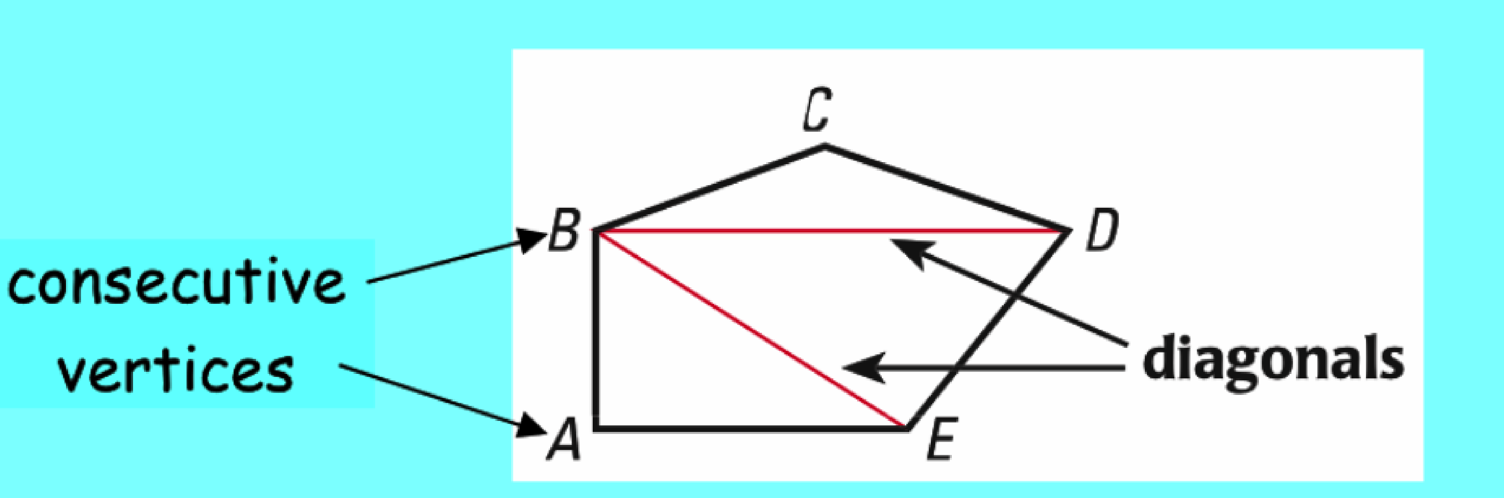
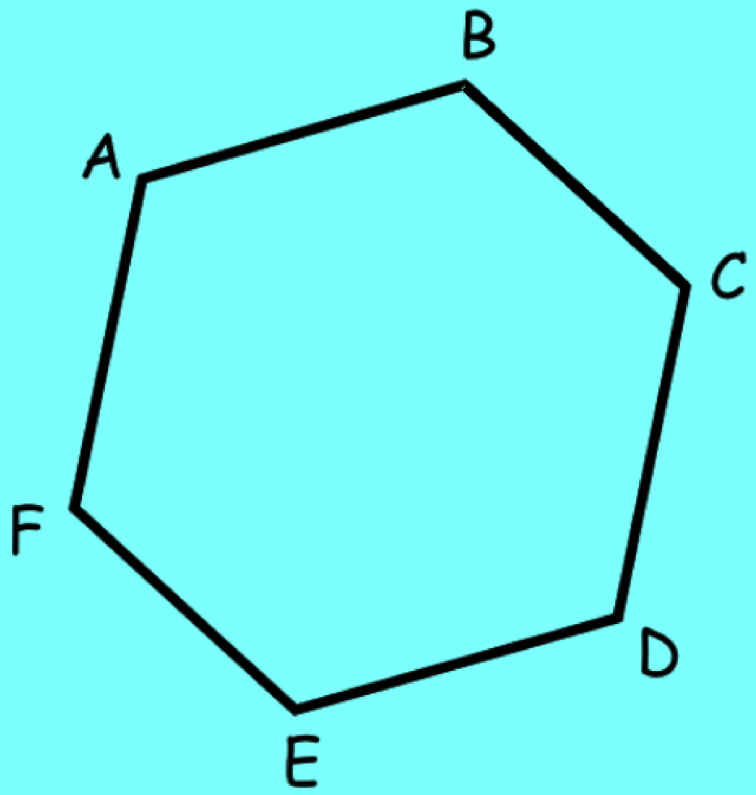
8.1 Find Angle Measures in Polygons

consecutive vertices- Two vertices that are endpoints of the same side_

diagonal- of a polygon is a segment that joins two *nonconsecutive vertices*

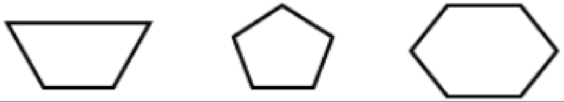


Draw the diagonals for this polygon.



8.1 Activity "Investigate Angle Sums in Polygons"

Question: What is the sum of the measures of the interior angles of a convex *n*-gon?



Polygon	# of Sides	# of Triangles	Sum of Measures of Interior Angles
Triangle	3	1	$1 \cdot 180° = \mathbf{180°}$
Quadrilateral			
Pentagon			
Hexagon			
Heptagon			
Octagon			
Nonagon			
Decagon			

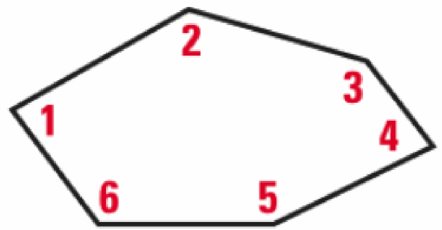
What "rule" could be made regarding the sum of the measure of the interior angles?

THEOREMS

For Your Notebook

THEOREM 8.1 Polygon Interior Angles Theorem

The sum of the measures of the interior angles of a convex n-gon is $(n - 2) \cdot 180°$.



$n = 6$

$$m\angle 1 + m\angle 2 + \cdots + m\angle n = (n - 2) \cdot 180°$$

Proof: Ex. 33, p. 512 (for pentagons)

COROLLARY TO THEOREM 8.1 Interior Angles of a Quadrilateral

The sum of the measures of the interior angles of a quadrilateral is 360°.

Proof: Ex. 34, p. 512

EXAMPLE 1 Find the sum of angle measures in a polygon

Find the sum of the measures of the interior angles of a convex octagon.

EXAMPLE 2 Find the number of sides of a polygon

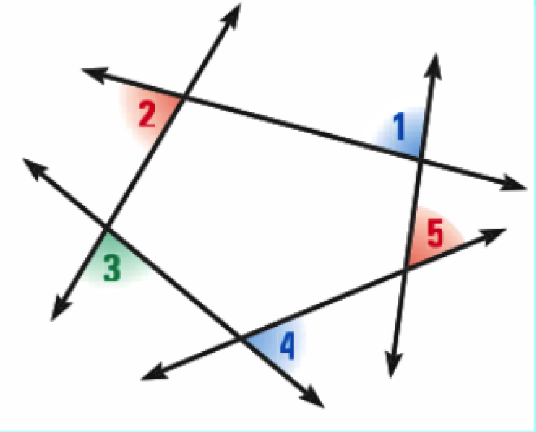
The sum of the measures of the interior angles of a convex polygon is 900°. Classify the polygon by the number of sides.

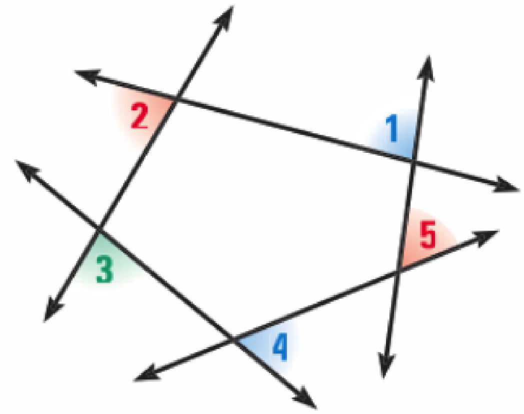
EXAMPLE 3 Find an unknown interior angle measure

ALGEBRA Find the value of x in the diagram shown.

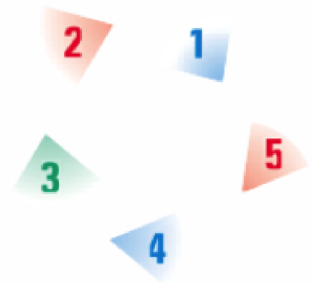
Exterior Angles

The sum of the exterior angle measures does **NOT** depend on the number of sides of the polygon.

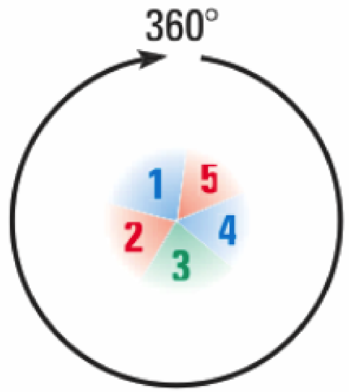




STEP 1 **Shade** one exterior angle at each vertex.



STEP 2 **Cut** out the exterior angles.

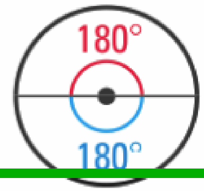


STEP 3 **Arrange** the exterior angles to form 360°.

This idea works for every polygon.

VISUALIZE IT

A circle contains two straight angles. So, there are 180° + 180°, or 360°, in a circle.



THEOREM

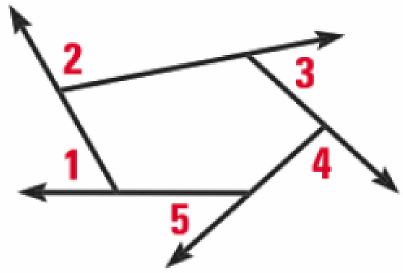
For Your Notebook

THEOREM 8.2 Polygon Exterior Angles Theorem

The sum of the measures of the exterior angles of a convex polygon, one angle at each vertex, is 360°.

$m\angle 1 + m\angle 2 + \cdots + m\angle n = 360°$

Proof: Ex. 35, p. 512



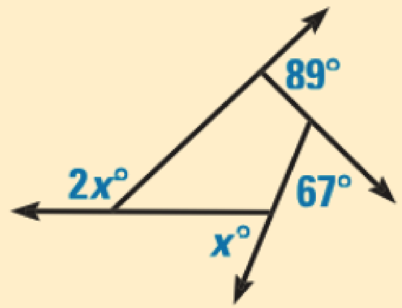
$n = 5$

EXAMPLE 4 Standardized Test Practice

What is the value of *x* in the diagram shown?

Ⓐ 67 Ⓑ 68

Ⓒ 91 Ⓓ 136



Summary:

Sum of the
interior angles of
a polygon:

Sum of the
exterior angles
of a polygon:

Assignment:

p. 510 (3-16, 19-21, 24, 25)