

Chapter 5 Project: Moving Entertainment

Beginning the Chapter Project

Pop-up cards and books, in which a flat piece of paper transforms into a three-dimensional creation, enchant children and adults alike. Other books and cards with movable parts offer things to spin or pull, or make a movement in some way. Surprisingly, “movable books” date back to the thirteenth century; however, pop-ups or movable parts were not used in children’s books until late in the eighteenth century.

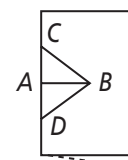
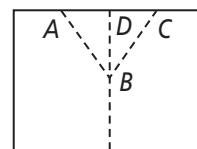
In this project you will explore the geometry of triangles by using pop-ups. You will make pop-up cards and then use the language of geometry to tell others how to make them.

Activities

Activity 1: Building

Follow the directions to make a triangle pop-up card.

- Fold two pieces of paper in half. Set one aside.
- Hold one paper with the fold on the left, and fold down the upper left corner, forming a triangle. Open up the paper to the inside, and label $\triangle ABC$ and altitude \overline{BD} .
- What kind of triangle is $\triangle ABC$?
- In addition to being an altitude, what other word could describe \overline{BD} ?
- Pull D toward you, and close the card so that $\triangle ABC$ folds inside the card like the figure at the right. The folds along \overline{AB} and \overline{BD} must be reversed. When you open the card, $\triangle ABC$ will pop up.
- Glue the other paper you folded in the first step to the outside of your card. Do not put glue on the pop-up triangle area.
- Decorate the card and pop-up. You can cut out a figure or an object, fold it vertically, and glue it along \overline{BD} , and it will pop up.



Activity 2: Experimenting

Follow the directions to make a “talking mouth” pop-up card.

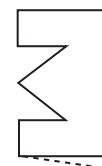
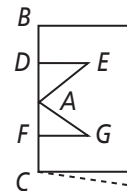
- Fold two pieces of paper in half. Set one aside.
- Find the midpoint A of the folded side.
- Draw \overline{AB} perpendicular to the fold.
- Draw isosceles $\triangle CBD$, which has base \overline{CD} on the fold and altitude \overline{AB} .
- Cut along \overline{AB} ; fold on \overline{BC} and \overline{BD} .
- Open the card, and pull each of the triangles to the inside of the card, as you did in the previous activity. When your card is closed, it should look like the figure at the right.
- When you open the card, the mouth should pop open.
- Experiment with a non-isosceles triangle $\triangle CBD$.
- Finish your “talking mouth” card by gluing paper on the outside and decorating the card. Draw an animal around the talking mouth pop-up.

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Activity 3: Designing

Follow the directions to make another kind of triangle pop-up.

- Fold two pieces of paper in half. Set one aside.
- Label the fold \overline{BC} . Label the midpoint A of \overline{BC} .
- Draw the perpendicular bisectors of \overline{AB} and \overline{AC} , labeling them \overline{DE} and \overline{FG} , as in the figure at the right.
- Cut along \overline{DE} and \overline{FG} .
- Fold on \overline{AE} and \overline{AG} .
- Open the card, and pull the triangles to the inside. When your card is closed, it should look like the figure at the right.
- Glue paper on the outside, and decorate your card.



Now, design a new kind of pop-up and create a pop-up card. Using your geometry vocabulary, write instructions for how to create your pop-up.

Finishing the Project

Make a display of your pop-up cards, or combine pop-up cards into a pop-up book. Include pop-ups that were designed in the activities as well as some that you created yourself. Include instructions for making your pop-ups. Your display also could include a history of pop-ups.

Reflect and Revise

Ask a classmate to review your project with you. Together, check that your pop-ups work when the page is opened, that they are all illustrated, and that you have included some original designs that have clear instructions.

Extending the Project

Research the Japanese art of paper folding called origami. Use a pattern or design of your own to create a piece of origami architecture.

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Getting Started

Read about the project. As you work on it, you will need several sheets of $8\frac{1}{2}$ -in.-by-11-in. paper. You also will need some heavier paper, such as construction paper or card stock, a ruler, scissors, and markers or colored pencils.

Checklist

- Activity 1:
triangle pop-up
- Activity 2:
talking mouth
- Activity 3:
original pop-up
- Pop-up book or display

Suggestions

- For best results, use construction paper or other heavy paper for your final product.
- Always cut on the folded edge.
- Consider using other shapes besides triangles, or using jagged edges and curves, to make your own pop-up.
- Books or the Internet are good resources for ideas.

Scoring Rubric

- 4** All elements of the project are clearly and accurately presented. Your pop-ups are well constructed and your diagrams and written instructions are clear and use geometric language appropriately. Your display or book is organized, attractive, and complete.
- 3** Your pop-ups, diagrams, and written instructions are adequate. Some elements of the project are unclear or inaccurate.
- 2** Significant portions of the project are unclear or inaccurate.
- 1** Major elements of the project are incomplete or missing.
- 0** Project is not handed in, or work does not follow instructions.

Your Evaluation of Project Evaluate your work, based on the *Scoring Rubric*.

Teacher's Evaluation of Project