

A Perfect Match

Congruent Polygons

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Grade Level	9th – 10th Grade	**Time Frame**	60–80 minutes
Subject	Mathematics	**Duration**	2 class periods
Course	Geometry		

Essential Question

How do the properties of congruent polygons help us solve problems?

Summary

In this lesson, students will explore the properties of congruent polygons and analyze how to apply those properties to solve problems.

Snapshot

Engage

Students use the Not Like the Others strategy to compare triangles with the same area.

Explore

Students explore the definition of congruence with the challenge of dividing a polygon into two congruent polygons.

Explain

Students complete guided notes with the class and label corresponding parts of a polygon that has been rotated or reflected.

Extend

Students apply what they have learned to find the values of unknown side lengths and angle measures of congruent polygons within a tessellation.

Evaluate

Students solve for unknown values given two congruent quadrilaterals.

Standards

ACT College and Career Readiness Standards - Mathematics (6-12)

G601: Use relationships involving area, perimeter, and volume of geometric figures to compute another measure (e.g., surface area for a cube of a given volume and simple geometric probability)

Oklahoma Academic Standards Mathematics (Geometry)

G.2D.1.8: Apply the properties of congruent or similar polygons to solve problems using mathematical models and algebraic and logical reasoning.

Attachments

- Corresponding Parts—A Perfect Match - Spanish.docx
- Corresponding Parts—A Perfect Match - Spanish.pdf
- Corresponding Parts—A Perfect Match.docx
- Corresponding Parts—A Perfect Match.pdf
- Finding Matches—A Perfect Match - Spanish.docx
- Finding Matches—A Perfect Match - Spanish.pdf
- Finding Matches—A Perfect Match.docx
- Finding Matches—A Perfect Match.pdf
- Guided Notes—A Perfect Match - Spanish.docx
- Guided Notes—A Perfect Match - Spanish.pdf
- Guided Notes—A Perfect Match.docx
- Guided Notes—A Perfect Match.pdf
- Lesson Slides—A Perfect Match.pptx
- Trying Tessellations—A Perfect Match - Spanish.docx
- Trying Tessellations—A Perfect Match - Spanish.pdf
- Trying Tessellations—A Perfect Match.docx
- Trying Tessellations—A Perfect Match.pdf

Materials

- Lesson Slides (attached)
- Finding Matches handout (attached; one per pair; print one-sided)
- Guided Notes handout (attached; one per student; print one-sided)
- Trying Tessellations handout (attached; one per pair; print one-sided)
- Corresponding Parts handout (attached; one half per student; print one-sided)
- Pencil
- Colored pencils (5 different colors per pair)
- Geoboards (optional for Explore)
- Student devices with Internet access (optional for Explore)

5 minutes

Engage

Introduce the lesson using the attached **Lesson Slides**. **Slide 3** displays the lesson's essential question. **Slide 4** identifies the lesson's learning objectives. Review each of these with your class to the extent you feel necessary.

Instruct students to find a partner or assign students partners. Show **slide 5**. Give each pair a copy of the attached **Finding Matches** handout. Introduce the Not Like the Others strategy and direct students' attention to the "Not Like the Others" portion of their handout. Ask students which polygon they think is not like the others.

Tell students that they have 2 minutes to select the triangle that they believe is not like the others and share their thoughts with their partner. Allow students approximately 3 minutes to share their selection and reasoning with the class.

Teacher's Note: Guiding the Activity

There is more than one possible answer for this prompt. Be open to multiple possible answers and justifications while also highlighting which shapes are congruent. The area of the triangles are all the same, but the triangles are not all congruent.

15 minutes

Explore

Display **slide 6** and direct students' attention to the "Equal Halves" portion of their handout. Each polygon can be divided into two congruent polygons by drawing a line segment from one point to another. Give students time to test and determine where to draw this segment. Consider reminding students that this line segment will likely not be the line of symmetry; this could potentially be a misconception.

Optional Geoboards or Virtual Geoboards

Students may be more willing to try and explore multiple options for splitting the polygons in a more hands-on setting. Geoboards or a virtual Geoboard can be provided to give students freedom for repeated tests as they work with the shapes. The Math Learning Center has a free virtual Geoboard.

Transition through **slides 7–9** and discuss strategies for determining that the two halves are congruent. Remind students that the examples on the slides are just that – examples of line segments that would divide the polygon into two congruent halves. As time allows, ask for volunteers to share alternative line segments.

20 minutes

Explain

Teacher's Note: Guiding the Activity

Here students use their colored pencils to trace the corresponding sides with the same color. The colors that the students use do not need to be the same as the colors used in the slides. There are also three given angles labeled on the first polygon; students are to label the corresponding angles on the other polygons with these three angle measurements.

Display **slide 10**. Give each student a copy of the attached **Guided Notes** handout. Each pair of students needs five colored pencils to share. Complete the handout as a class. Have students add this to their math notebook if that is a classroom norm.

Show **slide 11** and direct students' attention to Polygon *ABCDE* and use their colored pencils to trace each side of the polygon with a different color. Display **slide 12** as a model.

Show **slide 13**. Using the same five colored pencils, instruct students to trace the next polygon such that the corresponding sides are the same color as Polygon *ABCDE*. Transition to **slide 14** to show students the corresponding sides. Have students also label the three given angles. Display **slide 15** and explain to students how to write the congruence statement and the importance of the order of the letters – corresponding parts are written in the same order.

Display **slide 16** and direct students' attention to the horizontal reflection of Polygon *ABCDE*. Have them repeat the same steps as before, tracing and labeling corresponding parts. Display **slide 17**. Now if students take a moment to determine how many vertices are on this handout, they should notice that there are 30 vertices, which is more than there are letters in our alphabet. Display **slide 18** and instruct students to label the corresponding vertices A', B', ..., E'; this notation is used to allow for students to use the remaining letters to label the last three polygons. Display **slide 19** to show the congruence statement.

Show **slide 20** and instruct students to repeat this process for the remaining polygons.

Teacher's Note: Guiding the Activity

Use this time as guided practice. Circulate the room while students are working and monitor their work. Ask students to explain their thinking and how they wrote congruence statements. As you circulate, slowly transition through **slides 21–23** so students can self-check their work.

15 minutes

Extend

Teacher's Note: Preparation

Decide whether you want the Trying Tessellations handout to be guided practice or independent practice. The sample responses to the handout are on hidden slides, so if you would like the class to check their work as they go, unhide slides 26–33.

Display **slide 24** and give each pair of students the attached **Trying Tessellations** handout. Here students are given a tessellation of one repeated pentagon and are asked to solve for each unknown variable using their knowledge of congruence. Give students a moment to read the information about tessellations and directions on the handout, then show **slide 25**.

Optional Slides

Unhide and then display **slide 26** as a hint for how to get started. Explain that color-coding the corresponding parts and labeling Polygon *ABCDE* can be helpful.

Unhide and then show **slides 27–33** to review the value of each variable with the class.

5 minutes

Evaluate

Use the Exit Ticket strategy to individually assess what students have learned from the lesson. Show **slide 34** and give each student the **Corresponding Parts** handout. Students are asked to find the values of *x* and *y* given two congruent quadrilaterals.

After students have submitted their work, unhide and transition through **slides 35–37**. Give students time to reflect on their thinking. Use student responses to see what misconceptions still exist.

Alternative Pacing

This exit ticket can be completed in class or assigned for students to return to class the next day. Reviewing the values of *x* and *y* could also be done as bellwork the following day. Consider giving the Corresponding Parts handout as homework, then starting the next day with a 3–5 minute review using slides 35–37.

Resources

- K20 Center. (n.d.). Bell ringers and exit tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). Not like the others. Strategies. https://learn.k20center.ou.edu/strategy/77
- K20 Center. (n.d.). Geoboard. Tech Tools. https://learn.k20center.ou.edu/tech-tool/627