Solar System Activity Bag

Rockets! *Engineering Challenge:* Student Activity Guide

In this activity, we will work the way NASA engineers do to build a rocket that can deliver a payload to a specific altitude in as few launches as possible. Even before we launched rockets and created NASA, humans have been looking to the skies with wonder. As we have explored space with rockets and satellites, we have been able to learn more about the size and scale of the planets in our solar system.

Materials From The Bag

- 1 Plastic Tube With Cushion (rocket body and payload)
- 2 Small Plastic Caps (launch cap)
- 1 Plastic Cup (launch cup)
- 1 Graduated Medicine Cup
- 6 Effervescent Tablets
- Tape measure

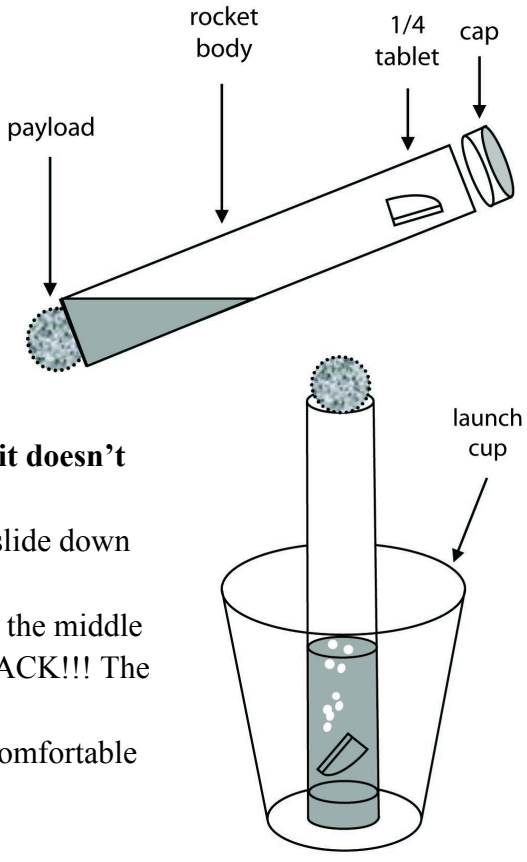
You Will Supply These Materials

- Water
- Pencil

Part 1: Launching the Rocket

First, we will launch a rocket safely.

1. From the bag, grab the rocket body with payload, small plastic cap, plastic cup, and effervescent tablets.
2. Put the plastic cup on the floor where no one will run into it and where it's easy to clean up spills.
3. Open one package of effervescent tablets and break a tablet into 4 equal parts.
4. Use the graduated medicine cup to measure out 7.5 mL of water and pour it into the rocket body.
5. Hold the tube at an angle as shown in the diagram to the right with the payload angled down and the mouth up. Place a piece of the effervescent tablet just inside the mouth so that **it doesn't touch the water**.
6. Place the cap carefully on the tube so that the tablet does not slide down into the water.
7. Look at the diagram to the right. Place the rocket on its cap in the middle of the launch cup. The tablet will fall into the water. STEP BACK!!! The rocket will launch in 3-5 seconds.
8. Use the rest of your tablet to launch a few more times to get comfortable with the launch process.



Part 2: Deliver the Payload

Now that we know how to launch a rocket, it's time to make it go to a certain height and deliver its payload. Using the rocket, determine how much water and effervescent tablet you need to deliver a payload into "outer space."

1. You have been hired by NASA to complete this challenge. Each test launch costs a lot of money, so fewer launches are better.

   Rules:

   - Launch only from the launching cup and use only the original rocket materials: a tube with the payload, launching cap, water, and part of an effervescent tablet.
   - The payload is the pom-pom on top of the rocket.
   - The payload must reach 80 inches or 203cm, the height of most interior doors. Place your cup on the floor inside the door frame and try to hit the top. Use your measuring tape to confirm the height.
2. Make a table to record how much water and effervescent tablet you used in each test launch. Before placing the effervescent tablet in the mouth of the tube, record the amount by tracing the piece you used in your data table. Also, record the height of each launch.
3. When a test launch reaches 80 inches, record how many launches it took to complete the challenge.

Part 3: How High Can You Fly?

1. Continue to change the amount of water and effervescent tablet and see how high you can launch the rocket.
2. Show how you measured the height your rocket flew.

Part 4: Size and Scale of the Planets in Our Solar System

Have you ever wondered about the sizes of the planets in the solar system? From our space exploration, we have been able to learn about the size and scale of the planets in our solar system. In this activity, you will draw all the planets to scale so you can see how they compare.

1. Get the tape measure from your bag and your student activity sheet, the last page in this packet.
2. Using a pencil, draw a 10 mm line on your student activity sheet. This line represents the diameter, or, the middle of the Earth. This measurement can also be thought of as the equator of Earth.
3. Now that we know the size of Earth in our model, let's draw another planet in our Solar System, Uranus.
4. Go to the website below and read the information about Uranus.
   https://www.readworks.org/article/Planets-of-the-Solar-System/f0ba2fd8-a604-4c4e-876a-67b8c5996f7b#!articleTab:content/contentSection:e75f9457-45ab-4d99-add8-1d78aa49cc7b/
5. Predict the size of Uranus compared to our model of Earth. For your prediction, draw a line under **Uranus - Prediction** that you think would represent the diameter of Uranus.
6. Uranus is 4 times the size of Earth, therefore Uranus has a diameter of 40 mm in our model (4 x 10mm = 40mm). Draw a line under **Uranus - Actual** that is 40 mm. This line represents the size of Uranus compared to Earth.
7. Use the Readworks link above to read information about the other six planets and predict the sizes of each planet by drawing prediction lines on your student activity sheet.
8. Use the chart below to determine the actual diameter of each of the other six planets.

Scale size = diameter x 10mm (size of Earth)

Planet	**Size compared to Earth (diameter)**	**Scale size (millimeters)** diameter x 10 mm
Mercury	0.4	
Venus	0.9	
Earth	1.0	10
Mars	0.5	
Jupiter	11.2	
Saturn	9.5	
Uranus	4.0	40
Neptune	3.9	

9. Draw a line the actual size of the planet on your student activity sheet. *Which planet's size, compared to Earth, surprised you the most? Explain your reasoning.*
10. How big do you think the Sun would be in our model?
11. In our model, the Sun would have a diameter of 109 cm or 1090 mm. This length is a little longer than your entire tape measure.