geo paperpolygons
revised edition

Exploring 2D Shapes Through Paper Folding

Sample Activities

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geo six-turn rhombus

A rhombus is a parallelogram that has all sides equal in length. It differs from a square in that it has no right angles. For this reason young students sometimes describe it as a leaning or tilting square. When it has a substantial “lean”, it is often called a diamond. However, all students should be encouraged to use the correct term, rhombus.

The angles in this rhombus are well suited to creating interesting designs, especially ones that represent rectangular-based prisms. The acute angles of six copies can also be arranged around a point without leaving gaps.

ALL

1. Folding the Rhombus

Materials

- A5 *GEO Metric Paper* — several sheets in different colors for each student
- A4 *GEO Metric Paper* — 1 sheet for demonstration model
- Overhead projector and a blank transparency sheet
- Blackline Master 12 (page 71)

Preparation

1. Make an overhead transparency (OHT) of Blackline Master 12.
2. Pre-fold your demonstration sheet of paper.

Activity

Use the OHT to help demonstrate the steps for folding the rhombus. First, fold the sheet in half and in half again. Unfold the paper. Next, holding the page as shown on the OHT, roll the lower left-hand corner up to the first fold line on the left and crease as indicated. Mirror this step with the right-hand corner and then fold the top left down as shown and crease. Again, mirror this step with the right-hand side. Finally, reveal the rhombus by turning the shape over so the folds are to the back. Provide ample time for the students to practice all the steps.

ALL

2. Same and Different

Materials

- A5 *GEO Metric Paper* — 5 sheets for each pair of students
- A7 *GEO Metric Paper* — 5 sheets for demonstration model
- Overhead projector

Preparation

1. Make a square as shown on Blackline Master 2 (page 61).
2. Make a two-fold kite as shown on Blackline Master 8 (page 67).
3. Make a six-turn parallelogram as shown on Blackline Master 9 (page 68).
4. Make a six-turn rhombus as shown on Blackline Master 12 (page 71).

Activity

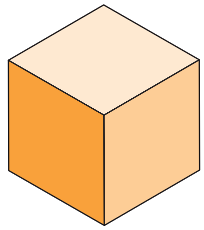
1. Have the students make a square, two-fold kite, six-turn parallelogram, and six-turn rhombus, and compare and contrast the rhombus to the other quadrilaterals and unfolded A5 sheet.
2. Place the demonstration shapes and unfolded A7 sheet on the overhead projector. Ask, *How is a six-turn rhombus similar to a rectangle or a parallelogram*? (They both have four sides and their opposite sides are parallel.) *How is it similar to a square*? (They both have four sides that are equal in length and opposite sides are parallel.) *How is it different to a square*? (The square has right angles.)

What do the kite and the rhombus have in common? (They are both quadrilaterals.) *Which shape would you say is most like a rhombus? Which is least like a rhombus?* The discussion will vary, but encourage the students to justify their reasoning.

3. Prism Pictures

Preparation

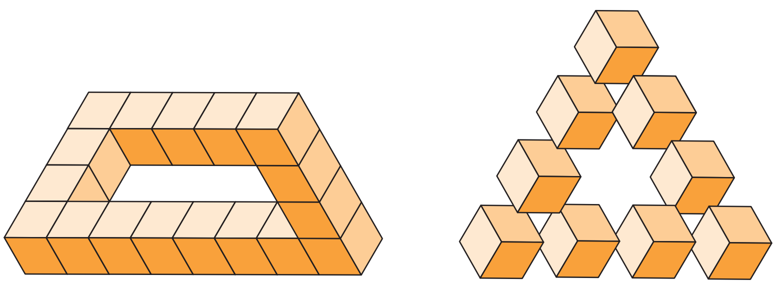
Make this cube picture with three six-turn rhombuses.



▶ *Show the students this representation of a cube and challenge them to make similar designs using six-turn rhombuses.*

Activity

1. Have the students make several six-turn rhombuses.
2. Ask them to explore how the shapes fit together and what designs can be produced. If students are unable to create a similar design, show them the cube. Some may want to make optical illusions like those shown below.



▲ *Challenge the students to make these intriguing optical illusions.*

8–10 10–12

Materials

- A7 *GEO Metric Paper* — several sheets in 3 different colors for each pair
- A4 *GEO Metric Paper* — 3 sheets in 3 different colors for demonstration model
- Tagboard or light card — 1 sheet for each pair
- Glue — for each pair
- Adhesive tape

Other activities on two-dimensional representations of three-dimensional objects can be found in *Faces and Frames*.

4. Working with Angles

Preparation

No preparation is required.

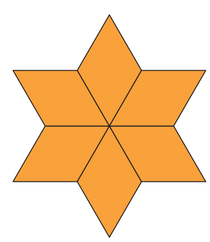
Activity

1. Have each pair of students make six-turn rhombuses from their six sheets of A5 paper. Challenge the students to create different tessellating designs using their six-turn rhombuses.
2. Have them use their results to figure out the size of each angle in the rhombus. The discussion will vary, but the students might say, *Six rhombuses fit together around a point to make a star, so the size of each of those angles is 360 divided by six. That's 60 degrees.* Ask, *How can we use what we now know to figure out the size of the other angles?* The students could use the cube from Activity 3 to calculate that 360 degrees divided by three is 120 degrees. Alternatively, they might say, *The two smaller angles total 120 degrees, so the two larger angles must total 240 degrees. This means they are 120 degrees each.* Encourage the students to share and justify their methods.

8–10 10–12

Materials

- A5 *GEO Metric Paper* — 6 sheets



▲ *Students can use this arrangement of rhombuses to help them calculate the interior angles.*