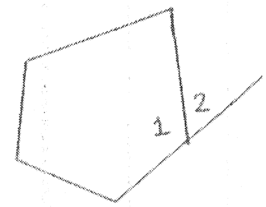
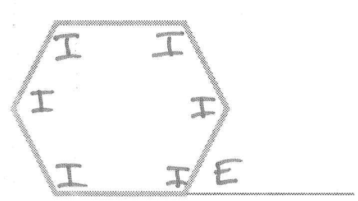
H.Geometry – Chapter 5– Definition Sheet

Section 5.1	
Definitions for ANY polygon	
Interior Angle	Angles formed by two sides of a polygon in the polygon's interior ∠1
Exterior Angle	Angle forming a linear pair with an interior angle ∠2
Notation for Any Polygons n	• # of sides of a polygon • # of vertices of a polygon • # of angles (interior) of a polygon $n=5$
S_i	• Sum of the measures of the interior angles in a polygon (n-gon)
S_e	• Sum of the measures of the exterior angles in an n-gon
Definition of Regular Polygons	A polygon that is both equilateral and equiangular
Notation for Regular Polygons I E	• Measure of one interior angle of a Regular Polygon • Measure of one exterior angle of a Regular Polygon





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Investigation:

Finding the sum of the interior angles of an n-gon

Steps:

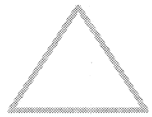
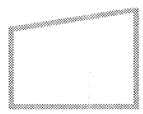
(1) Draw a convex polygon (each group gets a type of polygon with different n-values)

(2) Draw all the diagonals from one vertex (how many did you draw?)

(3) The diagonals cut the polygon into triangles. How many triangles (non-overlapping) were formed?

(4) Each triangle has a sum of the measures of the interior angles of ______ degrees. Use this information to find the sum of the angles in your polygon.

(5) Add your results to the table.

# of sides (n)	# of diagonals (non-overlapping)	# of triangles (non-overlapping)	Sum of the interior angles (S_i)
3 	0	1	$1 \cdot 180 = 180$
4 	1	2	$2 \cdot 180 = 360$
5	2	3	$3 \cdot 180 = 540$
6	3	4	$4 \cdot 180 = 720$
7	4	5	$5 \cdot 180 = 900$
8	5	6	$6 \cdot 180 = 1080$
9	6	7	$7 \cdot 180 = 1260$
n	$n-3$	$n-2$	$(n-2)180$

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Polygon Sum Theorem	The sum of the measure of the interior angles of an n-gon is: $S_i = (n-2)180$ **Example:** Find the sum of the interior angles of a: Decagon (10): $(10-2)180 = 1440°$ Dodecagon (12): $(12-2)180 = 1800°$ 40-gon (40): $(40-2)180 = 6840°$ **Example:** The sum of the interior angles of a polygon is 2,700°. How many sides doe the polygon have? $\frac{2{,}700}{180} = \frac{(n-2)180}{180}$ $15 = n-2$ $+2 \quad +2$ $\boxed{n=17}$
Regular Polygon Interior Angle Theorem	The measure of one interior angle of a regular polygon is: $I = \frac{S_i}{n}$ Or $I = \frac{(n-2)180}{n}$ **Example:** Find the measure of one interior angles of a: Regular Octagon (8): $I = \frac{(8-2)180}{8} = \frac{1080}{8} = 135°$ Regular 18-gon (18): $I = \frac{(18-2)180}{18} = \frac{2880}{18} = 160°$ **Example:** The measure of one interior angle of a regular polygon is 165.6°. How mar sides does the regular polygon have? $n \cdot 165.6 = \frac{(n-2)180}{n} \cdot n$ $165.6n = 180n - 360$ $-180n \quad -180n$ $\frac{-14.4n}{-14.4} = \frac{-360}{-14.4}$ $\boxed{n = 25 \text{ sides}}$