

IMPROVING TEACHER QUALITY PROGRAM  
**Mathematics Within: Algebraic Processes and Its Connections to Geometry**

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**Broad Topic:** Geometry (this series of 3-4 lessons would be used at the beginning of the unit)

**Subtopic:** Polygons

**Grade level:** 4-6

**Time:** 30-Minutes

**Aim:** To enable students to verbalize and characterize the similarities and differences between polygons.

**Specific Objective(s):**

- Gain a deeper understanding of characteristics of different polygons.
- Develop vocabulary related to geometric shapes and concepts.
- Extend geometric concepts into real life situations.

**Materials/Supplies:**

- Circle Sheet
- Learning Logs
- Posters

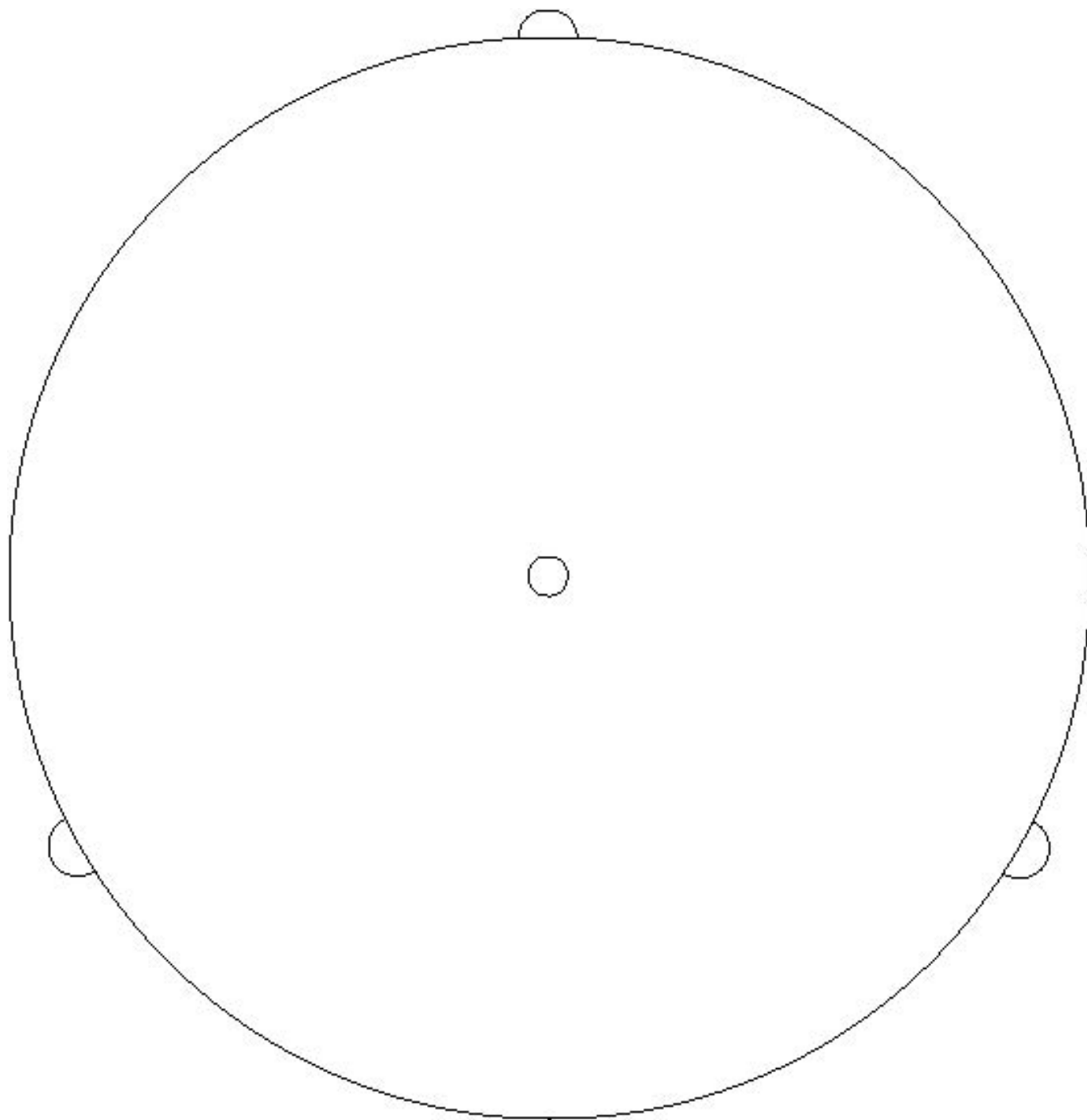
**References: (text/handouts, etc.)**

- Circle activity (more for teacher, pp.3-4)
- Graphic Organizers- (pp. 5- 6)
  - Prior knowledge
  - Frayer Concept for different sheets (pp. 7-14)
- *Mathscapes* Grade 6;
- *Everyday Math* Grades 4 and 5.

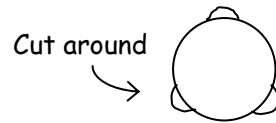
**Lesson:**

- **Introduction (Day 1)**
  - Activate prior knowledge about polygons from graphic organizer
  - Give them between 10 and 20 minutes (age appropriate) to complete as much as they can as individuals. When the time is up, let the kids set it aside and move to the next activity.
  - Teacher-led Circle Activity (see attached pp.3-4).
  - Let students discuss, explore, and refine their own definitions on graphic organizer below the half way line, and give them as much time as teacher deems necessary.
- **Body (Day 2)**
  - Split students into groups of three
  - Hand-out Frayer model graphic organizer (pp. 5-6). (Teacher can decide how to split up groups).
  - Students discuss and complete the four categories for two different polygons. (Eight shapes will overlap, so there are three shapes from each category; i.e., three groups may do triangles).
  - Groups hang individual sheets on board by like shapes for whole class discussion. This will become a class poster from their group work.
  - This can also be used as an assessment for teachers to monitor and adjust.

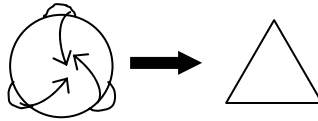
- Make class poster on poster paper for each shape from students' examples and prior knowledge of graphic organizers.
  - After all posters are finished, students will make appropriate changes and/or additions to their brainstorm graphic organizer from day 1 so they have access to accurate characteristics of polygons.
  - Go to learning logs: Ask students
    - What did you notice from this process from the last two days? We want to know how their ideas of shapes have changed from what their prior knowledge was to where they are now.
- **Close (Day 3)**
    - Differentiation: Ability level.
    - Students will choose one or two topics (depending on your class).
    - Students will pick a shape and make a Geometric cartoon character; e.g., "Sponge Bob Pentagon Pants."
    - Students can pick a photograph/picture and create a "Geometric Picture" for each item in the picture. For example for a tree, students may pick a rectangle for the stump, and a circle for the top of the tree.
- **Other options:** (Teachers should decide whether to stop and do the section as a "lesson" or, to let it be a "project" that continues during ongoing lessons.)
    - **Geometric scavenger hunt:** Students can be given a list of places to find geometric shapes – i.e., an advertisement with a triangle or cylinder, a photograph with a square, a city scene containing 3 rectangles and a trapezoid, etc. They would show the examples they found to fulfill the categories.
    - **Internet search for Geometry:** Encourage students to find areas of real life with a geometric connection – i.e., architecture, art, chemistry etc. They can report on or display their findings.
    - **Look at a historical search of Geometry**  
Students may choose to research the historical background for the various shapes, which would include famous early mathematicians and connections to the mathematics of Ancient Greece, Egypt, etc.
    - **Tessellation Art Project:** (Offered in Math/Art lesson books or at Tile stores)
- **Application/assessment**
    - Assessments can be any one of the above activities.
    - As stated earlier, the sheets that the groups do (Frayer concept sheets, p.7-14, could be used as an assessment.)
    - As the class is discussing each poster you are making as a class, you can get a good picture of how you are doing.



1. Cut out circle including dots on the circumference.



2. Fold dots into center to cover center dot. This should produce a large equilateral triangle. Discuss with class.



3. Fold apex of triangle down to the midpoint of the base. Should produce a trapezoid. Discuss with class.



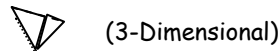
4. Fold up left bottom corner of trapezoid to right upper corner of the trapezoid. Should produce a parallelogram/rhombus. Discuss with class.



5. Fold up remaining lower corner to produce a second equilateral triangle. Discuss with class.



6. Allow flaps to "rise up" and form a triangle pyramid. Discuss with class.



7. Open up and lay it flat so that it is once more a large equilateral triangle. Fold vertices into center (dot) to produce a hexagon. Discuss with class.



8. GRAND FINALE - Allow flaps to "rise up" again. Overlap these triangular flaps to form a truncated tetrahedron - a 3D shape with a triangular base, a smaller triangular top, and 3 trapezoid sides. Truncated means having the top cut off - this is like a pyramid with the tip cut off.

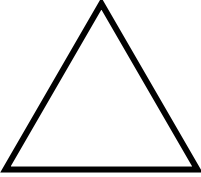
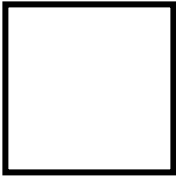
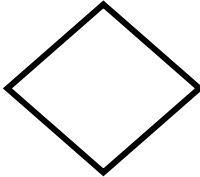
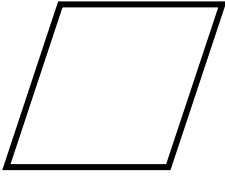


Nice extension is to ask them to figure out the relationship between the top and bottom triangle in the truncated tetrahedron (and also the relationship of either to the original triangle) and also the side trapezoid's relationship to our first larger trapezoid.

Additional Vocabulary that may arise in conversation:

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|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- angles</li> <li>- equilateral</li> <li>- midpoint</li> <li>- parallel</li> </ul> | <ul style="list-style-type: none"> <li>- similar</li> <li>- symmetry</li> <li style="padding-left: 20px;">- rotations</li> <li style="padding-left: 20px;">- reflection</li> </ul> |
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Page 5-Graphic Organizer

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