Geometry 6.1

Find and use the sum of the measures of the interior angles of a polygon.

Find and use the sum the of the exterior angles of a polygon

polygon Straight sides, closed, meet @ end

convex

concave

triangle sum theorem 180°

consecutive in a row

nonconsecutive not in a row

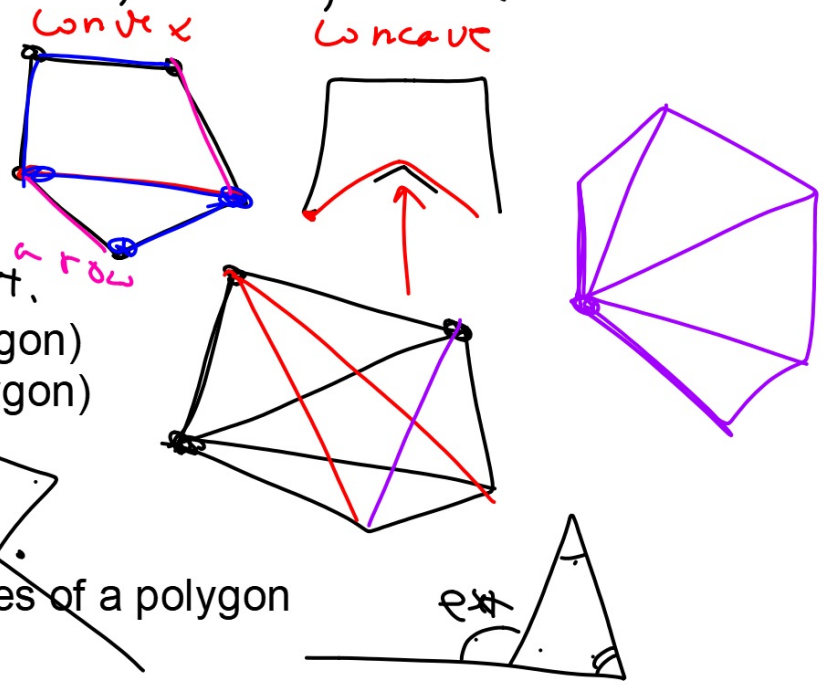
diagonal 2 nonconsec vert.

interior angles (of a polygon)

exterior angles (of a polygon)

regular polygon

polygon names



exploration: interior angles of a polygon

13-gon

StudyTip

Naming Polygons

Remember, a polygon with n-sides is an *n-gon*, but several polygons have special names.

Number of Sides	Polygon
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon
11	~~hendecagon~~ 11-gon
12	~~dodecagon~~ 12-gon
n	n-gon

p. 394

n-2

6 · 180

180

180

180

A

360°

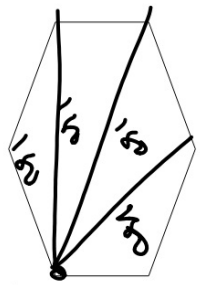
180

180

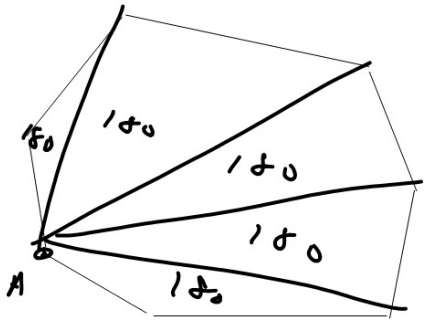
180

A

540°

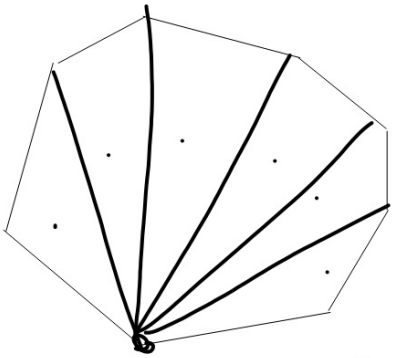


A 720



A

900



A 1080

n n-2 (n-2)·180

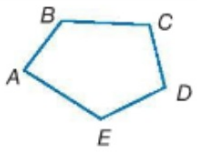
Polygon	Number of sides	Number of triangles	Sum of interior angle measures
Triangle	3	1	180
Quadrilateral	4	2	360
Pentagon	5	3	540
Hexagon	6	4	720
Heptagon	7	5	900
Octagon	8	6	1080
12-gon	12	10	1800
n-gon			

What do you notice? What do you wonder?

Don't memorize...
How many triangles can you form (from a vertex)?

Theorem 6.1 Polygon Interior Angles Sum

The sum of the interior angle measures of an n-sided convex polygon is $(n - 2) \cdot 180$.



Example $m\angle A + m\angle B + m\angle C + m\angle D + m\angle E = (5 - 2) \cdot 180$

$= 540$

You will prove Theorem 6.1 for octagons in Exercise 42.


PER 1 CUP
110 CALORIES
0g SAT FAT
150mg SODIUM
4g SUGARS
VITAMIN A
VITAMIN D
GUARANTEED QUALITY
HyVee
If you like Kellogg's® Crispix® cereal, try this!†
Good Source Of 11 Vitamins & Minerals
Crispy Hexagons
Corn & Rice Cereal
SERVING SUGGESTION ENLARGED TO SHOW TEXTURE
NET WT 12 OZ (340 g)

Example 1 Find the Interior Angles Sum of a Polygon

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

regular

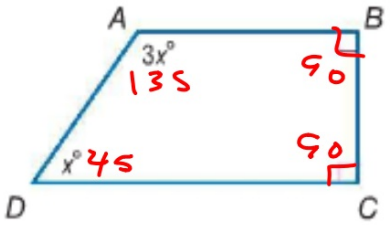
$\frac{900}{7}$

7

5·180

900

b. **ALGEBRA** Find the measure of each interior angle of quadrilateral $ABCD$.



$180 + 4x = 360$

$4x = 180$

$x = 45$

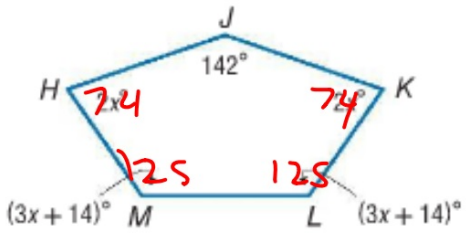
GuidedPractice

1A. Find the sum of the measures of the interior angles of a ~~convex~~ regular octagon.

$6 \cdot 180 = 1080$

$$\frac{1080}{8}$$

1B. Find the measure of each interior angle of pentagon *HJKLM* shown



$$10x + \overbrace{28+142}^{170} = 540$$

$$10x = 370$$

$$x = 37$$

regular:

Review Vocabulary

regular polygon
a convex polygon in which all of the sides are congruent and all of the angles are congruent

Real-World Example 2 Interior Angle Measure of Regular Polygon

TENTS The poles for a tent form the vertices of a regular hexagon. When the poles are properly positioned, what is the measure of the angle formed at a corner of the tent?

hendecagon (11 sides)

GuidedPractice

2A. COINS Find the measure of each interior angle of the regular hendecagon that appears on the face of a Susan B. Anthony one-dollar coin.

$9 \cdot 180 = 1620$

$\frac{1620}{11}$

147.3

2B. HOT TUBS A certain company makes hot tubs in a variety of different shapes. Find the measure of each interior angle of the nonagon model.

IF regular polygon... n = number of sides

Example 3 Find Number of Sides Given Interior Angle Measure

The measure of an interior angle of a regular polygon is 135. Find the number of sides in the polygon.

$(n-2)(180) = 135n$

$45n = 360$

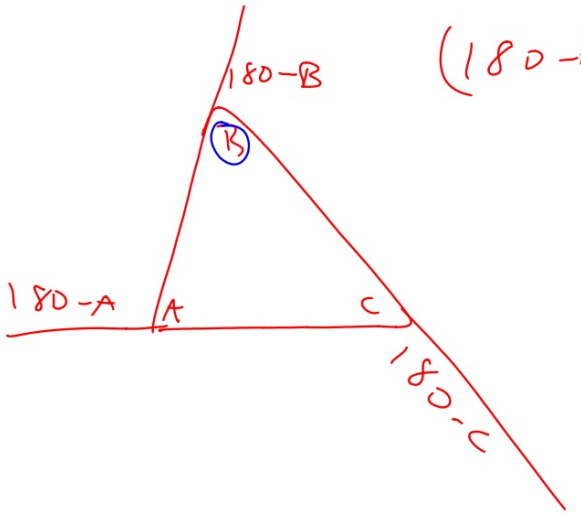
$n = 8$

(#triangles)x(180) = (#degrees)x(#angles)

$180n - 360 = 135n$

$+360$

Sum of exterior angles: 360



$(180-A)+(180-B)+(180-C)$

$540-A-B-C$

$540-(A+B+C)$

$540-180$

360

$45n = 360$

$n = 8$