WARM UP

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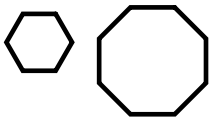
Discuss with your neighbor the meaning of the following terms:

1. convex polygon
2. concave polygon
3. equilateral sides ≅
4. equiangular angles ≅
5. regular polygon sides + angles ≅

write thoughts on MONDAY of warm-up sheet



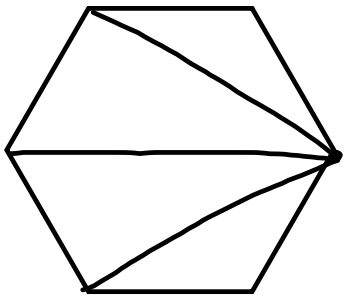
Learning Targets:

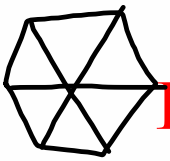
5.1 Polygon Sum Conjecture
- A. I can apply the polygon sum conjecture
- B. I can find the measure an interior angle of a regular polygon

5.2 Exterior Angles of a Polygon
- A. I can apply the exterior angle sum conjecture
- B. I can find the measure of an exterior angle of a regular polygon

Polygon	Sides	# of Triangles	Sum of Interior Angles
Triangle	3	1	180°
Quadrilateral	4	2	360°
Pentagon	5	3	540° 180·3
Hexagon	6	4	720° 180·4
Heptagon	7	5	900° 180·5
Octagon	8	6	1080 180·6
Polygon with n # of sides	n	n-2	180(n-2)

http://illuminations.nctm.org/ActivityDetail.aspx?ID=9





Section 5.1
Polygon Sum Conjecture

Recall: Polygons are closed figures whose sides are all segments.

Each segment has an endpoint called a vertex (plural - vertices).

Diagonal: A segment that connects any two nonconsecutive vertices.

Interior Angle Sum Theorem

The sum of the measures of the interior angles of a convex polygon with n sides is

$$180(n - 2).$$

EX 1 Find the sum of the interior angles of a(n):

a) decagon $180(10-2) = 180 \cdot 8 = 1440°$

b) pentadecagon (15 sides) $= 180 \cdot 13 = 2340°$

c) 22-gon $180 \cdot 20 = 3600°$

EX 2 The sum of interior angles of a n-gon is 1800. Solve for n. What would be the measure of one angle if this polygon was regular?

$$\frac{180(n-2)}{180} = \frac{1800}{180}$$

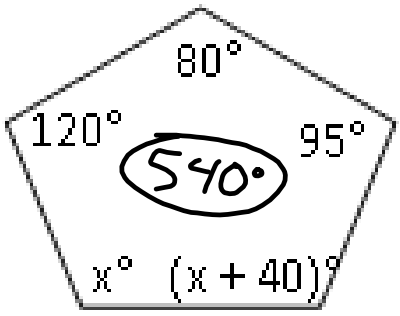
$$n - 2 = 10$$

$$n = 12$$

$$\frac{\text{sum}}{n}$$

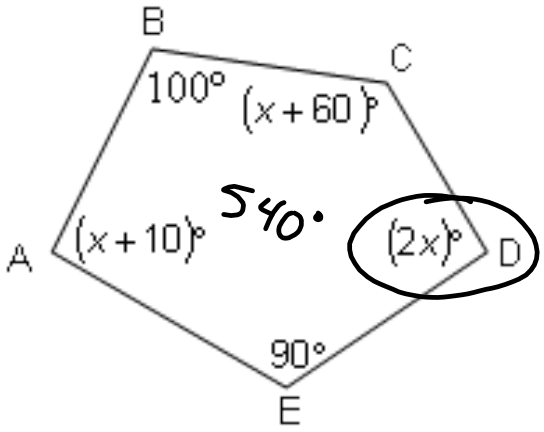
$$\frac{1800}{12} = 150°$$

EX 3 Solve for x.



$2x + 335 = 540$

EX 4 Find the measure of ∠D.



$4x + 260 = 540$

$4x = 280$

$x = 70$

$m\angle D = 140°$

EX 5 Find the measure of an interior angle of a regular heptagon.

$$\frac{180(n-2)}{n} = \frac{180 \cdot 5}{7} = \frac{900}{7} = 128.6°$$

EX 6 The measure of an interior angle of a regular polygon is 108. Find the number of sides in the polygon.

$$\frac{180(n-2)}{n} = 108$$

$180(n-2) = 108n$

$180n - 360 = 108n$

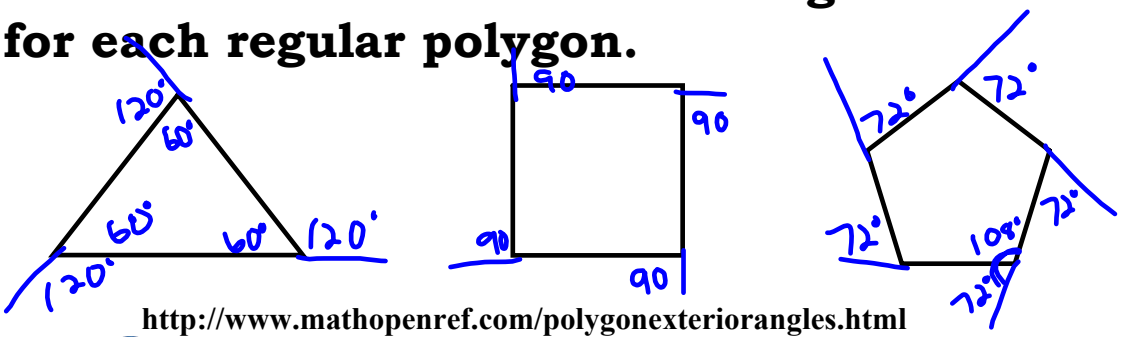
$-108n \quad -108n$

$72n = 360$

$n = 5$

Exterior angles

Find the sum of the exterior angles for each regular polygon.



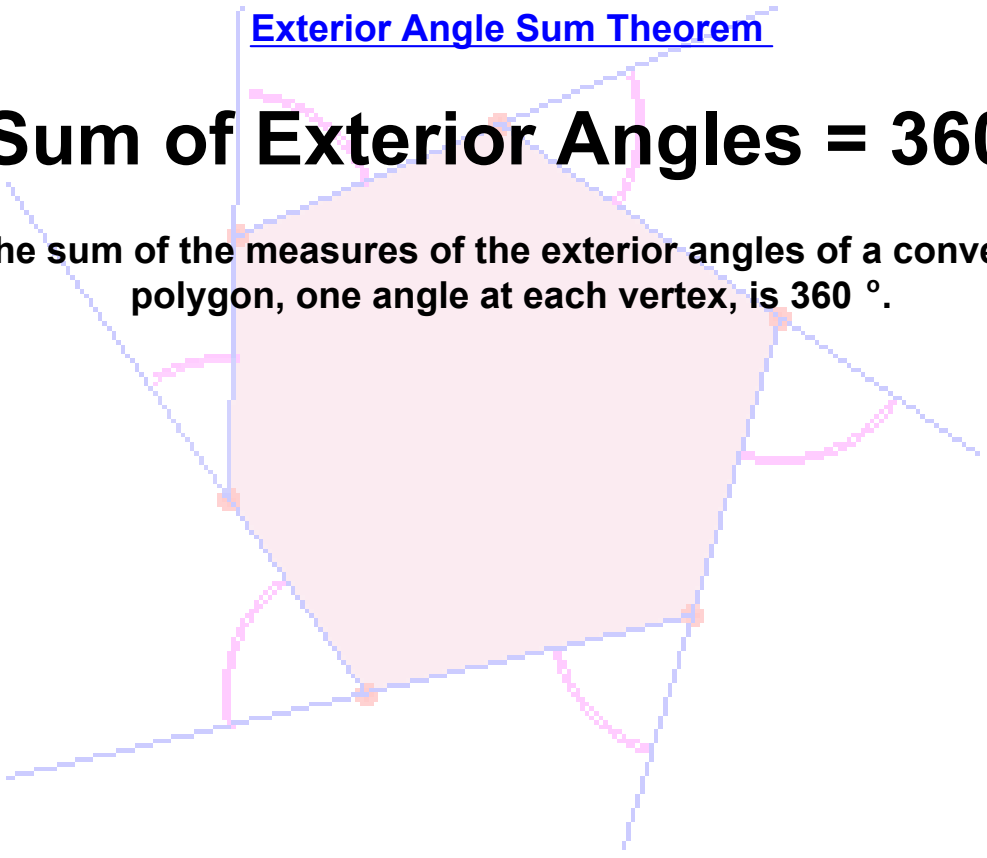
http://www.mathopenref.com/polygonexteriorangles.html

What do you notice about an interior and exterior angle of any polygon?

Exterior Angle Sum Theorem

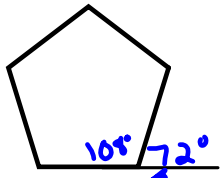
Sum of Exterior Angles = 360°

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



EX 7 Find the measure of each exterior angle of a regular pentagon.

$180 - 108 = 72°$



Exterior ∠ sum = 360

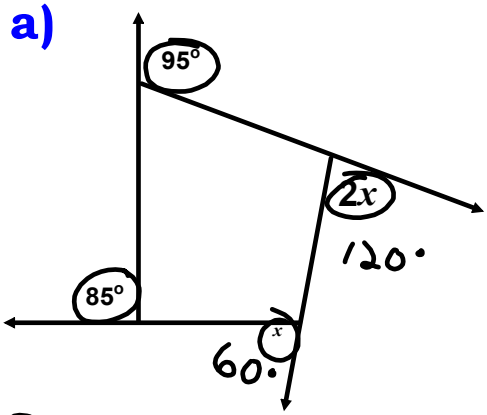
$\frac{360}{5} = 72°$

EX 8 Find each exterior angle of a regular nonagon.

$\frac{360}{9} = 40°$

EX 9 Solve for x.

a)

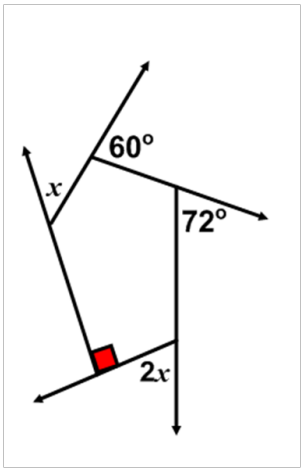


$3x + 180 = 360$

$3x = 180$

$x = 60$

b)



Practice: Angles in Polygons Worksheet

WARM- UP/ NOTES
Angles of Polygons

NAME: key

1. The SUM of the interior angles of a convex polygon is: $S = (n-2)\cdot 180$

2. Find the sum of the interior angles in a convex nonagon.

$(9-2)\cdot 180 = 1260°$

3. Each interior angle of a regular convex polygon is: $A = \frac{(n-2)\cdot 180}{n}$

4. Find each interior angle of a regular dodecagon.

$\frac{(12-2)\cdot 180}{12} = \frac{10(180)}{12} = \frac{1800}{12} = 150°$

5. The measure of an interior angle of a regular polygon is 160 degrees. How many sides does the polygon have?

$160 = \frac{(n-2)\cdot 180}{n} \rightarrow 160n = (n-2)\cdot 180 \rightarrow 160n = 180n - 360$

$-20n = -360$

$n = 18$

6. The sum of the measures of the exterior angles of a convex polygon is 360°.

7> Find the sum of the measures of the exterior angles of a convex heptagon.

360°

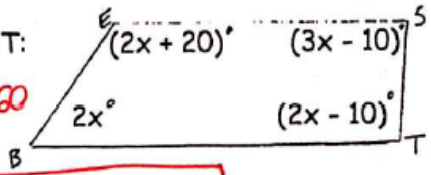
8. Find the number of degrees of each exterior angle of a regular pentagon.

$\frac{360}{5} = 72^\circ$

9. Find the measure of an exterior and an interior angle of a regular hexagon.

$E = \frac{360}{6} = 60^\circ$ $I = \frac{(6-2)\cdot 180}{6} = 120^\circ$

10. Find each angle in quadrilateral BEST:



$2x + (2x+20) + (3x-10) + (2x-10) = 360$

$9x = 360$

$x = 40$

$\angle B = 80^\circ$ $\angle S = 110^\circ$

$\angle E = 100^\circ$