

JUICE BOX VEHICLE DESIGN

★ GRADES 6-8 ⚙️ MATH SKILLS: SURFACE AREA/MEASURING/PROBABILITY
SCIENCE SKILLS: FORCES & MOTION/ENERGY ★

What you need:

- 1 juice box
- 3 bendy straws
- 4 milk or soda caps
- Hammer and 1 nail
- Balloon
- Thin, colored paper
- Scissors
- Utility knife (optional)
- Tape
- Markers or colored pencils

What to do:

1. First, ask your students to figure out the volume and surface area of the juice box.
 - a. Find the volume of your juice box container using the length, width, and height of your box. (Volume = $l \times h \times w$.)
 - b. Find the surface area of your vehicle. (Surface Area = $2lh + 2wh + 2lw$.)
2. Your automobile needs a distinct look. Have your students choose what color paper they would like to use to wrap their vehicle. Then, have your students cut it to fit the surface area based on the previous calculations. (Let your students know they are free to add designs to the paper using markers and colored pencils.)
3. Next comes engineering. Have students make holes into the center of the caps

(wheels) by using a hammer and a nail. Cut the bendy part of the straws off. Then insert the straws to make an axle. (Axle = 1 straw and 2 caps.)

4. Have students place an X on the juice box where they need to insert the axle. Use scissors (or a utility knife) to make the holes large enough to fit the straws through.
5. Tape a bendy straw on top of the juice box.
6. Test your vehicles! Blow up a balloon, attach it to the bendy part of the straw (tightly with tape) and watch them go!
7. Hand out copies of the Vehicle Design Student Page and have your students measure the distances their cars travel on each attempt.

Classroom Discussion:

Work in small groups or as a class to explore potential and kinetic energy.

- a. Does your balloon powered car have kinetic energy?
- b. Does an object that isn't moving have energy?
- c. What type of energy (potential or kinetic)?
- d. How does this experiment work?

(Note: Newton's Third Law of Motion, which states that for every action, there is an equal and opposite reaction. Action is the air coming from the straw. Reaction is the car moving!)