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; meet @ ends; closed

convex

concave

triangle sum theorem

* consecutive in a row next door

nonconsecutive not in a row not

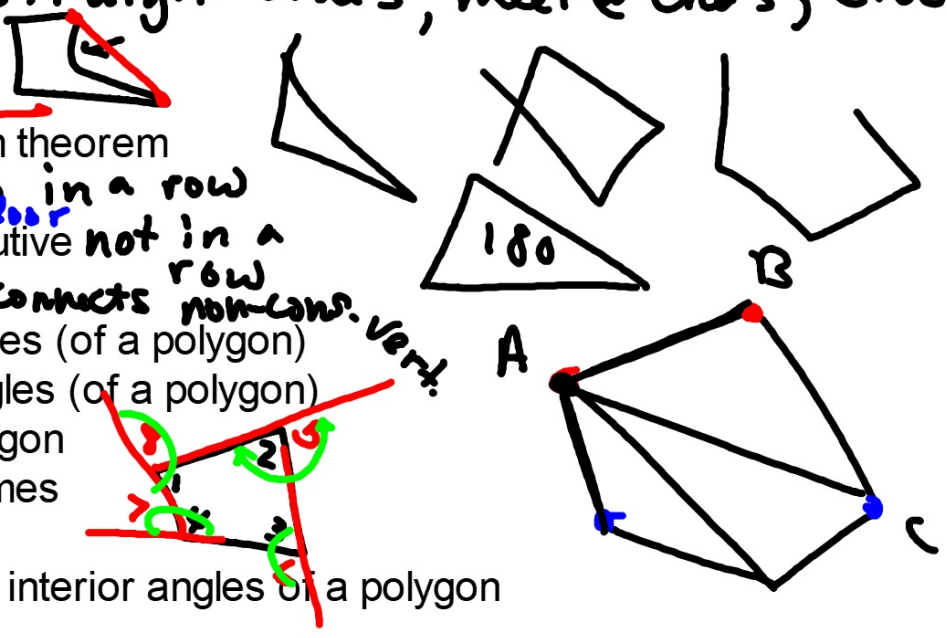
diagonal – connects non-cons. vert.

interior angles (of a polygon)

exterior angles (of a polygon)

regular polygon

polygon names



exploration: interior angles of a polygon

StudyTip

Naming Polygons

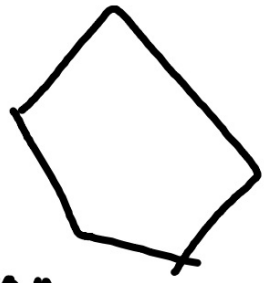
Remember, a polygon with *n*-sides is an *n-gon*, but several polygons have special names.

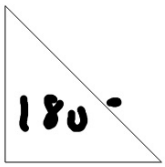
Number of Sides	Polygon
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon
11	hendecagon
12	dodecagon
n	*n*-gon

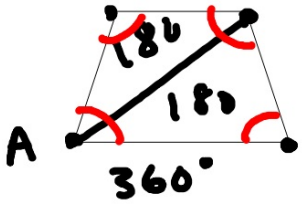
p. 394

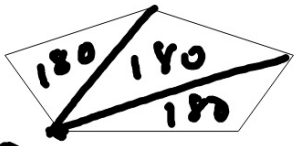
11-gon

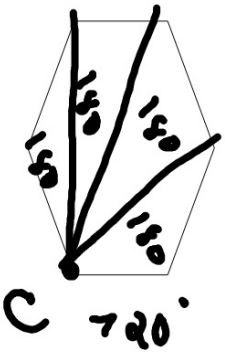
12-gon

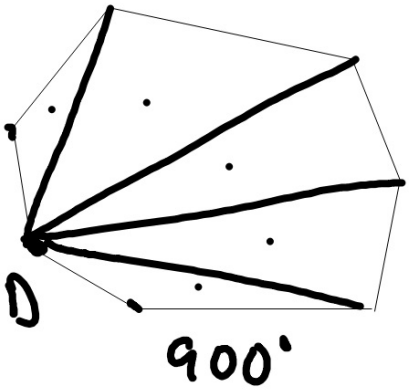


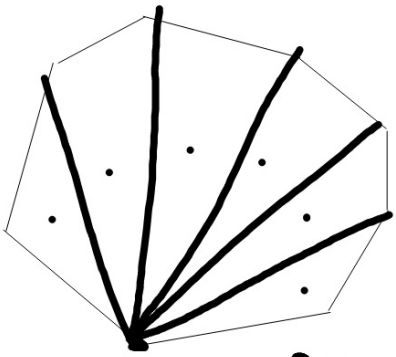

180°


A
180
180
360°


B
180
140
180
540°


C
150
150
150
150
720°


D
900°


E
6·180
1080°

n n-2

Polygon	Number of sides	Number of triangles	Sum of interior angle measures degrees
Triangle	3	1	180°
Quadrilateral	4	2	360°
Pentagon	5	3	540°
Hexagon	6	4	720°
Heptagon	7	5	900°
Octagon	8	6	1080°
Decagon	10	8	8·180 = 1440
n-gon	n	n-2	(n-2)(180)

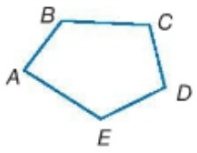
What do you notice? What do you wonder?

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

393

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

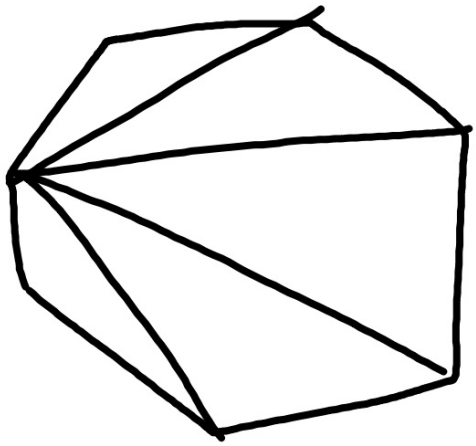
$= 540$

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
Hy-Vee
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)

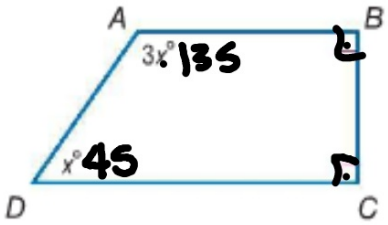
Example 1 Find the Interior Angles Sum of a Polygon

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



$5 \cdot 180 = 900$

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



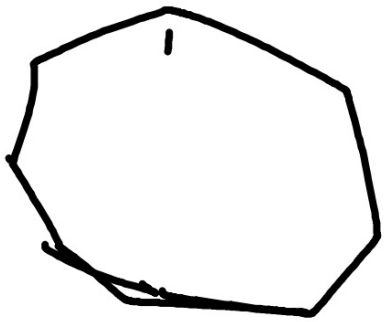
$$180 + 4x = 360$$
$$-180 \qquad -180$$
$$4x = 180$$
$$\frac{4x}{4} = \frac{180}{4}$$
$$x = 45$$

regular
all sides ≅
all ∠s ≅

GuidedPractice

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

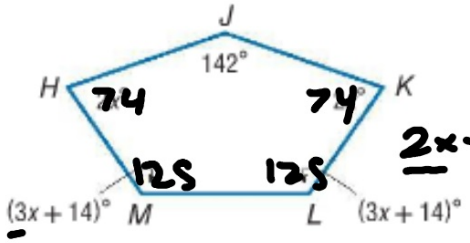
8



$6 \cdot 180 = 1080$

$\frac{1080}{8} = 135°$

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



$3(180)$

$2x+142+2x+3x+14+3x+14=540$

$10x+170=540$

$10x=370$

$x=37$

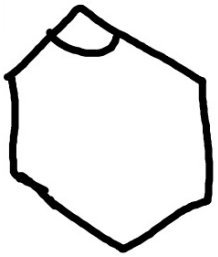
regular:

ReviewVocabulary

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?



$4 \cdot 180 = 720$

120

hendecagon (11 sides)

GuidedPractice

2A. COINS Find the measure of each interior angle of the regular ~~hendecagon~~ 11-gon that appears on the face of a Susan B. Anthony one-dollar coin.

$9 \cdot 180 = 1620$

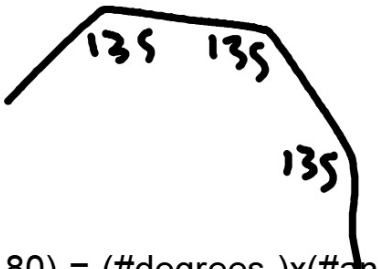
$n = 147.3^{\circ}$

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... Sum exterior = 360

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.



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

$180 \cdot n = 135(n+2)$

$180n = 135n + 270$

$-135n \quad -135n$

$45n = 270$

$n = 6$

Sum of exterior angles:

$= 360$

6.1 13-41, odd