

RUBBER BAND RACERS

SUPPLIES

MAIN BIN

- Masking Tape (4)
- Rubber bands (16)
- Straws (16)
- Popsicle Sticks (115)
- Large Wooden Beads (64)
- Skewers (32)

HANDOUTS FOLDER

- Paper - (15)

PENCIL BOX

- Scissors (15)
- Markers (15)
- Pencils (15)



OBJECTIVES


- Students will create a racing vehicle with wheels
- To understand the meaning of potential energy

HOOK 2 min

Have you ever seen a racecar? What do you think makes a racecar able to drive so much faster than a normal car?

Do you think a racecar would move as fast if it had square wheels?

INTRODUCTION

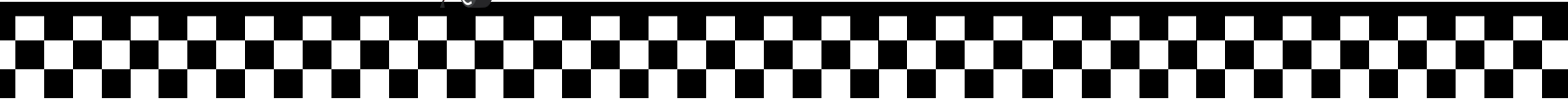
 3-5 min

Ready, set, go! In this experiment, we'll build our very own model racecar, and power them using rubber bands! We're going to explore how wheels help your car roll, and how rubber bands can store energy and release it to make your racecar zoom across the floor. While testing your racecars, you'll discover how pulling back on the rubber band gives it potential energy. When you let go, that energy turns into motion, and your car is off to the races.

Will your racecar roll the farthest or go the fastest? Will your car zoom ahead of the pack, or will it need a little tune-up in the pit stop? Let's test different designs and see what makes a racecar super speedy. It's time to race!

Before we discuss the propulsion of the racecar, we need to talk about wheels. Throughout history, the wheel has gone through many different stages. At first, people used logs to roll heavy things. Zooming forward through time, inventors began creating wooden wheels, which were lighter and attached via an axle to a car. Then came inflatable rubber wheels, which make the ride much smoother by absorbing bumps from the road. Today, racecar wheels are made from materials like steel, aluminum, and carbon fiber. These materials help make rides smoother and faster by reducing friction. These are all important things to consider when building a racecar!





DISCUSSION

🕒 2 min

Today, we will be making racecars! Once everyone has created a car that drives forward when launched with a rubber band, we will hold a race to see who has the fastest car!

Start by asking the students what makes cars move. Explain that wheels help cars move, and for our activity, we'll focus on making cars move without engines. Introduce the concept of using rubber bands as a source of propulsion and potential energy. Discuss how pulling the car back with the rubber band stores energy, which propels the car forward when the rubber band is released.

NOTE FOR TEACHERS

On the following page, there are detailed instructions for crafting a wooden car model. It is essential to go over the directions together as a class to assist all students in successfully finishing their wooden cars. For younger students, offering assistance with taping might be necessary to ensure the stability of their models.



Encourage creativity and embrace learning from mistakes!

DESIGN & BUILD

🕒 30 min

1. Each student will be making their own popsicle stick car.

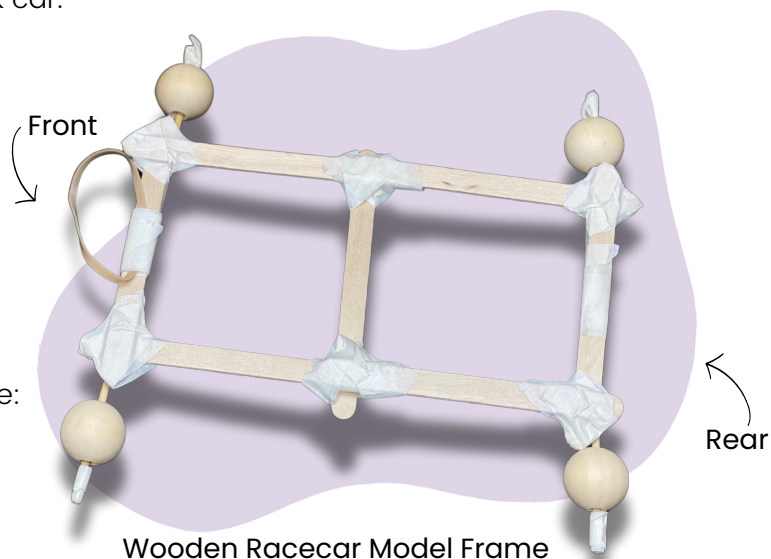
Give each student:

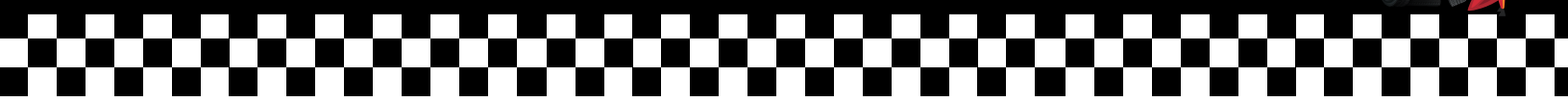
- 7 popsicle sticks
- 4 wooden beads
- 1 rubber band
- 2 skewers
- 1 straw
- 1 piece of printer paper

2.

Put out the following materials for all students to use:

- Masking tape
- Scissors
- Markers (for decoration)





DESIGN & BUILD (CONT.):

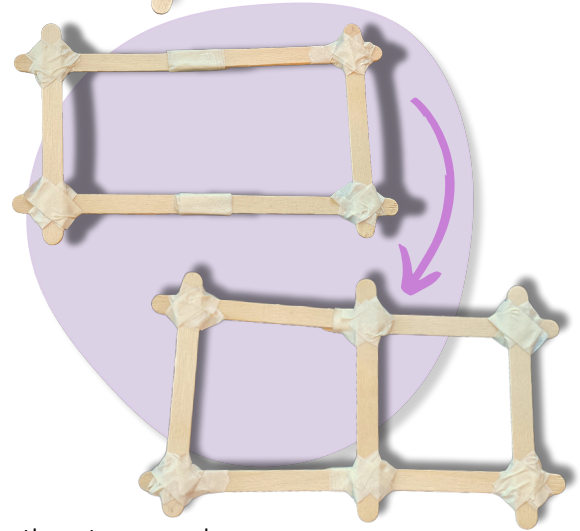
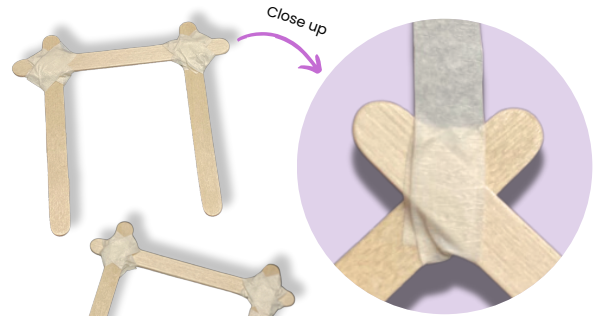
Making the Wooden Car Model:

1. Create the body by taping three popsicles sticks to create a frame. Students will need to make two of these frames.

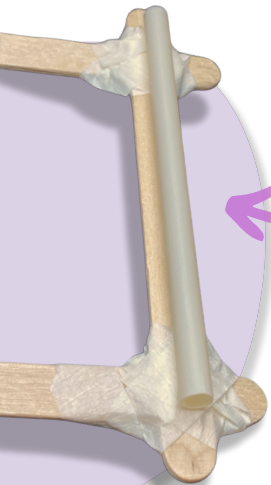


Tip: Cut masking tape in half for thinner pieces, making it easier to wrap around popsicle sticks.

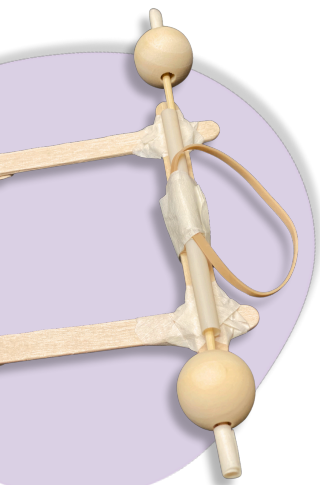
2. Combine both frames by attaching their ends with tape. Then, add another popsicle stick in the center for added reinforcement.



3. Have students cut their straw in half. Tape each half to the top of each frame.

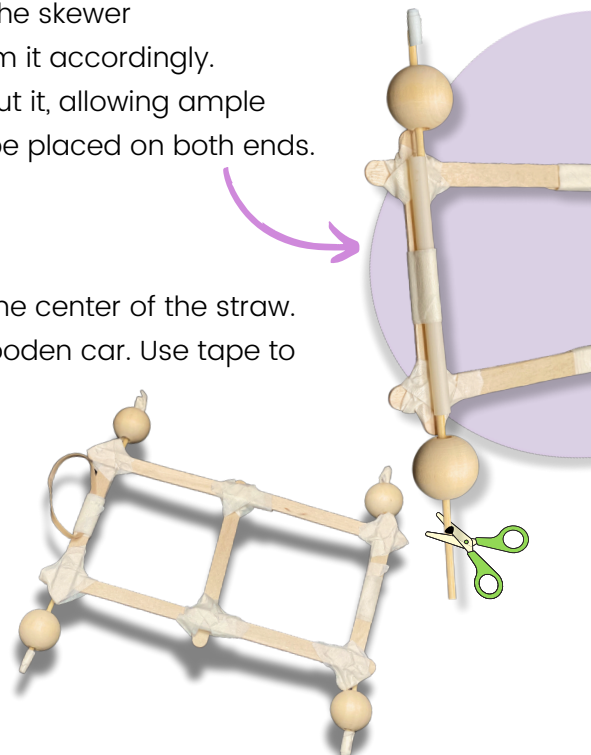


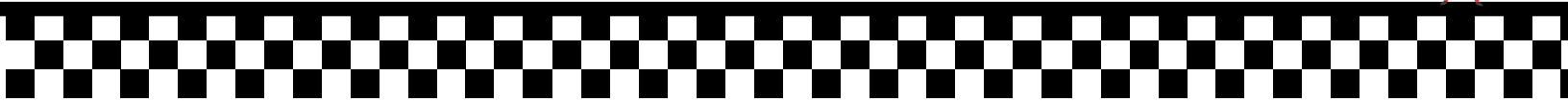
4. Next, instruct students to place a skewer into the straw and attach a wooden bead on each end. To ensure the skewer is an appropriate length, students will need to trim it accordingly. They can mark the skewer to indicate where to cut it, allowing ample space for the wooden beads and tape that will be placed on both ends.



5. Last, have students attach the rubber band to the center of the straw. The rubber band will indicate the front of the wooden car. Use tape to attach.

6. The wooden racecar model is now complete and ready to use! Students can also personalize their car by creating designs using markers, or by coloring a piece of paper and taping in to the frame.



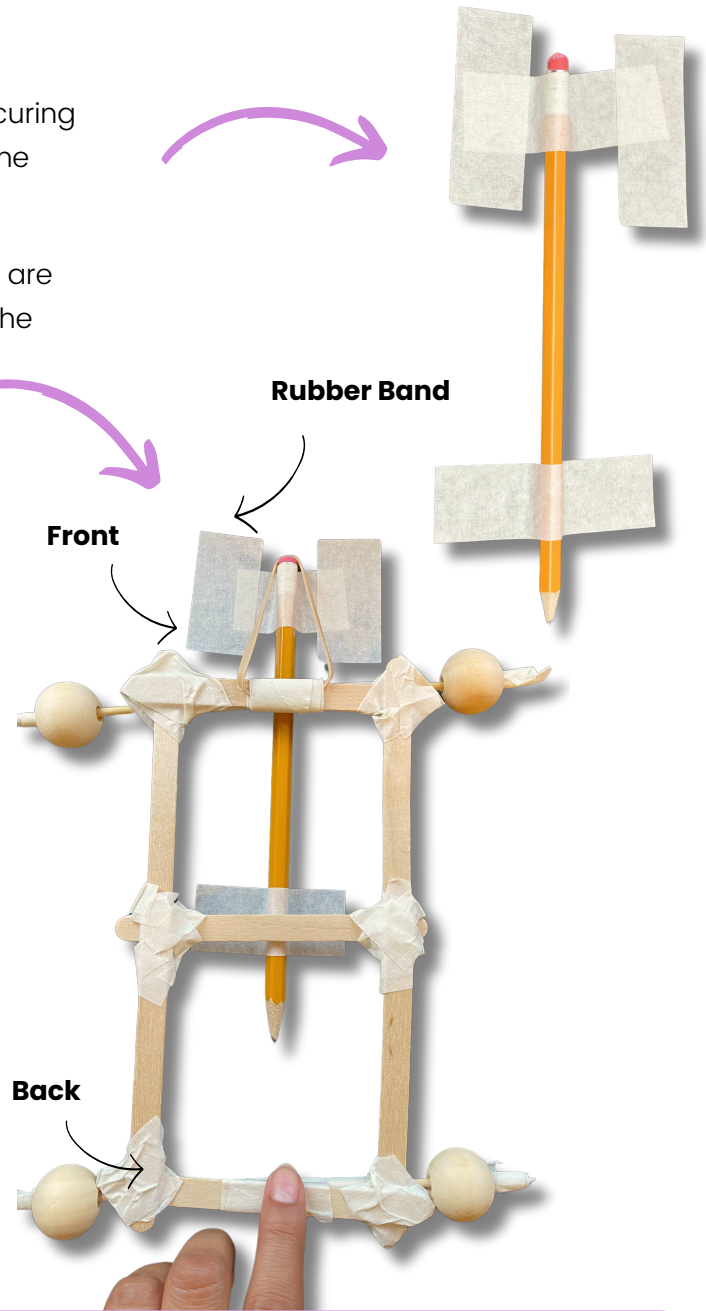


EVALUATE & REDESIGN

1. Set up at least 6 testing stations in the classroom by securing a pencil to the floor with tape, following the example in the image.
2. Assign students to each a testing station. Once students are at their designated station, demonstrate how to launch the car.
 - Place the car in the designated testing area.
 - Put the rubber band over the pencil eraser.
 - Hold the very **back center** of the car.
 - Pull the car back while keeping it level with the ground, and then release.

After the three trial runs, allow students to evaluate their design and make any necessary changes. For younger students, they can take this time to continue decorating their model.

If students are having trouble, have them go to the **pit stop!** Read the tips in the troubleshooting section below and assist students so that their racecars can be successfully launched.



TROUBLESHOOTING



If the car is spinning out of control:

- Check the wheel alignment. The axles should be parallel to each other and perpendicular to the pencil.
- Hold the very **back-center** of the car

If the car is not launching successfully:

- Launch with the rubber band perpendicular to the ground
- Check to see if the rubber band is twisted



ACTIVITY: TIME TO RACE!



5 min

1. Rearrange the testing stations to have two side by side so students can race their models.
2. Have students partner up to race their models. After each race, students will write the name of the winner on their worksheet.
3. Students will participate in 5 races or as many as time permits.



OBSERVE & EXPLAIN

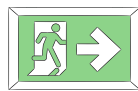


3-5 min

- Facilitate a discussion about the results, prompting students to think about the relationship between the rubber band tension and car performance. Encourage them to identify design choices that that helped the fastest cars win.
- Encourage students to make connections between their designs and the performance of their cars. Encourage them to identify patterns and draw conclusions based on data from their worksheet.

Encourage students to discuss the following aspects of their racecar designs:

- Wheel Alignment and Friction: Properly aligned wheels reduce friction and drag. Ensure axles are straight and wheels are straight for smooth movement and less friction.
- When the rubber band is pulled and let go, the stored energy in the band changes into movement energy, making the car move forward. This shows how potential energy turns into motion, which is an example of energy changing forms. Ask students if they have ever shot a rubber band by stretching it over their thumb. This is the same idea, just with a car attached!



Exit Ticket



Ask each student one of the following questions as they walk out the door.

- Why do you think it's important to align the wheels of your car model properly?
 - A: Proper wheel alignment reduces friction and drag, helping the car move smoothly and faster.
- Q: What part of our racecar used potential energy to make the car move forward?
 - A: The rubber band.