FoM11 Lesson 2.4

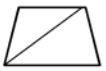
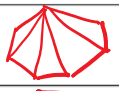
Monday, February 27, 2017 10:04 AM

FOM 11 **2.4 Angle Properties in Polygons**

A **polygon** is a closed geometric figure made up of *n* straight sides.

A **convex polygon** has all interior angles less than 180°.

A **concave polygon** has at least one interior angle greater than 180°.

# of sides in a polygon	sketch	# of triangles formed	Sum of interior angles of the polygon
3 Triangle		1	1×180° =180°
4 Quadrilateral		2	2×180° =360°
5 Pentagon		3	3×180° = 540°
6 Hexagon		4	4×180° = 720°
7 Heptagon		5	5×180° = 900°
8 Octagon		6	6×180° = 1080°
9 Nonagon	etc	7	7×180° = 1260°
10 Decagon		8	8×180° = 1440°
11 Hendecagon		9	9×180° = 1620°
12 Dodecagon		10	10×180° = 1800°
n Polygon		n-2	(n-2)×180° = 180(n-2)

In any polygon with n sides, the sum of the interior angles is $180°(n\text{-}2)$. A **regular polygon** has equal sides and equal angles.

Example 1: Determine the measure of each interior angle of a regular 17-sided polygon.

15 triangles

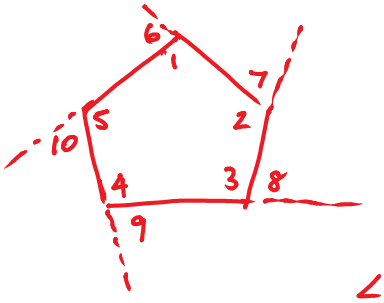
Sum of interior $\angle$'s $= 180(n-2)$
$= 180(17-2)$
$= 180(15)$
$= 2700°$

$\frac{2700°}{17} =$ 158.82° each int.$\angle$

The sum of the exterior angles of any convex polygon is 360°.

Each exterior angle of a regular polygon is $\frac{360^o}{n}$.

Example 2: Show that the sum of the exterior angles of a pentagon is 360°.



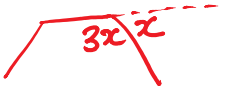
$\angle 1 + \angle 6 = 180°$
$\angle 2 + \angle 7 = 180°$
$\angle 3 + \angle 8 = 180°$
$\angle 4 + \angle 9 = 180°$
$\angle 5 + \angle 10 = 180°$

$\angle 1 + \angle 2 + \ldots + \angle 9 + \angle 10 = 5 \times 180°$

$5 \times 180°$ = sum of all int. & ext $\angle$'s
(Sum of int. $\angle$'s = 540°)
$5 \times 180° = 540° +$ ext $\angle$'s
$900° = 540° +$ ext. $\angle$'s
$360° =$ ext. $\angle$'s

360° = Sum ext. $\angle$'s.

Example 3: What type of regular polygon has an interior angle 3 times the exterior angle?



Let x ext. $\angle$ (int $\angle = 3 \times$ ext $\angle$)

$x + 3x = 180°$
$4x = 180°$
$x = 45°$

$\frac{360°}{n} =$ each ext. $\angle$

$n \times \frac{360°}{n} = 45° \times n$

$\frac{360°}{45} = \frac{45n}{45}$

$8 = n$

∴ octagon

Assignment: Pg. 99 #1-4, 6-11, 14, 18 optional