



# GRADE 5 SUPPLEMENT

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## Set C2 Geometry: Transformations

### Includes

Activity 1: Sketching & Identifying Transformations	C2.1
Independent Worksheet 1: Transforming Figures, Part 1	C2.7
Independent Worksheet 2: Transforming Figures, Part 2	C2.9

### Skills & Concepts

- ★ predict and describe the results of translating, reflecting, and rotating two-dimensional shapes
- ★ describe a motion or a series of motions that will show that two shapes are congruent

**Bridges in Mathematics Grade 5 Supplement**

**Set C2** Geometry: Transformations

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*Bridges in Mathematics* is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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# Set C2 ★ Activity 1



## ACTIVITY

### Sketching & Identifying Transformations

#### Overview

Students sketch examples of translations (slides), rotations (turns), and reflections (flips) on a Quadrant 1 coordinate grid. Then they identify more examples of these transformations on Quadrant 1 coordinate grids.

#### Skills & Concepts

- ★ predict and describe the results of translating, reflecting, and rotating two-dimensional shapes
- ★ describe a motion or a series of motions that will show that two shapes are congruent

#### You'll need

- ★ Transforming Figures (page C2.4, run 1 copy on a transparency, plus a class set on paper)
- ★ Paper Figures (page C2.6, run a quarter-class set, cut into fourths)
- ★ Name that Transformation (page C2.5, run 1 copy on a transparency, plus a class set on paper)
- ★ 2 pieces of paper to mask parts of the transparencies
- ★ overhead pens
- ★ scissors

#### Instructions for Sketching & Identifying Transformations

1. Display the first grid on the Transforming Figures transparency, keeping the other three covered for now. Ask students to share what they notice about the grid and the figure on it. Most likely, they will comment on the two numbered axes and the properties of the trapezoid (e.g., one pair of equal sides, one pair of parallel sides, and so on). Some may also identify the coordinates of any or all of the vertices of the trapezoid.

Set C2 Geometry: Transformations Blackline Run a class set and 1 copy on a transparency

NAME \_\_\_\_\_ DATE \_\_\_\_\_

### Transforming Figures

Sketch the results of each transformation

**1** Translate this figure.

2. Now give each student a copy of the Transforming Figures sheet, along with a quarter sheet of Paper Figures. Ask them to sketch what would happen if they translated (slid) this trapezoid to another location on the same grid. Where would it end up? How would it be positioned? Invite them to cut out the trapezoid from the Paper Figures blackline if they need to physically carry out the translation before sketching it or if they need to trace the figure.

### Activity 1 Sketching & Identifying Transformations (cont.)

3. When they finished, ask them to compare their sketches with those of classmates sitting nearby. How are their sketches similar and how are they different? Students will probably find that they have translated the trapezoid in a variety of ways. After they have had a minute to talk, invite volunteers to sketch their trapezoids on the overhead and show with their finger or the closed tip of the overhead pen how the translation would occur. Suggest that if they identify the coordinates of the four vertices on the grid it may be easier for them to replicate their work at the overhead.

**Jorge** *I made another trapezoid kind of up and over diagonal from the first one, but it's kind of hard to show where it ended up.*

**Teacher** *Jorge, it might help if you look at your paper and see where the vertices of the trapezoid lie. For example, I notice on your paper that this vertex is at the point (6,7). Could you do the same thing with the other three vertices to position your trapezoid on the overhead? Then show us with an arrow how you translated or slid the trapezoid to its new position.*

**Jorge** *Oh, I see. Okay, the others are at (10,7), (9,9), and (7,9). See, this is how I moved it. I just made one slide, I mean translation, up diagonally.*

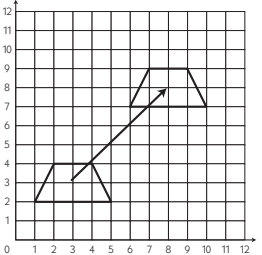
Set C2 Geometry: Transformations Blackline Run a class set and 1 copy on a transparency

NAME \_\_\_\_\_ DATE \_\_\_\_\_

### Transforming Figures

Sketch the results of each transformation

**1** Translate this figure.



4. As volunteers share their work at the overhead, be sure students understand that they can slide the trapezoid horizontally, vertically, or diagonally, but they can't turn or twist it in any way when they make a translation. One way to confirm this is to check that each vertex has moved the same distance in the same direction. In the example above, for instance, the vertex at (1,2) has moved to (6,7), while the vertex at (2,4) has moved to (7,9). In fact, all 4 vertices have moved over 5 and up 5.

5. Repeat this process with the other three grids on the transparency. Three examples of each transformation are shown below; in these examples, the original figure is gray, and the transformed figures are shown in white.

## Activity 1 Sketching &amp; Identifying Transformations (cont.)

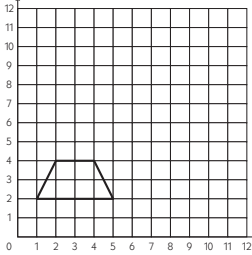
Set C2 Geometry: Transformations Blackline Run a class set and 1 copy on a transparency

NAME \_\_\_\_\_ DATE \_\_\_\_\_

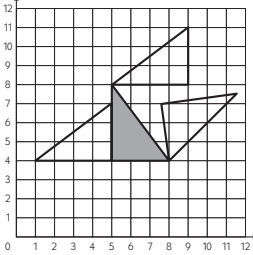
### Transforming Figures

Sketch the results of each transformation on the grids below.

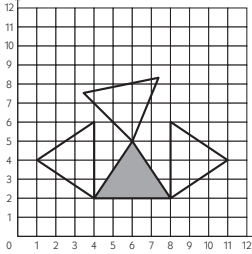
**1** Translate this figure.



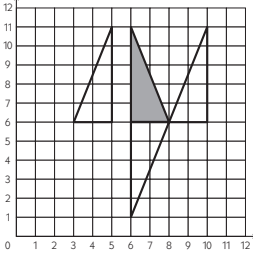
**2** Rotate this figure.



**3** Rotate this figure.



**4** Reflect this figure.



6. Next, display the Name that Transformation transparency and give each student his or her own copy as well. Now that they have sketched three different kinds of transformations, they are going to identify which transformation has been performed on the gray figure to get to the white figure on each grid. Do the first one together as a class.

7. Give students all but the last 5 or 10 minutes of the period to complete the page. Take the last 5 or 10 minutes to review and discuss the answers as needed.

### Extensions

- Have students label the vertices of each figure on both blacklines with their x- and y-coordinates.
- Make additional copies of the Transforming Figures sheet and ask students to show two or more different solutions for each transformation. Challenge them to translate along diagonals, rotate using different vertices as points of rotation, and to reflect so that the resulting figure does not share any sides or vertices with the original.



### INDEPENDENT WORKSHEET

See Set C2 Independent Worksheets 1 and 2 for more practice sketching the results of transformations on Quadrant 1 coordinate grids and identifying the transformation that generates one figure from another.

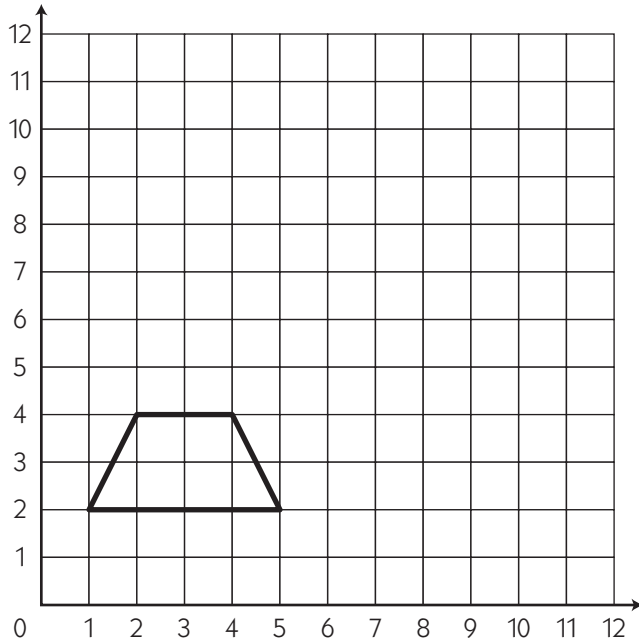
NAME \_\_\_\_\_

DATE \_\_\_\_\_

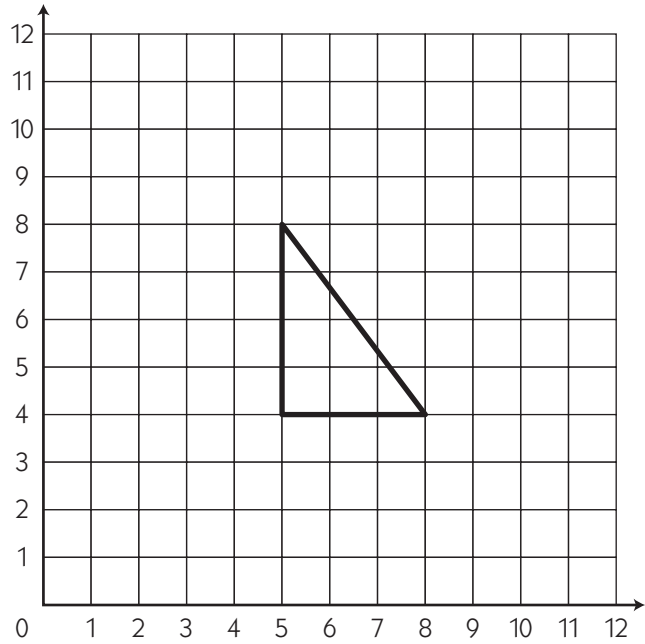
# Transforming Figures

Sketch the results of each transformation on the grids below.

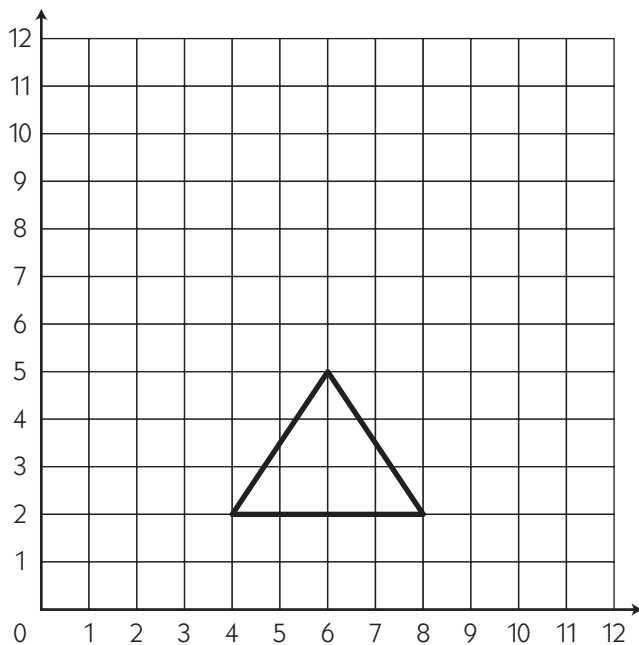
**1** Translate this figure.



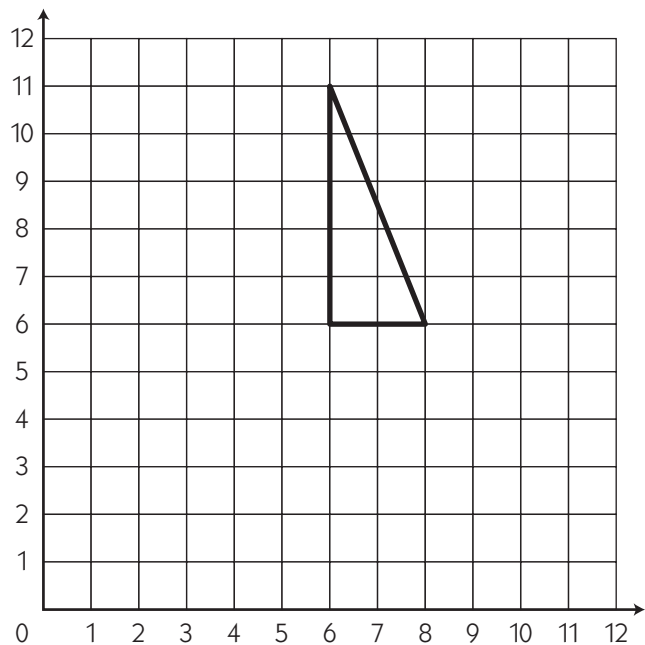
**2** Rotate this figure.



**3** Rotate this figure.



**4** Reflect this figure.



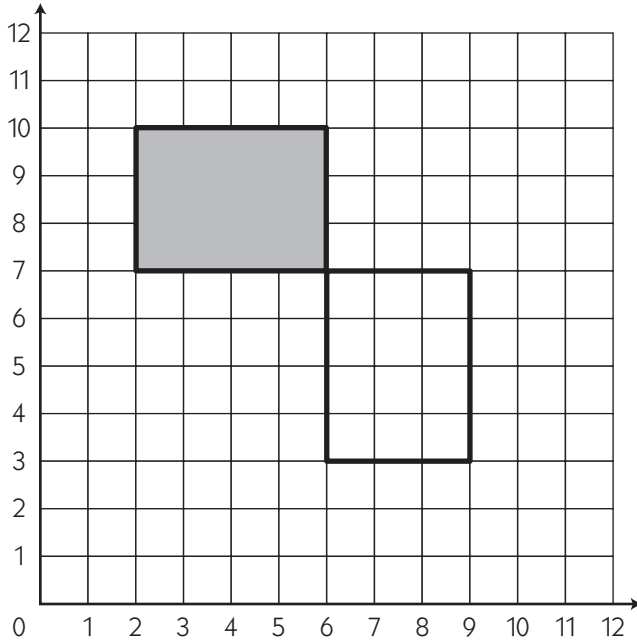
NAME \_\_\_\_\_

DATE \_\_\_\_\_

# Name that Transformation

For each pair of figures below, select the transformation that takes the gray figure to the white figure.

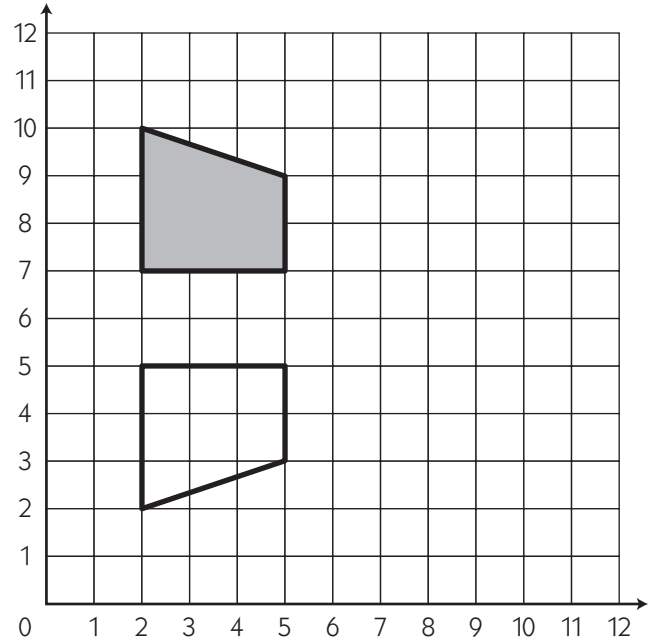
**1**



translation      rotation      reflection



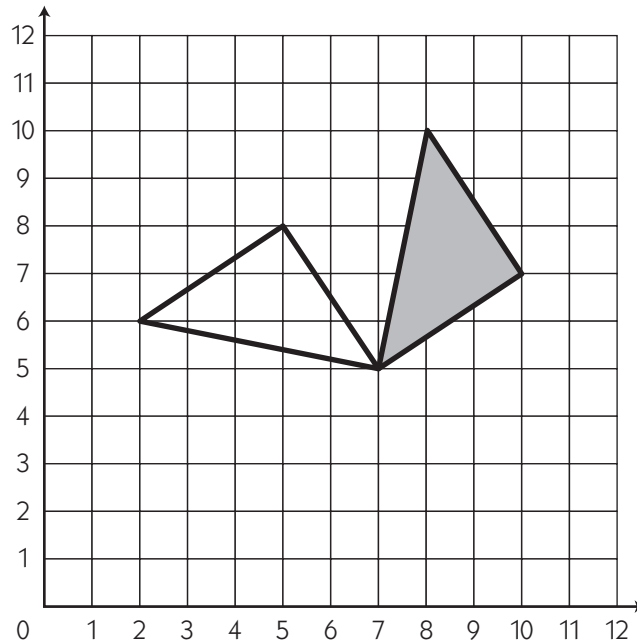

**2**



translation      rotation      reflection



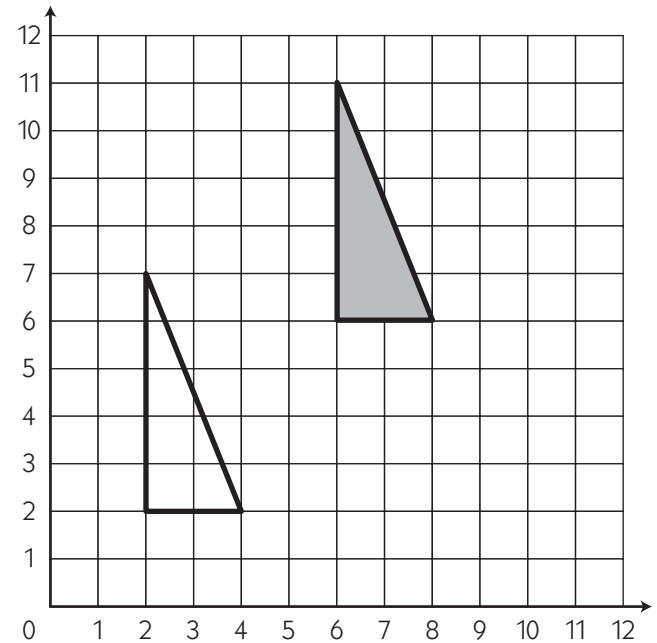

**3**



translation      rotation      reflection




**4**

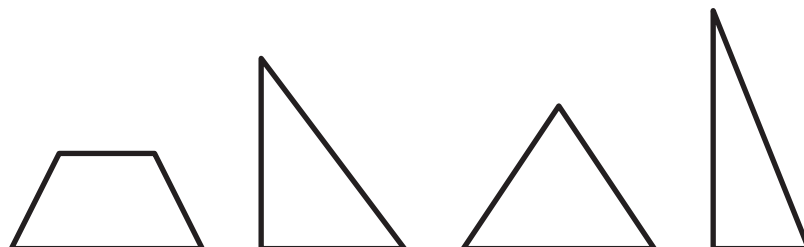


translation      rotation      reflection

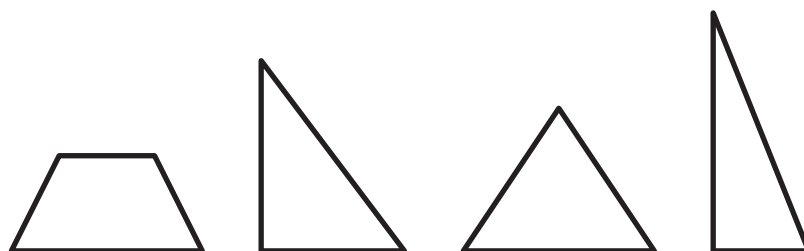
## Paper Figures

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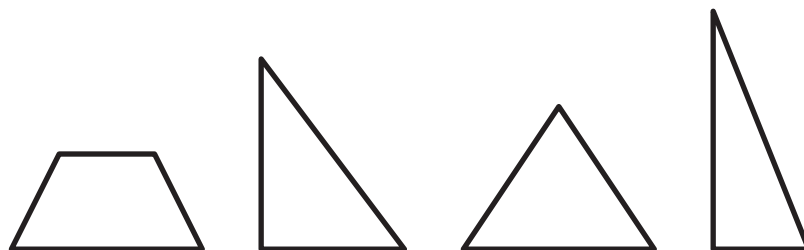
Cut out these shapes to help complete the transformations or to trace them on the grids.



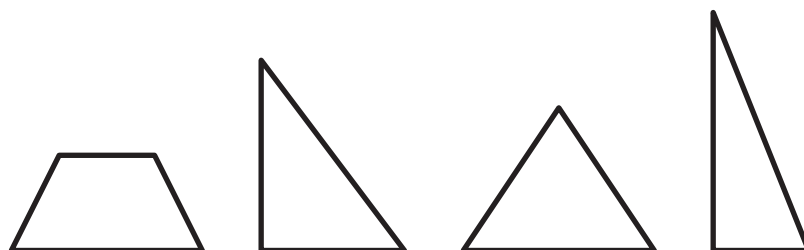
Cut out these shapes to help complete the transformations or to trace them on the grids.



Cut out these shapes to help complete the transformations or to trace them on the grids.



Cut out these shapes to help complete the transformations or to trace them on the grids.





NAME \_\_\_\_\_

DATE \_\_\_\_\_

# Set C2 ★ Independent Worksheet 1

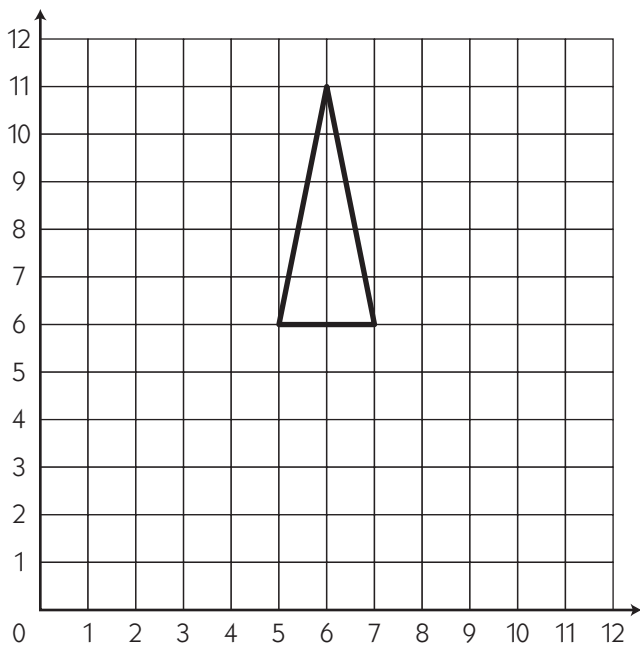


## INDEPENDENT WORKSHEET

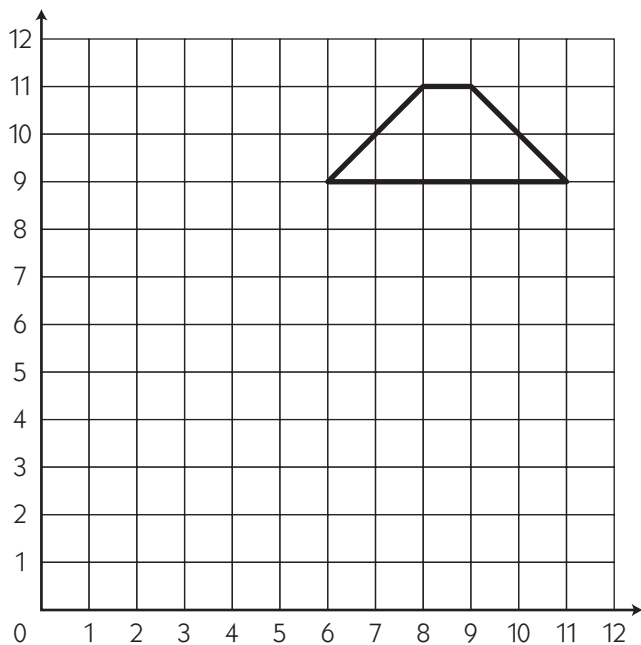
### Transforming Figures, Part 1

Sketch the results of each transformation on the grids below.

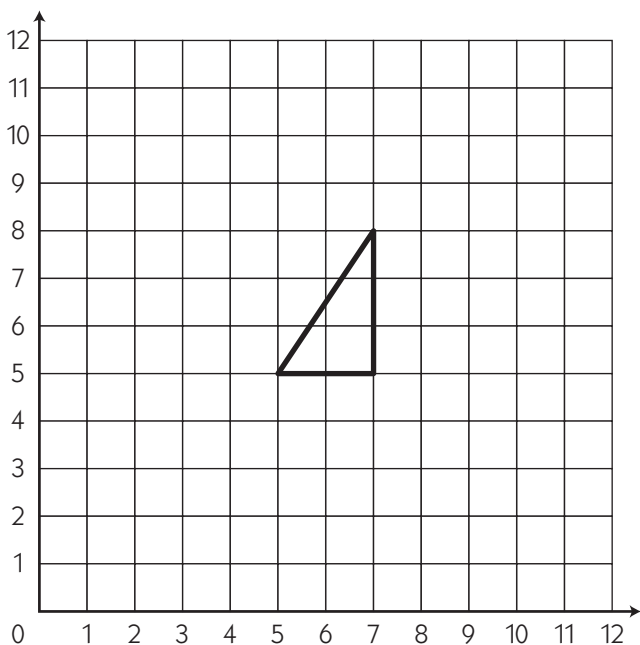
**1** Reflect this figure.



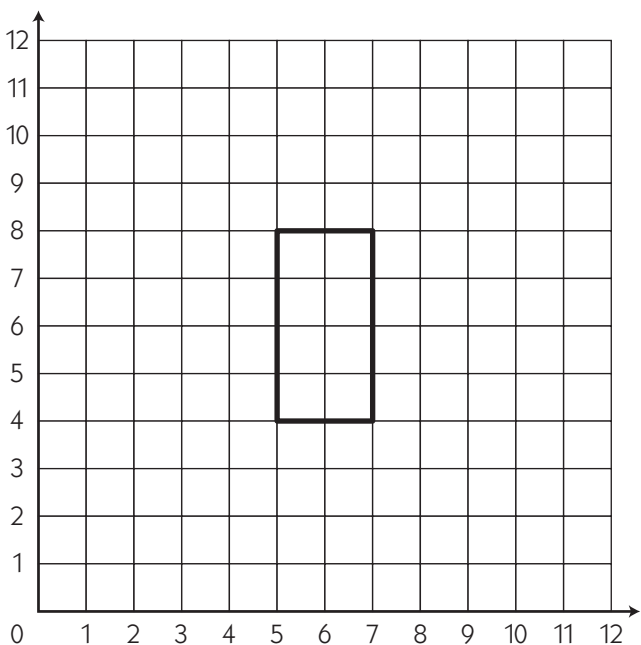
**2** Translate this figure.



**3** Rotate this figure.



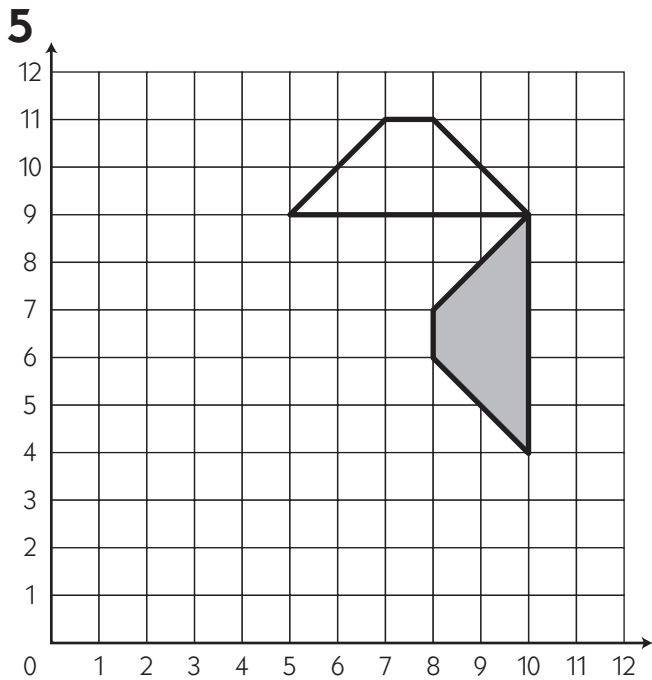
**4** Rotate this figure.



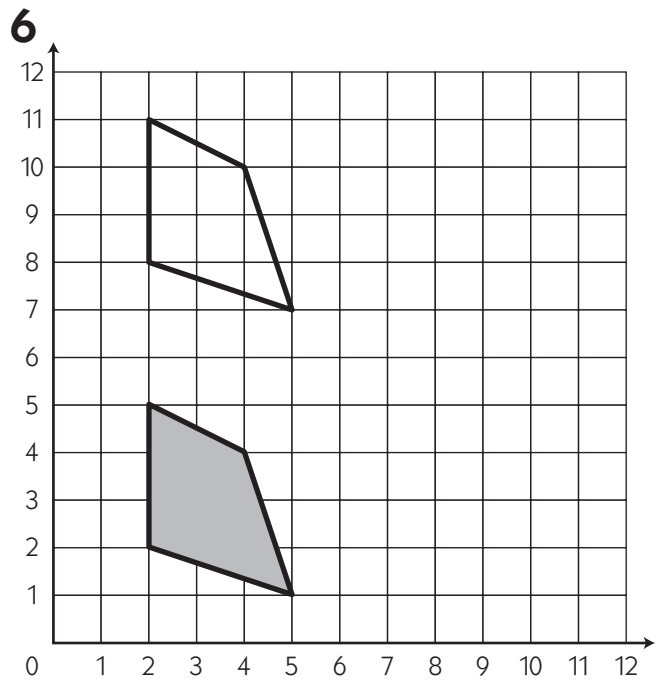
(Continued on back.)

**Independent Worksheet 1** Transforming Figures, part 1 (cont.)

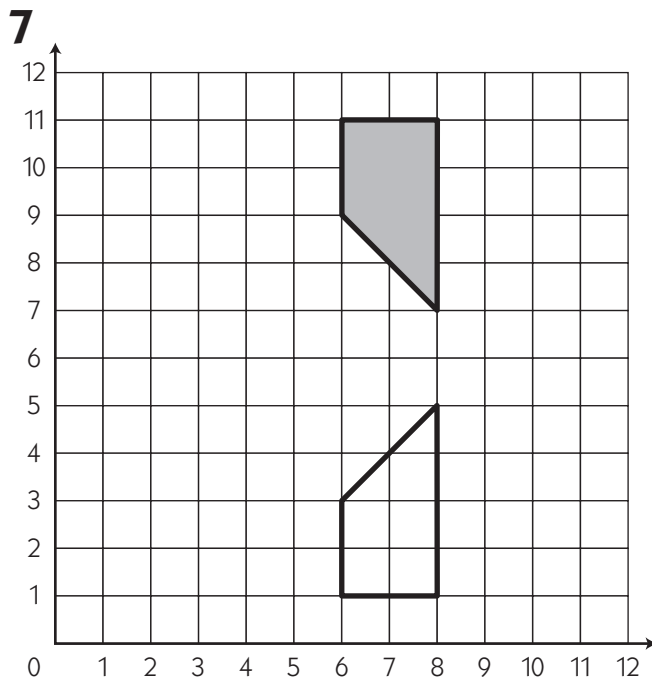
For each pair of figures below, select the transformation that takes the gray figure to the white figure.



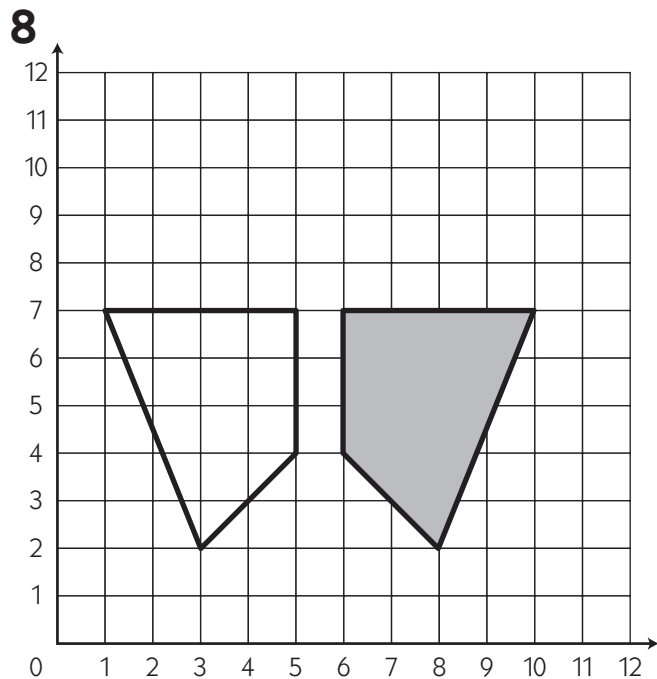
translation      rotation      reflection  
                                           



translation      rotation      reflection  
                                           



translation      rotation      reflection  
                                           



translation      rotation      reflection

NAME \_\_\_\_\_

DATE \_\_\_\_\_

# Set C2 ★ Independent Worksheet 2

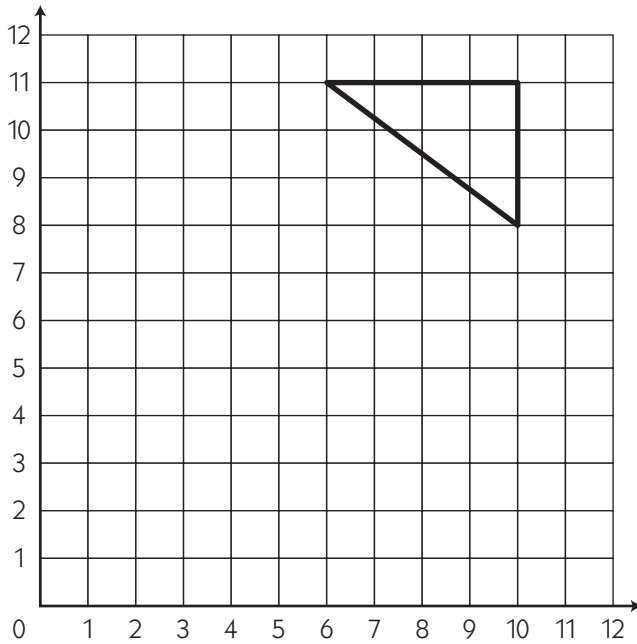


## INDEPENDENT WORKSHEET

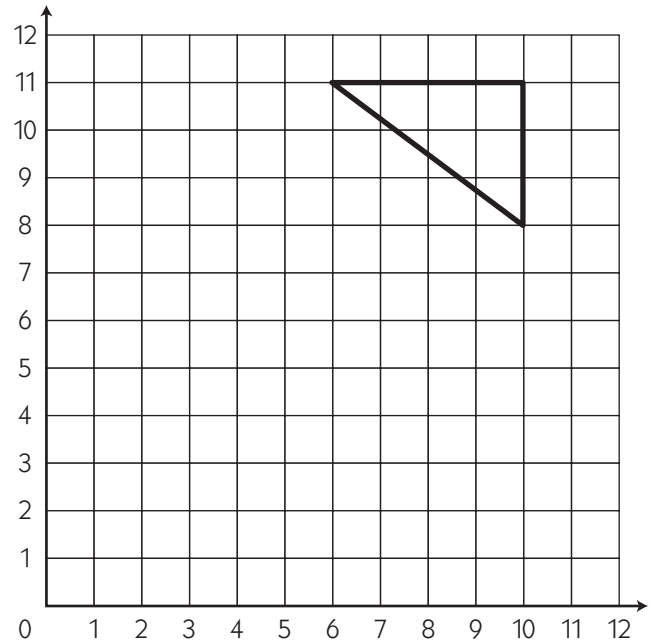
### Transforming Figures, Part 2

Sketch the results of each transformation on the grids below.

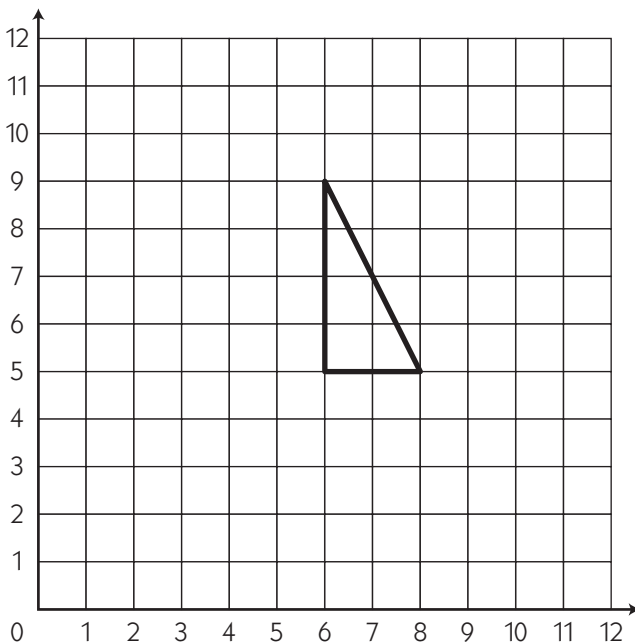
**1** Reflect this figure.



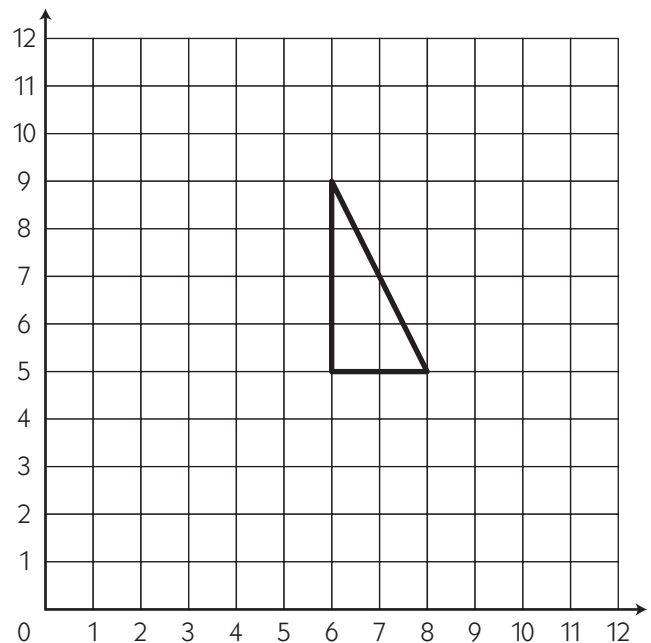
**2** Reflect this figure in a different way.



**3** Rotate this figure.



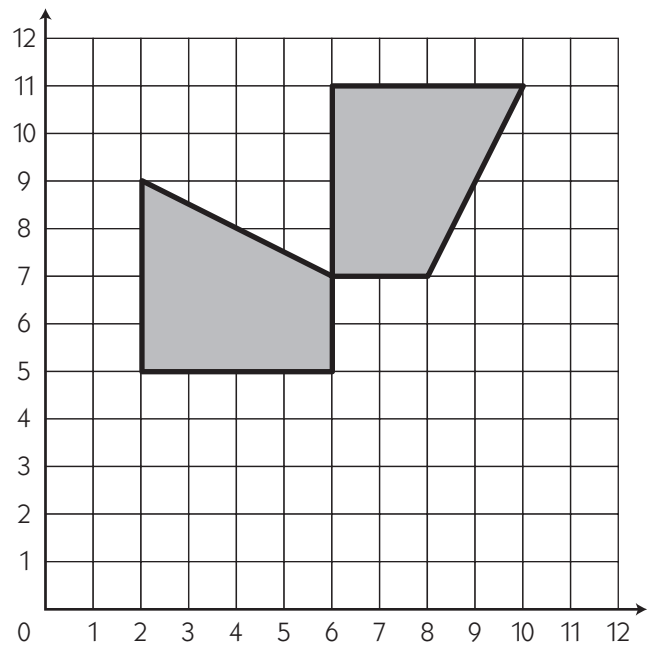
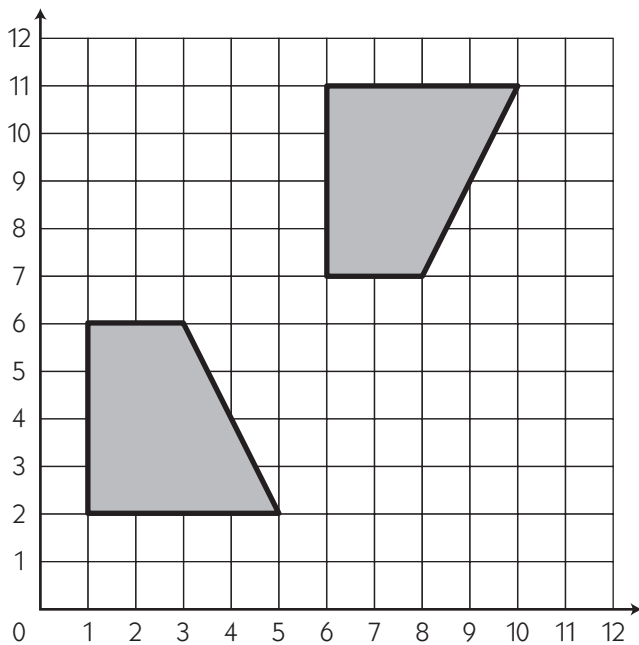
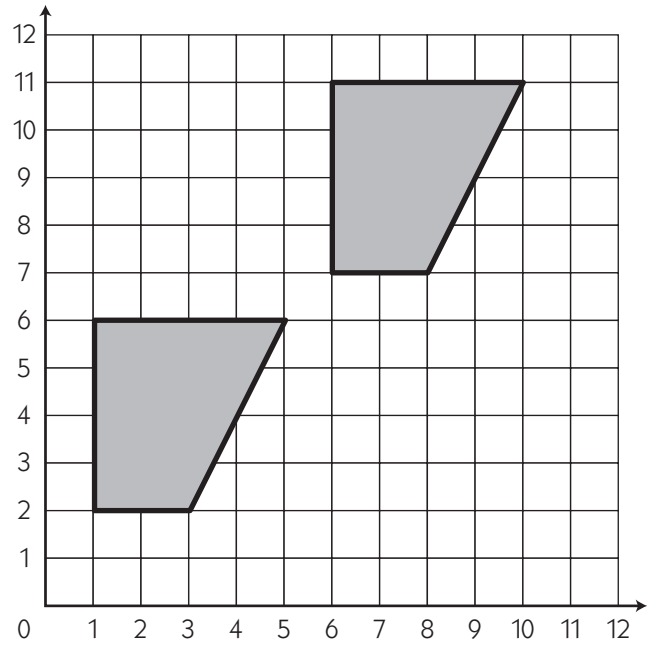
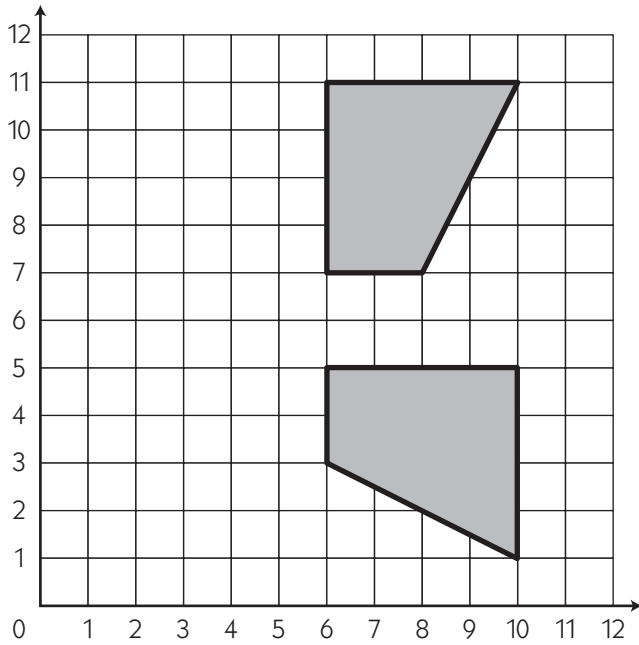
**4** Translate this figure.



(Continued on back.)

**Independent Worksheet 2** Transforming Figures, Part 2 (cont.)

**5** Circle the grid that shows only a translation. Label each of the other grids with the transformation(s) needed to move the figure from one location to another.



(Continued on next page.)

**Independent Worksheet 2** Transforming Figures, Part 2 (cont.)

**6** Circle the grid that shows only a reflection. Label each of the other grids with the transformation(s) needed to move the figure from one location to another.

