Geometry MONDAY 2-11-13 CLASS NOTES

Ch. 6-1 Properties and Attributes of Polygons

characteristics

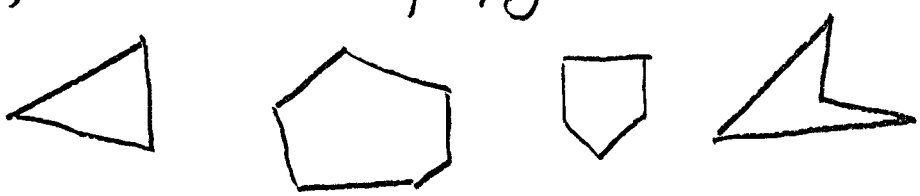
many angles ("gonia" is Greek for knee)

POLYGON A CLOSED PLANE figure

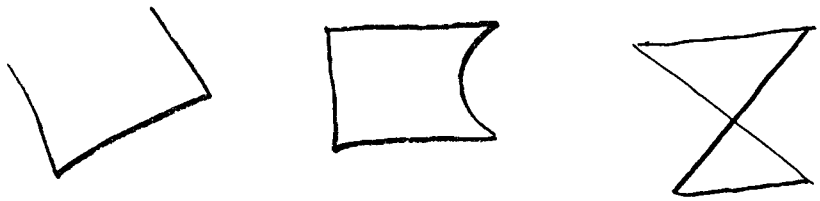
flat surface

formed by 3, or more, line segments that intersect (meet) ONLY AT THEIR ENDPOINTS

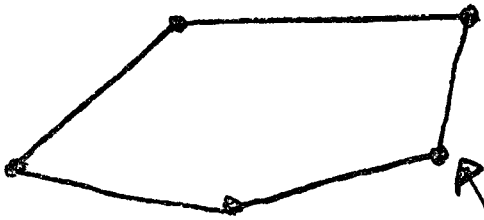
(EX) Yes, these are polygons



(EX) No, these are NOT POLYGONS



More polygon terms:

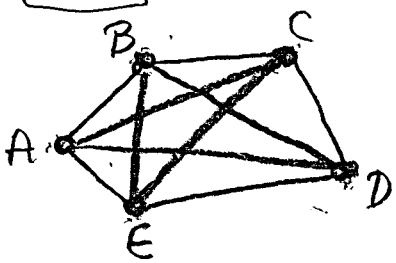


THIS POLYGON HAS
5 VERTICES AND 5 SIDES

DIAGONAL A line segment that connects ANY two NONCONSECUTIVE vertices

(NOT NEXT TO EACH other)

(EX)

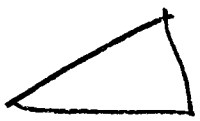


$\overline{AC}$, $\overline{AD}$, $\overline{BE}$, $\overline{BD}$, $\overline{CE}$
ARE DIAGONALS

CONCAVE (↑ ONE SIDE "CAVES IN") **VS. CONVEX**

IF ANY PART OF ANY DIAGONAL CONTAINS POINTS OUTSIDE THE POLYGON, IT IS CONCAVE

CONCAVE

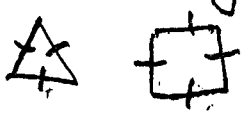


CONVEX

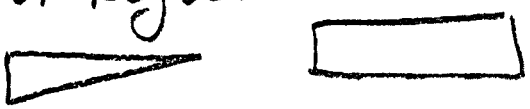
Regular Polygon

A polygon with all sides congruent

vs irregular

(EX)  Regular

(EX) NOT regular



Names of Polygons

Pg 394

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

(EX) 20-gon

NOTE:

* You could see any of these named by an N-gon

(EX) triangle = 3-gon

The sum (total) of all the Angles inside CONVEX polygons

triangle	3-sides	180°
quadrilateral	4-sides	360°
pentagon	5-sides	540°

RULE: start with a triangle which is 180° and add 180° every time you add a side.

formula

let N = number of sides

$$\text{total degrees of all angles} = (N-2)180^\circ$$

Check: triangle $= (3-2)(180)$ ✓

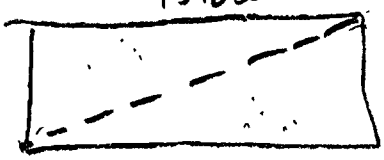
quadrilateral $= (4-2)(180)$ ✓

20-gon $= (20-2)\,180$

$= 3240^\circ$ ✓

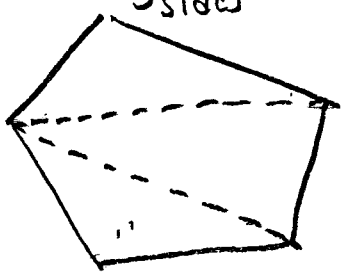
Another way to find the sum of all the interior angles is to add up all the triangles you can make by drawing all possible diagonals from ONE vertex.

(Ex) 4 sides



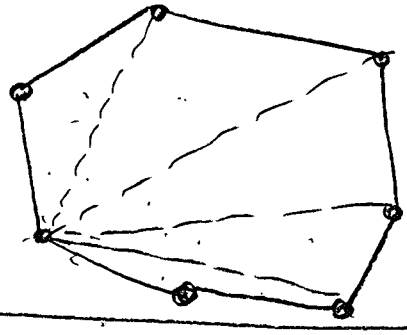
two triangles
$\Rightarrow 180^\circ \cdot 2 = 360^\circ$

(Ex) 5 sides



three triangles
$\Rightarrow 180^\circ \cdot 3 = 540^\circ$

(Ex) 7 sides



5 triangles
$\Rightarrow 180^\circ \cdot 5 = 900^\circ$

How big is each interior angle in a regular polygon? (All angles the same)

(Ex) triangle $\Rightarrow \frac{180}{3} = 60^\circ$ hexagon $= \frac{720^\circ}{6} = 120^\circ$

Ex (3) Pg 396

(A) Find the sum of the interior angle measures of a convex octagon.

$$S_{\text{sum}} = (N-2)\,180^\circ$$

$\therefore S = (8-2)180$

$\boxed{S = (6)180 = 1080^\circ}$

(B) Find the measure of each interior angle of a regular nonagon.

$S = (N-2)\,180$

$S = (9-2)\,180$

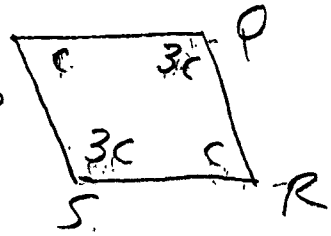
$S = 7(180) = 1260^\circ$

$\therefore \dfrac{1260 \text{ deg}}{9 \text{ Angles}} = \boxed{140^\circ \dfrac{\text{deg}}{\text{Angle}}}$

(C) Find the measure of each interior angle of quadrilateral PQRS

$8c = (4-2)180^\circ$

$8c = 360^\circ \therefore c = 45^\circ$

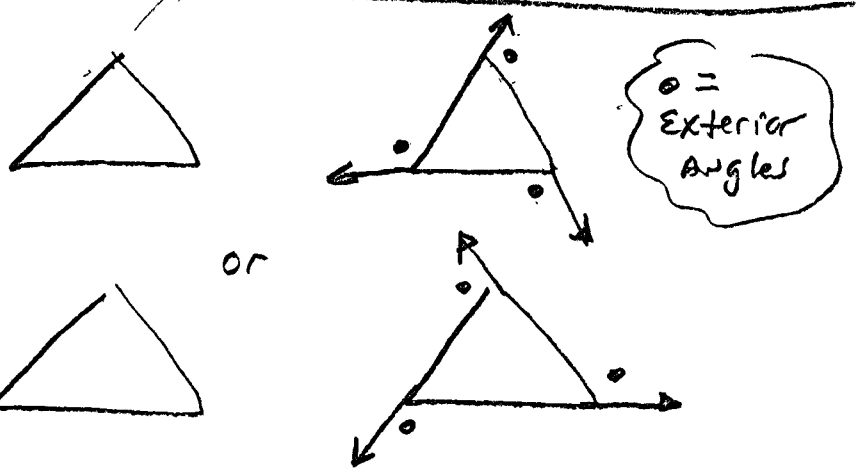


$\therefore \boxed{m\angle P = m\angle R = 45^\circ}$

$\boxed{m\angle S = m\angle Q = 135^\circ}$

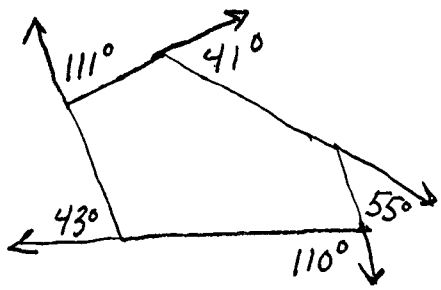
Exterior Angle of a polygon — the Angle formed by ONE SIDE of A polygon AND the EXTENSION OF the CONSECUTIVE SIDE

Ex



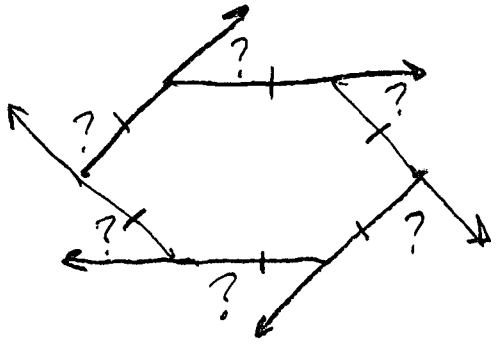
Polygon Exterior Angle Sum Theorem Pg 396 — THE SUM OF THE Exterior Angles OF A CONVEX polygon, ONE Angle At each vertex, is 360°

Ex Pg 396



41
55
110
43
111
360° ✓

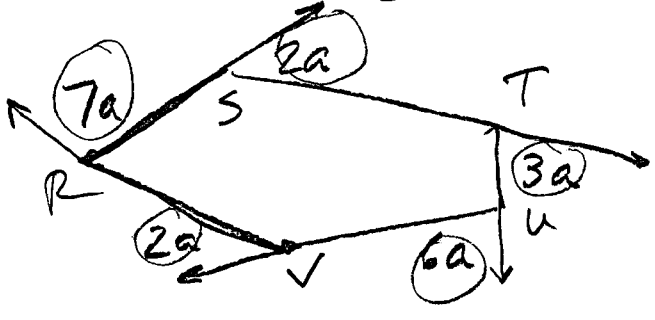
(Ex 4)(A) Pg 397 Find the measure of each exterior angle of a regular hexagon.



There are 6 exterior angles, they must add to 360 degrees.

∴ Each angle is $\frac{360}{6} = \boxed{60^\circ}$

(B) Find a in polygon RSTUV



$7a + 2a + 3a + 6a + 2a = 360^\circ$

$\frac{20a}{20} = \frac{360^\circ}{20}$

$\boxed{a = 18}$