

6-1

**THE POLYGON
ANGLE-SUM
THEOREMS**



OBJECTIVES

- TO CLASSIFY POLYGONS BASED ON THEIR SIDES AND ANGLES
- TO FIND AND USE THE INTERIOR AND EXTERIOR ANGLES OF POLYGONS

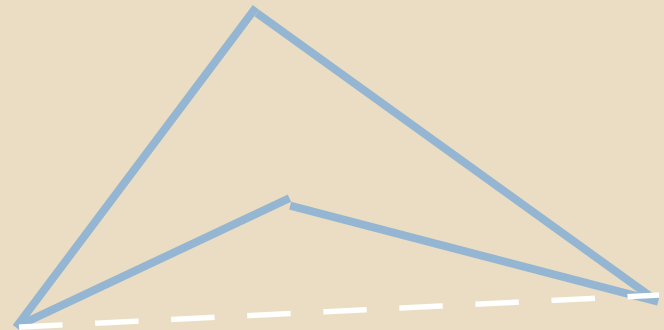
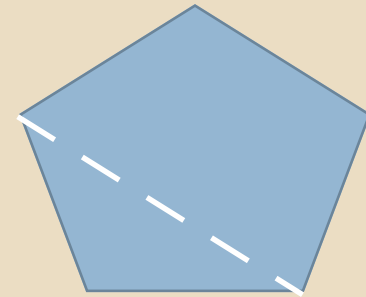
POLYGON REVIEW

Polygon – closed plane figure formed by three or more segments.

Diagonal – segment that connects two nonconsecutive vertices.

Convex polygon – no diagonal with points outside the polygon

Concave polygon – has at least one diagonal with points outside the polygon

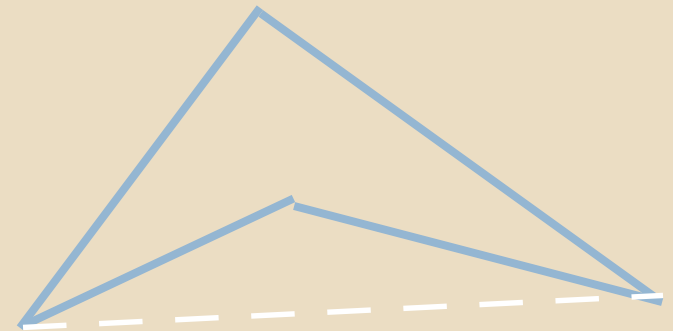
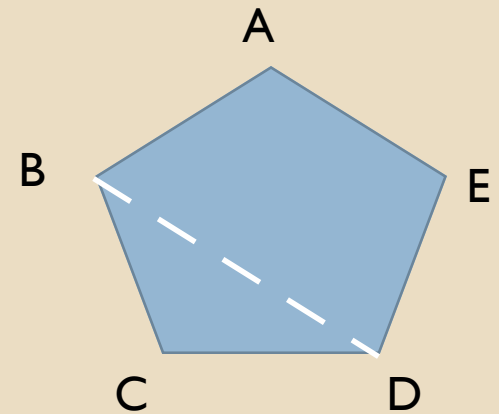


POLYGON REVIEW

Naming a polygon – classify by the number of sides, then list each vertex.

Pentagon ABCDE

Number of Sides	Name of Polygon
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon
12	Dodecagon
n	n -gon

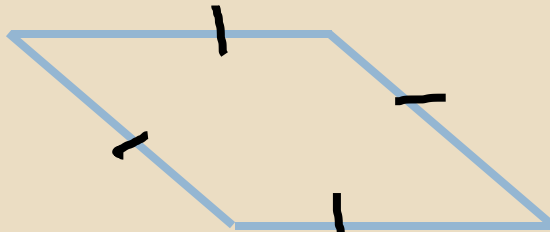


KEY CONCEPT

Special Polygons:

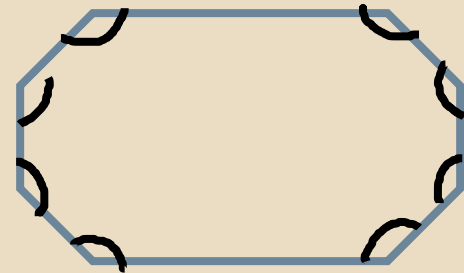
Equilateral polygon:

all sides congruent



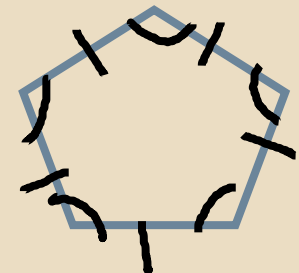
Equiangular polygon:

all angles congruent



Regular Polygon:

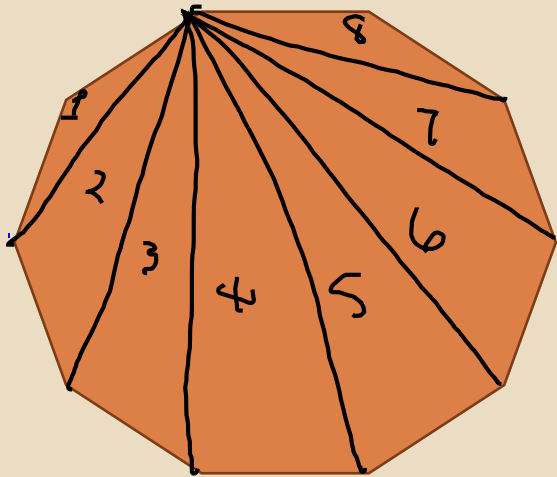
Both sides and angles are congruent



KEY CONCEPT

Polygon Angle-Sum Theorem:

The sum of the measures of the interior angles of an n -gon is $180(n - 2)$.



Decagon: 10 sides

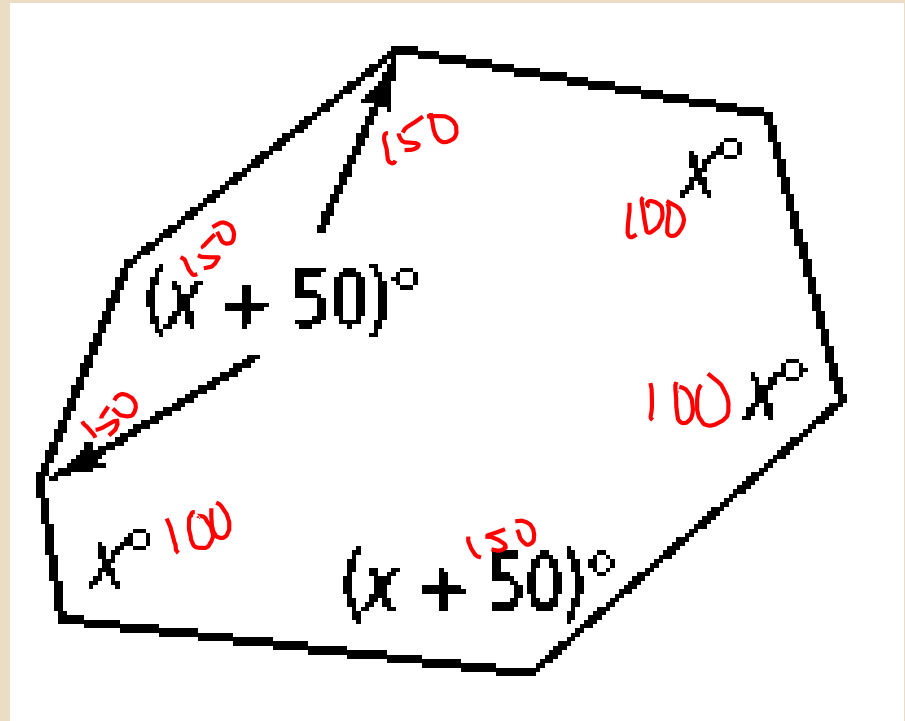
$$180(10-2)$$

$$180(8)$$

The sum of the interior angles is 1440°

CLASS WORK

Find the missing
angle measures.



$$3x + 4(x + 50) = 180(7 - 2)$$

$$3x + 4x + 200 = 180(5)$$

$$7x + 200 = 900$$

$$7x = 700$$

$$x = 100$$

KEY CONCEPT

Corollary to the Polygon Angle-Sum Theorem:

The measure of each interior angle of a regular n-gon is $\frac{180(n - 2)}{n}$.



Heptagon: 7 sides

$$\frac{180(7-2)}{7} = \frac{180(5)}{7} = \frac{900}{7}$$

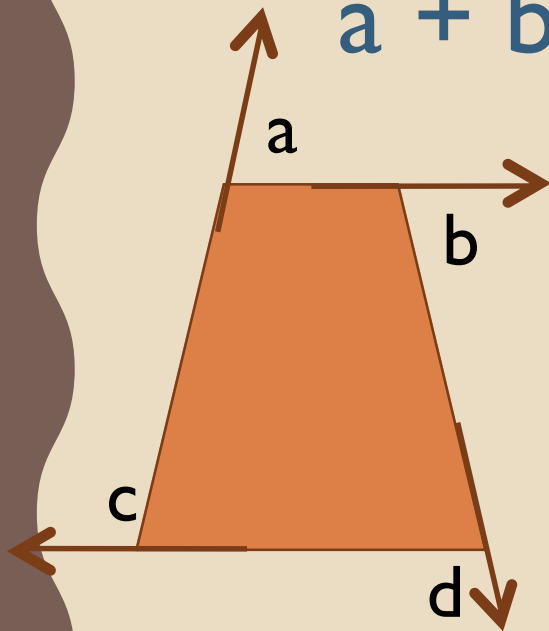
The measure of one interior angle is 128.6° .

KEY CONCEPT

Polygon Exterior Angle-Sum Theorem:

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

$$a + b + c + d = 360^\circ$$



Regular polygon:

If all interior angles are the same, then all exterior angles will be the same, because each interior angle forms a linear pair with an exterior angle. What is the measure of each exterior angle of a regular heptagon?

$$180 - 128.6 = 51.4 \text{ or}$$

$$\frac{360}{7} = 51.4$$

CLASS WORK

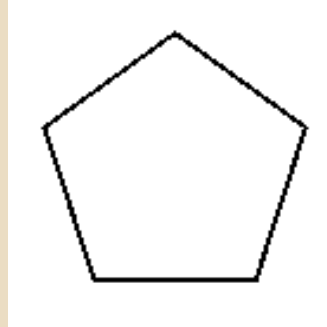
4. Find the measure of one angle in a regular 15 - gon.
Round to the nearest tenth if necessary.

$$\frac{180(15-2)}{15} = \frac{180(13)}{15} = 156^\circ$$

5. Find the measure of one exterior angle of a regular 72-gon. $\frac{360}{72} = 5^\circ$

Find the sum of the angle measures of each polygon.

2.

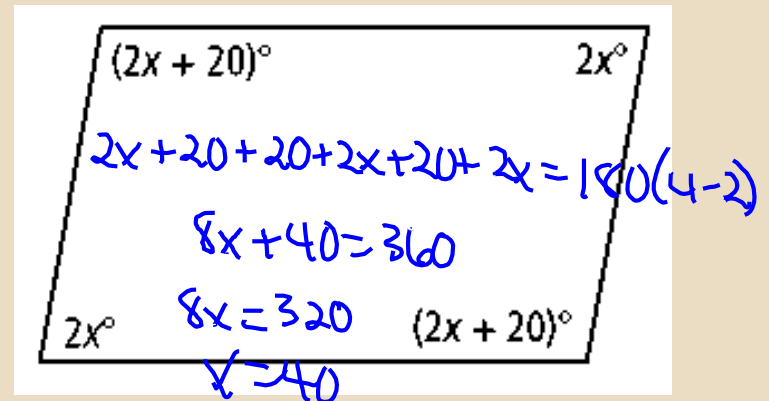


$$180(5-2) = 540^\circ$$

3.

102-gon $180(102-2) = 18,000^\circ$

6. Find the value of x.


$$\begin{aligned} 2x + 20 + 20 + 2x + 20 + 2x &= 180(4-2) \\ 8x + 40 &= 360 \\ 8x &= 320 \\ x &= 40 \end{aligned}$$

LEARNING RUBRIC

Got It: Calculates the interior and exterior angles of non-regular polygons

Almost There: Calculates the interior and exterior angles of regular polygons

Moving Forward: Correctly names polygons

Getting Started: Correctly classifies polygons

HOMework

Pages 399 – 400

16 – 42 even

46

SUMMARY

- **SUM OF INTERIOR ANGLES: $180(n - 2)$**
- **ONE INTERIOR ANGLE OF A REGULAR POLYGON: DIVIDE ABOVE BY n**
- **SUM OF EXTERIOR ANGLES IS 360 DEGREES**