

# Lesson 1-7

Objective - To describe and interpret translations and reflections in the coordinate plane.

Types of Rigid Motion

Translation: A right triangle is moved to the right, indicated by a red arrow.

Rotation: A right triangle is rotated clockwise, indicated by a red curved arrow.

Reflection: A right triangle is reflected across a vertical dashed red line.

Rotations

The triangle below is rotated clockwise  $90^\circ$  around the origin. Give the coordinates of the image.

Image Coordinates

$C'(1, 5)$   
 $D'(4, 2)$   
 $E'(2, 0)$

Translations

The triangle below is translated 5 units right and 4 units down. Describe the translation below using coordinate notation.

Coordinate Notation

$C(-5, 1) \rightarrow C'(0, -3)$   
 $D(-2, 4) \rightarrow D'(3, 0)$   
 $E(0, 2) \rightarrow E'(5, -2)$   
 $(x, y) \rightarrow (x + 5, y - 4)$

$\triangle C'D'E'$  is the image of  $\triangle CDE$ .

Use coordinate notation to describe the translations below.

1)  $(x, y) \rightarrow (x - 6, y - 4)$

2)  $(x, y) \rightarrow (x + 7, y - 2)$

Draw the image of Rectangle ABCD under the translation  $(x, y) \rightarrow (x - 4, y + 3)$ . Find the coordinates of the image.

Coordinate Notation

$(x, y) \rightarrow (x - 4, y + 3)$

$A(2, -1) \rightarrow A'(-2, 2)$   
 $B(4, -1) \rightarrow B'(0, 2)$   
 $C(4, -4) \rightarrow C'(0, -1)$   
 $D(2, -4) \rightarrow D'(-2, -1)$

Change each description of rigid motion to coordinate notation.

- Move 6 units right, and 3 units down.  
 $(x, y) \rightarrow (x + 6, y - 3)$
- Move 2 units up, and 5 units left.  
 $(x, y) \rightarrow (x - 5, y + 2)$
- Move 2 units right.  
 $(x, y) \rightarrow (x + 2, y)$
- Move 1 unit left, and move 3 units down.  
 $(x, y) \rightarrow (x - 1, y - 3)$

# Lesson 1-7

Reflections

Reflect  $\triangle ABC$  over the y-axis.

Coordinate Notation

$(x, y) \rightarrow (-x, y)$

$A(-5, 4) \rightarrow A'(5, 4)$   
 $B(-5, 1) \rightarrow B'(5, 1)$   
 $C(-1, 1) \rightarrow C'(1, 1)$

$\triangle A'B'C'$  is the image of  $\triangle ABC$ .

Reflection over y-axis

$(x, y) \rightarrow (-x, y)$

Reflection over x-axis

$(x, y) \rightarrow (x, -y)$

Reflect  $\overline{MN}$  over the y-axis to produce the image  $\overline{M'N'}$ , then reflect  $\overline{M'N'}$  over the x-axis to obtain  $\overline{M''N''}$ .

Give the coordinates of the image if the given point is reflected over the given line of reflection.

1)  $A(5, -3)$ ; x-axis      3)  $T(-9, 11)$ ; y-axis  
 $(x, y) \rightarrow (x, -y)$        $(x, y) \rightarrow (-x, y)$   
 $A(5, -3) \rightarrow A'(5, 3)$        $T(-9, 11) \rightarrow T'(9, 11)$

2)  $H(-3, -7)$ ; y-axis      4)  $R(-3, 8)$ ; x-axis  
 $(x, y) \rightarrow (-x, y)$        $(x, y) \rightarrow (x, -y)$   
 $H(-3, -7) \rightarrow H'(3, -7)$        $R(-3, 8) \rightarrow R'(-3, -8)$

Draw the image of Quadrilateral ABCD if it follows the given reflection.

1)  $(x, y) \rightarrow (x, -y)$       2)  $(x, y) \rightarrow (-x, y)$

Points  $L(-3, 2)$ ,  $M(3, 1)$ , and  $N(-2, -2)$  are the vertices of a triangle. If  $\triangle LMN$  is reflected over the x-axis, what are the coordinates of its image?

Coordinate Notation

$(x, y) \rightarrow (x, -y)$

$L(-3, 2) \rightarrow L'(-3, -2)$   
 $M(3, 1) \rightarrow M'(3, -1)$   
 $N(-2, -2) \rightarrow N'(-2, 2)$