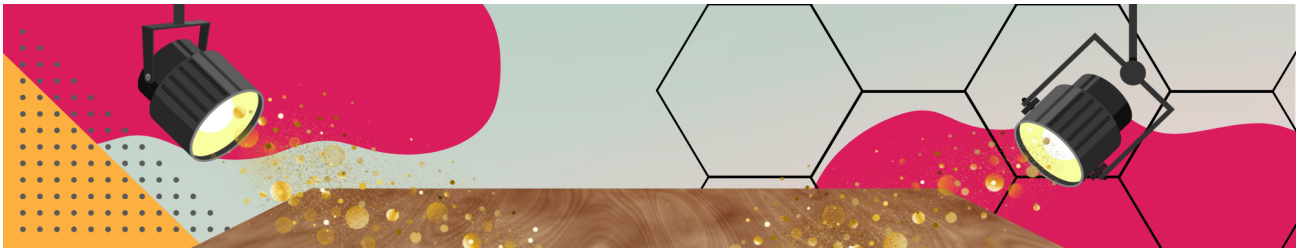
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Integrated learning solutions

UNIT: POLYGON PERSPECTIVES–MATH MEETS CREATIVITY
POLYGON FAMILIES
Grade Band: 5
Content Focus: Theatre & Math



LEARNING DESCRIPTION

Students will assume roles as different polygons to explore the relationships among categories of polygons.

LEARNING TARGETS

Essential Questions	"I Can" Statements
What are the properties and defining attributes of various polygons? How can we enact polygons to more clearly understand their attributes and relationships?	I can engage in drama activities involving polygons. I can play a role as a polygon. I can work with a group to create a simple performance piece about polygons.

GEORGIA STANDARDS

Curriculum Standards	Arts Standards
5.GSR.8.1 Classify, compare, and contrast polygons based on properties. 5.GSR.8.2 Determine, through exploration and investigation, that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.	TA5.PR.1 Act by communicating and sustaining roles in formal and informal environments.

SOUTH CAROLINA STANDARDS

Curriculum Standards	Arts Standards
5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. 5.G.4 Classify two-dimensional figures in a hierarchy based on their attributes.	**Anchor Standard 3:** I can act in improvised scenes and written scripts.

KEY VOCABULARY

Content Vocabulary	Arts Vocabulary
• Polygon - A plane figure enclosed by line segments called sides • Regular polygon – A polygon whose sides are all equal and whose interior angles are all congruent • Parallel lines - Lines in the same plane that never intersect, no matter how far they are extended • Perpendicular lines - Lines that intersect at a 90-degree angle, forming right angles where they meet • Triangle – A polygon with three sides and three angles	• Role – A part played by an actor in a scene, play, movie or other performance. • Collaboration – Working together as a team • Unison – Speaking or reciting as one

- Equilateral triangle – A triangle with three equal sides and three congruent triangles
- Isosceles triangle – A triangle with two equal sides and two congruent angles
- Scalene triangle – A triangle with three different sides and three incongruent angles
- Right triangle – A triangle in which one angle is a right angle
- Acute triangle – A triangle with three acute (less than ninety degree) angles
- Obtuse triangle – A triangle with one obtuse (greater than ninety degree) angle
- Quadrilateral – A polygon with four sides
- Trapezoid – A quadrilateral with only one set of parallel sides
- Isosceles trapezoid – A trapezoid whose non-parallel sides are equal in length
- Rectangle – A quadrilateral with four right angles
- Square – A quadrilateral with four right angles and four equal sides
- Parallelogram – A four-sided plane rectilinear figure with opposite sides parallel.
- Rhombus - A parallelogram with opposite equal acute angles, opposite equal obtuse angles, and four equal sides
- Pentagon – A five-sided polygon
- Hexagon – A six-sided polygon

• Octagon – An eight-sided polygon (Note: This list can be revised and curated depending on the teacher's discretion and the particular polygons under study.)	

MATERIALS

- Polygons Poster or Graphic of Hierarchy of Polygons to project
- A class set of name tags for regular polygons: Equilateral triangle, isosceles triangle, scalene triangle, right triangle; trapezoid, rectangle, square, rhombus, parallelogram, pentagon, hexagon, octagon. Two of each will comprise a class set of 24 tags. *Note: additional name tags can be created as needed.*
- Index cards and writing utensils
- Polygon Hierarchy/Family Tree
  - https://mathmonks.com/polygon/polygon-hierarchy
  - http://jessicasgeometryspace.weebly.com/polygon-family-tree.html
- Quadrilateral Family Tree:
  - https://graphicmaths.com/gcse/geometry/quadrilateral-family-tree/

INSTRUCTIONAL DESIGN

Opening/Activating Strategy

Statues in the Garden:

- Lead students in "Statues in the Garden" (also sometimes known as "Night at the Museum"): One actor is the guard wandering through the garden, while the other actors assume poses as statues in the garden. When an actor senses that the guard will not see them, they can change their pose. If the guard sees the statue move, they say, "I saw you move" and that actor steps out.
- Play Statues in the Garden with the added rule that every statue must have a polygon in it. Actors can form the polygons with their fingers, arms, legs, or any other part of their bodies, or in collaboration with other actors. Appoint a student to be the guard, and then during the game ask actors, "Tell me about your statue," to have them describe the polygons in their statues. Play several rounds with a different guard each time, and encourage variety and creativity in the formation of the polygons.

Work Session

Who Am I?

- Review with students the definition of a polygon, and types of polygons under study (i.e., the polygons included in the set of name tags).
- With the class set of name tags, distribute one to each student, instructing them that they can look at it but must not let others see what they have.

- Have each student clip the tag they have onto another student's back, so that each student ends up with an unknown tag on their back. The tags should be placed so that the identity is easily visible to others.
- Give each student an index card and writing utensil. Have them write their name on their card.
- Tell students they will try to determine their identity by asking yes/no questions of other students.
    - Brainstorm the types of questions that can be asked, such as, "Do I have any right angles?"; "Do I involve the number three?"; "Do I have any obtuse angles?"; "Do I have any equivalent sides?"; etc.
    - If students are stuck, questions can also be about the words: "Do I have two words in my name? Do I have an 'a' in my name?" (Note: Questions should be in first person – "Do I . . .?" or "Am I . . ." rather than about the tag – "Is my shape . . . ?")
- Instruct students to find another student, ask each other one question and answer each other's question, and make a note of what they have learned about their identity. Their notes can be in their own shorthand (e.g., "no equiv. angles," "'> 4 sides," "triangle").
- Then have them repeat the process with other partners, each time adding information until they have discovered their identity. When they get to that point, they can ask, "Am I a pentagon?", "Am I a scalene triangle?", etc., and if the answer is "Yes," they can take the name tag off of their back and put it on their front, ideally on the torso or upper sleeve where it will be easily visible.
- *Teacher discretion: Have the entire list of polygons available on a screen or poster for students to refer to as they are trying to determine their identity.*
- If most students have figured out their identity, but some have not, allow partners to give hints. It is also fine to stop the activity and simply have students move their tags from back to front and see what they have on their tag.
- Once all students have discovered their identity, tell them that the tag gives them their role – it is the character they are playing.
- Collect the index cards.

<u>Meet-and-Greet:</u>

- Direct students to move about meeting and greeting one another in character as their polygon, exploring what they have in common and what differentiates them. Remind them to use polygon vocabulary: Sides, angles, equivalent, congruent, parallel, right, acute, obtuse, etc. Encourage them to speak in character (first person) and to meet several other polygon characters.

<u>Polygon Family Groups:</u>

- Have the students get into polygon family groups: Triangles, Quadrilaterals, and Others (polygons with more than four sides, possibly referred to as 'N-gons' where N represent the number of sides).
- Display graphics (teacher's choice) that show the Hierarchy of Polygons and Polygon Families – these can be from the class text or curriculum or from the internet (some sites listed in "Materials" above).
- Instruct them to work as a group to create a chant, rap, poem, or song that conveys information about what distinguishes their group, and also about the sub-groups or individuals in the group.

- Instruct them to include parts that are spoken in unison, and also an individual part for each member of the group.
- Encourage them to have fun and be creative but to be sure to include defining information.
- Remind them of relevant vocabulary terms: Sides, angles, equivalent, congruent, parallel, right, acute, obtuse, etc.
- The groups can write out their chant, rap, poem or song; they can also model it on a familiar tune or text.

- Have students rehearse their pieces. Remind them to take their time, to rehearse the group parts together, and to speak clearly. Encourage them to add in simple movements and gestures – this will enhance the performance, and also facilitate memorization and clarity.
- Move from group to group to coach as needed.
- Have each group share/perform their piece. Discuss appropriate audience participation and etiquette prior to performances.
- Lead reflection in which the other students can provide positive feedback about what the group did well, in terms of both the math and the drama (the composition and performance).

Closing/Reflection

- Have students reflect on and share responses to the following question: How did you work together to compose your pieces? How did you decide on the information to include in your piece? What was most challenging about this lesson? How did you and/or your group overcome the challenge?

ASSESSMENTS

Formative

- In the “Statues in the Garden,” “Who am I?,” and “Meet-and-Greet” activities, students demonstrate understanding of the attributes of polygons.
- In the composition and rehearsal process, students demonstrate understanding of the relationships and differences among the polygons in their groups.
- In the composition and rehearsal process, students work together creatively and respectfully, and use creativity to develop their pieces.

Summative

- The group pieces convey accurate information about the polygons in their polygon family, regarding both the characteristics that define the group as a whole and the characteristics that differentiate the individual members.
- The group performs their chant, rap, song or poem with clarity – they speak loudly and clearly, and they work together effectively. (Note: As these will have been minimally rehearsed, they are not expected to be polished or perfect, but they should show evidence of collaboration and solid rehearsal.)
- Each group speaks/raps/sings some parts chorally (in unison), and also a part spoken by each individual voice.

- The collected index cards demonstrate evidence of comprehension of polygons in the notes the students took to determine their identities.

DIFFERENTIATION

Acceleration:

- Include a larger selection of polygons, including irregular polygons and polygons with higher number of sides (e.g., nonagon, dodecahedron, pentadecagon, concave hexagon, etc.).
- Add a requirement that the group piece composed must have a rhyme scheme.

Remediation:

- Reduce the number of polygons in the group under study.
- Write the brainstormed questions on the board for easy reference.
- As needed, coach individual students and give them hints during the “Who am I?” activity.

ADDITIONAL RESOURCES

CREDITS

U.S. Department of Education- STEM + the Art of Integrated Learning
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**This integrated lesson provides differentiated ideas and activities for educators that are aligned to a sampling of standards. Standards referenced at the time of publishing may differ based on each state’s adoption of new standards.*

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