PROJECT #2

Crash Test Piñata

The piñata was originally a Chinese invention that made its way to Mexico in the 16th century. Today, piñatas filled with candy are a tradition at birthday parties and special events. They take a lot of abuse from children trying to get the candy out.

In this activity, your child will design a piñata using an empty cereal box and other materials. Like a safety engineer designing a car to withstand a crash, your child will use engineering skills to make a piñata that can withstand the impact of 10 hits and safely contain one cup of candy.

MATERIALS

- Cereal box (or other food packaging box)
- Small pieces of cardboard
- Newspaper
- Styrofoam peanuts
- Two feet of tape
- Two feet of string
- Scissors
- One cup of candy
- Decorating materials
- Rope
- Wooden broomstick

CHALLENGE

Use the materials to construct a piñata that:

- Can withstand the impact of 10 hits
- Has enough storage space for one cup of candy
- Has a hole for inserting the candy
- Uses no more than two feet of tape and two feet of string
- Can be attached to a rope

DIRECTIONS

1 **Look over the materials and ask your child:**

- ☑ How strong is a cereal box?
- ☑ What are the weak points in a cereal box?
- ☑ How could you change the box to make it stronger?
- ☑ Can you incorporate a crumple zone and a safety cell into your design?

Note: Crumple zones and safety cells are used in cars to protect passengers during a crash. A crumple zone acts like a cushion that can absorb some of the energy during an impact, while the safety cell is a reinforced area that protects the objects inside.

- ☑ Can you incorporate triangles into your design?

Note: Triangles are extremely stable and do not change under pressure, which means that they can be useful in safety cell designs.

2 **Design and build the piñata.** Encourage your child to be creative and experiment with different piñata shapes and designs. During the design process ask your child:

- ☑ How can we better protect our candy?
- ☑ Are there additional materials we could use to make the piñata stronger?

3 **Test the piñata.** Hang it from a tree branch and have your child hit it with the broomstick. Be careful not to hit other objects or people. Start with one hit and review the damage. Continue this process until you get all 10 hits in or the piñata breaks. Have your child assess the damage:

- ☑ How well did your piñata do?
- ☑ Was any of the candy damaged?
- ☑ What additional steps can you take to make your next design stronger?

4 **Redesign the piñata** using the information you gathered from testing your original design.

MORE ABOUT
Safety Engineering

Starting Salary:
$51,500

Safety engineers develop, improve, and test automotive safety systems, including airbags, seatbelts, and crumple zones. Engineers use various tools to test cars and ensure that they meet safety standards.

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SCIENCE
BACKGROUND

Issac Newton was an influential scientist who wrote about three laws of motion that describe how objects behave. Newton's Second Law of Motion plays an important role in the design of crumple zones.

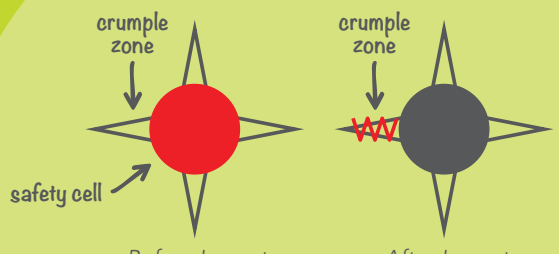
The Second Law says that the more mass an object has, the more force is needed to quickly speed up (accelerate) or slow down (decelerate) its motion.

The more quickly the piñata starts moving when it is hit by a stick, the more force is applied to the candy inside. Too much force and the candy will break. Crumple zones increase the time it takes for the piñata to accelerate (speed up) after it is hit by the stick.

A crumple zone is designed to be crushed and to absorb some of the force of a crash, distributing the force around the safety cell.

- ☑ The crumple zone is also designed to increase the time it takes for the car to stop after a crash (thus reducing the force).
- ☑ In cars, crumple zones are often at the front, where most accidents occur. Where could you put a crumple zone on a piñata?

Safety Cell On a Piñata



OUT AND ABOUT

Visit a car dealership and look at all the car safety features:

- ☑ How have car safety features changed over the years?
- ☑ How can you incorporate what you see into the design of your piñata?

Watch YouTube videos on crash tests:

- ☑ Watch the crumple zones in action.
- ☑ Compare the injuries of a test dummy who wears a seatbelt to a test dummy who doesn't.

FOR YOUNGER KIDS

» Provide a stronger box, such as a shoe box or a cardboard box.

FOR OLDER KIDS

» Have your child construct a piñata using five sheets of newspaper rather than cardboard.

ADDITIONAL RESOURCES

» **Engineering websites for kids:**
www.sciencekids.co.nz/engineering.html
pbskids.org/designsquad/parentseducators/index.html

» **Engineering books:**
Janice Vancleave. *Engineering for Kids.*