Table of Contents

Table of Contents, continued

Resources continued

QuickView

Students design and construct original fold-and-roll patterns.

Standards Addressed

NSTA 5-8
Students develop abilities necessary to do scientific inquiry.

- Students design and conduct a scientific investigation.
- Students use appropriate tools and techniques to gather, analyze, and interpret data.
- Students develop descriptions, explanations, and models using evidence.
- Students think critically and logically to make the relationships between evidence and explanations.
- Students communicate scientific procedures and explanations.
- Students use mathematics in all aspects of scientific inquiry.

Students develop abilities for technological design.

- Students evaluate completed technological designs or products.

NCTM 6-8
Students apply appropriate techniques, tools, and formulas to determine measurements.

- Students select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels or precision.
- Students solve problems involving scale factors, using ratio and proportion.
- Students solve simple problems involving rates and derived measurements for such attributes as velocity and density.

Students select and use appropriate statistical methods to analyze data.

Students develop and evaluate inferences and predictions that are based on data.

Students recognize and apply mathematics in contexts outside of mathematics.

ITEA 6-8
Students develop an understanding of engineering design.

- Students learn that modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.

Students develop an understanding of the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

- Students learn that some technological problems are best solved through experimentation.

Students develop the abilities to apply the design process.

- Students learn to apply a design process to solve problems in and beyond the laboratory-classroom.
- Students learn to specify criteria and constraints for the design.
- Students learn to make two-dimensional and three-dimensional representations of the designed solution.
- Students learn to test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
- Students learn to make a product or system and document the solution.

Students develop the abilities to assess the impact of products and systems.

- Students learn to design and use instruments to gather data.

Time Required

180-270 minutes (will vary with class size)

Content Areas

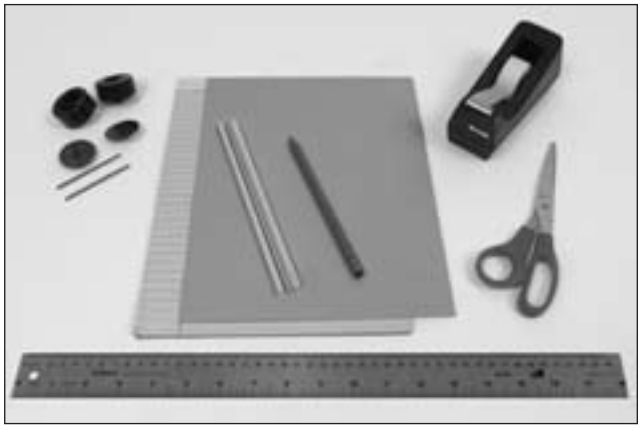
Primary: Technology
Secondary: Math, science, language arts

Vocabulary

- design
- orthogonal drawing

Materials

- Glue or tape
- Card stock
- Ruler
- Wheels
- Axles
- Straws
- Hobby knife or scissors
- Ramp (not shown)
- Paper
- Pencil
- Computer with CAD software (optional – not shown)



Procedure

1 Brainstorm ideas for a fold-and-roll vehicle different from any of the pre-designed vehicles with which you have worked.

Students may complete this part of the activity in groups, but each student should design and construct his or her own vehicle.

2 Select an idea for your fold-and-roll vehicle. On a piece of paper, create a sketch of the idea you select.

The sketches do not need to be precise but should give a general impression of each idea. While the sketches do not need to be to scale, they should give a general idea of the size and shape of each proposed vehicle.

3 Create a drawing of each of the six orthogonal drawing views of the vehicle: top view, bottom view, right view, left view, front view, and back view. Draw each view actual size.

You may choose to have the students create the drawing by hand or by using a CAD program.

4 Using your drawings, determine the actual length of the edges of your vehicle. One of the views, if not more than one, will usually show the actual length of the edge. However, you must sometimes calculate the length of an edge based upon the other lengths in your drawing.

5 On the card stock, draw the pattern for the fold-and-roll vehicle. To do this, redraw the sides with each edge its actual length and the sides connected. Be careful to determine where the sides need to connect for easy folding. Some sides might not be a single piece but might connect to other sides along different edges that will be folds. In your pattern, only include portions of the view that are part of that side of the pattern. Do not add tabs yet.

6 Measure the corresponding edges to verify that they are all the same length and will align properly.

Review the students' patterns before having them move to adding the tabs.

7 Add tabs to your pattern. The tabs should extend no more than 1/2 inch from an edge where two sides meet. Glue or tape will be placed on a tab to hold together the two sides it connects.

If students choose to glue the vehicle, they may wish to also use tape to hold the vehicle together while the glue dries.

8 Cut out and assemble your vehicle. Add axles and wheels to your vehicle.

If the students discover that their vehicle patterns do not align properly, have them fold their vehicles anyway. You may choose to allow them to try to design new patterns, but have them complete their original designs to discover all the flaws in their designs before redesigning.

9 Test your vehicle by rolling it down the ramp. Write a short evaluation of your vehicle's pattern and performance. Describe any flaws in your design and how the flaws could be corrected.

QuickView

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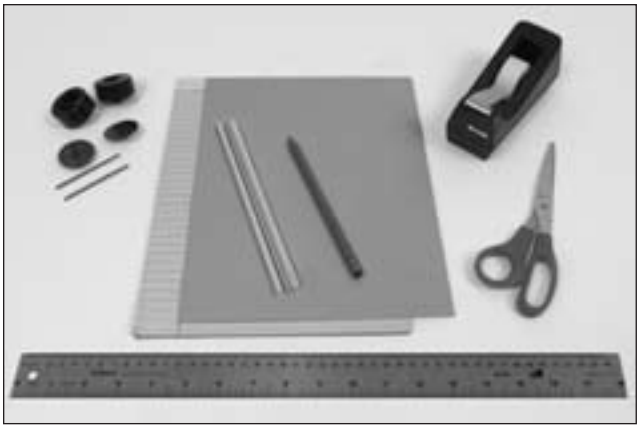

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