Department of the Interior Angles

Polygons and the Interior Angle Sum Theorem

K20 Center, Daniel Schwarz, Alexandra Parsons
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Grade Level	9th – 10th Grade	**Time Frame**	60 minutes
Subject	Mathematics	**Duration**	1-2 class period(s)
Course	Geometry		

Essential Question

How creatively can a math theorem be interpreted and applied?

Summary

This lesson introduces and enforces the polygon interior angle sum theorem and the corresponding formula. This lesson does not include a proof related to the theorem, but it does have students critique a claim using the theorem as the reasoning foundation.

Snapshot

Engage

Students watch a TikTok video that makes a claim about the U.S. states.

Explore

Students use a Geogebra activity to collect data about angles in different polygons.

Explain

Students draw conclusions based on their data from the Explore activity.

Extend

Students use their data to verify the formula for calculating the sum of polygon interior angles.

Evaluate

Students use their knowledge to confirm or refute the TikTok video's claim.

Standards

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

G402: Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)

Oklahoma Academic Standards Mathematics (Geometry)

G.2D.1.4: Apply theorems involving the interior and exterior angle sums of polygons to solve problems using mathematical models, algebraic reasoning, and proofs.

Attachments

- Interior Angles TikTok.mp4
- Polygon Interior Angles Exploration—Department of the Interior Angles - Spanish.docx
- Polygon Interior Angles Exploration—Department of the Interior Angles - Spanish.pdf
- Polygon Interior Angles Exploration—Department of the Interior Angles.docx
- Polygon Interior Angles Exploration—Department of the Interior Angles.pdf

Materials

- Polygon Interior Angles Exploration handout (attached; one per student)
- Student devices with internet access

Lesson Format

This lesson is built for flexibility and promoting quick yet deep student understanding of interior angles. It is supported by a self-contained handout without a lot of frills. The intent is to give students an opportunity to gather information and draw conclusions on their own with as little dependence on you as possible.

Students can work at their own pace either independently or in small groups. Even though this lesson is student-driven, don't think of it as a slow cooker where you can set it and forget it! Frequent check-ins and in-the-moment formative assessments will help you keep students on track and help them build confidence in their independence.

5 minutes

Engage

Teacher's Note: One Class Period? No Problem.

If you want to complete this lesson in one class period, it's doable, but you'll need to get students started as soon as they arrive. So, the "bell work" for today is to get a handout and get to work!

Make sure each student gets a copy of the **Polygon Interior Angles Exploration** handout and has access to a Chromebook or other internet-connected device.

Teacher's Note: Together or Not?

The entire lesson is represented in the handout. Students can complete any part of it on their own or as homework.

Inform students they are never safe from learning things, no matter the social media platform. TikTok is not an exception! (The specific video used in this lesson is not on TikTok anymore, but the downloaded video is attached to the lesson.) Open the **Interior Angles TikTok** attachment and have the video ready to play for the class.

Draw students' attention to **Step 1** on the handout. Before you play the video, tell students to look for evidence of the creator's logic; they'll use this evidence later.

Play the TikTok video. The video ranks the states based on the creator's estimation of the sum of the interior angles of each state.

After watching the video, provide students with the link to the GeoGebra activity: geogebra.org/m/qqx4vtKs. Here students will formulate a preliminary definition of interior angles and how the number of sides relates to the number of interior angles.

15 minutes

Explore

Students will use the same GeoGebra activity to complete **Step 2** on the handout. They will move the vertices of the three polygons around and document the angle measurements and the sums of those angles. Remind students that they are making three versions of each polygon, not a mix of random angles.

Teacher's Note: Guidance Is Needed

The GeoGebra activity is great, but think of it as an activity that needs support and not a stand-alone activity. Without scaffolding instructions or questions (like those on the handout), students working on the activity would likely struggle to draw a conclusion from their observations. So, be sure to help students make that connection.

Teacher's Note: Need Collaboration?

This lesson is predominately written for students to complete on their own. However, there are small opportunities to have students "work together." If you would like, have students swap data tables. Six data points are better than three!

10 minutes

Explain

Students will complete **Step 3** on the handout. Students should look back over the data they collected in the **Explore** section and make inferences and determine patterns based upon their results.

Teacher's Note: Hands Off

Although this lesson follows the 5E format, it is written so that students can self-pace their progress and work independently. Rather than calling together the whole group of students, use this time to walk around, check students' work, and answer questions individually.

15 minutes

Extend

To extend their learning, students will complete **Step 4** on the handout. They are presented with three options for the formula for calculating the sum of interior angles. They must use their data from the **Explore** activity to identify which of the three is the correct formula.

Teacher's Note: Getting It Correct

This is a vital time to circulate around the room and ensure that students have selected the correct formula.

Once they've made a selection, students will use their chosen formula to calculate the sum of interior angles for various polygons.

5 minutes

Evaluate

Students will complete **Step 5** on the handout as an evaluation to wrap up the lesson.

They will watch the TikTok video from the **Engage** section again, using what they just learned to decide whether they agree or disagree with the creator's claim and logic.

Teacher's Note: Expectations Matter

How students answer the questions in Step 5 depends on the expectations you set. That is, are you wanting students to write a few words, to write a complete sentence, or to draw a detailed diagram that looks similar to a logic proof? Decide how much depth you would like from students, communicate your expectations clearly, and stick to them.

Teacher's Note: Next Up, Exterior Angles!

If you would like students to explore the Sum of Exterior Angles Theorem, see the "Department of the Exterior Angles" lesson.

Resources

- @jakespankenheimer. (n.d.). *Ranking all 50 states by the sum of their interior angles Pt. 4 [Video].* TikTok. https://www.tiktok.com/@jakespankenheimer
- K20 Center. (n.d.). GeoGebra. Tech Tools. https://learn.k20center.ou.edu/tech-tool/2352
- Mueller, M. (n.d.). *Polygon interior angle sum patterns.* GeoGebra. https://www.geogebra.org/m/qqx4vtKs