

# The SAT Initiative

## G10 Topic Breakdown SOL - Geometry

The student will solve real-world problems involving angles of polygons.

### Essential Knowledge and Skills

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- \*Understand the difference between regular and irregular polygons
- \*Measure interior and exterior angles of polygon
- \*Identify patterns in nature consisting of shapes

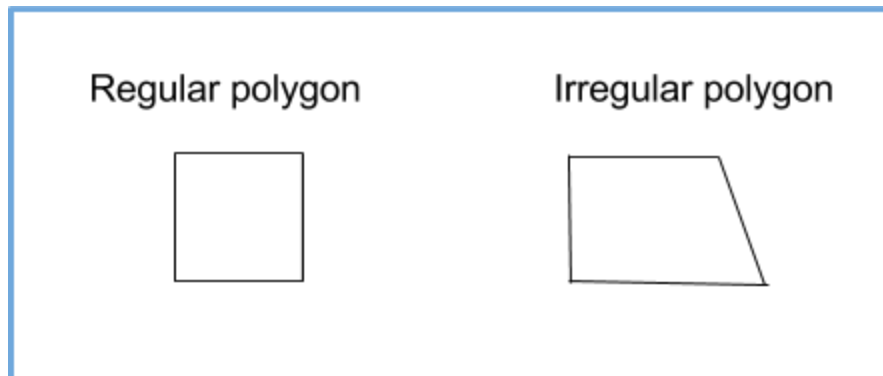
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#### \*What is a regular polygon?

A **regular** polygon is one that has all sides and angles are equal.

~(All sides are of equal length, all interior angles are congruent, and all exterior angles are congruent)

An **irregular** polygon is one that is not regular.



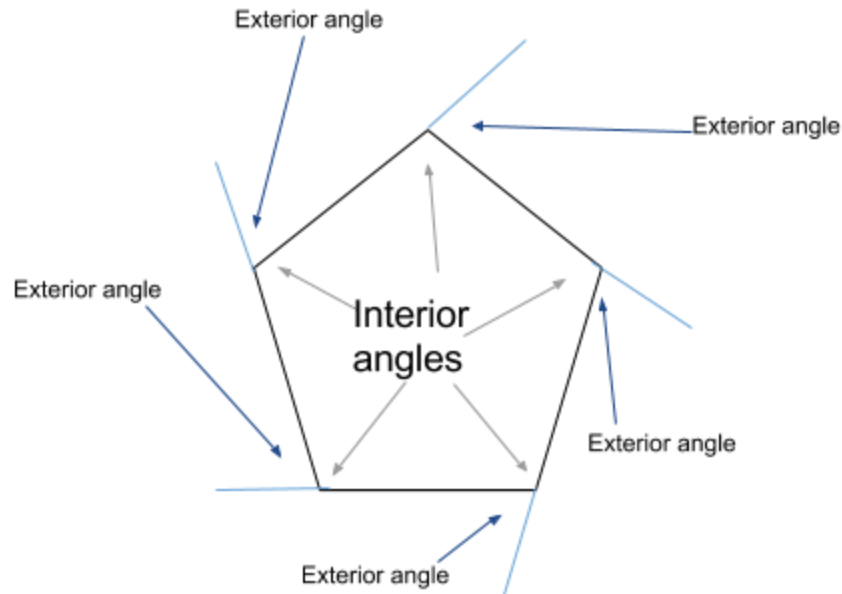
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#### \*Measure interior and exterior angles of polygon

##### ~Find the sum of the measure of interior and exterior angles of a convex polygon

\*First of all, it is essential to know the definition of a **convex** polygon. A **convex** polygon is one in which all of the individual interior angles are less than 180 degrees.

\*For a **convex** polygon, the **interior angles** are at each vertex of the polygon. For a polygon with  $n$  sides, there are  $n$  vertices. This means that there are  $n$  interior angles. For each interior angle, there is an **exterior angle**. An **exterior angle** is the angle made from the side of the polygon and an extension of its adjacent side. An example is drawn below:



\*The equation for sum of interior angles of a polygon is:

$$\text{Sum of interior angles} = 180^\circ(n - 2)$$

\*For exterior angles:

$$\text{Exterior angles of a polygon always add up to } 360^\circ$$

As you can see, **each interior angle and exterior angle are supplementary**, meaning that they add up to 180 degrees! This means that each exterior angle can be found if its interior angle is given. To do this, use the equation below:

$$\text{Exterior angle} = 180^\circ - \text{Interior angle}$$

~Find the measure of interior and exterior angles of a regular polygon

\*For a regular polygon, the sum of both interior and exterior angles are found in the way described above. A regular polygon is one in which all sides and angles are equal.

Because of this, if there are  $n$  sides, each interior angles equal:

$$\text{Interior angle} = (\text{sum of interior angles}) / n$$

With the same reasoning, each exterior angle equals:

(Again, we know that the sum of exterior angles of ANY polygon =  $360^\circ$  )

$$\text{Exterior angle} = \frac{360^\circ}{n}$$

**THESE TWO EQUATIONS CAN ONLY BE USED FOR REGULAR POLYGONS!**

~Find the number of sides of a regular polygon given the measure of interior and exterior angles of the polygon

If you know the sum of interior angles of a polygon, the number of sides can be found using the equation below:

$$(\text{Sum of interior angles})/180^\circ + 2 = n$$

If given one angle of a **REGULAR** polygon, the number of sides can be found using the equation below and **solving for  $n$ !**:

<b>Interior angle</b>	=	$\frac{180^\circ(n - 2)}{n}$
* $n$		* $n$
Interior angle*( $n$ )	=	180 $n$ -360
+360		+360
Interior angle*( $n$ )+360	=	180 $n$
-interior angle*( $n$ )		-interior angle*( $n$ )
360	=	180 $n$ -interior angle* ( $n$ )
360	=	$n$ *(180-interior angle)
/(180-interior angle)		/(180-interior angle)
<b>360/ (180-interior angle) = <math>n</math></b>		

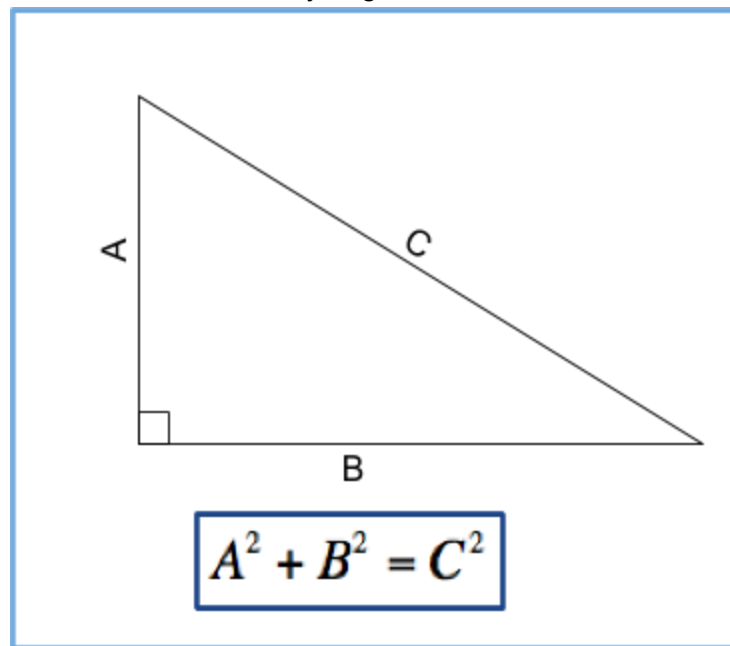
**\*Identify patterns in nature consisting of shapes**

There are some useful patterns to be aware of when dealing with right TRIANGLES:

**THE SUM OF INTERIOR ANGLES OF A TRIANGLE IS:**

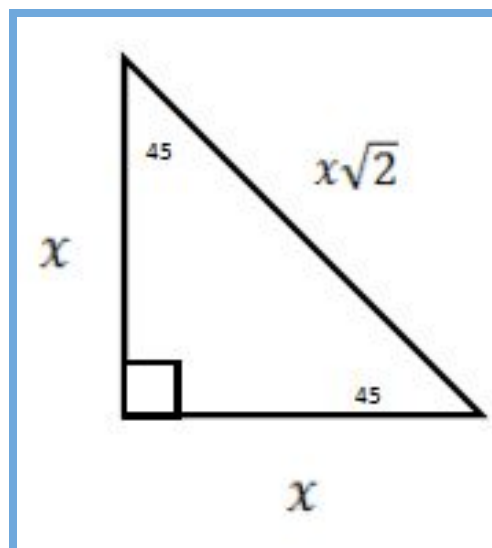
**$180^\circ$**

**\*Pythagorean Theorem**

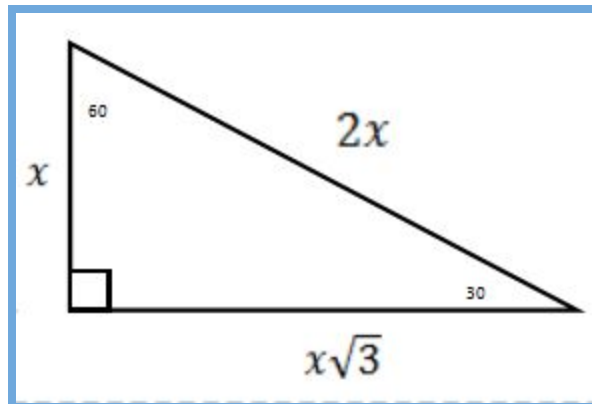


**\*Special Right Triangles**

45-45-90



30-60-90



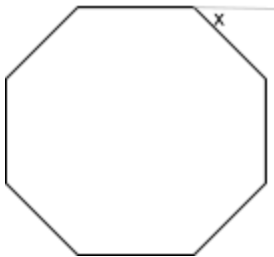
## Practice Problems

### G.10 Review

1. What is the measure, in degrees, of an interior angle in a regular decagon?

- a. 128.6
- b. 135
- c. 140
- d. 144

2. What is the measure of exterior angle  $x$  below? The polygon is a regular octagon

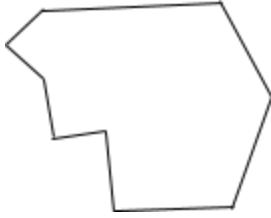


- a. 45
- b. 43
- c. 40
- d. 36

3. If the interior angle of a regular polygon is 150 degrees, what is the number of sides of the polygon?

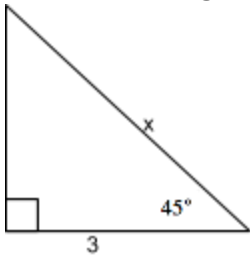
- a. 10
- b. 11
- c. 12
- d. 13

4. What is the sum interior angles in the polygon below?



- a. 900
- b. 1080
- c. 1260
- d. 1440

5. Find the length of side x on this triangle.



- a. 4
- b.  $3\sqrt{2}$
- c.  $\sqrt{2}$
- d.  $3/2$

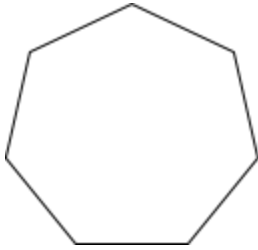
6. In a pentagon, what is the sum of exterior angles?

- a. 360 degrees
- b. 720 degrees
- c. 400 degrees
- d. 540 degrees

7. In an irregular dodecagon, the measure of one of the interior angles is 70 degrees. What is the measure of its exterior angle (in degrees)?

- a. 30
- b. 45
- c. 110
- d. 150

8. What is the approximate measurement (in degrees) of an exterior angle in this regular polygon?



- a. 51
- b. 45
- c. 40
- d. 36

9. What is the measurement of angle  $x$  in the isosceles trapezoid below?



- a. 130
- b. 135
- c. 145
- d. 150

## Answer Key: Practice Problems

### G.13 Geometry

1.	D
2.	A
3.	C
4.	C
5.	B
6.	A
7.	C
8.	A
9.	B





Angles of Polygons - Questions for Practice  
SOL - Geometry

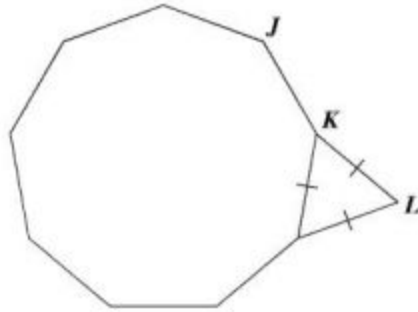
**Given statements:**

*If a shape is a parallelogram, then opposite angles are congruent.  
A rhombus is a parallelogram.*

**Which is a logical conclusion from the given statements?**

- A** A rhombus has opposite angles that are congruent.
- B** The opposite sides of a rhombus are congruent.
- C** The diagonals of a rhombus are congruent.
- D** A rhombus is a quadrilateral.

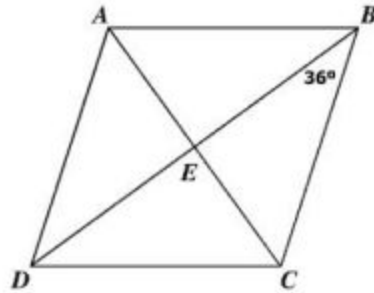
The floor plan for a modern home is modeled by the composite of the regular nonagon and triangle shown.



What is the measure of  $\angle JKL$  ?

- A  $150^\circ$
- B  $160^\circ$
- C  $165^\circ$
- D  $175^\circ$

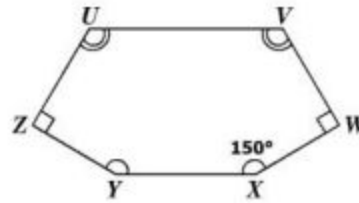
Parallelogram  $ABCD$  is a rhombus with  $m\angle EBC = 36^\circ$ .



What is the  $m\angle DAE$  ?

- A  $36^\circ$
- B  $54^\circ$
- C  $108^\circ$
- D  $144^\circ$

A polygon is shown.



What is the measure of  $\angle U$  ?

- A  $60^\circ$
- B  $90^\circ$
- C  $120^\circ$
- D  $240^\circ$

This figure is composed of an isosceles trapezoid and a regular octagon.



What is the value of  $x$  ?

- A 100
- B 125
- C 135
- D 190