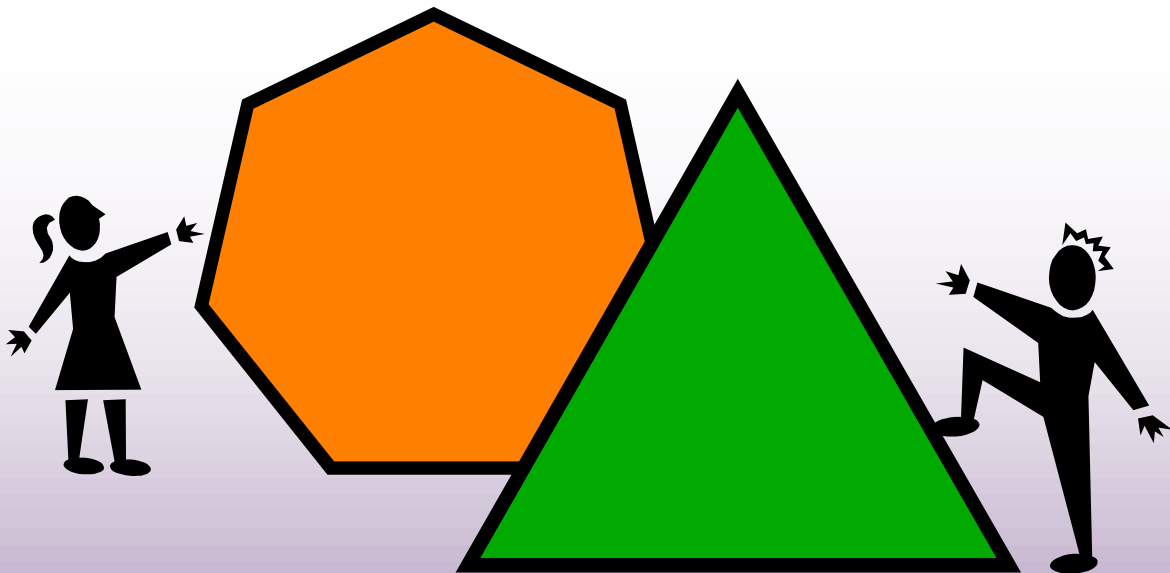


# Polygon Explorations

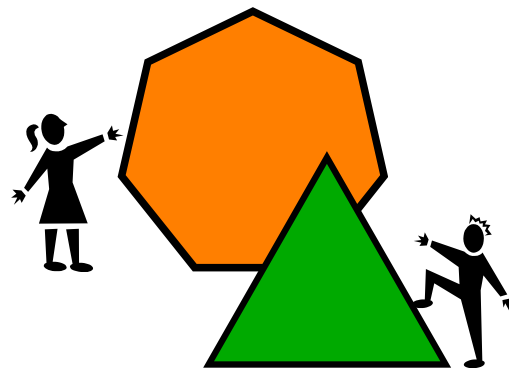
Engaging Activities to  
Explore Geometry Concepts



Laura Candler  
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[www.lauracandler.com](http://www.lauracandler.com)

# Polygon Explorations

Created by Laura Candler  
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## Teacher Information and Directions

**Polygon Explorations** includes a variety of flexible and adaptable polygon activities to supplement your existing geometry unit. The activities are designed around a set of 30 “Poly Shapes.” You’ll find ideas introducing geometry concepts to your students as well as several review activities including two games. All of activities can be conducted in a whole group setting, and many of them can be used with cooperative learning teams and in math centers. If you laminate the shapes, you can use them repeatedly throughout the year to engage students in hands-on activities with geometric concepts.

### Poly Shape Patterns (Pages 7 - 10)

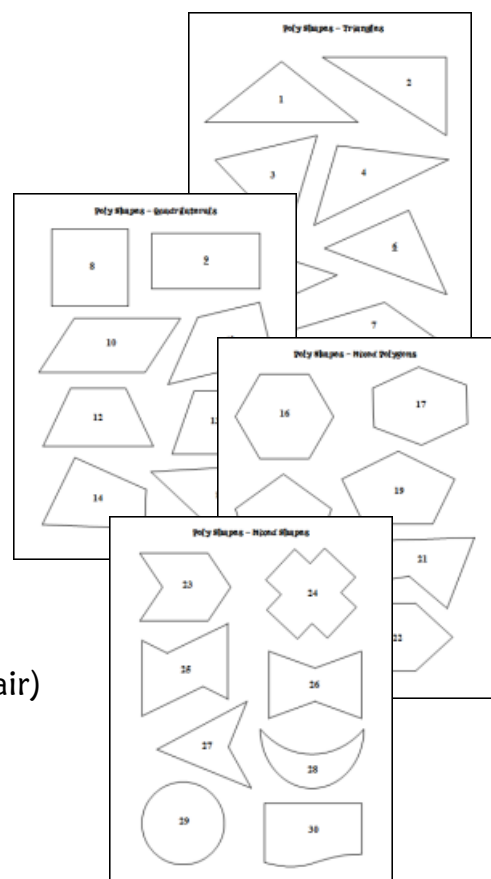
- **7 different triangles** including acute, isosceles, equilateral, right, obtuse, and scalene
- **8 different quadrilaterals** including a rhombus, a square, rectangles, trapezoids, and parallelograms
- **7 mixed polygons**
- **8 mixed shapes** including 3 non-polygons

### Polygon Instruction Strategies

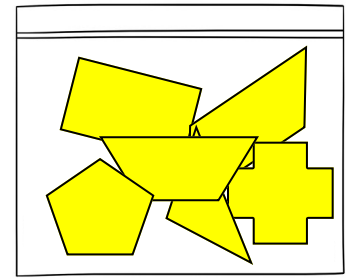
- **Exploring Geometric Concepts**
- Review Activities
  - **Poly Shape Sorting** (Pages 11 - 14)
  - **Polygon Showdown** (Pages 15 - 20)
  - **Polygon Capture** (Pages 21 - 26)

### General Materials Needed (for each team or pair)

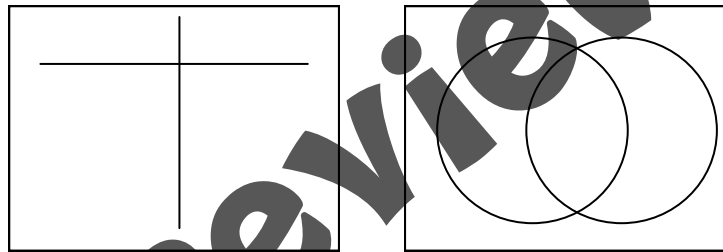
- One set of 30 Poly Shapes (4 pages, 30 shapes total)
- Large T-chart and Large Venn diagram
- Dry-erase markers
- Individual dry erase boards
- 2 different colored plastic cups



## Advanced Preparation



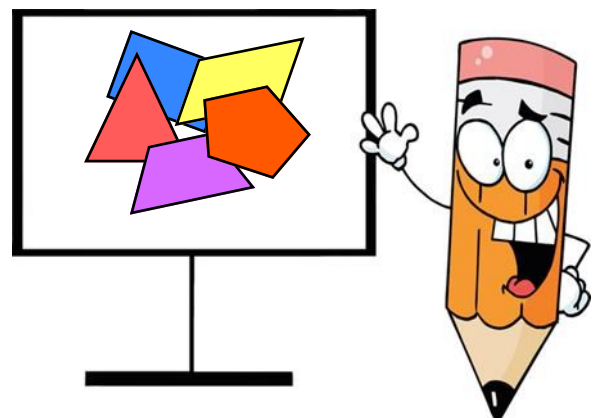
- 1. Duplicate and Cut Out Shapes** - You'll need one set of shapes for each pair or group, and I recommend that you choose a different color for each set. That way if a piece drops on the floor, you'll know where it belongs. So if you have 7 teams, you'll need 7 different colors. Likewise, if your students will be working in pairs, you'll need a full set of shapes for each pair. Print the shapes on colored cardstock, laminate them, cut them out, and store them in Ziploc bags. To find enough colors, buy several packs of mixed cardstock in brights and pastels. These sets should last you many years so it's worth the investment. Some of the shapes are not polygons; they were included intentionally so students can learn to differentiate between polygons and non-polygons.
- 2. Prepare Graphic Organizers** - For each team, you will need two large charts such as the ones below. Draw the diagrams on a 12" x 18" sheet of construction paper and laminate them so students can write on them with a dry erase marker.



**Laura's Tip:** Draw the two charts on opposite sides of the same sheet of sturdy construction paper. That way students just flip them over when you are ready to switch to a new chart.

- 3. Prepare Demo Shapes** -

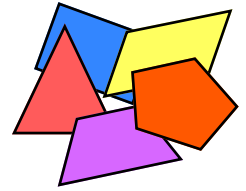
It's important to prepare a set of demo shapes to use when introducing new concepts, games, and activities. You can use the patterns provided to create shapes to use on an overhead projector or with a document camera. If you have an overhead projector, duplicate the 4 pages on transparencies and cut them out. Colored transparencies work best since it will



be easier to find the shapes you need during an activity. If you have a document camera, create an extra set of shapes for yourself out of cardstock or construction paper for demonstration purposes.

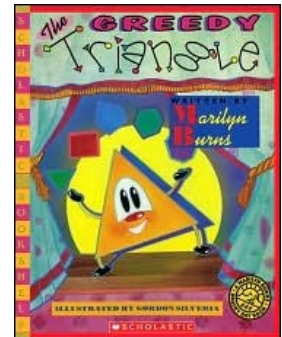
# Introducing and Exploring Geometric Concepts

If you prepare the Poly Shapes before starting your geometry unit, you'll be able to use them to support almost every concept you teach. Take a look at these starter ideas, but feel free to develop your own. You'll be amazed at how easy it is to come up with your own strategies!



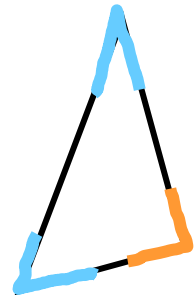
## 1. Introduce Polygons by reading The Greedy Triangle

The Greedy Triangle by Marilyn Burns is a great way to introduce students to polygon names and how they look in everyday objects.. The triangle in the story is not happy to be just a triangle and wished he had more sides. He visits the Shape Shifter who turns him into a quadrilateral. You guessed it—he's not happy as a quadrilateral either! Throughout the story the triangle is transformed into a sequence of polygons. Kids of all ages will love hearing the story and looking for polygons in their own environment.



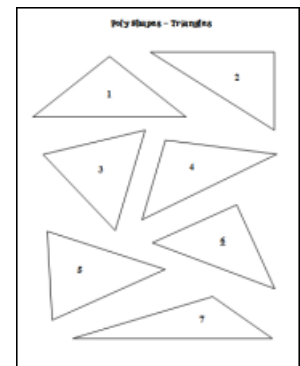
## 2. Finding Types of Angles Within Polygons

After you have introduced your students to the three types of angles (acute, obtuse, and right), have them look for angles within particular shapes. At first, you may want to focus on one shape at a time. Use your set of demo shapes and choose one, for example triangle #7. Trace the shape and identify each interior angle as right, obtuse, or acute. A great way to do this is to outline the angles using different a different color for each type of angle. After you demonstrate the procedure, assign particular shapes to your students and have them take turns tracing the shapes and outlining them in the designated colors.



## 3. Exploring Specific Polygons

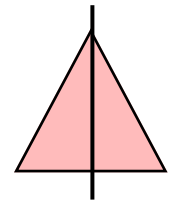
- The Poly Shapes are perfect for exploring specific types of triangles and quadrilaterals. For instance, if you want to introduce specific triangles, have students remove all the triangles and place the remaining shapes back in their Ziploc bags. Then as you introduce each type of triangle, for example, scalene or obtuse, have students find the triangles in the set that fit the definition. They will quickly discover that most triangles have two names, one that describes the type of angle and the other that describes the lengths of the sides. Most quadrilaterals have more than one name as well. For example, a square is a rectangle, a rhombus, and a parallelogram, but it's not a trapezoid.



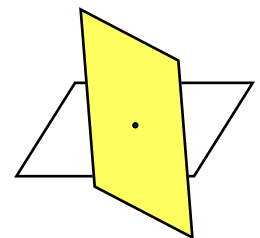
#### 4. Introducing and Exploring Symmetry

Poly Shapes also work well for exploring symmetry. These are teacher-directed activities; monitor students closely to be sure they are grasping the concepts.

→ For **line symmetry**, give students pipe cleaner halves and have them place the pieces on top of the shapes to show lines of symmetry. You can also have students trace the shapes on a sheet of paper and cut them out. This is helpful for students who need to fold and manipulate the shapes to locate lines of symmetry.

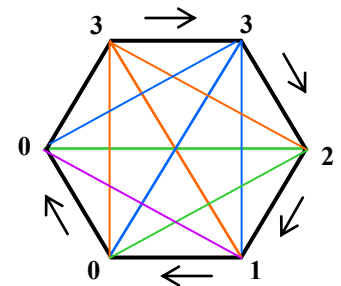


→ For **rotational symmetry**, have students choose a shape and trace it. Then have them mark a point in the center and rotate the shape around the point to see if it matches the tracing before it returns to the starting position. For example, if the shape matches after a quarter turn, the shape has 90° rotational symmetry. In the picture shown at right, the parallelogram does not have 90° rotational symmetry. However, it does have 180° rotational symmetry which you can see if you continue to rotate it around the point. If you have the Smartboard shapes, clone some of them and rotate them to demonstrate this concept.



#### 5. Introducing and Exploring Diagonals

Laminated Poly Shapes can be used to explore diagonals of polygons. If you don't want students to draw directly on the shapes, ask them to trace the shapes on plain paper before completing the suggested activities.



→ **Drawing Diagonals** - Explain that a diagonal is a line segment that connects two non-adjacent vertices. Ask students to select any shape, trace it, and draw the diagonals. Students often have trouble finding and counting ALL the diagonals of a shape with many sides. To solve this problem, start at one vertex, draw all the diagonals from that vertex in one color, and write the number next to the vertex. Move to the next vertex, use a different color to draw all the new diagonals possible, and then record the number. Move in a clockwise direction around the shape until you can't add any new diagonals, and then count the numbers.

→ **Exploring Diagonal Relationships** - After students know how to draw and count diagonals, discuss the relationships of the diagonals to each other and to the sides. Are they intersecting, parallel, or perpendicular to each other? Challenge: Try to find the relationship between the number of sides and diagonals. Make a chart of the number of sides versus the number of diagonals and draw conclusions. (Answer shown at right)

Sides	Diagonals
4	2
5	5
6	9

$$s(s-3) \div 2 = d$$

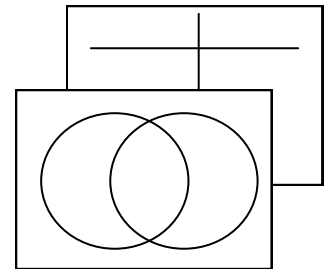
# Reviewing and Extending Geometric Concepts

Looking for engaging strategies to review and extend geometric concepts? These activities are just what you need! I recommend that you introduce the activities in a whole group setting before placing them in centers or math stations. Below you'll find an overview of each activity, and on the next few pages you'll find specific directions.



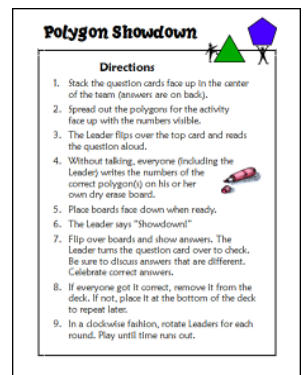
## 1. Poly Sorting (Pages 11 - 14)

In this activity, students will take turns sorting the shapes onto a team graphic organizer. Poly Sorting can be implemented as a fast-paced activity or a slower reflective activity depending on the time allowed and how you present it. The complete directions are on the next page. You'll also find some recording pages to use if you want students to write down their results.



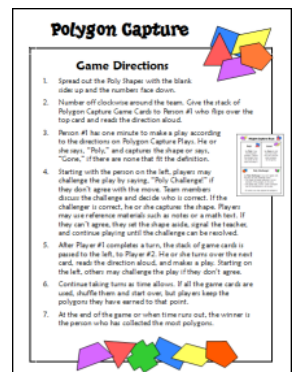
## 2. Polygon Showdown (Pages 15 - 20)

Polygon Showdown is a simple yet engaging activity that works best in teams of 3 or 4 students. Each student needs a dry erase board and a marker. It's best to focus on a particular set of shapes such as the triangles and quadrilaterals; duplicate a set of questions cards for each team accordingly. If you want the activity to be self-checking, duplicate the answers on the backs of the cards. Display the Polygon Showdown directions (page 15) for the class and use one team to model one round of the activity. Only display the polygons that relate to the set of question cards being used. After you demonstrate the procedure, designate a leader for each team and allow them the teams to begin playing while you circulate and answer questions. Alternatively, you could introduce this game in a small guided math group and then place it in a center later.

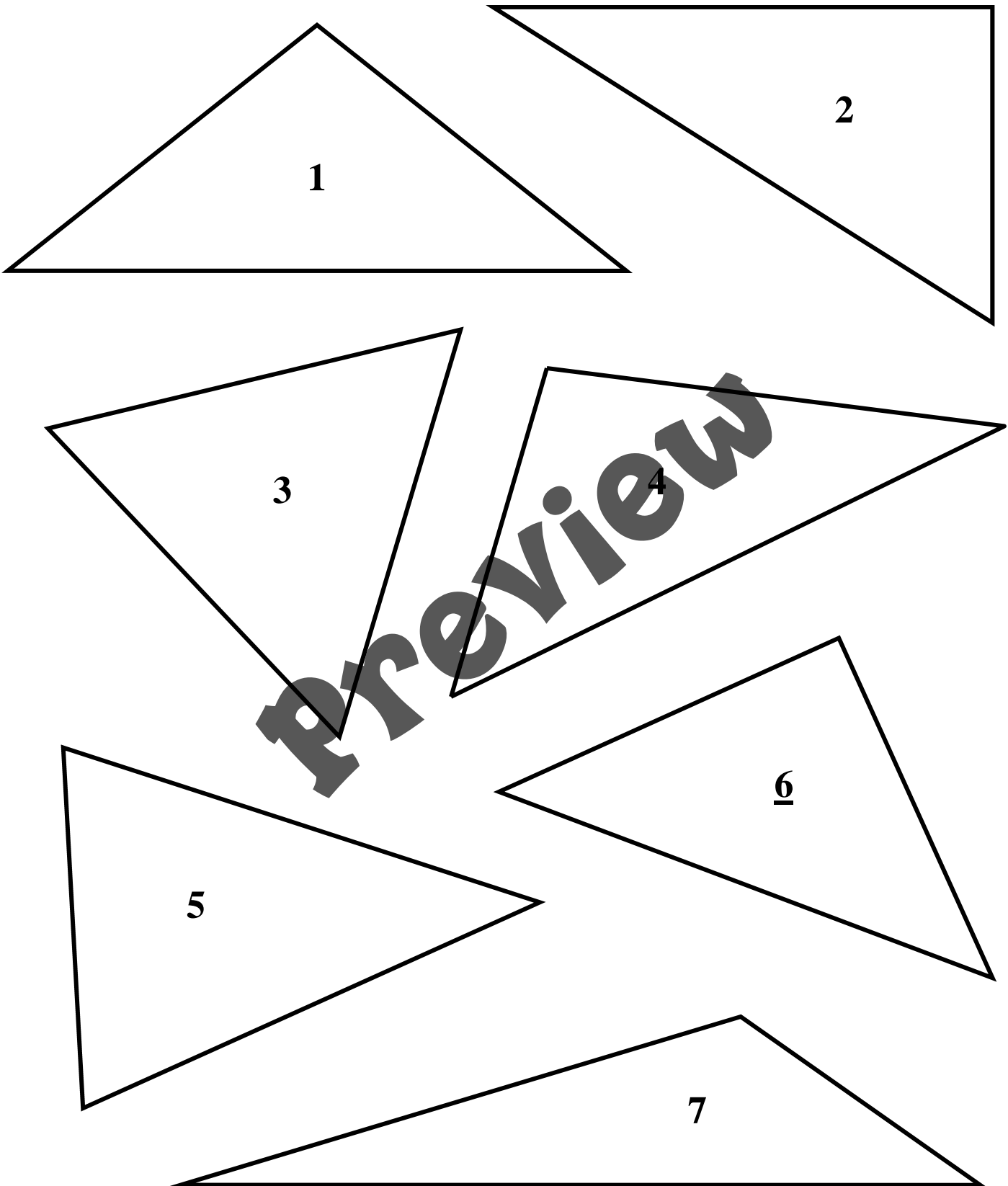


## 3. Polygon Capture (Pages 21 - 26)

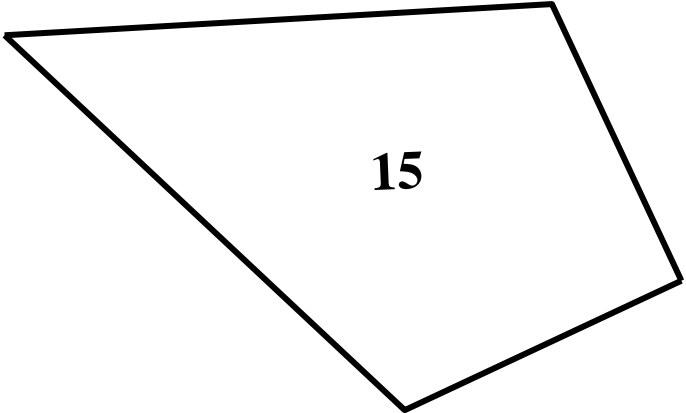
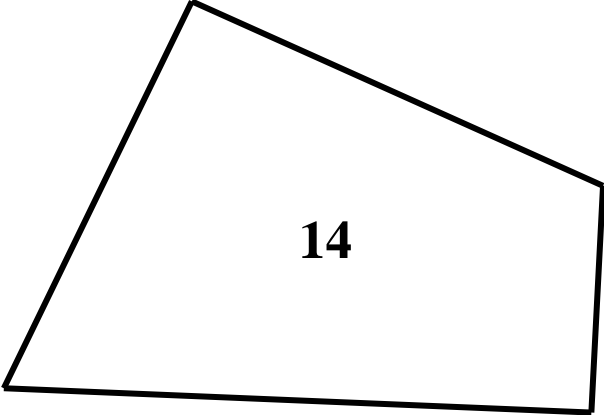
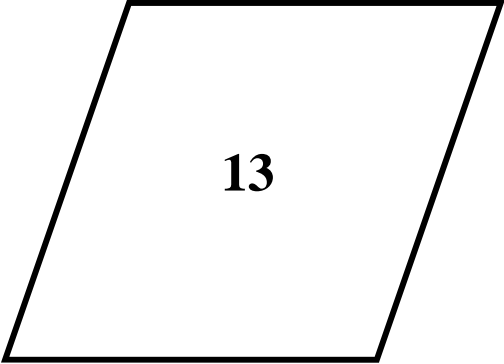
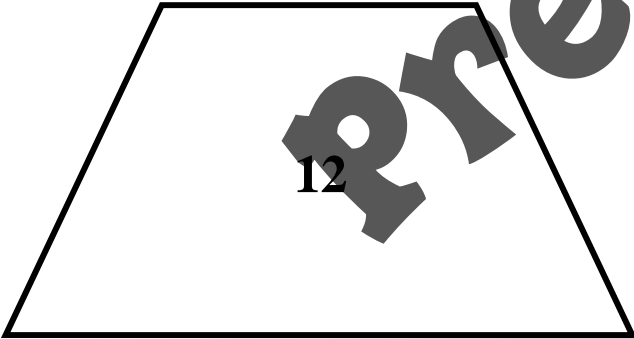
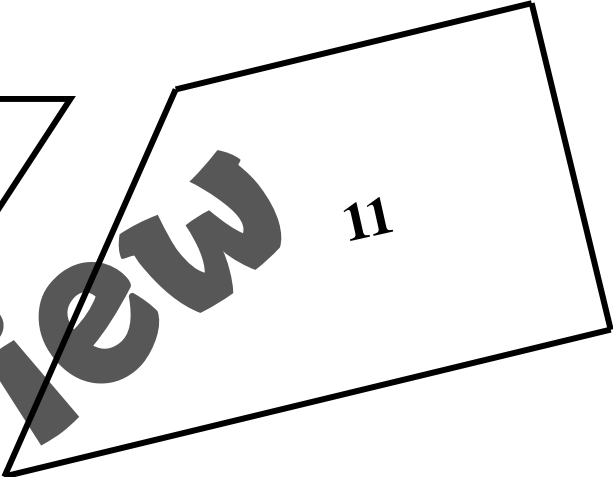
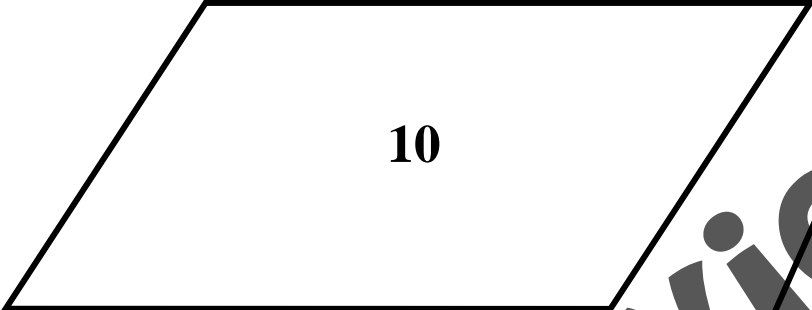
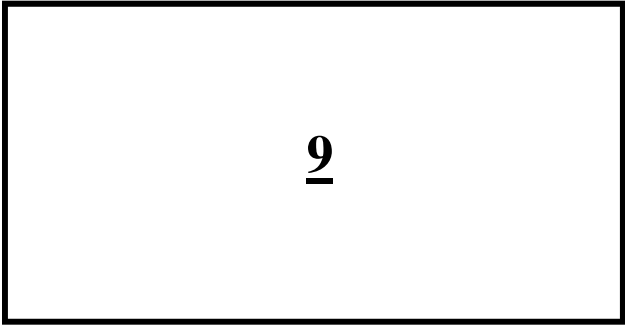
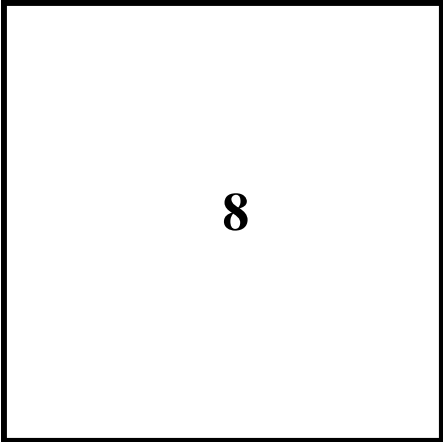
Polygon Capture is a more competitive game than Polygon Showdown and it requires a higher level of social skill development. Shapes are spread out in front of the team and students take turns trying to "capture" the shapes according to the directions on the game cards. Other students may challenge the play if they don't agree with the move. Complete teacher directions can be found on page 21. When you model the game for students, be sure to discuss appropriate and respectful ways of challenging other players.



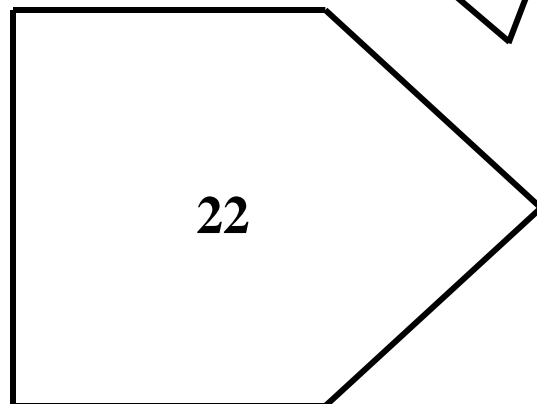
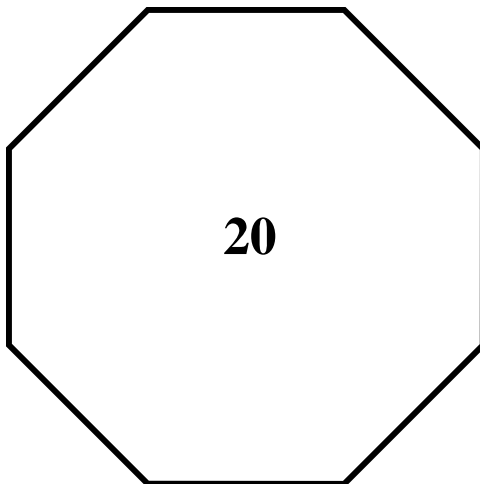
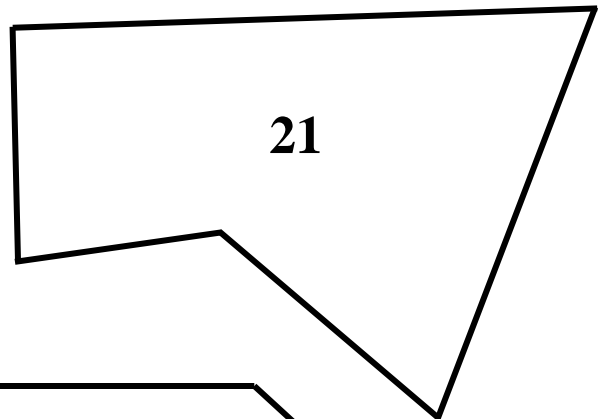
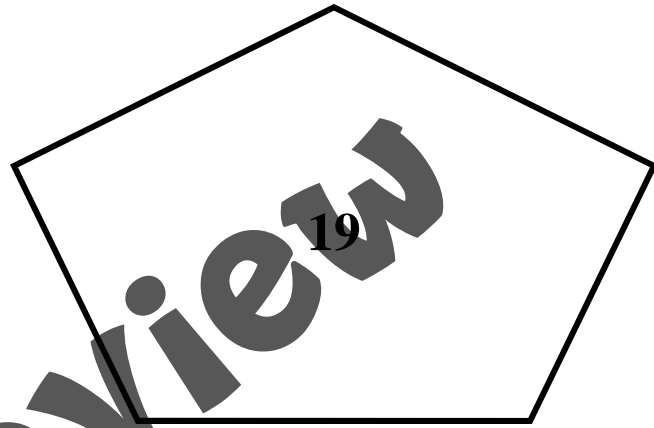
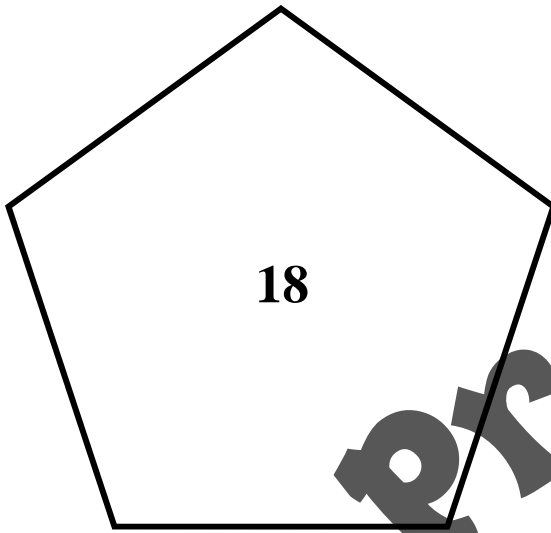
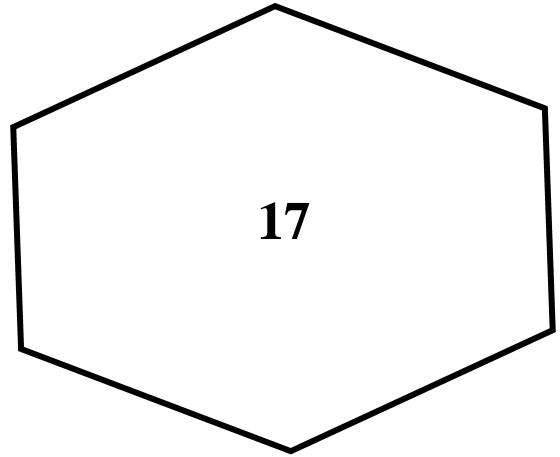
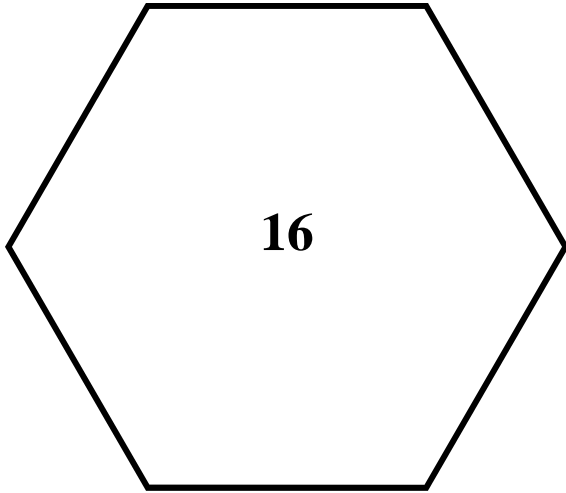
# Poly Shapes - Triangles



# Poly Shapes - Quadrilaterals

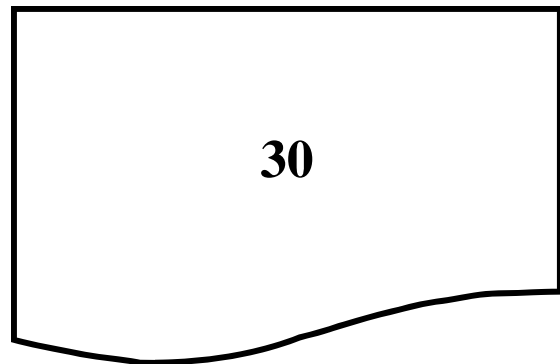
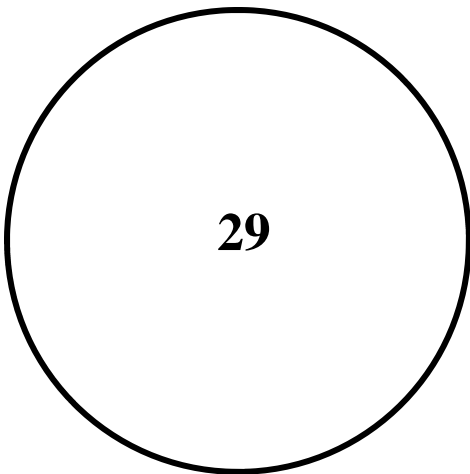
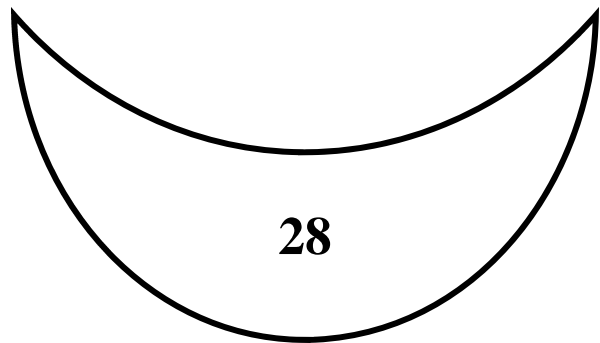
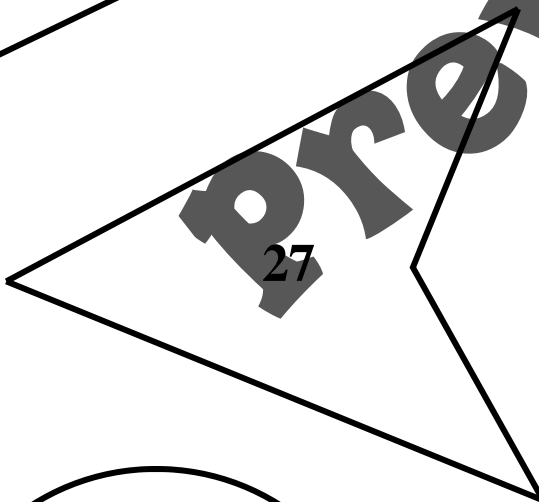
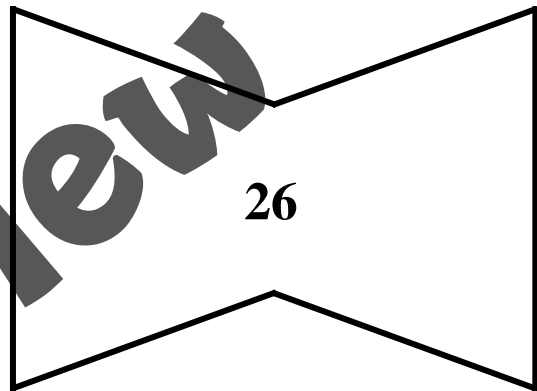
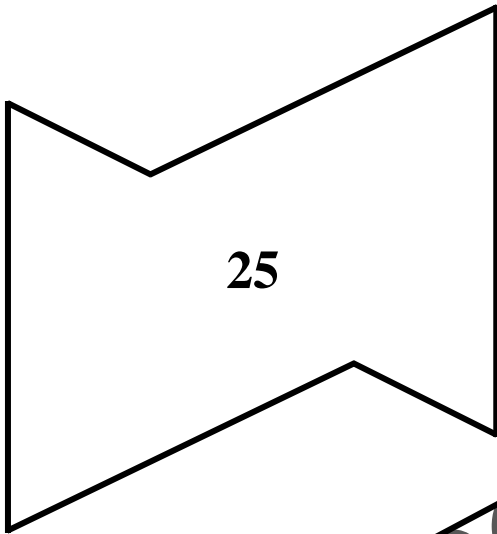
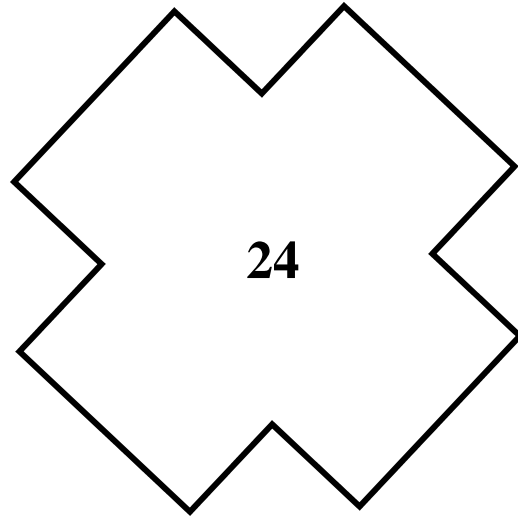
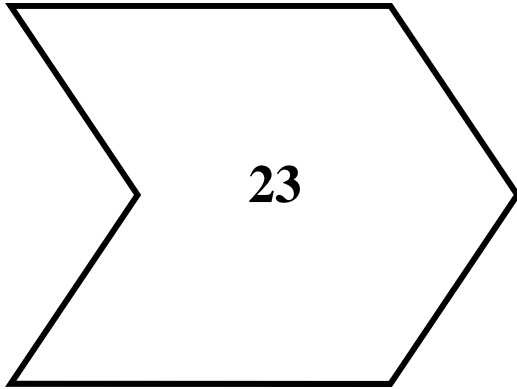


# Poly Shapes - Mixed Polygons



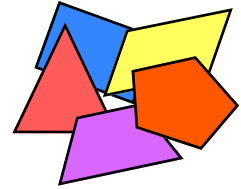
preview

# Poly Shapes - Mixed Shapes



Preview

# Poly Sorting Teacher Directions

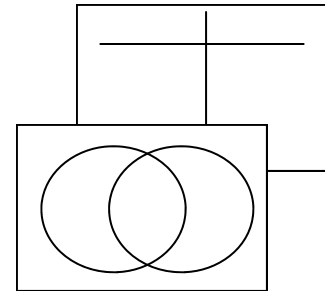


## Materials:

- One set of numbered polygons per team
- Large laminated T-chart and Venn Diagram for each team
- Poly Sorting Recording Pages (optional)
- Two plastic colored cups

## General Directions:

1. Give each team one set of shapes to spread out on their desks, numbered side down.
2. Place a sorting chart in the middle of the team. It's recommended that you start with the T-chart so you can focus on a single attribute. After students master the T-chart, introduce the Venn diagram.
3. Refer to the Poly Sorting Methods on the next page for specific examples of attributes. Name an attribute pair such as Polygon and Not Polygon and have one person write the headings at the top of the team chart.
4. Next, have the students take turns placing the shapes on the chart, making sure that all team members agree with each placement. Any shapes that don't fit either definition are placed to the side of the chart.
5. Note: If this process is too slow, have the students divide the shapes equally among themselves and then sort them simultaneously.
6. When a team has sorted all the shapes and everyone agrees with the placement of all shapes, they flip the shapes over so the numbers are face up and use a signal to show that they are finished. Two colored plastic cups work well for this. For example, they could display green while working and blue when finished.
7. If needed, review and discuss the results as a class using the numbers to refer to the shapes. If shapes are laminated, students may draw lines of symmetry or diagonals on the shapes to help them determine the correct classifications for those areas.
8. You may duplicate the Poly Sorting Recording Pages if you want students to record their results for you to check later. The example below is incomplete but shows how to complete the chart.



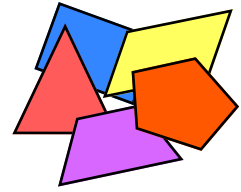
Convex	Concave
10, 11, 15, 17, 22, etc.	21, 23, 24, 25, 27, etc.

**Poly Sorting T-charts**

Label the columns, sort the shapes, and record the shape number under the headings.

Name: \_\_\_\_\_  
Date: \_\_\_\_\_

# Poly Sorting Methods



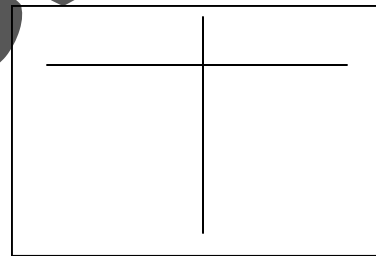
## 1 - Open Sorting

When you first introduce the shapes, ask your students to sort and classify them in any manner they choose. Then ask a reporter from each team to briefly describe the method their team used to sort the shapes. A more advanced strategy is to provide 5 minutes for students to sort their shapes, then allow them to get up and observe the sorting methods used by others. If the groups are not labeled, students will have to guess the method used to classify the shapes.

## 2 - T-Chart Sorting (1 attribute)

Name a particular category and have students sort each shape according to whether it displays or does not display the attribute. Or select opposite attributes. See examples below:

- ◆ Polygon/Not Polygon
- ◆ Quadrilateral/Not Quadrilateral
- ◆ Convex/Concave
- ◆ Regular/Irregular
- ◆ Line Symmetry/No Line Symmetry
- ◆ Obtuse Angle(s)/No Obtuse Angles

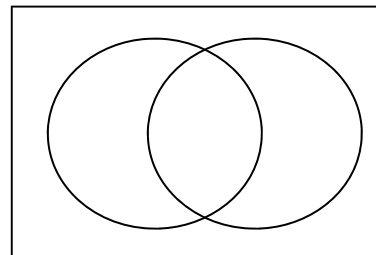


## 3 - Venn Diagram Sorting (2 attributes)

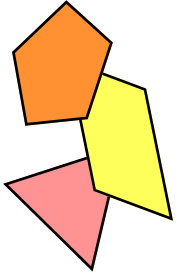
Name two categories and have students sort each shape according to where it fits in the overlapping circles. Some shapes may belong in the area outside the circles.

Possible attributes:

- ◆ Hexagons/Parallel Sides
- ◆ Rotational Symmetry/Line Symmetry
- ◆ Regular Polygons/Parallelograms
- ◆ Parallel Sides/Line Symmetry
- ◆ Perpendicular Diagonals/Quadrilaterals



# **Poly Sorting T-charts**



Name \_\_\_\_\_

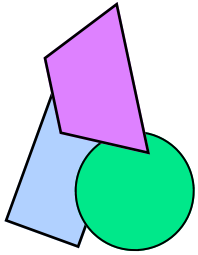
Date \_\_\_\_\_

Label the columns, sort the shapes, and record the shape numbers under the headings.

<hr/> <hr/>	<hr/> <hr/>
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Preview

# Poly Sorting Venn Diagrams



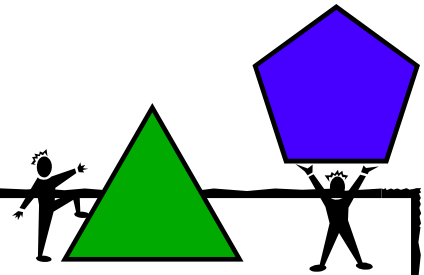
Name \_\_\_\_\_

Date \_\_\_\_\_


Label the circles, sort the shapes, and record the shape numbers inside the sections.

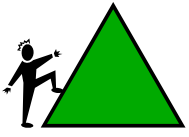

Preview

# Polygon Showdown



## Directions

1. Stack the question cards face up in the center of the team (answers are on back).
2. Spread out the selected polygons face up with the numbers visible.
3. The Leader flips over the top card and reads the question aloud.
4. Without talking, everyone (including the Leader) writes the numbers of the correct polygon(s) on his or her own dry erase board. 
5. Place boards face down when ready.
6. The Leader says "Showdown!"
7. Flip over boards and show answers. The Leader turns the question card over to check. Be sure to discuss answers that are different. Celebrate correct answers.
8. If everyone got it correct, remove it from the deck. If not, place it at the bottom of the deck to repeat later.
9. In a clockwise fashion, rotate Leaders for each round. Play until time runs out.



# Triangle Showdown



Use Poly Shapes 1 - 7 for this activity.

Which polygons are right triangles?

Which polygons are obtuse triangles?

Which polygons are acute triangles?

Which polygons are equilateral triangles?

Which polygons are scalene triangles?

Which polygons are isosceles triangles?

Which polygons are both obtuse and scalene?

Which polygons are right scalene triangles?

Which polygons have no lines of symmetry?

Which polygons have just one line of symmetry?



# Triangle Showdown Answers



to duplicate on the card backs

1, 4, 7

2 and 6

3

3 and 5

1 and 6

2, 4, 5, and 7

2

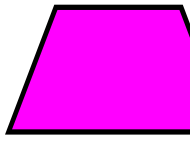
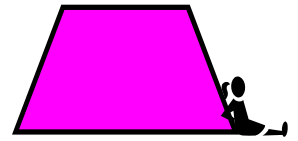
4 and 7

1 and 6

2, 4, 5, and 7



# Quadrilateral Showdown



Use Poly Shapes 8 - 15 for this activity.

Which polygons  
are squares?

Which polygons  
are rectangles?

Which polygons  
are rhombi?

Which polygons  
are parallelograms?

Which polygons  
are trapezoids?

Which polygons  
do not have any  
parallel sides?

Which polygons have  
no congruent sides?

Which polygons have at  
least one set of opposite  
sides congruent?

Which polygons  
have adjacent  
congruent sides?

Which polygons  
have perpendicular  
diagonals?

# Quadrilateral Showdown Answers



to be duplicated on card backs



8 and 9

8

8, 9, 10, and 13

8 and 13

14 and 15

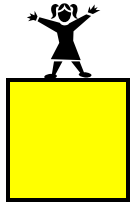
11 and 12

8, 9, 10, 12, and 13

14

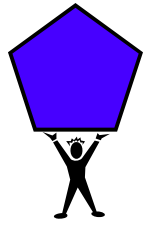
8 and 13

8, 13, and 15



# Polygon Showdown

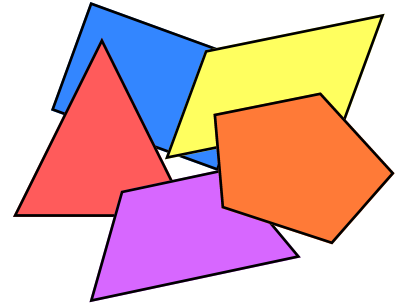
Create Your Own Question Cards




preview

# Polygon Capture

## Teacher Information



### Materials for each team:

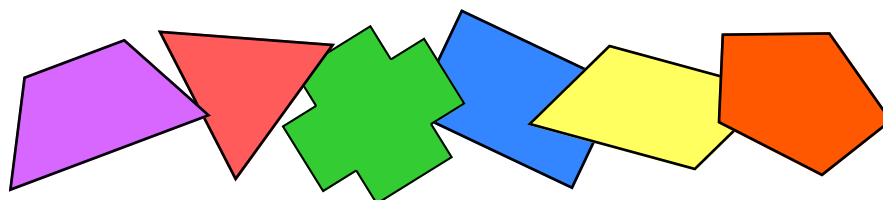
- One set of Poly Shapes
- One set of Game Cards (Basic and/or Advanced)
- Clock with second hand or 1-minute timer
- 2 colored plastic cups (optional - see below)

### Overview

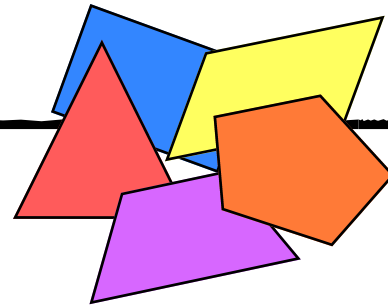
Polygon Capture is a review game to be used at the end of a geometry unit. Shapes are spread out and students take turns trying to “capture” them according to the directions on the game cards. This game works well for cooperative learning teams but needs to be modeled in a whole class setting before doing so. Students may need some guidance and direction with how to challenge each other in a respectful way.

### Suggestions

- Before having students play in teams, introduce the game by playing a few rounds against the class using your demo shapes.
- To create a faster version of the game, have students randomly remove half of the shapes and set them aside before the game begins.
- Encourage students to challenge each other frequently but in a respectful manner. If your students are reluctant to place a challenge, walk around and challenge them yourself. Having to justify a capture requires fluency with mathematical vocabulary and involves the students in talking about the polygons. The game is much more fun when kids begin to feel comfortable challenging each other.
- If students can't resolve a challenge by consulting a source such as a textbook, they should set the piece aside and signal you to come help. A good way to do this is to use colored plastic cups. Stack two different-colored cups and have them place a particular color on top when they begin playing. Ask them to switch colors as a signal to you when they need help and continue to play until help arrives.
- For an interesting variation, at the end of the game have students total the numbers on their shapes and the winner in each team is the one with the highest sum. You can surprise them with this twist at the end of the game.

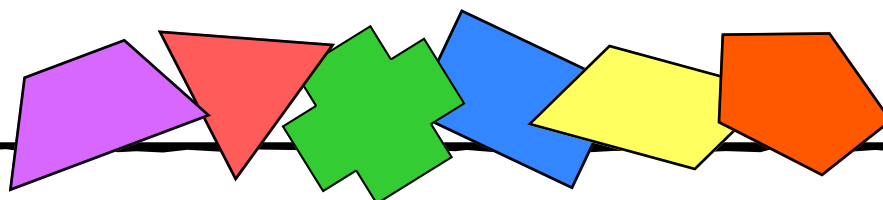
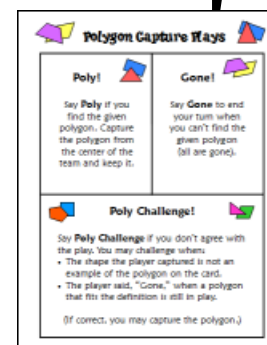


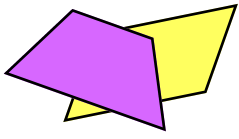
# Polygon Capture



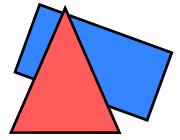
## Game Directions

1. Spread out the Poly Shapes with the blank sides up and the numbers face down.
2. Number off clockwise around the team. Give the stack of Polygon Capture Game Cards to Person #1 who flips over the top card and reads the instructions aloud.
3. Person #1 has one minute to make a play according to the directions on Polygon Capture Plays. He or she says, "Poly," and captures the shape or says, "Gone," if there are none that fit the definition.
4. Starting with the person on the left, players may challenge the play by saying, "Poly Challenge!" if they don't agree with the move. Team members discuss the challenge and decide who is correct. If the challenger is correct, he or she captures the shape. Players may use reference materials such as notes or a math text. If they can't agree, they set the shape aside, signal the teacher, and continue playing until the challenge can be resolved.
5. After Player #1 completes a turn, the stack of game cards is passed to the left, to Player #2. He or she turns over the next card, reads the direction aloud, and makes a play. Starting on the left, others may challenge the play if they don't agree.
6. Continue taking turns as time allows. If all the game cards are used, shuffle them and start over, but players keep the polygons they have earned to that point.
7. At the end of the game or when time runs out, the winner is the person who has collected the most polygons.

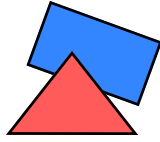




# Polygon Capture Plays

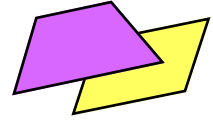


## Poly!

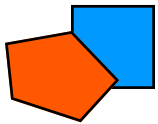


Say **Poly** if you find the given polygon. Capture the polygon from the center of the team and keep it.

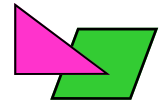
## Gone!



Say **Gone** to end your turn when you can't find the given polygon (all are gone).



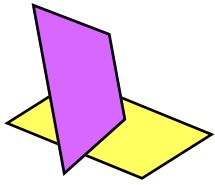
## Poly Challenge!



Say **Poly Challenge** if you don't agree with the play. You may challenge when:

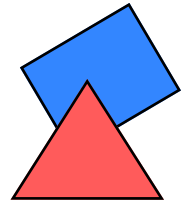
- The shape the player captured is not an example of the polygon on the card.
- The player said, "Gone," when a polygon that fits the definition is still in play.

(If correct, you may capture the polygon.)



# Polygon Capture Game Cards

## Basic Cards



Take one  
**quadrilateral**

Take one  
**square**

Take one  
**rhombus**

Take one  
**octagon**

Take one  
**pentagon**

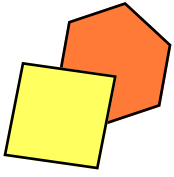
Take one  
**trapezoid**

Take one  
**hexagon**

Take one  
**rectangle**

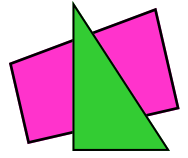
Take one  
**parallelogram**

Take one  
**triangle**



# Polygon Capture Game Cards

## Advanced Cards



Take one  
**concave polygon**

Take one  
**isosceles triangle**

Take one  
**scalene triangle**

Take one  
**regular polygon**

Take one  
**shape with two  
lines of symmetry**

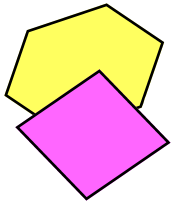
Take one  
**irregular polygon**

Take one  
**shape with all  
congruent sides**

Take one  
**scalene triangle**

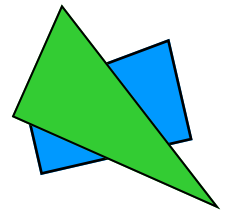
Take one  
**shape with two sets  
of parallel sides**

Take one  
**convex polygon**



# Polygon Capture Game Cards

Create Your Own Cards




preview



# Laura Candler's Teaching Resources

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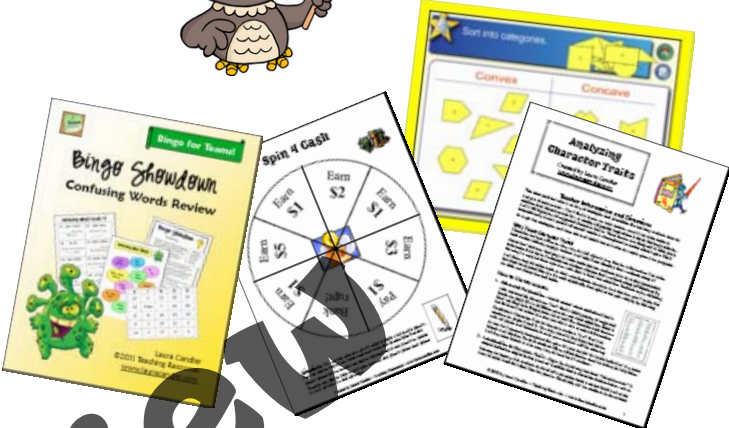


Laura Candler

Teaching Multiple Intelligence Theory

Bingo Showdown:  
Confusing Words Review

- Character Bio Reports
- Analyzing Character Traits
- Powerful Poetry Combo
- Plural Noun Showdown
- Sentence Go Round
- Writing Powerful Poetry



Geometry: Exploring the Basics

Math Stations for Middle Grades (3-8)

- Mastering Math Facts
- Polygon Explorations
- Polygon Explorations (Smartboard)
- Place Value Spinner Games
- Fraction Spinner Games
- Simplify and Snap Fraction Game
- Order of Operations Bingo

## Seasonal Teaching Packs

October

November

December

January

February (Free!)

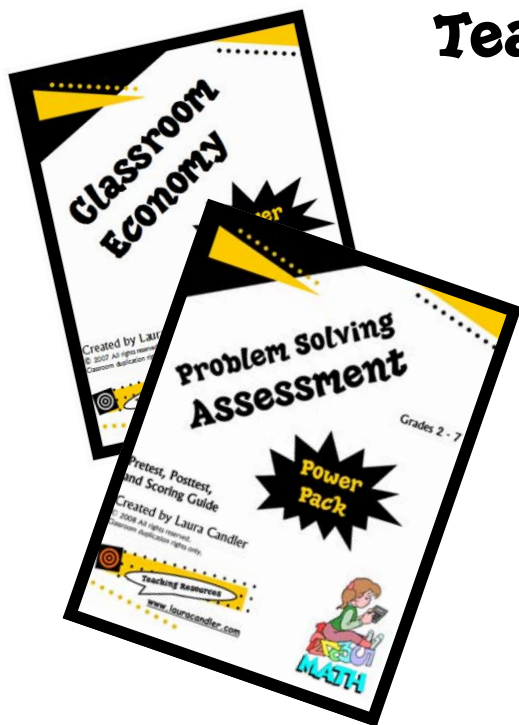
March

April



# Teaching Resources Website

[www.lauracandler.com](http://www.lauracandler.com)



## Free Resources for Teachers!

- Printables and activity pages
- Lesson plans and teaching strategies
- Cooperative learning methods
- Classroom management and motivation
- Literacy and Literature Circle strategies
- Mathematics games and activities
- Weekly Email Newsletters



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Laura Candler  
Milken Educator