A mission to Mars

Introduction:

This week's lesson is about our neighboring planet Mars and efforts by scientists to send probes and rovers to the planet's surface. In November 2011 NASA launched the *Curiosity* probe in an attempt to put a large rover onto the surface of Mars. The rover landed successfully in August of 2012 and has been gathering important data about the geology and climate of the planet since that time.

Large group activity (everyone)

We will watch the following video together:

1) "7 minutes of terror: Curiosity Rover's Risky Mars Landing" https://www.youtube.com/watch?v=h2I8AoB1xgU

Discuss with your group:

- The rover is **autonomous**. What does autonomous mean? Why does the rover have to land on its own without human control? (It takes 14 minutes for information to travel back to earth and the decent takes 7 minutes).
- What was required to help the rover land?
    - Parachute
    - Rockets/Rocket propulsion
    - Sky crane
- Why can't the rover just use a parachute? (Mars' atmosphere is much thinner than ours and the drag is not enough to sufficiently slow the rover down).

Group Activity 2 (30 minutes):

We are going to build our own version of the Mars rover lander. Our rover is actually an egg which is meant to simulate the fragile nature of the actual Mars rover. We need to design a parachute system that slows the eggs decent from a height of about 10' so that it does not break when it hits lands on the floor. If time permits you can build one of each design below.

Design 1:

A design modeled after the Pathfinder (earlier Mars rover) method of landing. A template for cutting out an equilateral triangle is provided below. Students will use this template to cut a triangle out of cardboard and fold it along the fold lines to build a tetrahedral. The egg will go inside this structure (inside a plastic bag). Then build a parachute out of newspaper and tie it to the lander with string. Finally, tape balloons to each side of the tetrahedral to act as airbags. Once this is done, it is time to test. With the remaining 15 minutes left in class we will go outside and drop the eggs from about 10'.

Design 2:

Create your own design for an egg-lander using the materials available. First have your students draw their design and describe the plan for their lander. The only rule is the egg must be inside a plastic bag so that the mess is contained. Once they have described their plan, they begin to build. The can use any of the materials listed below. These landers will also be dropped from 10'.

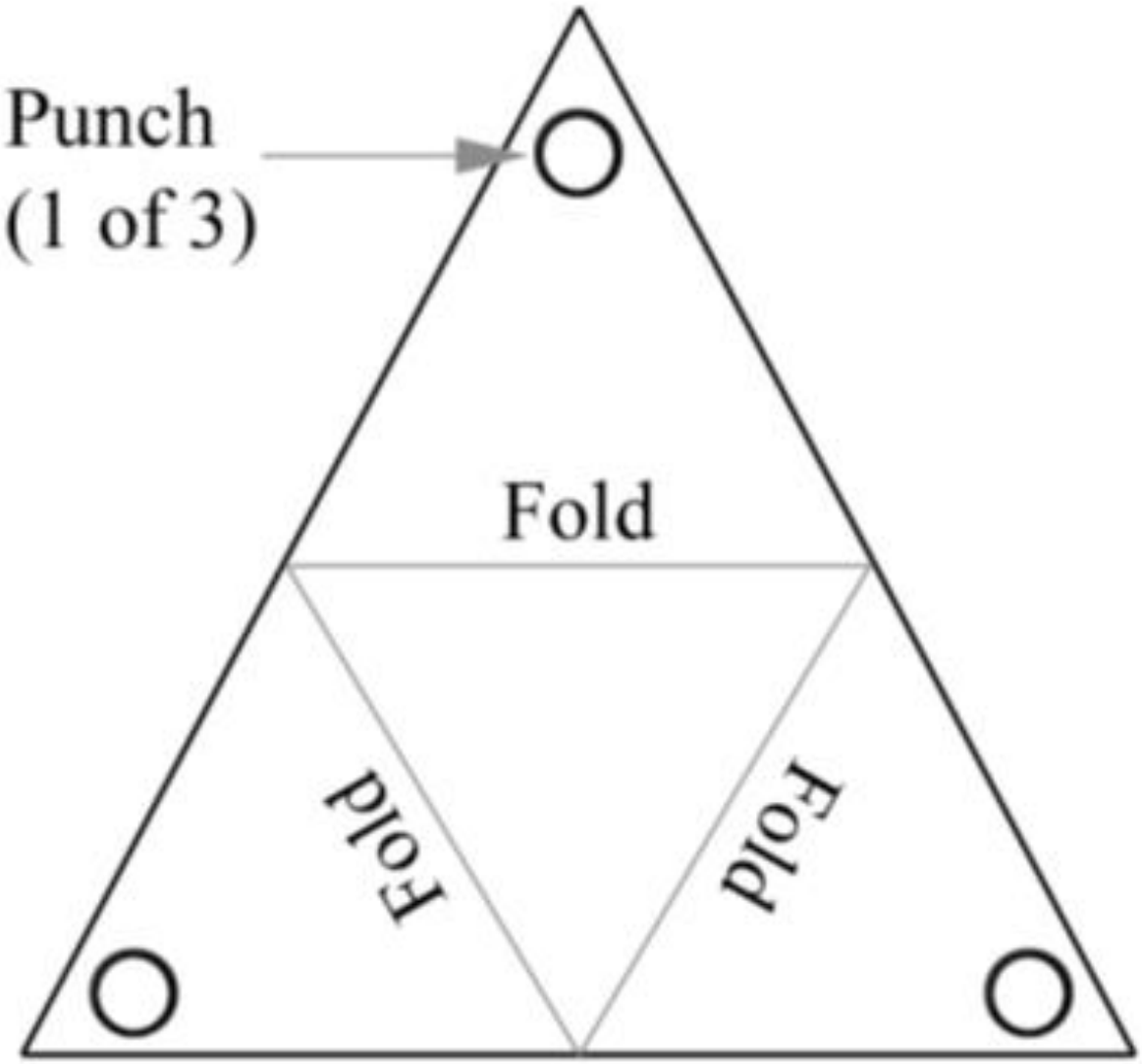
Materials:

Required:
cardboard cereal boxes
newspaper
masking tape
string
balloons
plastic bag
egg
scissors

Optional:
plastic bags, paper clips, drinking straws, popsicle or craft sticks, string, masking tape, rubber bands, pipe cleaners, paper, bubble wrap, Styrofoam, Balloons, Plastic Bags

Group Activity 3 (15 minutes):

We will take the landers outside and have them dropped from a height of about 10'. The students will see if their designs hold up. Discuss which design works best and possible reasons for this. This is a great time to talk about impulse. The egg has to go from moving quickly to stopping. The *longer* it takes for it to stop, the less likely it is to break (less *force*). Ask your group if they know of any safety features in a car, for example, that work to stop you, or the car, more slowly. (crumple zone, air bags).


Punch
(1 of 3)
Fold
Fold
Fold