

Rocket Activity

Pop! Rockets

Objective

Students design, construct, and launch paper rockets.

Description

A rocket with a triangular cross section is made from three rocket-shaped strips of card-stock paper and launched with the Pop! Rocket Launcher. Students can customize their rocket fin shapes and decorate the rockets using a computer with an illustration program. An alternative single-piece Pop! Rocket is also explained.

Materials

Card-stock paper
Glue stick
Cellophane tape
Scissors
Optional - Computer with an illustration program and printer
Crayons or colored markers
Ruler
Pop! Rocket Launcher (see page 63)
Penny
30 cm-long pieces of 1/2" PVC pipes

National Science Content Standards

Unifying Concepts and Processes

- Evidence, models, and explanation
- Change, constancy, and measurement

Science as Inquiry

- Abilities necessary to do scientific inquiry

Physical Science

- Position and motion of objects
- Motions and forces

Science and Technology

- Abilities of technological design

National Mathematics Content Standards

- Number and Operations
- Geometry
- Measurement
- Data Analysis and Probability

National Mathematics Process Standards

- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representations

Management

Pop! Rockets are made by cutting out three rocket-shaped pieces of paper and joining them together. The basic pattern is a long rectangle with a triangle on one end. When the three rocket sides are taped together, the triangles are bent inward and taped to form a three-sided pyramid that serves as the rocket's nose cone. At the opposite end are geometric shapes such as triangles or parallelograms, that extend from the sides of the rectangles to form the fins. The fins are glued or taped together face-to-face to make them stiff.

The basic pattern is found on page 70. If you have a computer with an illustration program available, the pattern can be laid out on the computer and the fins custom-designed by your students. The only dimension that must be preserved is the width of the rectangle. The three rectangles, when taped side-to-side, form a triangular prism shape that slides over the launch tube of the Pop! Rocket Launcher.

Print the blank rocket pattern or student's custom-designed rockets on card stock paper. If designing by computer, make three copies of the pattern on the page. To make all patterns fit, use the rotation control to rotate the middle pattern upside down.

If using the rocket with young students, enlist the aid of older students for the rocket assembly (peer teaching) or have the patterns cut out and fold lines scored in advance. Before taping, have students draw pictures of themselves or friends or family peering out from "port holes" near the nose cone end of the rockets. The rockets can be decorated along their entire length. If using a computer illustration program, the decoration can be added to the pattern before printing.

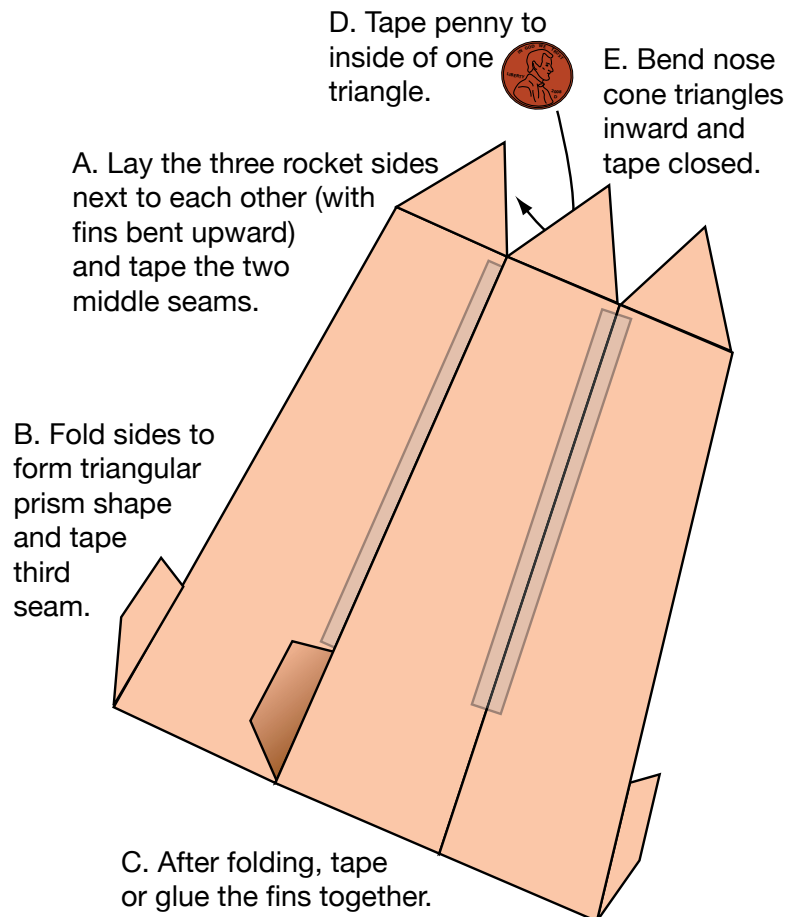
Have students tape a penny to the inside of one of the three nose cone triangles before taping the nose cone together. The penny adds additional mass to the nose and increases its flight stability.

To provide support for the nose cone during taping, insert a PVC pipe segment into the rocket.

Ask students why fins are important to the rocket shape. After collecting their ideas, demonstrate how fins work by tossing two rockets (without the pennies) like javelins into the air. One should have fins and the other should not. The rocket with fins will sail straight across the room, while the one without will flop or tumble in the air. Have your students describe and explain what happened.

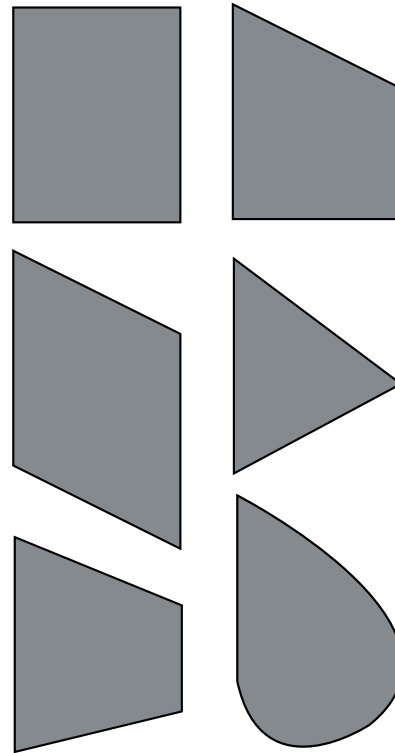
Procedure Three-Piece Pop! Rocket

1. If using a computer with an illustration program for designing Pop! Rockets, draw a vertical rectangle that is 3 cm wide and 22 cm long. The nose cone triangle can either be an isosceles or equilateral triangle. Add fins to the sides of the bottom of the rectangle. Keep in mind that the size of the paper limits the size of the fins.
2. After completing one rocket pattern, copy it two times and fit all the pieces on the paper with two patterns pointing up and one pointing down. If the fins are too large for a single sheet of paper, create two patterns on one page and the third on a second page.
3. When the patterns are complete, students can add decorations to their rockets or wait until the patterns are printed and then decorate them.
4. Cut out the three pieces and press the edge of a ruler to the fold lines for the fins and nose cone to get a straight fold. Fold the fins outward.

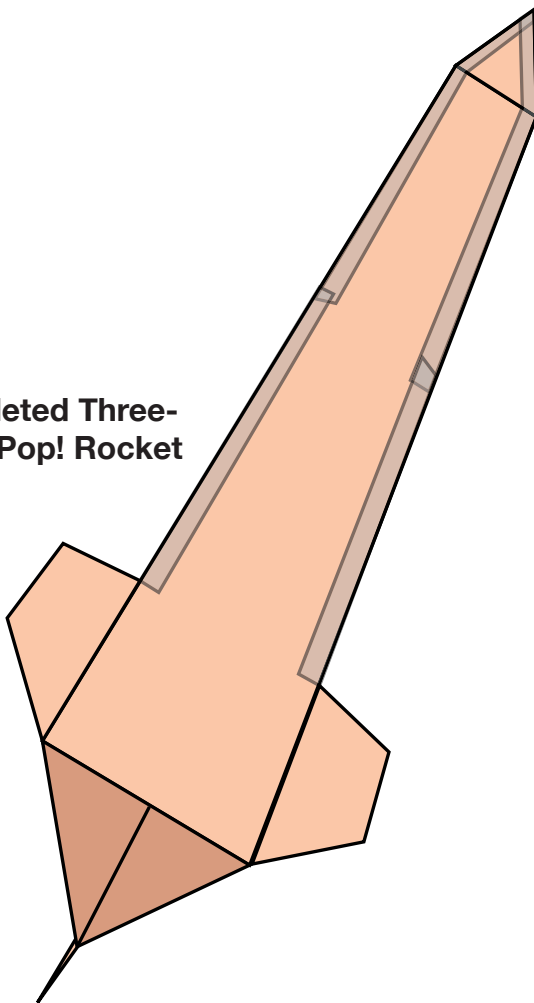


5. Tape a penny securely to the inside of one of the nose cone triangles.
6. Slide the pieces together and match up the sides of the rocket body. Run a strip of tape along the seams. Do not tape the fins or nose cone pieces yet.
7. Pick up the rocket, bring the two side pieces together, and tape the seam. It may be helpful to insert the PVC pipe into the rocket before taping.
8. Use glue stick or tape to join adjacent fins pieces together to make three fins. If desired, the fins can be left untaped to make six fins.

Ideas for Different Fin Shapes



Completed Three-Piece Pop! Rocket



9. Push the PVC pipe inside the rocket body up to the position of the nose cone. Use the pipe for support while taping. Fold the three triangles inward and tape the seams.
10. The rocket is ready for launch. Follow the launch instructions for the Pop! Rocket Launcher (page 63).

Procedure One-Piece Pop! Rocket

1. Print the pattern on the next page on card stock paper.
2. Use a ruler and the edge of a penny to score the fold lines. To do so, place the ruler along a dashed line and run the edge of the penny (held at an angle) across the paper to make a small groove. The groove will insure that the fold line is both accurate and straight.
3. Cut out the pattern on the solid lines.
4. Tape a penny to the inside of one of the nose cone triangles.
5. Fold the three rectangles into a triangular prism shape with the large tab inside. Tape the seam.

6. Fold the triangles inward to form the nose cone. The tabs should be inside. They will provide support for taping.
7. Bend the fins outward. The rocket is ready for flight.

Discussion

What are the parts of a rocket?

The pointy upper end of the rocket is the nose cone. It helps the rocket spread apart the air as the rocket flies. The nose cone can be compared to the pointed bow of a boat that spreads water apart as it sails forward. Astronauts and spacecraft are usually placed in or near the nose cone. (Note: The space shuttle is a little different in design. However, the astronauts still ride in the cone-shaped front of the Orbiter.)

The body of the rocket is the tube-shaped (triangular-shaped in this activity) part of the rocket that holds the rocket fuel.

Engines are where the rocket fuel is burned. These are found at the lower end of the rocket body. The engines push the rocket into space.

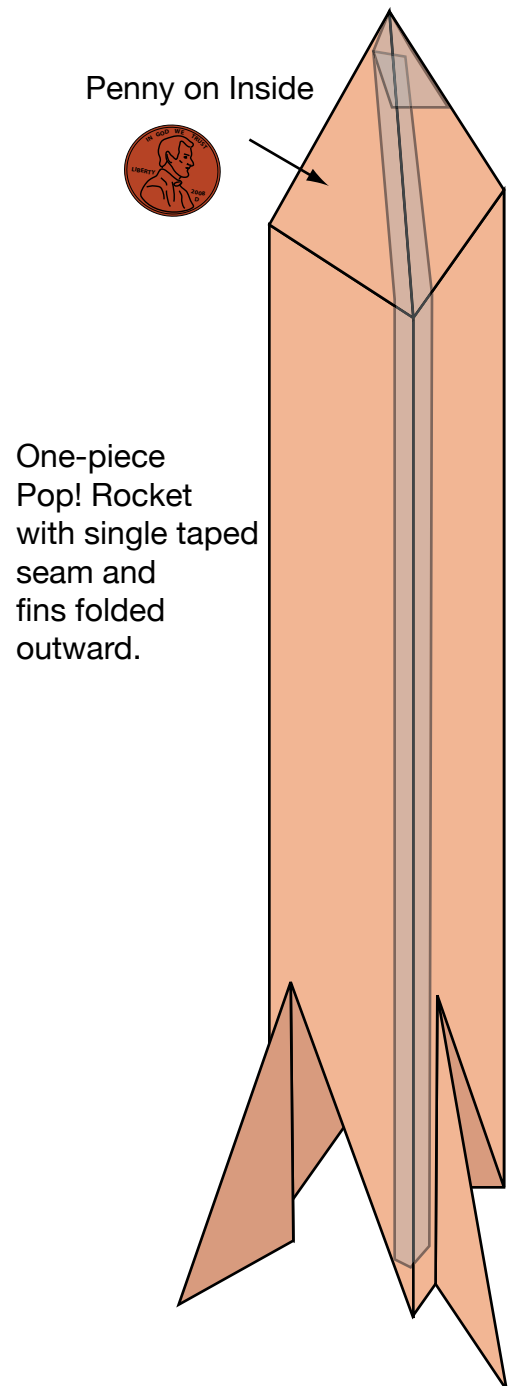
Fins are the tiny wings at the lower end of the rocket body. They help the rocket fly straight.

Assessment

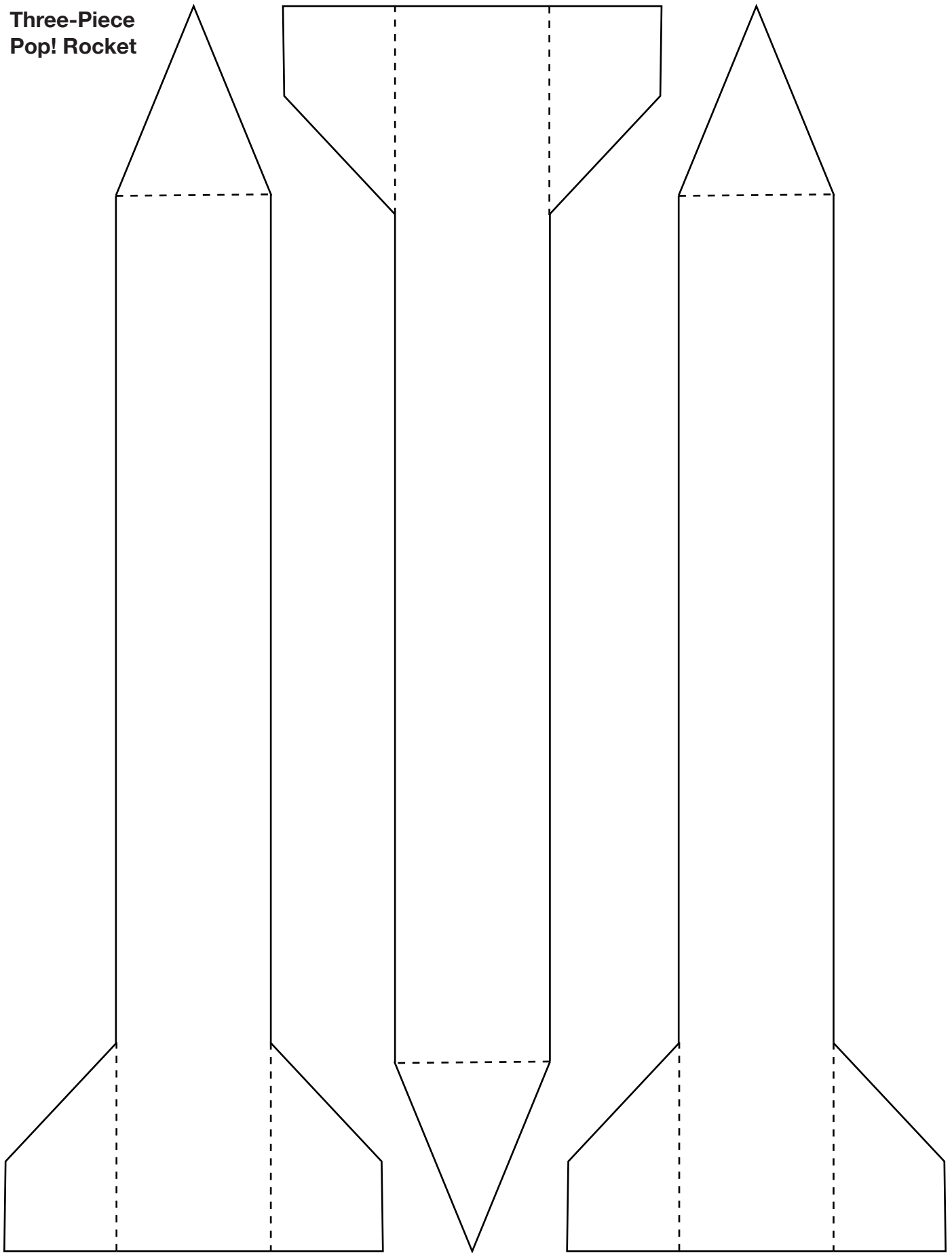
- Ask students to write or tell a short story describing their rocket and how they flew.
- Have students draw pictures of their rockets flying through space.

Extensions

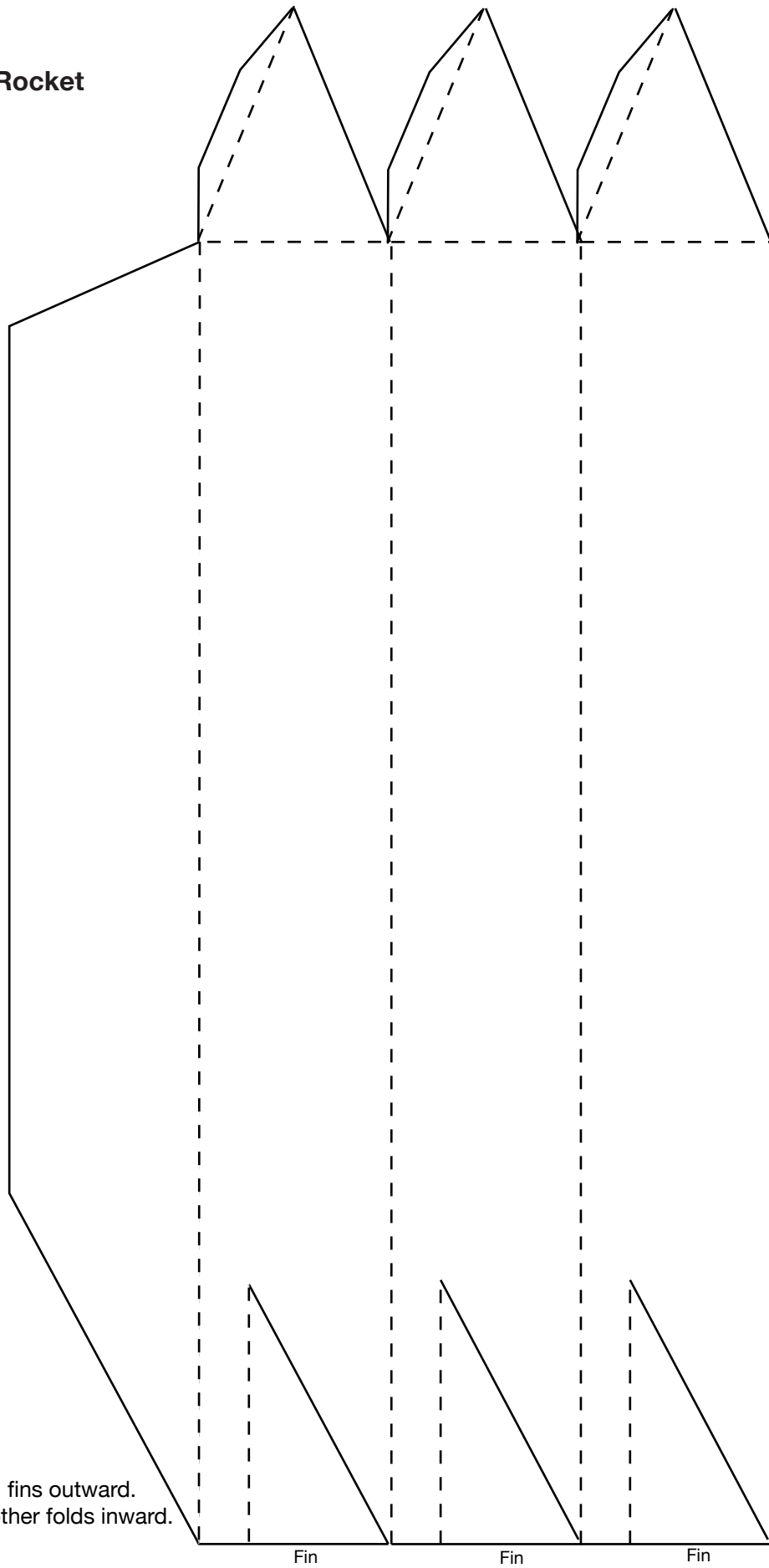
- Compare rockets to an arrow, a weather vane, or a dart. Bring one or more of these objects to class and compare them to the shape of the students' rockets.
- Show pictures of different rockets and compare them to students' rockets.



**Three-Piece
Pop! Rocket**



One-Piece Pop! Rocket



Fold fins outward.
All other folds inward.

Fin

Fin

Fin