Just In Time Quick Check

Standard of Learning (SOL) G.10a

Strand: Polygons and Circles

Standard of Learning (SOL) G.10a

The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the sum of the interior and/or exterior angles.

Grade Level Skills:

- Solve problems, including practical problems, involving angles of convex polygons.
- Determine the sum of the measures of the interior and exterior angles of a convex polygon.

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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 1 - Interior Angles of a Polygon (eMediaVA)
    - Geometry, Module 9, Topic 2 - Exterior Angles of a Polygon (eMediaVA)

Supporting and Prerequisite SOL: 8.5

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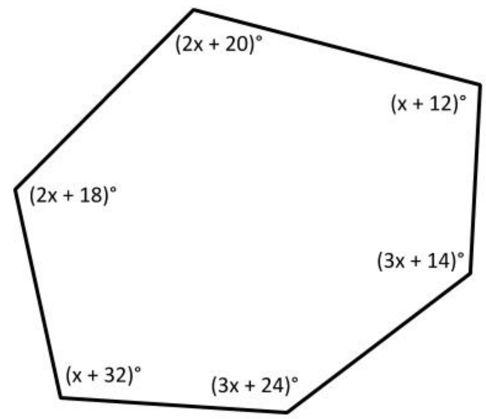
1. A convex polygon is shown. What is the value of x?



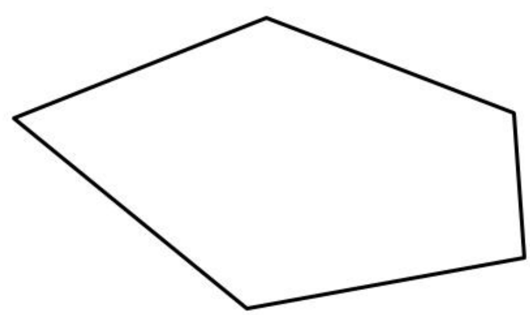
2.

   a) What is the difference between the sum of the exterior angles of a convex hexagon and the sum of the exterior angles of a convex decagon? Explain your thinking.

   b) What is the difference between the sum of the interior angles of a regular octagon and the sum of the exterior angles of a regular octagon? Explain your thinking.

3. Kelvin would like to find the sum of the interior angles in a pentagon. Kelvin thinks that if he can divide the pentagon into triangles, he can find the total interior angle sum.

   a) How many non-overlapping triangles can be formed by drawing all possible diagonals from one vertex of a pentagon? Use the diagram to draw them.



   b) Use what you know about the angle measures in each triangle to find the sum of the interior angles of a pentagon.

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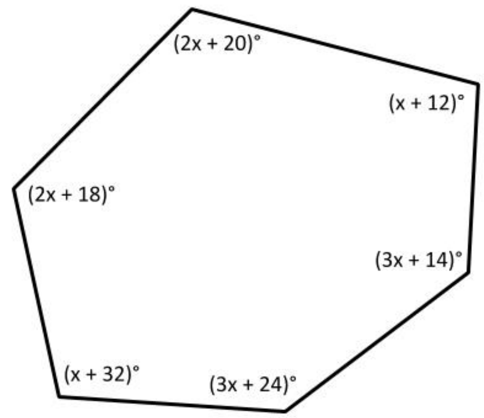
Common Errors/Misconceptions and their Possible Indications

1. A convex polygon is shown. What is the value of x?



A common error a student may make is to write an equation where the sum of the measures of the interior angles is set equal to $360°$. *This may indicate that a student has confused the sum of the exterior angles with the sum of the interior angles of a convex hexagon. Students may benefit from analyzing the interior angle sum as a pattern that increases by 180 with each added side.*

2.

a) What is the difference between the sum of the exterior angles of a convex hexagon and the sum of the exterior angles of a convex decagon? Explain your thinking.

A common error in student thinking is that the sum of the exterior angles of a convex polygon is dependent on the number of sides in the polygon. This misconception makes it likely that students will try to use an incorrect formula rather than just using the constant sum of 360°. Students may benefit from analyzing a wide variety of examples of convex polygons using the exterior angle sum theorem either through a dynamic geometry tool or through a class jigsaw activity.

b) What is the difference between the sum of the interior angles of a regular octagon and the sum of the exterior angles of a regular octagon? Explain your thinking.

An error that some students may make is to find the difference between one interior angle and one exterior angle of the regular octagon. This may indicate that the student understands how to find the measures of an interior and exterior angle of a regular octagon, but fails to find the difference of the sum of the interior angles and the sum of the exterior angles. To help students make connections, teachers could review the relationship between the measure of one interior angle to the sum of all of the interior angles of a regular octagon:

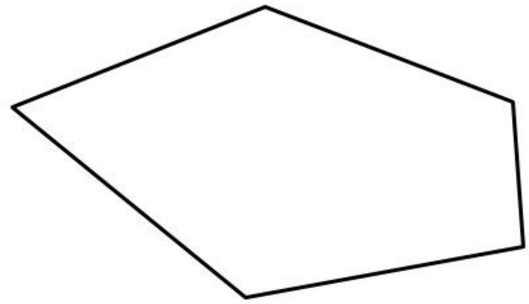
Connect: $8x = 1080$ *to* $\frac{180(n-2)}{n}$, where *x* is the measure of one interior angle of the octagon and *n* = number of sides.

Teachers could also review the relationship between the measure of one exterior angle to the sum of all exterior angles of a regular octagon:

Connect: $8x = 1080$ *to* $\frac{180(n-2)}{n}$ *and* $8y = 360$ *to* $\frac{360}{n}$, where *y is* measure of one exterior angle of the octagon and *n* is the number of sides.

3. Kelvin would like to find the sum of the interior angles in a pentagon. Kelvin thinks that if he can divide the pentagon into triangles, he can find the total interior angle sum.

   a) How many non-overlapping triangles can be formed by drawing all possible diagonals from one vertex of a pentagon? Use the diagram to draw them.



      A common misconception that some students have is assuming that the number of triangles will be equivalent to the number of sides. This misconception indicates that students will likely misuse or incorrectly remember the formula for the sum of the interior angles as 180n instead of 180(n – 2). Students may benefit from determining the number of triangles as part of a pattern that increases by 1 with every side length that is added.

   b) Use what you know about the angle measures in each triangle to find the sum of the interior angles of a pentagon.

      A common error is that even after determining the number of triangles correctly, a student may still apply the interior angle sum theorem incorrectly by using either 180n or 360(n – 2). This error indicates that the student does not understand and connect to the conceptual basis of the interior angle sum theorem. One strategy would be to have students work through a small subset of polygons, draw in the non-overlapping triangles from one vertex and use the triangle angle sum in order to generalize how to find the sum of the interior angles of a convex polygon.