



60 minutes



Grades
3–5, 6–8

Safe Landing

How can you ensure a safe landing when you drop a cup holding a ball?



Instructions

Students devise ways to ensure that a cup with a ball inside it lands upright, without the ball falling out, when dropped from a height of at least 1 foot.

1 Introduce the challenge and note that students can't cover the cup to keep the ball inside as part of their design.

2 Discuss two ways that engineers ensure that a container lands safely after falling from a great height:

- Parachutes slow the fall of the container via air trapped in the canopy, the fabric that puffs out into a balloon shape.
- Shock absorbers lessen the impact upon landing. Demonstrate one type of shock absorber by folding an index card (use an accordion fold), compressing it, and allowing it to decompress. Note that their own bodies act similarly when they jump off a step: they bend their back and knees to absorb some of the energy and break the fall. Ask students to jump up and down and notice how their body acts like a spring.



Materials

PER PAIR:

- 1 or 2 pieces of cardboard
- 1 small paper or plastic cup
- 1 ping-pong ball
- Scissors
- Masking or duct tape
- Ruler
- Paper and pencil

SUPPLIES TO HAVE ON HAND:

- Plastic shopping bags
- String
- Index cards
- Plastic straws
- Cotton balls
- Rubber bands

- 3 Organize students into pairs and tell them to come up with a design on paper for their device.
- 4 Distribute supplies, show students where optional supplies are located, and tell them to build their safe landing device.
- 5 Test each design by dropping it starting at 1 foot. If the device fails, tell the pair to redesign and try again. If the device succeeds, try dropping it from greater heights.



Engineering & Science Connections

-  A *canopy* is the part of a parachute that fills with air. Air trapped in the canopy slows the fall of a parachute because of air resistance, or the force of the air pushing against the canopy.
-  A *shock absorber* is used to absorb the energy of the impact when gravity slams something into the ground. The leather or rubber on the bottom of our shoes cushions our feet as we walk. Springs also make good shock absorbers.
-  When people need food, medicine, and life-saving supplies that must be airdropped because of natural disasters or war, engineers have to make sure that the supplies land safely, no matter what height they fall from.

Guiding Questions ?

Which materials could help to soften the cup's landing?

How might you create a parachute to slow the container's fall?

How can you make sure the cup doesn't tip over as it is falling?

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