



Rockin' Rockets: Student Guide

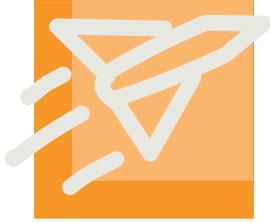
Use this guide to assist you with gathering materials and following along with the activities in the *Rockin' Rockets* video. The video has three activities you can do along with the instructor using simple materials. There is a materials list below that you can use to gather everything you need for the experiments. During the video, the instructor will let you know when you will use the materials you need. Pause the video when you need time to prep your materials or conduct your experiment. If you don't have the materials, don't worry, you can still watch the video and observe the experiments. There are vocabulary words in this guide to assist you if the instructor mentions a new word you may not yet know. At the end of the video answer the reflection questions to test your knowledge.

Objectives:

> Explore the forces that interact with a rocket to defy gravity.

Grades: 3 & 4

MATERIALS		
Activity 1: Straw Rocket	Activity 2: Stomp Rocket	
<input type="checkbox"/> Straw <input type="checkbox"/> Tape <input type="checkbox"/> Scissors <input type="checkbox"/> Paper <input type="checkbox"/> Pencil	<input type="checkbox"/> Straw rocket from Activity 1 <input type="checkbox"/> Resealable plastic bag or juice pouch <input type="checkbox"/> Tape <input type="checkbox"/> Straw	



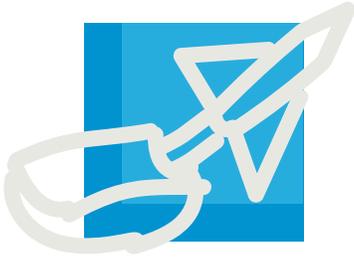
Activity 1: Straw Rocket

WHAT TO DO

1. First, take your paper and cut out a small rectangle shape.
2. Wrap the rectangle around the straw and tape it into a tube. This is the rocket's body.
3. Take the tube off the straw, and squeeze one end of the tube flat. This is your rocket's nose cone.
4. Tape it so that no air can escape. You can test this by putting the open end of the tube on the straw and blowing. If the rocket doesn't launch, feel for air escaping out the top as you blow into the straw, and add more tape as necessary.
5. Once your rocket body is made and working well, it's time to add fins! Cut out two triangle shapes from the paper and tape them to your rocket body.
6. Once your fins are attached, your rocket is complete! Head to the launchpad to test it out. Use the Rocket Trial Chart to write down how far your rocket traveled under Rocket 1.

MATERIALS

- Straw
- Tape
- Scissors
- Paper
- Pencil
- Rocket Trial Chart
(found under the reflection questions)



Activity 2: Stomp Rockets

WHAT TO DO

Juice Pouch Method

1. First, empty the juice from your juice pouch. Then puff air into the juice pouch. Take the small straw out of the juice pouch.
2. Insert the pencil into the straw hole to make the hole bigger, then place a regular straw in the hole. Use the tape to seal the hole and make sure there is no air escaping. The air should only come out of the straw. Puff up your juice pouch. It is ready to launch some rockets!

If you don't have a juice pouch, you can use a resealable plastic bag instead.

1. Open your resealable plastic bag, and place your straw in the Ziplock bag with the top part of the straw sticking out.
2. Then seal the bag and place tape around the straw to secure the opening, and make sure there is no air coming out of the bag. Now we are ready to launch!
3. Launch your rocket three times and use the Rocket Trial Chart to write down how far your rocket traveled under Rocket 2.

MATERIALS

- Straw rocket from the last activity
- Resealable plastic bag or juice pouch
- Tape
- Straw
- Rocket Trial Chart (found under the reflection questions)

VOCABULARY

Motion — the act or process of changing place.

Aerodynamic — of or having a shape which reduces the drag from air moving past.

Propulsion — the force that moves something forward.

Thrust — a force or a push. When a system pushes or accelerates mass in one direction, there is a thrust (force) just as large in the opposite direction.

Accelerate — to move or cause to move faster.

Gravity — a force of attraction that pulls together all matter.

Launch — to put in motion with force.

Newton's First Law — any object in motion will continue to move in the same direction and speed unless forces act on it.

Newton's Third Law — Every action has an equal and opposite reaction.

STUDENT REFLECTION QUESTIONS

Activity 1: Straw Rockets

Measure the distance between your launchpad and where your rocket landed. Write down the measurements for your straw rocket launch in the table below.

Rocket Design	Trial 1	Trial 2	Trial 3
Rocket 1			
Rocket 2			

What did you observe about your rocket's flight? Think about the flight path it took and how far it traveled.

What would happen if you made a longer rocket? How would it affect the rocket's flight?

What is another change you can make to your rocket? How would the change affect the rocket's flight?

Activity 2: Stomp Rockets

Measure the distance between your launchpad and where your rocket landed. Write down the measurements for your Stomp Rocket launch in the table below.

Rocket Design	Trial 1	Trial 2	Trial 3
Rocket 1			
Rocket 2			

What was different about using the stomp rocket compared to using only the straw?

What is a change you can make to your stomp rocket? How would the change affect its launching power?

WHAT'S HAPPENING?

Motion is the process of something moving or changing place, or even just changing position. There are some laws that govern how motion works that are important for us to understand. These are called "**Newton's Laws of Motion**," named after the man who developed them, Sir Isaac Newton. The **first law** states that an object in motion will stay in motion unless acted on by other forces. This means that if you throw a ball it should stay soaring through the air until other forces, such as gravity and air resistance slow the ball and drag it back down. The **second law** states that the greater the mass of an object, the more force needed to accelerate

it. Basically, this is saying that if you want to throw a big heavy object, like a rock, you'll need a lot more energy and force than you would if you're throwing a small, light object like a cork. The **third law** states that every action has an equal and opposite reaction. For example, if you take a balloon full of air and release the balloon, the **action** is the air leaving out of the balloon and the **reaction** is the balloon being pushed forward by the air moving out of the balloon.

The way rocket ships defy gravity is simply by using a lot of power. In fact, when we went to the moon in 1969, NASA sent Neil Armstrong, Buzz Aldrin and Michael Collins into space with 4,578,000 lbs. of fuel! That is how much fuel or energy was needed for the rocket to get enough **thrust**. **Thrust** is a force that moves the rocket through the air and through space. **Thrust** is created by the propulsion system which uses **Newton's Third Law** to achieve liftoff. As the rocket fuel is burned up in that **propulsion** system, it creates gas that pushes against the ground underneath the rocket. Since there is nowhere for the gas to go except up, with such a large amount of pressure that they push the rocketship up, all the way into outer space.

OTHER ACTIVITIES AND INFORMATION

Moon Lander Anniversary Video Explainer TV:

<https://www.youtube.com/watch?v=vJs84oFocgY&t=37s>

Check out more activities at www.nysci.org.