Just In Time Quick Check
Standard of Learning (SOL) G.10c

Strand: Polygons and Circles

Standard of Learning (SOL) G.10c
The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the number of sides of a regular polygon.

Grade Level Skills:
- Solve problems, including practical problems, involving angles of convex polygons.
- Determine the number of sides of a regular polygon, given the measures of interior or exterior angles of the polygon.

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Just in Time Quick Check Teacher Notes

Supporting Resources:
- VDOE Mathematics Instructional Plans (MIPS)
  - G.10a-c - Angles in Polygons (Word) / PDF Version
- VDOE Word Wall Cards: Geometry (Word) | (PDF)
  - Polygon Exterior Angle Sum Theorem
  - Polygon Interior Angle Sum Theorem
  - Regular Polygon
- Other VDOE Resources
  - Geometry, Module 9, Topic 3 – Determining the Number of Sides of a Regular Polygon (eMediaVA)

Supporting and Prerequisite SOL: G.10a, G.10b, 8.5

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1. A convex polygon has an interior angle sum of 2520°. How many sides does the convex polygon have? Explain your thinking.

2. The measure of each exterior angle of a regular polygon is 18°.

   a) What is the sum of the exterior angles of this regular polygon?

   b) Determine the number of sides in this regular polygon. Explain how you used the exterior angle measure to find the number of sides.

3. Sabrina would like to create a collage for art class in the shape of a regular polygon with an interior angle that measures 156°.

   a) What is the measure of one exterior angle of this regular polygon?

   b) How many sides are in the regular polygon used in her collage? Explain how you used the interior and exterior angle measures of the regular polygon to find the number of sides.

SOL G.10c - Just in Time Quick Check Teacher Notes
Common Errors/Misconceptions and their Possible Indications

1. A convex polygon has an interior angle sum of 2520°. How many sides does the convex polygon have? Explain your thinking.

   A common error that students may make when calculating the number of sides is only dividing the sum of the interior angle measures by 180 and not adding two to the result. This indicates that the student may not conceptualize how the polygon interior angles sum theorem is derived. The student may benefit from a demonstration of how to check their answer and instruction that includes the polygon interior angle sum theorem as an equation rather than just an expression.

2. The measure of each exterior angle of a regular polygon is 18°.

   a) What is the sum of the exterior angles of this regular polygon?

   A common misconception some students may have is to think that they need to know the number of sides in the polygon before they can determine the sum of the exterior angles. This may indicate that students do not recognize that the sum of the exterior angles is a constant value of 360°. Students would benefit from analyzing a wide variety of convex polygons and explore the relationship to the exterior angle sum either through a dynamic geometry tool or through a class jigsaw activity.

   b) Determine the number of sides in this regular polygon. Explain how you used the exterior angle measure to find the number of sides.

   A common error that students may make is to misinterpret the problem and try to use n = 18 in the polygon interior angle sum theorem. This may indicate that students do not understand what n represents. A strategy that may benefit students is to have them work through a small subset of regular polygons, calculating the measure of each exterior angle. The teacher could then use the same set of problems as examples when calculating the number of sides. This method would allow the teacher to emphasize the relationship between the process of calculating the measure of one exterior angle and the process of calculating the number of sides.

3. Sabrina would like to create a collage for art class in the shape of a regular polygon with an interior angle that measures 156°.

   a) What is the measure of one exterior angle of this regular polygon?

   A common misconception students may have is to fail to recognize interior and exterior angles as linear pairs. This indicates that students have difficulty with scenarios that require the use of linear pairs. Teachers should have students practice with a wide variety of polygons with interior and exterior angle labeled, either by using dynamic geometry tools to measure angles or a through the use of a class jigsaw activity with protractors.

   b) How many sides are in the regular polygon used in her collage? Explain how you used the interior and exterior angle measures of the regular polygon to find the number of sides.

   A common error that students may make is not being able to use the given interior angle of a regular polygon to determine the number of sides. A student who is struggling with this question type may not have the algebraic understanding to be able to set up and solve this equation correctly. Students who are able to set up the equation $156 = \frac{180(n-2)}{n}$ correctly may benefit from additional review of isolating a variable. For many students, however, instruction about the alternative strategy of using the exterior angle of 24° in order to determine the number of sides of the regular polygon may be helpful.