Commentary:
Instruction in basic geometric concepts should include investigations of shapes and relationships between shapes. Using triangles, students can
a. see relationships between two shapes such as two triangles can make a square,
b. compose and decompose a variety of shapes to sort and classify and
c. build a foundation to investigate the relationship of other shapes such as two trapezoids can make a hexagon.
Developing spatial ability is an integral part of applications related to other areas of mathematics such as measurement and patterns.

Lesson Summary:
In this lesson, students draw, create and describe different shapes using triangles. They discuss attributes of the original and created shapes, learning new vocabulary and attributes. Students classify the created shapes and draw and write in mathematics journals to communicate understanding.

Estimated Duration: Three hours over several days

Ohio Standards Connection

Geometry and Spatial Sense

Benchmark A
Describe and create plane figures: circle, rectangle, square, triangle, hexagon, trapezoid, parallelogram and rhombus and identify them in the environment.

Indicator 2
Create new shapes by combining or cutting apart existing shapes.

Related Benchmarks

Benchmark C
Sort and compare two-dimensional figures and three-dimensional objects according to their characteristics and properties.

Indicator 1
Identify, compare and sort two-dimensional shapes; i.e., square, circle, ellipse, triangle, rectangle, rhombus, trapezoid, parallelogram, pentagon and hexagon. For example:

- a. Recognize and identify triangles and rhombuses independent of position, shape or size;
- b. Describe two-dimensional shapes using attributes such as number of sides and number of vertices (corners or angles).

Benchmark E
Recognize two- and three-dimensional objects from different positions.

Indicator 5
Copy figures and draw simple two-dimensional shapes from memory.

Pre-Assessment:
Prepare sets of shapes for each pair of students. Include shapes such as circles, hexagons, parallelograms, rectangles, squares, triangles and trapezoids. Use tangram pieces, pattern blocks or other available materials.

- Distribute a set of shapes to each pair of students. Have them sort the shapes into categories of their choice. Observe how students sort the shapes. If students use non-geometric attributes such as color, guide them to use attributes about the shape.
- Select students to share how they sorted the shapes. Listen for the use of shape names or the number of sides and corners.
- Record shapes and descriptions students use on the board, chart paper or bulletin board.

Scoring Guidelines:
Students who sort using attributes such as the name of the shapes or numbers or corners or sides are ready for instruction. The sorting may include grouping all shapes with the same number of sides and corners together. Some may sort using familiar shapes such as circles, squares and triangles and place other shapes in a separate category. Students who cannot identify triangles and squares will need additional support as the lesson proceeds.
**Post-Assessment:**

Have students complete the following tasks:
- Sort and identify a set of shapes including triangles, squares, trapezoids, rhombi, parallelograms, pentagons and hexagons.
- Draw or create shapes using triangles from memory.
- Describe shapes using qualitative and quantitative attributes through written or verbal expression in mathematics journals or small group interviews.

**Scoring Guidelines:**

Use a rubric to describe student performance.

<table>
<thead>
<tr>
<th>Level of Understanding</th>
<th>Performance Description</th>
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<tbody>
<tr>
<td><strong>Meets Expectations</strong></td>
<td>The response provides evidence of sorting, identifying, describing and creating shapes including triangles, squares, trapezoids, rhombi, parallelograms, pentagons and hexagons. Descriptions include qualitative and quantitative attributes using mathematical vocabulary.</td>
</tr>
<tr>
<td><strong>Approaching Expectations</strong></td>
<td>The response provides evidence of sorting, identifying, describing and creating shapes including triangles, squares, trapezoids, rhombi, parallelograms, pentagons and hexagons. Descriptions include Some qualitative and/or quantitative attributes using mathematical vocabulary. Minor flaws may occur in the creation of shapes.</td>
</tr>
<tr>
<td><strong>Working Towards Expectations</strong></td>
<td>The response provides partial evidence of sorting, identifying, describing and creating shapes including triangles, squares, trapezoids, rhombi, parallelograms, pentagons and hexagons. Minor flaws may occur in all parts of the assessment. Students may rely on everyday vocabulary to describe attributes.</td>
</tr>
<tr>
<td><strong>Intervention Necessary</strong></td>
<td>The response provides minimal evidence of sorting, identifying, describing and creating shapes including triangles, squares, trapezoids, rhombi, parallelograms, pentagons and hexagons. Major errors are included in sorting and identifying shapes. Descriptions may be limited to one attribute.</td>
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</table>
Instructional Procedures:

Part One

1. Distribute models of triangles from construction paper, tangram or pattern block sets, or *Triangles*, Attachment A. If using construction paper, cut into three-inch squares, then cut on the two diagonals to make four small triangles. Ask students questions about the shapes. Allow students to think about their ideas and then share with a partner. Select students to share their response with the class.

   - What shape is this?
   - How do you know it is a triangle?
   - Are the triangles the same size?
   - How can you show that the triangles are the same size?

2. Show students samples of triangles and non-triangles using a transparency of *Which Are Triangles?*, Attachment B. Ask students questions such as,

   - Is this a triangle?
   - How do you know?
   - How is it like a triangle?
   - How is it different from a triangle?

3. Direct students to create shapes using two triangles. Each shape is different. Model the activity by creating or showing acceptable shapes and unacceptable shapes. Acceptable shapes place the edges of triangles next to each other. Edges must be of same length. Acceptable shapes include:

   ![Acceptable shapes diagram]

   Unacceptable shapes include:

   ![Unacceptable shapes diagram]

Instructional Tip:

Some students may call a square rotated at 45 degrees a diamond. Encourage students to name the shape square or rhombus. A diamond is not used in mathematics to describe a shape.

a. After creating the shape with the triangles, have students paste the triangles to index cards in the same shape.

b. Have the students share the shapes they created. Ask students to describe the shape. Make a chart on a bulletin board or chart paper. Create and label four columns using the number of sides of a shape.

<table>
<thead>
<tr>
<th>Three Sides</th>
<th>Four Sides</th>
<th>Five Sides</th>
<th>Six Sides</th>
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</thead>
<tbody>
<tr>
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</tbody>
</table>
Describing and Creating Plane Figures – Grade One

c. Place the shapes created by students in the correct column. Label the shapes.
d. Compare the square and the parallelogram. Ask students how the two shapes are alike and how they are different. Use a Venn diagram as a visual aid if students are familiar with it.
e. Tell students the name of the parallelogram and have them repeat it.

4. Tell students to make shapes with three triangles. Give them time to create the shapes and paste onto index cards. Shapes made with three triangles include:

![Trapezoid](image1)

![Pentagon](image2)

![Trapezoid](image3)

a. Select students to share the shapes they created and describe the shapes.
b. Sort the shapes and add to the appropriate columns on the bulletin board. Label the shape.

5. Have students explore the room for the different shapes.

6. Distribute *Shapes*, Attachment C, for practice. Read each statement aloud and discuss. Use as a formative assessment to check student progress.

7. Have students draw a picture of a new shape they learned in this lesson. Have them share with a partner and talk about the shape, including the name of the shape.

Part Two

8. Display a trapezoid and a square. Ask students questions about the shapes such as:
   - What are the names of these two shapes?
   - How are these two shapes alike?
   - How are these two shapes different?
   - How many sides does a trapezoid have? How many sides does a square have?
   - How are the sides different?

9. Distribute triangles and index cards to students. Have them make shapes with four triangles. Review the rule that the shapes that touch must be the same length.

10. Observe students as they create the shapes. Ask questions about the shapes to individual students to informally assess their descriptions of the shapes.

11. Select students to share and describe their shapes. Have them decide which column of the bulletin board the shape belongs in. Place the shape in the correct column and label.

12. Set the room up for a gallery walk. Have students compare shapes they made and those made by other students.

13. Distribute *Dot Shapes*, Attachment D to each student. On the first page, in the top section of the first column, model how to connect the dots to create a shape. Ask the students for the name of the shape. Tell students to make three more triangles by placing three dots in different parts of the section and connecting the lines. Discuss the triangles and compare them. Complete the same activity for quadrilaterals, pentagons and hexagons as time permits.

14. Have students complete a journal entry about hexagons. Tell them to draw a picture and describe a hexagon. Allow them to share and discuss with a partner.
Part Three

Instructional Tip:
Prepare a loop made of string or yarn for every three students in the class. Use six feet of yarn or string and tie the ends together.

15. Gather students into groups of three. Give each group a loop of yarn.
   a. Tell the students to make a triangle with the loop of yarn. Ask questions such as:
      • How many hands did you use to make the triangle?
      • How do you know it is a triangle?
      • Can you make another triangle that looks different?
   b. Have students make quadrilaterals, pentagons and hexagons. Ask similar type questions.
   c. Introduce corners. Conjecture about number of sides and corners for each shape.

16. Have students complete a journal entry entitled “My Favorite Shape”. Have them draw a picture and write about their favorite shape. Allow them to discuss and share with a partner.

Instructional Tip:
Continue the development of two-dimensional concepts by investigating differences among quadrilaterals: parallelograms, rectangles, rhombi, squares and trapezoids. Show examples and non-examples of each. Encourage qualitative descriptions (flat, straight sides, length of sides) as well as quantitative descriptions (number of sides and corners).

Differentiated Instructional Support:
Instruction is differentiated according to learner needs, to help all learners either meet the intent of the specified indicator(s) or, if the indicator is already met, to advance beyond the specified indicator(s).
   • Provide assistance for students as they create shapes with triangles. Do not expect students to create all 14 possible shapes using four triangles.
   • Use larger models or die-cuts of the triangles.
   • Interview students for the post-assessment. Provide students with shapes. Have them sort the shapes into categories. Have them describe how they sorted the shapes.

Extensions:
   • Use geoboards to make triangles, quadrilaterals, pentagons and hexagons. Provide geoboard paper to record students’ findings.
   • Have students work in pairs. One partner describes a shape while the other creates the shape on the geoboard or draws on paper. Encourage the use of appropriate vocabulary.
   • Create classroom shape books. Have students use a shape to create and draw a character and write a sentence about the shape and character. Place the book in the class library or allow students to take the book home.

Home Connections:
Have students identify shapes in their home and community environment.
Materials and Resources:
The inclusion of a specific resource in any lesson formulated by the Ohio Department of Education should not be interpreted as an endorsement of that particular resource, or any of its contents, by the Ohio Department of Education. The Ohio Department of Education does not endorse any particular resource. The Web addresses listed are for a given site’s main page, therefore, it may be necessary to search within that site to find the specific information required for a given lesson. Please note that information published on the Internet changes over time, therefore the links provided may no longer contain the specific information related to a given lesson. Teachers are advised to preview all sites before using them with students.

For the teacher: chart paper, overhead transparency, overhead projector

For the student: triangle models, index cards

Vocabulary:
- corner
- hexagon
- parallelogram
- pentagon
- rectangle
- rhombus
- square
- trapezoid
- triangle

Technology Connections:
Search for Web sites that address polygon properties. Some sites have interactive activities with geoboards.

Research Connections:

Attachments:
Attachment A, Triangles
Attachment B, What Are Triangles
Attachment C, Shapes
Attachment D, Dot Shapes
Attachment A

Triangles
Attachment B
Which are Triangles?
Name ________________________ ______________________________

1. Draw a line around the trapezoid.

![Trapezoid](image1)

2. Draw a line around the pentagon.

![Pentagon](image2)

3. Draw a line around the parallelogram.

![Parallelogram](image3)
### Attachment D

**Dot Shapes**

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Attachment D (continued)
Dot Shapes