

Lesson Title: Creating Polygons, Classifying Shapes		Pre 7.6
Utah State Core Standard and Indicators Pre-algebra Standard 3.1 Process Standards 1-4		
Summary		
In these lessons, students build and classify polygons using right isosceles triangles. Then they investigate characteristics of polygons. Several options for these investigations are listed below, including worksheets, games, etc.		
Enduring Understanding	Essential Questions	
Two dimensional shapes created on a flat surface, polygons, can be classified using number and size of sides and angles.	How do you communicate about two-dimensional shape?	
Skill Focus	Vocabulary Focus	
<ul style="list-style-type: none"> • Observing geometric shape characteristics • Classifying shapes by sides and angles 		
Assessment ideas:		
Circle folding assessment below		
Materials: For Polygons, you need 2 inch or 3 inch construction paper squares, scissors, tape or past, newsprint or poster-paper Computers with Geometer's Sketchpad, Tangrams, Polygon Cutouts (see below)		
Launch		
Explore		
<ul style="list-style-type: none"> • How do you classify triangles? • What are the similarities and differences among parallelograms, rectangles, rhombi, squares, trapezoids, isosceles trapezoids? 		
Summarize		
Apply		

Directions:

Students could begin by recording the shapes they already know on the recording sheet. (See below) Then as they investigate more shapes, they can continue to record them. Please access the graphic organizer (see associated link) could be used as well.

Sorting shapes by characteristics and using informal deduction skills are basic to Geometry. Pick and choose from the selection of these kinds of activities below. **As students investigate the following activities, they should record their learning as they go. (See record-sheet below) This worksheet should be utilized throughout the Geometry and Measurement module.**

1) Have students analyze 2 and 3 dimensional shapes by exploring their characteristics and properties in the following activity from Navigating Through Geometry .

- Geodee's sorting Scheme, pages 13-15 and student worksheet page 86

2) Play the Classify and Capture game. See directions and card set 1 below. (Taken from an article in Mathematics in the Middle School, NCTM, February 2003)

3) To help students **define triangles**, access the worksheet on page 63-64 of [Exploring Geometry with Geometer's Sketchpad](#). You will also need the Classify Triangles.gsp from the premade sketches found on the disc which accompanies the book.

You could also access the activity, "Exploring Triangles" from Navigating Through Geometry, pages 16-18 and student worksheet pages 87-88. This also requires the use of Geometer's Sketchpad or some other dynamic software.

4) Have students **classify triangles** using Venn Diagrams. See [Navigating Through Geometry](#), Using Venn Diagrams to Reason about Shapes, pages 23-24 and student worksheet page 93.

5) To help students **define quadrilaterals**, access the worksheets on page 89-98 of [Exploring Geometry with Geometer's Sketchpad](#). You will also need the Special Quads.gsp from the premade sketches found on the disc which accompanies the book.

6) Have students **classify quadrilaterals** using Venn Diagrams. See [Navigating Through Geometry](#), Using Venn Diagrams to Reason about Shapes, pages 23-24 and student worksheet page 93.

7) Students could now play the classify and capture game using attribute cards for card set 2. (See pattern below.)

Record of Geometry Terms, Figures and Shapes

Shape	Description	Examples
Symmetry		
Polygons		
Triangles (classified by properties of sides)		
Equilateral		
Isosceles		
Scalene		
Triangles (classified by properties of angles)		
Right		
Acute		
Obtuse		
Quadrilaterals (convex)		
Parallelogram		
Rectangle		
Square		
Rhombus		
Kite		
Trapezoid		
Isosceles Trapezoid		
Regular Polyhedra		
Prisms		
Right Prisms		
Pyramids		
Right Pyramids		
Cylinders		
Right Cylinders		
Cones		
Right Cones		

Pre 7.6

Intro: Creating Polygons

You will create different polygon shapes using triangles. To make a record of the shapes you create, glue or tape the shapes to newsprint or poster paper. Title your poster "POLYGONS". Organize your poster into four columns, *triangles*, *quadrilaterals*, *pentagons*, *hexagons*.

- 1) Cut a square in half, corner to corner. How many different shapes can you make with just these two triangles?
- 2) How many different shapes can you make using four triangles? Try six and then eight.

What are your observations about the shapes you created?

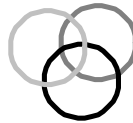
Classify and Capture

Materials needed:

- Sets of commercial or homemade tangrams in four different colors. (If you are playing the advanced polygon game, then you will need to create the playing pieces in different colors for each of the four group members. Using the pattern below, copy 8–10 groups of four colors. Use cardstock, laminate and cut out.)
- Sorting hoops (can be purchased from Educator’s Outlet) or appropriate Venn diagrams drawn on large sheets of paper.
- A set of teacher-made attribute-label cards for each group. Make color cardstock copies of the sheet below. Laminate

Getting Started:

- Divide students into groups of four.
- Distribute one set of playing cards and three sorting hoops to each group.
- Each player receives 1 set of tangrams.(four players receive four different colors)
- Place label cards face down on the table.
- Arrange the sorting hoops in overlapping
- circles.



Playing the Game:

- Player 1 begins the game by turning over 3 label cards and placing one in each of the three circles
- All four players place their tangrams in the appropriate circles, classifying each piece according to the label cards in each of the three hoops. Once pieces are placed, players are not permitted to retrieve them.
- The object of the game is to “capture” misplaced pieces. The person with the most pieces at the end of the game wins. After all players have placed their pieces, students reason and argue about placement. Player 1 tries first. If he/she identifies a misplaced piece (his or someone elses), he must argue why the piece does not fit and then explain where it should be placed. If player 1 argues his point correctly, he takes the piece. If the misplaced piece was his own, he can use it again in the next round. If the misplaced piece belonged to an opponent, player 1 “captures” this piece; it doesn’t go back into play for the remainder of the game.
- After player 1, the other players take their turns identifying misplaced pieces. On each turn, players may identify and remove only one misplaced piece at a time. Play continues until everyone in the group agrees there are no more misplaced pieces.
- To prepare for round 2, remove the three label cards used in the first round and players collect their uncaptured pieces. Player two places three new cards on the Venn diagram. After all players place their pieces back on the diagram, player two begins the process of arguing and capturing misplaced pieces.
- If a player identifies a piece as misplaced when it was placed correctly, the next player continues.
- Play continues until all label cards have been used.
- If a player loses all her pieces, she may still argue and capture in turn.

Classify and Capture card set 1

Yellow	Not Yellow	Large Triangle
Blue	Not Blue	Not Large Triangle
Green	Not Green	Medium Triangle
Red	Not Red	Not Medium Triangle
Triangle	Not Triangle	Triangle
Square	Not Square	Not Small Triangle
Parallelogram	Not Parallelogram	

Classify and Capture advanced polygon card set 2

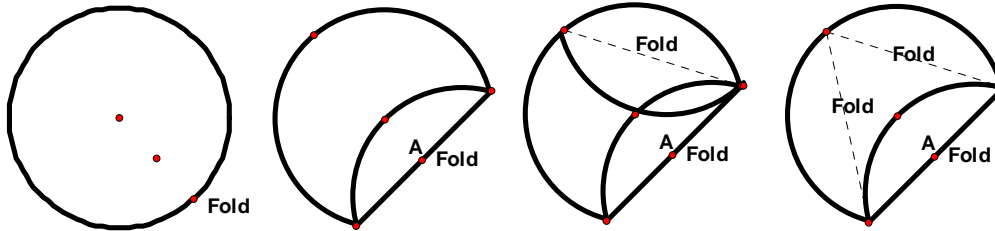
Isosceles	Not Isosceles	Trapezoid
Equilateral	Not Equilateral	Not Trapezoid
Scalene	Not Scalene	Square
Right	Not Right	Not Square
Acute	Not Acute	Triangle
Obtuse	Not Obtuse	Not Triangle
Parallelogram	Not Parallelogram	Quadrilateral
Kite	Not Kite	Not Quadrilateral
Concave	Convex	Tessellating
Regular	Irregular	Non Tessellating
Curved	Non-curved	Rectangle
Not Rectangle	Rhombus	Not Rhombus

Assessment

Folding a Circle

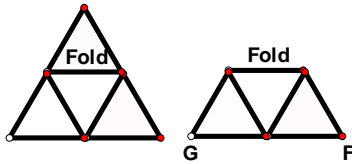
You will submit your folded circle for evaluation along with the following worksheet.

1) Create a circle with about a 20 cm diameter (about the width of a sheet of paper). Mark the center. Pick a point on the circle and fold to the center. Do it again, using one endpoint of A as an endpoint of B.



Fold the remaining third to the center. What shape do you have? _____.

2) Find the midpoint of one side by creasing lightly. Fold the opposite vertex to the midpoint and you have now formed _____



3) Observe the 3 triangles in the shape above. Fold one triangle over the top of the middle one and you have made a _____ or a _____

4) Fold the remaining triangle over the top of the other 2 triangles. What shape do you have now? _____

4) Let the 3 triangles folded over in steps 2, 3, and 4 open up. Bring points G and F together. What 3D shape is revealed? _____

8) Open back up to the original triangle you made in step 1. Fold each of the vertices to the center. You now have a _____