

CONSTRUCTING TASK: Line Symmetry

STANDARDS FOR MATHEMATICAL CONTENT

MCC.4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

In this task, students will develop an understanding of line symmetry and how it is related to transformations. Opportunities for exploring symmetry should be given to students. Teachers should also support good student dialogue and take advantage of comments and questions to help guide students into correct mathematical thinking.

Students should discuss how line symmetry makes a picture or shape look balanced. It is important for students to understand that each half of a figure is a mirror image of the other half. Students may demonstrate this understanding by folding a figure along the axis of symmetry to see if the figure lines back up with itself. Students may also use a transparent mirror by placing the beveled edge along the axis of symmetry to see if the figure lines back up with itself.

While students are exploring the symmetry of these various shapes, use questioning to guide their thinking when they mark a line of symmetry that is incorrect. For example, “How do you know that is a line of symmetry?” or “How can you prove that shape is symmetrical?” could be used to probe students to explain their work and correct any misconceptions.

ESSENTIAL QUESTIONS

- How do you determine lines of symmetry? What do they tell us?
- How is symmetry used in areas such as architecture and art? In what areas is symmetry important?

MATERIALS

- Mira or transparent mirrors
- scissors
- paper
- pattern blocks (optional)

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I.

- Provide students with a plain sheet of paper and a pair of scissors. Ask students to fold the sheet of paper in half and cut out a shape of their choosing along the fold. Next, ask students to open the paper. The fold line will be a line of symmetry.
- Ask students to discuss each half of their figure.
- Students may also use transparent mirrors or MIRAS to further explore line symmetry.
- Ask students to discuss each half of their figure.
- Use these discussions to allow your students to construct an understanding of line symmetry. Students should understand that half of the figure is a mirror image of the other half and together they re-create the original figure. If the figure is symmetrical, one side of the figure will fall on top of the other side of the figure. This demonstrates that one side of the figure is reflected onto the other side.
- Students should also explore figures that are asymmetrical.

Part II

- Provide students with the *Nature* handout.
- Ask students to respond to the following question:
 - *What characteristics does each object have that makes it look balanced or symmetrical?*
- Instruct students to draw all lines of symmetry on each figure.
- Have them cut out the shapes and fold along those lines of symmetry to prove their thinking.
- Ask students to discuss how they determined each line of symmetry and what it tells them.
- Ask students to respond to the following question:
 - *Where can you find other examples of symmetry in your environment?*

Part III

- Provide students with the *World Flags* handout.
- Ask students to respond to the following question:
 - *What characteristics does each flag have that makes it look balanced?*
- Instruct students to draw all lines of symmetry on each flag.
- Students benefit from folding each flag or using a Mira to determine a line of symmetry.
- Ask students to discuss how they determined each line of symmetry and what it tells them.

- Ask students to respond to the following question:
 - *Where can you find other examples of symmetry in other areas such as architecture or art?*

Part IV

- Provide students with the *Shapes* handout.
- Ask students to respond to the following question:
 - *What characteristics does each shape have that makes it look balanced?*
- Instruct students to draw all lines of symmetry on each shape.
- Ask students to discuss how they determined each line of symmetry and what it tells them.

FORMATIVE ASSESSMENT QUESTIONS

- How do you know that a figure has symmetry?
- How can you test a figure for symmetry?
- How can you be sure you've found all the lines of symmetry for a figure?

DIFFERENTIATION

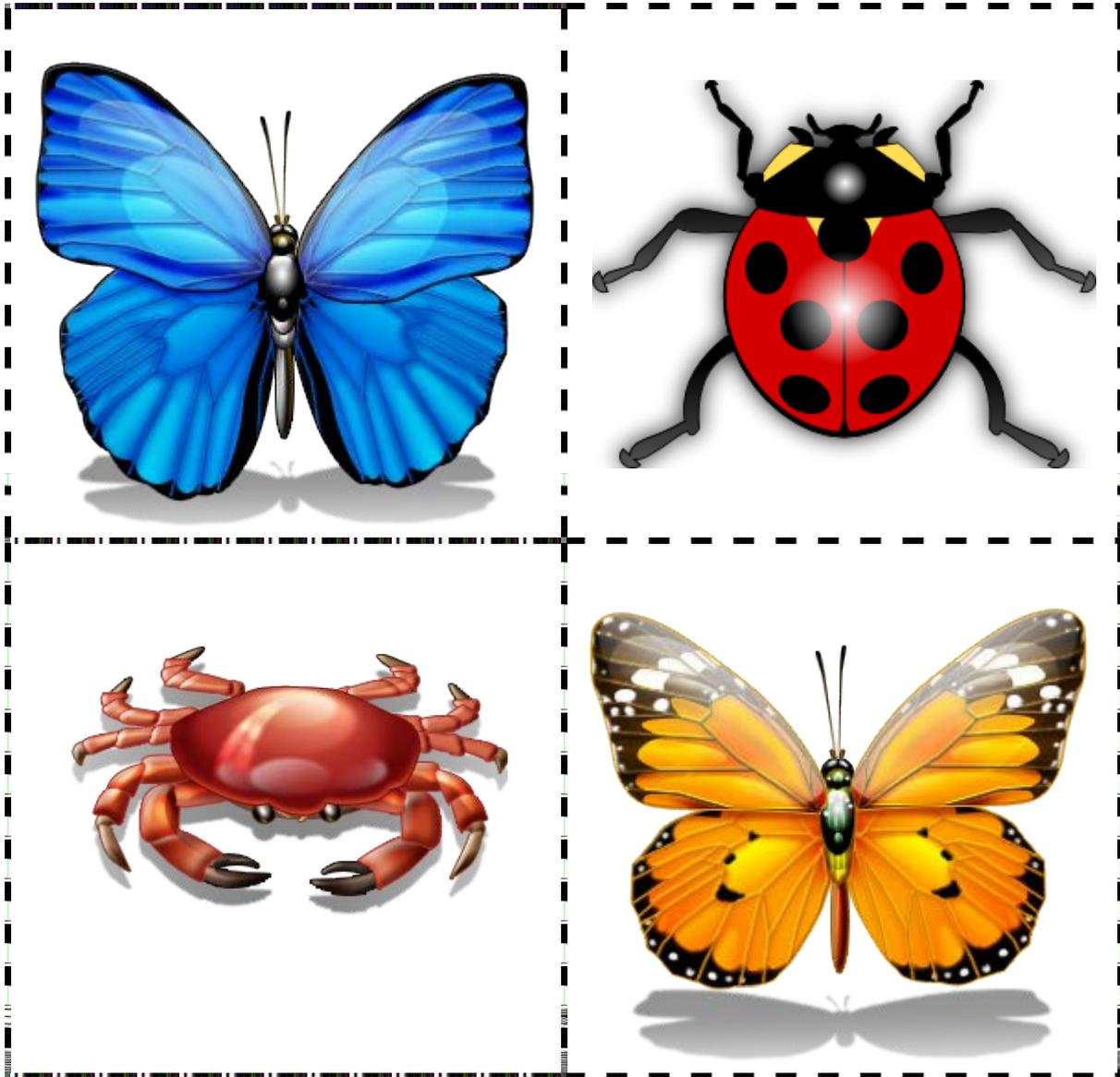
Extension

- Students may use Geometer's Sketchpad or the "draw tool" in word processing software or a "paint" program in order to draw quadrilaterals with a specified number of lines of symmetry. Students may work in pairs and then report to the whole class.

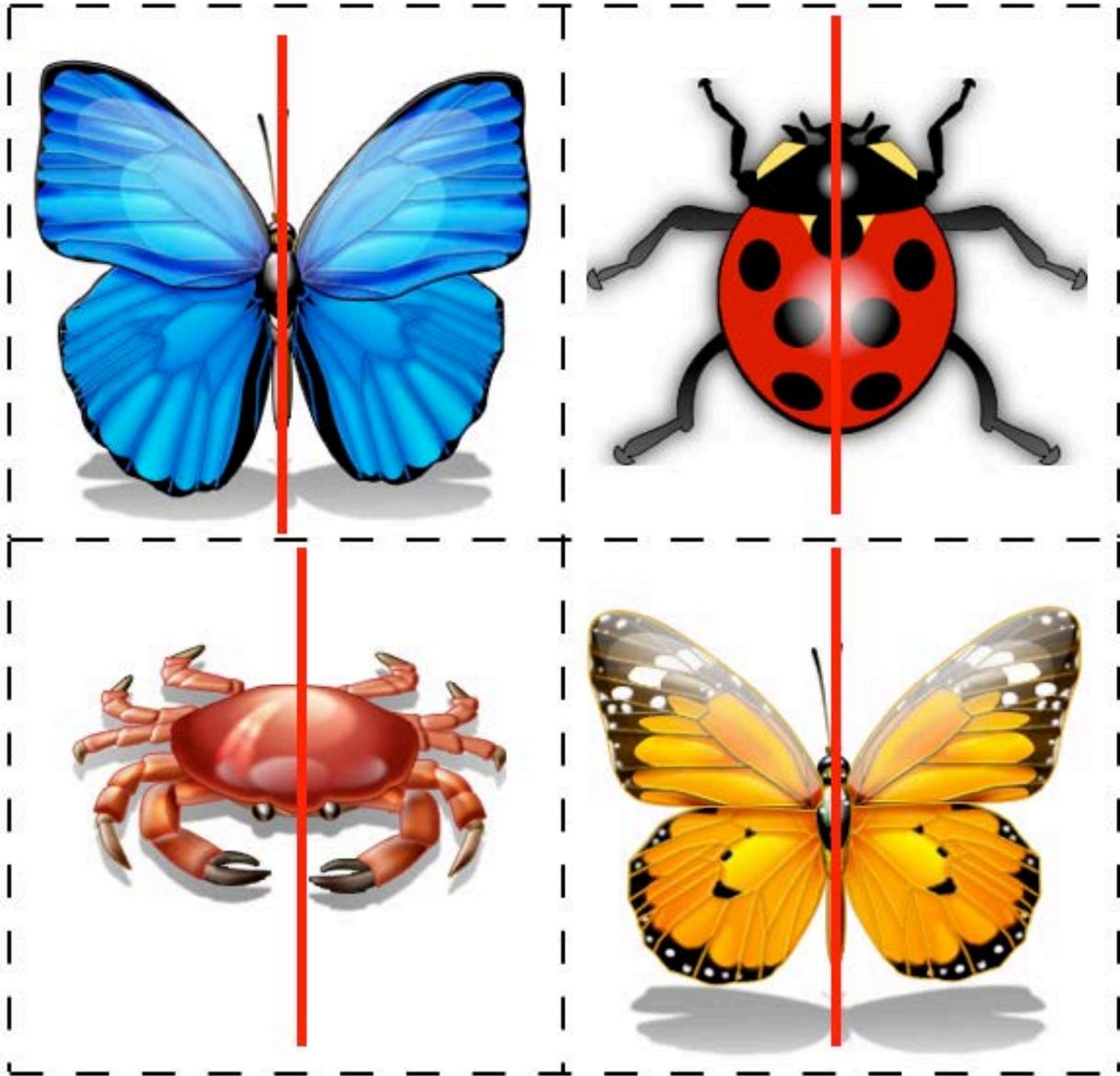
Intervention

- Give students paper pattern blocks to fold and have them draw lines of symmetry directly on the paper blocks.
- Ask students to draw the second half of a given symmetrical figure with only one line of symmetry.
- Ask students to draw the second half of a given symmetrical figure with two lines of symmetry.

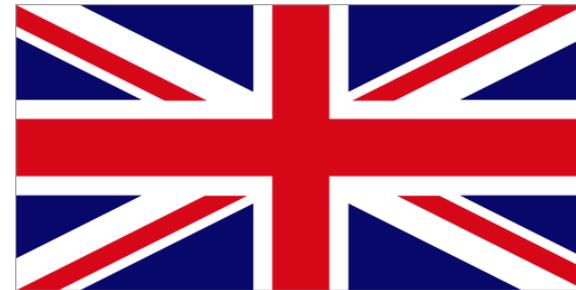
Nature



Key

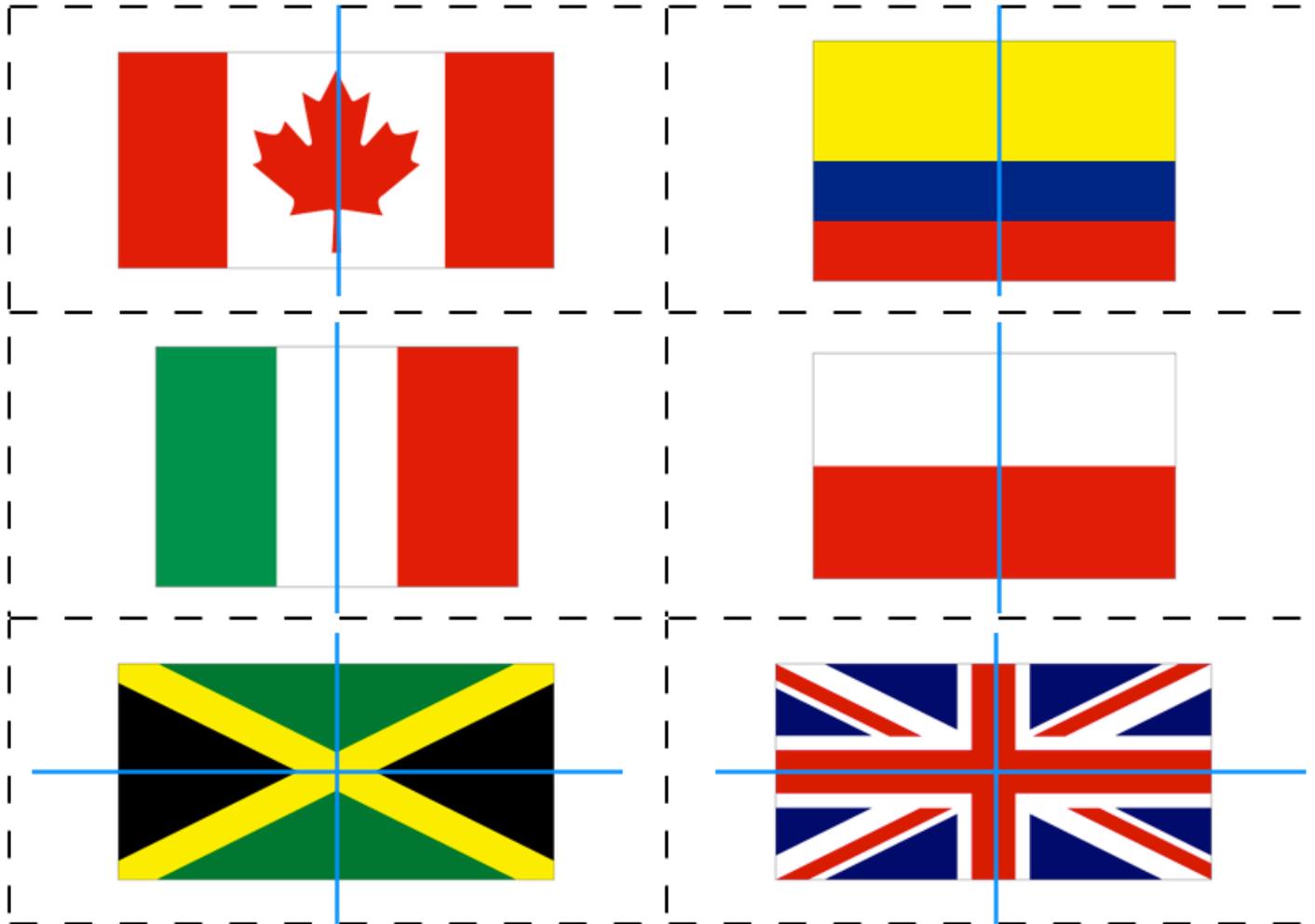


World Flags

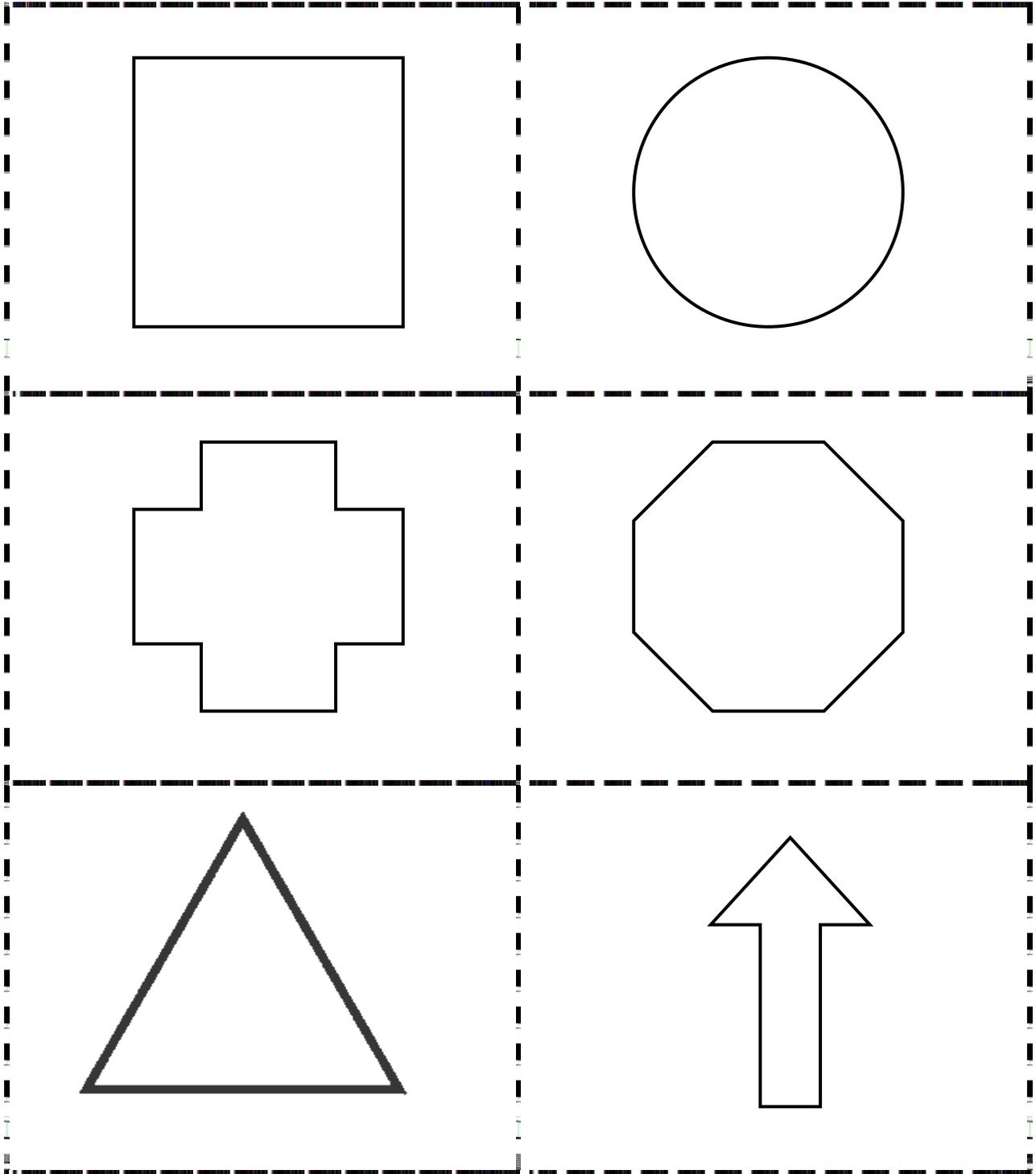


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Key



Shapes



Key

