

## Teacher Information

# Rocket Car

### Objectives:

- To construct a rocket propelled vehicle.
- To experiment with ways of increasing the distance the rocket car travels.

### Description:

Students construct a balloon-powered rocket car from a styrofoam tray, pins, tape, and a flexible straw, and test it along a measured track on the floor.

### Science Standards:

Science as Inquiry  
 Physical Science - Position and motion of objects  
 Science and Technology - Abilities of technological design  
 Unifying Concepts and Processes - Change, constancy, and measurement

### Science Process Skills:

Observing  
 Communicating  
 Measuring  
 Collecting Data  
 Inferring  
 Making Models  
 Interpreting Data  
 Making Graphs  
 Controlling Variables  
 Defining Operationally  
 Investigating

### Mathematics Standards:

Mathematics as Problem Solving  
 Mathematics as Communication  
 Mathematics as Reasoning  
 Mathematical Connections  
 Measurement  
 Statistics and Probability  
 Patterns and Relationships

### Management:

This activity can be done individually or with students working in pairs. Allow 40 to 45 minutes to complete the first part of the activity. The activity stresses

## Materials and Tools:

- 4 Pins
- Styrofoam meat tray
- Masking tape
- Flexible straw
- Scissors
- Drawing compass
- Marker pen
- Small round party balloon
- Ruler
- Student Sheets (one set per group)
- 10 Meter tape measure or other measuring markers for track (one for the whole class)

technology education and provides students with the opportunity to modify their car designs to increase performance. The optional second part of the activity directs students to design, construct, and test a new rocket car based on the results of the first car. Refer to the materials list and provide what is needed for making one rocket car for each group of two students. Styrofoam food trays are available from butchers in supermarkets. They are usually sold for a few cents each or you may be able to get them donated. Students can also save trays at home and bring them to class.



If compasses are not available, students can trace circular objects to make the wheels or use the wheel and hubcap patterns printed on page 38.

If using the second part of the activity, provide each group with an extra set of materials. Save scraps from the first styrofoam tray to build the second car. You may wish to hold drag or distance races with the cars. The cars will work very well on tile floors and carpeted floors with a short nap. Several tables stretched end to end will also work, but cars may roll off the edges.

Although this activity provides one car design, students can try any car shape and any number, size, and placement of wheels they wish. Long cars often work differently than short cars.

### Background Information:

The rocket car is a simple way to observe Newton's Third Law of Motion. (Please refer to pages 15-16 of the rocket principles section of this guide for a complete description.) While it is possible to demonstrate Newton's Law with just a balloon, constructing a car provides students with the opportunity to put the action/reaction force to practical use. In this case, the payload of the balloon rocket is the car. Wheels reduce friction with the floor to help cars move. Because of individual variations in the student cars, they will travel different distances and often in unplanned directions. Through modifications, the students can correct for undesirable results and improve their cars' efficiency.

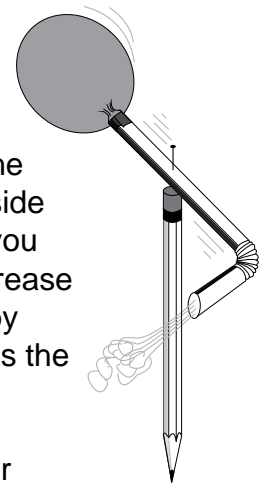
### Making a Rocket Car:

1. Distribute the materials and construction tools to each student group. If you are going to have them construct a second car, tell them to save styrofoam tray scraps for later. Hold back the additional materials for the second car until students need them.

2. Students should plan the arrangement of parts on the tray before cutting them out. If you do not wish to use scissors, students can trace the pattern pieces with the sharp point of a pencil or a pen. The pieces will snap out of the styrofoam if the lines are pressed deeply.
3. Lay out a track on the floor approximately 10 meters long. Several metric tape measures joined together can be placed on the floor for determining how far the cars travel. The students should measure in 10 centimeter intervals.
4. Test cars as they are completed. Students should fill in the data sheets and create a report cover with a drawing of the car they constructed.
5. If a second car will be constructed, distribute design pages so that the students can design their cars before starting construction.

### Extensions:

- Tie a loop of string around the inflated balloon before releasing the car. Inflate the balloon inside the string loop each time you test the cars. This will increase the accuracy of the tests by insuring the balloon inflates the same amount each time.
- Make a balloon-powered pinwheel by taping another balloon to a flexible straw. Push a pin through the straw and into the eraser of a pencil. Inflate the balloon and watch it go.



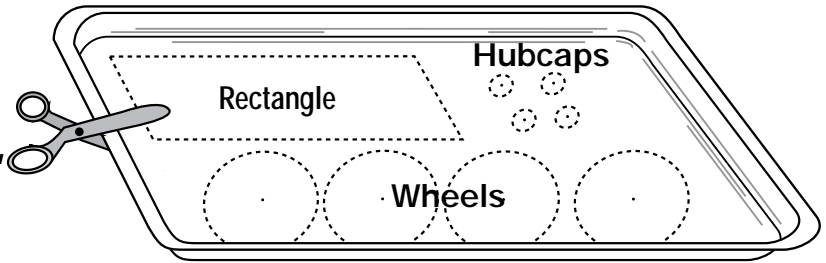
### Assessment:

Students will create "Rocket Car Test Reports" to describe test runs and modifications that improved their car's efficiency. Use these reports for assessment along with the design sheet and new car, should you choose to use the second part of this activity.

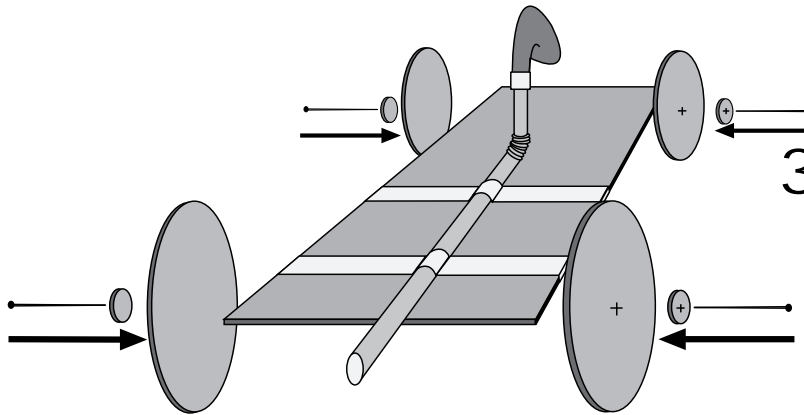
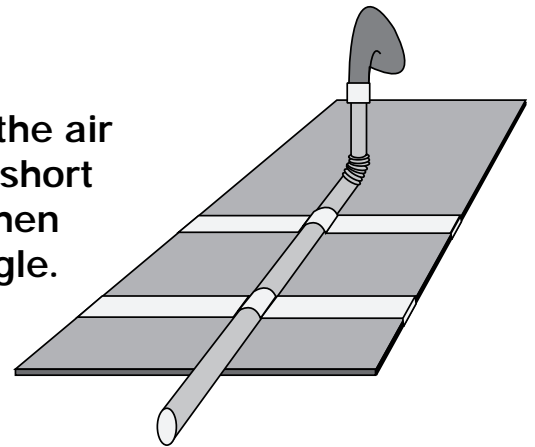


# How To Build A Rocket Car

1. Lay out your pattern on a styrofoam tray. You need 1 rectangle, 4 wheels, and 4 hubcaps. Use a compass to draw the wheels.

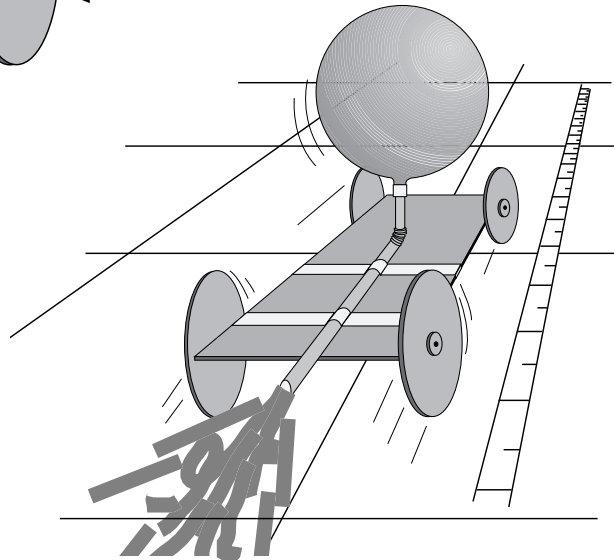


2. Blow up the balloon and let the air out. Tape the balloon to the short end of a flexible straw and then tape the straw to the rectangle.



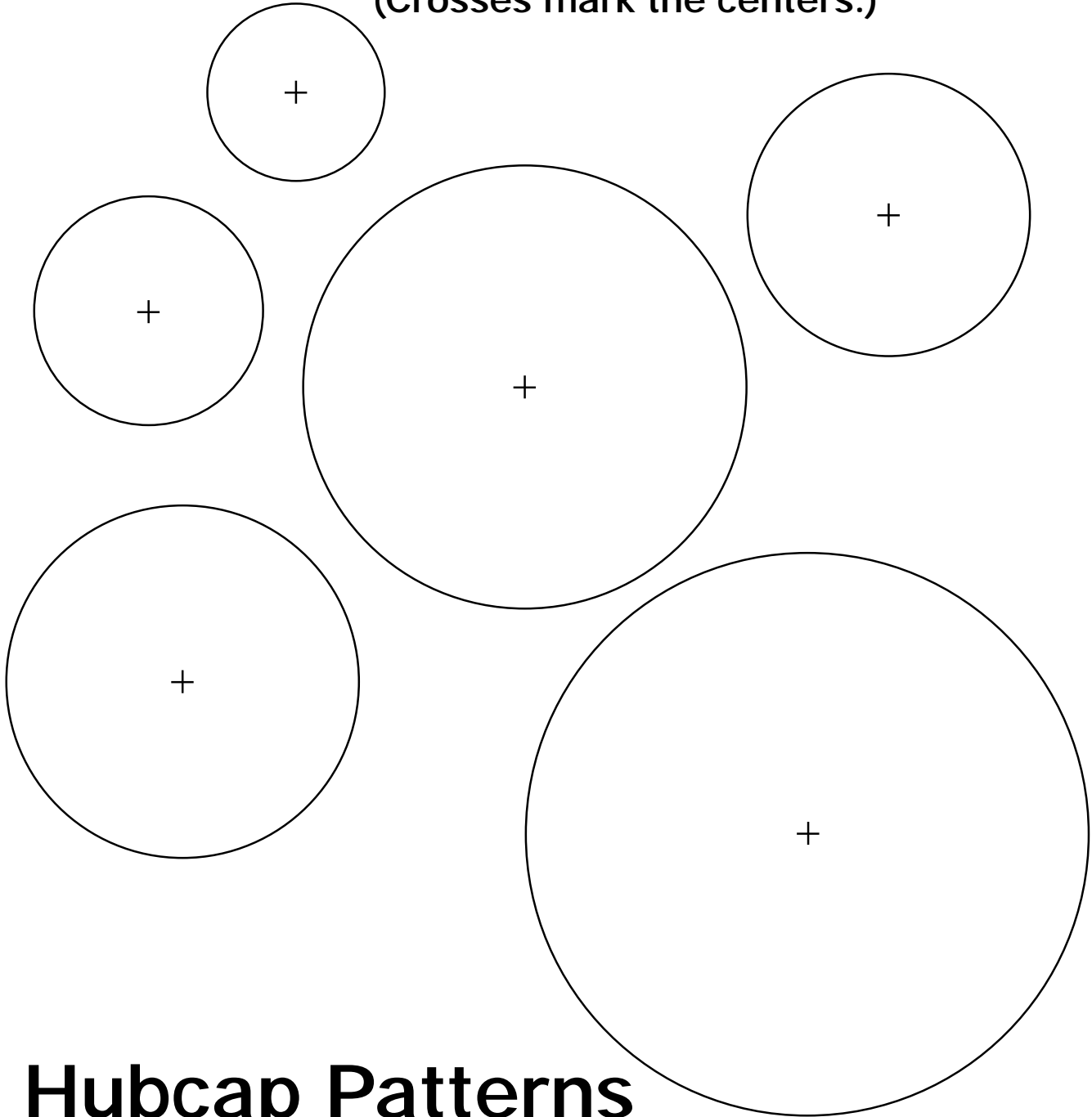
3. Push pins through the hubcaps into the wheels and then into the edges of the rectangle.

4. Blow up the balloon through the straw. Squeeze the end of the straw. Place the car on floor and let it go!



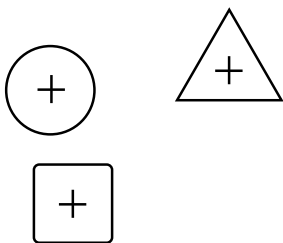
# Wheel Patterns

(Crosses mark the centers.)



# Hubcap Patterns

(Crosses mark the centers.)



# Rocket Car Test Report

Draw a picture of your rocket car.

BY

\_\_\_\_\_

\_\_\_\_\_

DATE: \_\_\_\_\_



# Rocket Car Test Report

Place your rocket car on the test track and measure how far it travels.

1. Describe how your rocket car ran during the first trial run.

(Did it run on a straight or curved path?)

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How far did it go? \_\_\_\_\_ centimeters

Color in one block on the graph for each 10 centimeters your car traveled.

2. Find a way to change and improve your rocket car and test it again.

What did you do to improve the rocket car for the second trial run?

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How far did it go? \_\_\_\_\_ centimeters

Color in one block on the graph for each 10 centimeters your car traveled.

3. Find a way to change and improve your rocket car and test it again.

What did you do to improve the rocket car for the third trial run?

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How far did it go? \_\_\_\_\_ centimeters

Color in one block on the graph for each 10 centimeters your car traveled.

4. In which test did your car go the farthest? \_\_\_\_\_

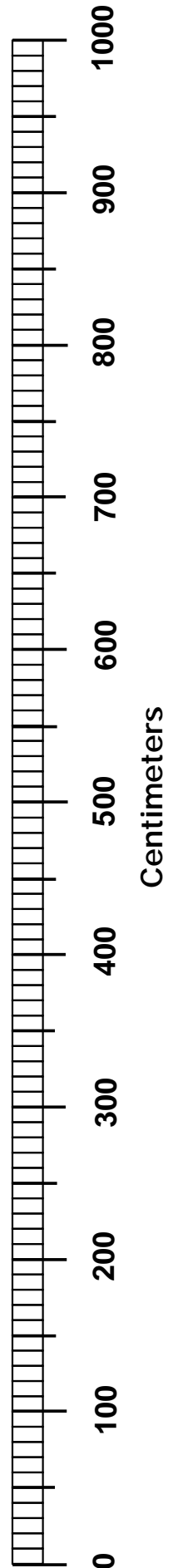
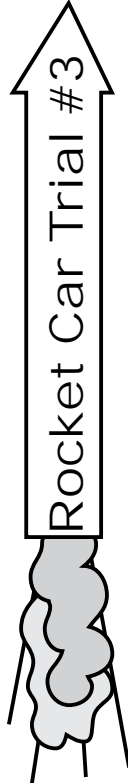
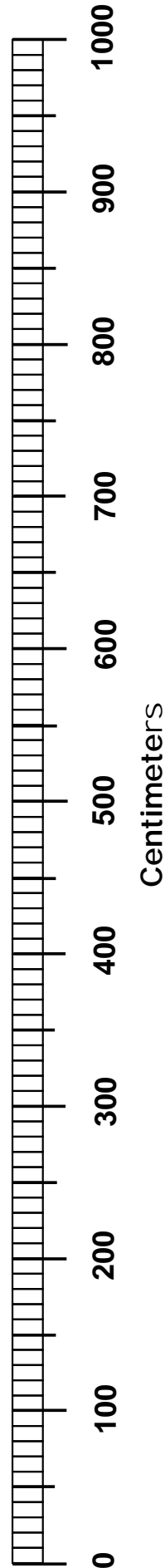
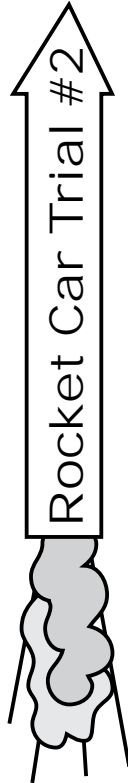
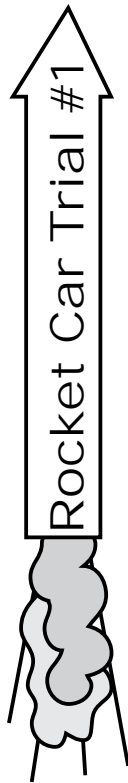
Why? \_\_\_\_\_

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# Rocket Car Data Sheet



# DESIGN SHEET

Design and build a new rocket car based on your earlier experiments.

Front View

Top View

Side View

