
- 8, 9. Triangle; square; rectangle; hexagon; pentagon

Teacher Notes

- 10–12.** Answers will vary with student choices.
- 13, 14.** Answers will vary with student results.
- 15.** Tables will vary with student results.
- 16.** Answers will vary with student results.