

# Pattern Motion Lab

Track how designs slide, flip, turn, and grow.

**GRADE 8 • 8.MG.3.g**

**8.MG.3.g** "Identify and describe transformations in context (e.g., tiling, fabric, wallpaper designs, art)."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## TRANSFORMATION CLUES

A transformation changes a figure's position, direction, or size by following a rule. A translation adds the same change to every coordinate, a reflection flips a figure across a line, a rotation turns it around a center, and a dilation multiplies distances from a center.

## WORKED EXAMPLE

A tile design has vertices  $T(20,31)$ ,  $U(24,31)$ , and  $V(20,36)$ . It is translated 13 units right and 17 units down. Find the image of each vertex.

1. Write the rule:  $(x, y) \rightarrow (x + 13, y - 17)$ .
2. Apply the rule to T:  $(20,31) \rightarrow (33,14)$ .
3. Apply the rule to U:  $(24,31) \rightarrow (37,14)$ .
4. Apply the rule to V:  $(20,36) \rightarrow (33,19)$ .

**Answer:  $T'(33,14)$ ,  $U'(37,14)$ ,  $V'(33,19)$**

## PRACTICE 6 problems

- 1** A sticker pattern has points  $P(1,4)$  and  $Q(3,4)$ . The new points are  $P'(6,2)$  and  $Q'(8,2)$ . Name and describe the transformation.

**ANSWER** \_\_\_\_\_

- 2** A wallpaper motif has vertices  $R(2,1)$ ,  $S(4,1)$ , and  $T(2,3)$ . Its image has vertices  $R'(-2,1)$ ,  $S'(-4,1)$ , and  $T'(-2,3)$ . Name the transformation.

**ANSWER** \_\_\_\_\_

- 3** A game icon has vertices  $A(1,2)$ ,  $B(3,2)$ , and  $C(1,5)$ . Its image has vertices  $A'(-2,1)$ ,  $B'(-2,3)$ , and  $C'(-5,1)$ . Name the transformation.

**ANSWER** \_\_\_\_\_

- 4** A fabric tile has vertices  $M(2,3)$ ,  $N(4,3)$ , and  $O(2,6)$ . Its image has vertices  $M'(3,-2)$ ,  $N'(3,-4)$ , and  $O'(6,-2)$ . Name the transformation.

**ANSWER** \_\_\_\_\_

- 5** A mural shape has vertices  $X(2,-1)$ ,  $Y(4,-1)$ , and  $Z(2,-3)$ . Its image has vertices  $X'(4,-2)$ ,  $Y'(8,-2)$ , and  $Z'(4,-6)$ . Name and describe the transformation.

**ANSWER** \_\_\_\_\_

- 6** A logo has vertices  $K(-1,3)$ ,  $L(2,3)$ , and  $M(-1,5)$ . Its image has vertices  $K'(-1,-3)$ ,  $L'(2,-3)$ , and  $M'(-1,-5)$ . Name the transformation.

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** For a hoodie graphic, a designer maps triangle  $A(-3,2)$ ,  $B(-1,2)$ ,  $C(-3,4)$  to  $A'(2,3)$ ,  $B'(2,1)$ ,  $C'(4,3)$ . What transformation did the designer use?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** A digital poster enlarges a music-note pattern by a dilation centered at the origin. Point  $D(2,-2)$  maps to  $D'(6,-6)$ . What is the scale factor, and where does  $E(1,3)$  map?

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A tessellation tile has vertices  $P(-2,1)$ ,  $Q(-1,3)$ , and  $R(-3,2)$ . First, translate the tile 4 units right. Then reflect the result across the  $y$ -axis. Find the final coordinates. Explain why the two transformations are equivalent to one reflection across a different vertical line.

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## PART 1 • PRACTICE

| # | PROBLEM                                                                                                                                                  | ANSWER                                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1 | A sticker pattern has points P(1,4) and Q(3,4). The new points are P'(6,2) and Q'(8,2). Name and describe the transformation.                            | <b>Translation 5 units right and 2 units down.</b>          |
| 2 | A wallpaper motif has vertices R(2,1), S(4,1), and T(2,3). Its image has vertices R'(-2,1), S'(-4,1), and T'(-2,3). Name the transformation.             | <b>Reflection across the y-axis.</b>                        |
| 3 | A game icon has vertices A(1,2), B(3,2), and C(1,5). Its image has vertices A'(-2,1), B'(-2,3), and C'(-5,1). Name the transformation.                   | <b>90° counterclockwise rotation about the origin.</b>      |
| 4 | A fabric tile has vertices M(2,3), N(4,3), and O(2,6). Its image has vertices M'(3,-2), N'(3,-4), and O'(6,-2). Name the transformation.                 | <b>90° clockwise rotation about the origin.</b>             |
| 5 | A mural shape has vertices X(2,-1), Y(4,-1), and Z(2,-3). Its image has vertices X'(4,-2), Y'(8,-2), and Z'(4,-6). Name and describe the transformation. | <b>Dilation with scale factor 2 centered at the origin.</b> |
| 6 | A logo has vertices K(-1,3), L(2,3), and M(-1,5). Its image has vertices K'(-1,-3), L'(2,-3), and M'(-1,-5). Name the transformation.                    | <b>Reflection across the x-axis.</b>                        |

## PART 2 • APPLY IT

- 90° clockwise rotation about the origin.** Use the clockwise rule  $(x, y) \rightarrow (y, -x)$ . Each original vertex maps to its matching image vertex.
- Scale factor 3; E'(3,9).** Each coordinate of D is multiplied by 3, so the dilation has scale factor 3. Multiply both coordinates of E by 3.

## CHALLENGE

**P'(-2,1), Q'(-3,3), R'(-1,2).** The combined rule is  $(x, y) \rightarrow (-x - 4, y)$ , which is a reflection across  $x = -2$  because each original x-coordinate and image x-coordinate are equally far from -2.

Accept equivalent wording such as "slide right 5 and down 2" for translations. For rotations and reflections, require the direction and center or line of reflection when asked.