## GLUE IS THECLUE

### Can an engineer make something stronger?

#### Advance Preparation

- Glue two index cards, one of each color, together like a sandwich. Allow them to dry thoroughly. Label both sides with the word “glued” across the top (see below).
- Label both sides of the remaining cards, one of each color, with the word “unglued” across the top.
- Draw a 2-inch diameter circle in the center on both sides of each pair of cards. This will indicate where the washers should be stacked to ensure a fair test.
- Set the two cups upside down on the table surface so that there are 4 inches between the tops of the cups. Tape them to the table to prevent them from moving.

---

### Supplies

- 4 colored index cards (4” x 6”), 2 of one color and 2 of another color
- 2 plastic cups (12 oz. or larger)
- 30 flat metal washers (1–1½” diameter)
- container to hold washers
- Glue is the Clue activity sign (Appendix A)

### Advance Preparation Supplies

- glue stick
- ruler
- marker
- tape

---

### Engineering Fields

- materials engineering
- chemical engineering

### Engineering Concepts & Skills

- role of failure
- controlled experimentation and testing

---

© 2011 Foundation for Family Science & Engineering and Michigan Technological University
All rights reserved. Material not for reproduction or distribution. www.familyengineering.org

---

Openers
Activity Steps

1. Stack the two unglued cards together and place them across the top of the two cups like a bridge. How many washers do you think the cards will hold before collapsing?
2. Carefully stack the washers in the circle on the top card, counting them as they are added. Keep going until the cards collapse.
3. Now, repeat with the glued cards. How many washers do you think the glued cards will hold?
4. Which pair of cards held more washers? Why?

ENGINEERING CONNECTION

The two glued cards stay together, becoming a single, thicker card with greater strength. The two unglued cards do not work as well together to hold up weight because they can bend and slide apart.

Gluing layers of material together is called lamination. Plywood is an engineered wood product that uses lamination. To make plywood, chemical engineers developed a special glue to hold many thin layers of wood together. This makes plywood stronger than solid wood of the same thickness.

Skateboards are made out of plywood so that they can be both strong and lightweight.