

Stomp Rocket

Thank you for downloading the science and mathematics activity packet! Below you will find a list of contents with a brief description of each of the items. This activity packet contains all the information (including any handouts) you will need to run this activity in your own classroom or at a science festival.

Please note: some activities might require the need for a facilitator to be present to oversee the activity. Activities that require a facilitator will be clearly noted.

-Community Resources for Science



Stomp Rocket

ACTIVITY PACKET CONTENTS

1. Organizer instructions for the person running the activity
 - Print suggestion: 1 for the facilitator
 - Includes information for setup prior to the event (e.g., materials prep)
 - Estimated cost for one set of supplies, excluding common household items
2. Participant Instructions (tabletop)
 - Print suggestion: 1-2 to put in a plastic sign holder



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ORGANIZER INSTRUCTIONS

Grade(s): K-5

Standard connections:

- **CCSS.Math.Practice: MP.2:** Reason abstractly and quantitatively.

Next Generation Science Standards: Science and Engineering Practices

- **Constructing Explanations and Designing Solutions** Use tools and/or materials to design or build a device that solves a specific problem or a solution to a specific problem
- **Structure and Function:** The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

Objective: design and improve rocket bodies and then launch them using a plastic soda bottle and bicycle inner tube.

Activity overview and background: Students will design rocket bodies and then launch them using a plastic soda bottle and bicycle inner tube. After launching and observing their rockets flight they will modify their design to make a rocket that can fly further, faster or do something else, such as spinning or flipping.

This activity requires the presence of a facilitator and must be done outdoors, if using 2-liter size soda bottles

Estimated cost for one set activity supplies: \$5.60

Materials:

For the rocket launcher:

- Several plastic water or soda bottles
 - The 2-liter size bottle for outdoor launches
 - A smaller size bottle for indoor launches
- Used bicycle inner tubes, ideally a wider diameter (\$3/each)
 - Typically the inner tubes used from mountain and hybrid bikes works best. Often bike shops save these for recycling or would be willing to save them for teachers if you ask ahead of time. In Berkeley the Missing Link bike shop on Shattuck Ave is a great resource for inner tubes
- Duct tape
- ½ inch inner diameter PVC tubing (\$1.30/ft)
 - One ~14 inch section for each launcher you plan to make

For the rocket bodies:

- 8.5 x 11 inch paper – reused paper is great, ideally with one blank side



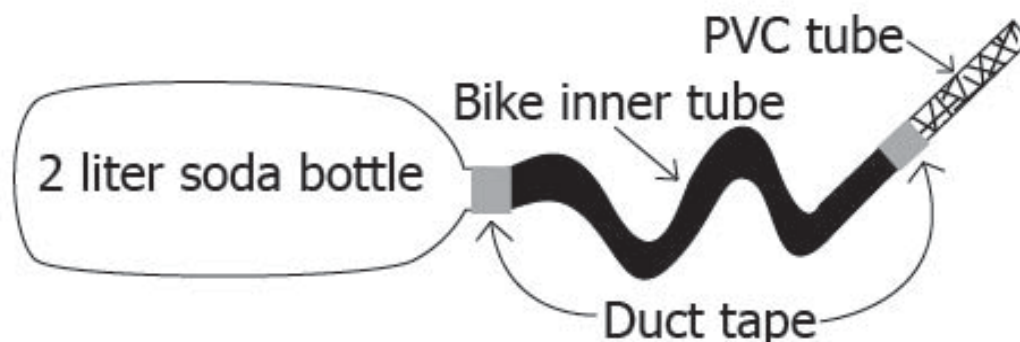
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- PVC tubing of the same diameter used for the rocket launcher, cut in 12 inch-long pieces (\$1.30/ft)
- Markers – multiple colors if you plan to let the students decorate their creations
- Clear tape
- Card stock / index cards
- Scissors

Setup:

Building the launcher:

- Have the $\frac{1}{2}$ inch (inner diameter) PVC tubing cut into sections that are 14 inches long. Most hardware stores can help with this. (Make sure to buy some extra pieces of approximately the same length that the students will use to roll the tubes of their rockets.)
- Cut the inner tubes so you have a straight tube approximately 3 – 5 feet long. If you notice a hole try to avoid using that section, although small holes in the tube shouldn't have a significant effect on the launch. Also make sure to cut out the section that has the valve attached.
- If this is the first time you're using the inner tube blow through the tube while you're outside somewhere. There is a powder coating on the inside of most bicycle inner tubes.
- Slide one end of the bicycle inner tube around one end of the PVC pipe. Use the duct tape to seal the inner tube to the PVC pipe. Wrap the duct tape around multiple times to make the seal as airtight as possible.
- Wrap the other end of the bicycle inner tube around the outside of a clean, dry plastic soda bottle. Wrap the duct tape around to create another airtight seal connecting the inner tube to the bottle.

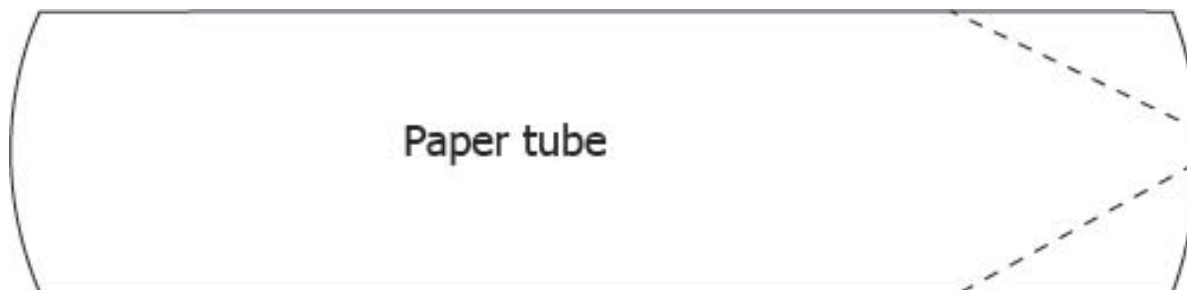


For younger students or groups with limited time:

- If you have a younger group or limited time you may want to pre-roll the rocket bodies. You could leave them without the nose cones cut, or you can also pre-cut the nose cones (instructions below).
- To create the body of the rocket, roll an 8.5 x 11-inch piece of paper around one of the unused sections of PVC pipe. The paper shouldn't be snug. Leave a little room – if the tube is rolled too tight it can be difficult to slide it back onto the launcher once it is ready to be launched.

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- c. Use a few pieces of the clear tape to keep the tube rolled up.
- d. Push one end together and cut out triangular pieces to make a cone shape.
- e. Use the clear tape to completely seal the nose cone. If the nose cone isn't completely sealed air will escape and the rocket won't fly as far.



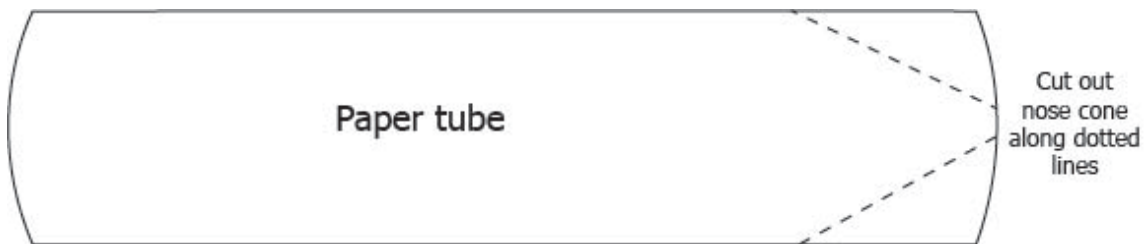
The rocket launch:

- a. Find a space outside to launch the rockets. (If launching indoors start by using 1 liter plastic bottles.)
- b. Bring multiple launchers, as well as extra plastic bottles and duct tape, in case any of the bottles break. (most plastic bottles will allow at least 12 launches, and often many more.)
- c. Identify the launch area. Make sure the students understand that they should not stand in front of the rockets or retrieve their rocket until everyone has had a chance to launch. The rockets will launch with enough force that it is important the students be cautious.
- d. To launch the rocket make sure the plastic bottle is inflated. To re-inflate a bottle after it has been stomped on blow air through the open end of the PVC tube. The plastic bottle should readily re-inflate.
- e. Gently slide the body of the rocket over the PVC pipe
- f. Have students work in pairs. One person should hold the PVC pipe, pointing the rocket in the correct direction and at the angle they think will send the rocket the furthest. (a 45° angle is best, this is a great opportunity to explore trajectory with older students.)
- g. The other student should stomp on the bottle as hard as possible.
- h. Ask the students not to retrieve their rockets until everyone has had a chance to do a launch.



Instructions

1. Make your rocket body
2. Roll piece of paper around one of sections of PVC pipe. The paper shouldn't be snug
3. Use a few pieces of the clear tape to keep the tube rolled up
4. Push one end together and cut out triangular pieces to make a cone shape
5. Use the clear tape to completely seal the nose cone. If the nose cone isn't completely sealed air will escape and the rocket won't fly as far



6. You can decorate the rocket body and write your name on it
7. Make fins for your rockets. Cut out pieces of cardstock and fold over one edge to create a foot that will allow them to tape the fin to the rocket. Triangles are the traditional fin shape, but experiment with different shapes and fin placement!

The Rocket Launch

1. Go to the launch area
 - Don't stand in front of the rockets or retrieve your rocket until everyone has had a chance to launch
2. Gently slide the body of the rocket over the PVC pipe
3. One person should hold the PVC pipe, pointing the rocket in the correct direction and at the angle they think will send the rocket the furthest (45° angle is best)
 - The other student should stomp on the plastic bottle as hard as possible!
4. Make sure the plastic bottle is inflated before re-launching the rocket
 - To re-inflate a bottle after it has been stomped on blow air through the open end of the PVC tube