**Unit Title: "Kaleidoscopes, Hubcaps, and Mirrors"**

**Course: Middle School Mathematics**

**Subject Area: Mathematics**

**Time Frame: 20 days**

**Standards**

| **Middles School Mathematics Standards** | **Sunshine State Standards Benchmarks** | **NCEE New Standards** |
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| The student will:<br><br>20.1 Recognize and describe symmetries of figures.<br>20.2 Use technology to examine symmetries and transformations.<br>20.3 Create figures with specified symmetries.<br>20.4 Perform transformations of figures, including reflections, translations, and rotations.<br>20.5 Give precise directions in mathematics for performing reflections, rotations, and translations.<br>20.6 Write coordinate rules for specifying the image of a general point under particular transformations.<br>20.7 Find single transformations that will produce the same result as a combination of transformations.<br>20.8 Use transformation to describe motions, patterns, and designs in the real world. | MA.C.2.3.1<br>The student visualizes and illustrates ways in which shapes can be combined, subdivided, and changed.<br><br>*Expectations*<br>The student:<br>• Uses the properties of parallelism, perpendicularity, and symmetry in solving real-world problems.<br>• Identifies congruent and similar figures in real-world situations and justifies the identification.<br>• Identifies and performs the various transformations (reflection, translation, rotation, dilation) of a given figure on a coordinate plane. | The student:<br><br>M2b Identifies similar and congruent shapes and uses transformations in the coordinate plane, i.e., translations, rotations, and reflections.<br>M2d Determines and understands length, area, and volume, including perimeter and surface area; uses units, square units, and cubic units of measure correctly; computes areas of rectangles, triangles, and circles; computes volumes of prisms. |

**Desired Results**

| Enduring Understanding | Essential Questions | Knowledge and Skills |
|---|---|---|
| Students will understand<br><br>• Symmetry is commonly described in terms of transformations. Symmetry transformations, or rigid motions, include reflections, rotations, and translations.<br>• Symmetry transformations are congruences. It preserves both angle measures and side lengths, resulting in an image that is congruent to the original figure. | • What makes an artistic design appealing?<br>• How can this design be described so that someone could re-create it?<br>• What patterns are apparent in the design? Can the patterns be used to make predictions about the design?<br>• What connections between geometry and algebra help create certain kinds of designs? | Students will know<br>• Key terms (e.g., congruent figures, line reflection, reflect ional symmetry, rotation, rotational symmetry, symmetry, transformation, translation, translational symmetry)<br><br>Students will be able to<br>• Describe symmetries of figures..<br>• Use tools to examine symmetries and transformations.<br>• Create figures with specified symmetries.<br>• Perform symmetry transformations of figures, including reflections, translations, and rotations.<br>• Give precise mathematical directions for performing reflections, rotations, and translations.<br>• Write coordinate rules for specifying the image of a general point under particular transformations.<br>• Combine transformations and find a single transformation that will produce the same result.<br>• Find the symmetries of geometric figures and make tables showing the results of combining symmetry transformations. |

**Acceptable Evidence**

| Performance Tasks | Quizzes, Test, and Work Samples | Observations and Dialogues |
|---|---|---|
| • **Three Types of Symmetry**<br>Students are introduced to reflectional, rotational, and translational symmetry. They identify the symmetries in several designs and create designs with given symmetries. Students are also introduced to tools and procedures for testing for symmetry and making symmetric figures.<br>• **Symmetry Transformations**<br>Students are challenged to describe the motions involved in constructing symmetric destines. They explore the relationships between figures and their images under reflections, rotations, and translations. They use their finding to write precise rules for finding images under each type of transformation. Students also look at combinations of reflections. In each case, they determine whether the combination of reflections is equivalent to a single transformation.<br>• **Transforming Coordinates**<br>Students work with figures drawn on a coordinate grid. By writing computer commands for creating figures and their images under various transformations, students develop rules for locating the image of a general point under particular reflection, rotation, or translation. The idea of rigid motion is use to introduce the notion of congruent figures.<br>• **Symmetry and algebra**<br>Students explore combinations of symmetry transformations of an equilateral triangle and a square, they create tables showing the results of every combination of two symmetry transformations for theses figures. Students then use their tables to determine whether the combining operation satisfies important algebraic properties. | Check-Up 1<br>Quiz A<br>Check-Up 2<br>Quiz B<br>Unit Test<br>Unit Project – Creating Tessellations<br>Making a Wreath and a Pinwheel | Teacher observations of students during work on performance tasks.<br>Accountable talk during work on performance tasks. |