Dear Parents

In this unit students will take a closer look at translations, rotations, and reflections on the coordinate plane. Students will develop a better understanding of transformations by using a variety of tools.

Concepts Students will Use & Understand

- Know precise definitions of geometric figures
- Represent transformations in the plane and describe as functions
- Describe the rotations/reflections given a rectangle, parallelogram, trapezoid or regular polygon that carry it onto itself
- Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments
- Given a geometric figure and a rotation, reflection or translation, draw the transformed figure - specify a sequence of transformations that will carry a given figure onto another.

Vocabulary

- **Angle**: A figure created by two distinct rays that share a common endpoint (also known as a vertex). \( \angle ABC \) or \( \angle B \) or \( \angle CBA \) indicate the same angle with vertex B.
- **Angle of Rotation**: The amount of rotation (in degrees) of a figure about a fixed point such as the origin.
- **Bisector**: A point, line or line segment that divides a segment or angle into two equal parts.
- **Circle**: The set of all points equidistant from a point in a plane.
- **Congruent**: Having the same size, shape and measure. \( \angle A \cong \angle B \) indicates that angle A is congruent to angle B.
- **Corresponding angles**: Angles that have the same relative position in geometric figures.
- **Corresponding sides**: Sides that have the same relative position in geometric figures.
- **Endpoint**: The point at each end of a line segment or at the beginning of a ray.
- **Image**: The result of a transformation.
- **Intersection**: The point at which two or more lines intersect or cross.
- **Isometry**: A distance preserving map of a geometric figure to another location using a reflection, rotation or translation. \( M \rightarrow M' \) indicates an isometry of the figure M to a new location M’. M and M’ remain congruent.
- **Line**: One of the undefined terms of geometry that represents an infinite set of points with no thickness and its length continues in two opposite directions indefinitely. \( \overline{AB} \) indicates a line that passes through points A and B.
- **Line segment**: A part of a line between two points on the line. \( \overline{AB} \) indicates the line segment between points A and B.
- **Parallel lines**: Two lines are parallel if they lie in the same plane and do not intersect. \( \overline{AB} \parallel \overline{CD} \) indicates that line AB is parallel to line CD.
- **Perpendicular lines**: Two lines are perpendicular if they intersect to form right angles. \( \overline{AB} \perp \overline{CD} \) indicates that line AB is perpendicular to line CD.
- **Point**: One of the basic undefined terms of geometry that represents a location. A dot is used to symbolize it and it is thought of as having no length, width or thickness.
- **Pre-image**: A figure before a transformation has taken place.
- **Ray**: A part of a line that begins at a point and continues forever in one direction. \( \overrightarrow{AB} \) indicates a ray that begins at point A and continues in the direction of point B indefinitely.
- **Reflection**: A transformation of a figure that creates a mirror image, “flips,” over a line.
• Reflection Line (or line of reflection): A line that acts as a mirror so that corresponding points are the same distance from the mirror.

• Rotation: A transformation that turns a figure about a fixed point through a given angle and a given direction, such as 90° clockwise.

• Segment: See line segment.

• Transformation: The mapping, or movement, of all points of a figure in a plane according to a common operation, such as translation, reflection or rotation.

• Translation: A transformation that slides each point of a figure the same distance in the same direction.

• Vertex: The location at which two lines, line segments or rays intersect.


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**Example 1**

**Skill-based Task**
Which of the following preserves distance and which does not?

\((x, y) \rightarrow (x + 1, y + 2)\)

\((x, y) \rightarrow (x^2, y + 1)\)

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**Example 2**
Translation \((x, y) \rightarrow (x + 4, y – 2)\). Rotation 180° about the origin. Reflection about the line \(y = -x\).

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**Example 3**
Identify the coordinates of point \((-7, -6)\) under the rotation of 90º clockwise about the origin?

- a. \((7, 6)\)
- b. \((6, -7)\)
- c. \((-6, 7)\)
- d. \((-7, 6)\)

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**Key**

**Example 1**
The first one preserves distance since it is a translation with adding and subtracting. The second one has a quadratic applied, so the distance is not constant.

**Example 2**
Black to blue to yellow to red.

**Example 3**
C