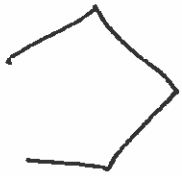
Refer to p. 157-160 in Book

Day 23 9/18 B1

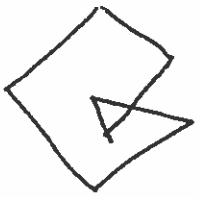
3-5 The Polygon Angle Sum Thms.

A **Polygon** is a **closed plane** figure with at least **3** sides that are segments.
- the sides intersect only at their endpoints, and no **adjacent** sides are **collinear**

polygon

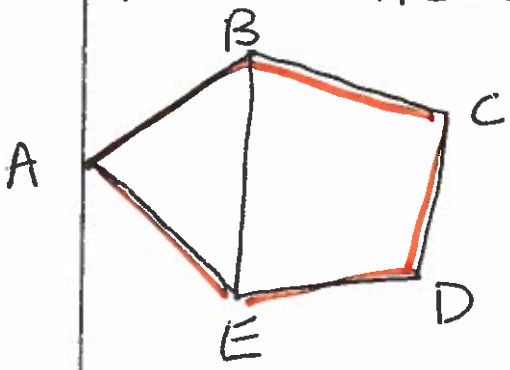


not closed
not a polygon



not a polygon - 2 sides intersect

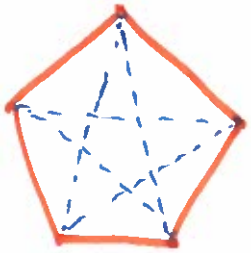
Name the 3 polygons.



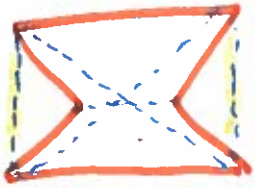
Triangle ABE
Quadrilateral BCDE
Pentagon ABCDE

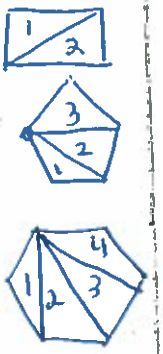
Polygons can be convex or concave.

Convex has no with points the polygon.



Concave has **at least 1 diagonal** with points outside the polygon.





Sides	Names	Interior ∠ Sum	each interior ∠ For regular polygon
3	triangle	180°	180° ÷ 3 = 60°
4	quadrilateral	360°	360 ÷ 4 = 90°
5	pentagon	3(180°) = 540°	540 ÷ 5 = 108°
6	hexagon	4(180) = 720°	÷ 6 = 120°
7	septagon	5(180) = 900°	÷ 7 = 128.6°
8	octagon	6(180) 1080°	= 135°
9	nonagon	7(180) 1260°	
10	decagon	8(180) 1440°	
11	undecagon	9(180) 1620°	
12	dodecagon	10(180) 1800°	
n	n-gon	(n-2)180°	

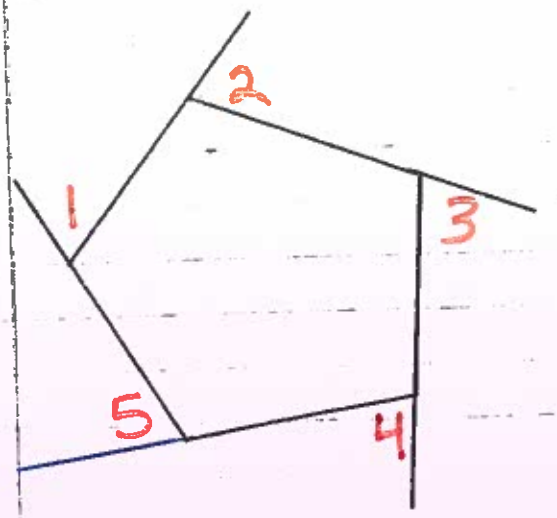
↑ number of sides

$\frac{\text{sum}}{\text{sides}} = \frac{(n-2)180^\circ}{n}$

Equilateral polygon has all sides ≅.

Equiangular polygon has all angles ≅.

A regular polygon is equilateral and equiangular.



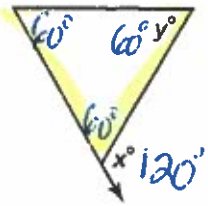
P. 161
(1-5, 8-20)

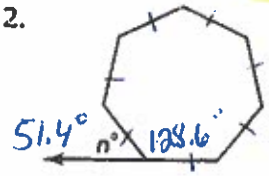
The sum of the Exterior ∠'s of a polygon is 360° Always!!

only for regular polygons

each exterior ∠ = $\frac{360^\circ}{n}$

Find the values of the variables for each polygon. Each is a regular polygon.

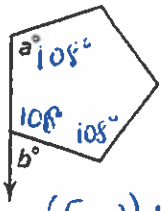
1. 

2. 

$(n-2)\cdot 180^\circ$

$(7-2)180^\circ = \frac{900^\circ}{7}$

each $\angle = 128.6$

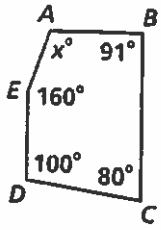
3. 

$(5-2)\cdot 180^\circ = \frac{540^\circ}{5}$

a = each interior $= 108^\circ$

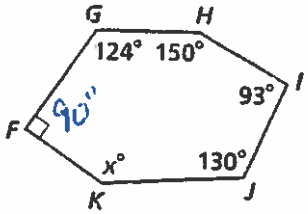
$b = 180 - 108 = 72^\circ$ exterior

Find the missing angle measures.

4. 

540
−91
−160
−100
−80
109°

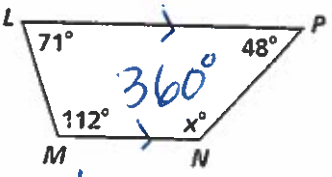
pentagon
540°

5. 

hexagon $= 720^\circ$

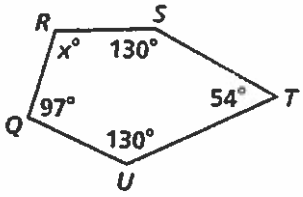
$x = 720 - 90 - 124 - 150 - 93 - 130$

$x = 136^\circ$

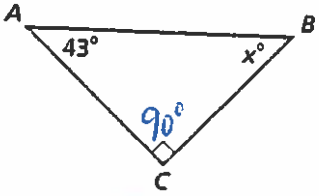
6. 

trapezoid

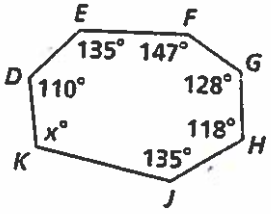
$x = 129^\circ$

7. 

pentagon
540°
$x = 129^\circ$

8. 

right triangle
180° $x = 47^\circ$

9. 

septagon
900°
$x = 127^\circ$

For a regular 12-sided polygon, find each of the following.

10. the measure of an exterior angle $360 \div 12 = 30^\circ$

11. the measure of an interior angle

$180 - 30 = 150^\circ$ or $\frac{(n-2)\cdot 180}{n}$

$\frac{(12-2)\cdot 180}{12} = \frac{10\cdot 180}{12}$

interior \ exterior
are supplementary

Exterior
$180-120=60$ → use exterior ∠ Formula

$ext.\angle = \frac{360}{n}$

$\frac{60^\circ}{1} = \frac{360}{n}$

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

12. 120

$\frac{(n-2)\cdot 180}{n} = \frac{120^\circ}{1}$

$(n-2)\cdot 180^\circ = 120n$

$180n - 360^\circ = 120n$

$-180n \quad\quad -180n$

$-360^\circ = -60n$

$\frac{-360^\circ}{-60} = \frac{-60n}{-60}$

$6 = n$

hexagon

13. 108

$n = 5$

pentagon

$60n = 360$

$\frac{60n}{60} = \frac{360}{60}$

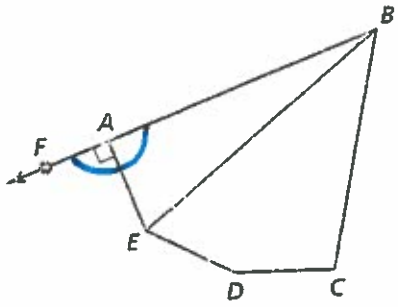
14. 135

$n = 6$

$n = 8$

octagon

Identify each item in Exercises 15–18 in the figure.



15. quadrilateral BEDC

16. exterior angle ∠EAF

17. pair of supplementary angles ∠FAE & ∠BAE

18. pentagon ABCDE

19. A regular polygon has an exterior angle of measure 18. How many sides does the polygon have?

20 sides

$\frac{18^\circ}{1} = \frac{360}{n}$

each interior ∠ $= 160^\circ$

exterior 20°

Find the # OF sides

$\frac{(n-2)\cdot 180^\circ}{n} = 160$

$\frac{20^\circ}{1} = \frac{360}{n}$

$180n - 360 = 160n$

$-180n \quad\quad -180n$

$n = 18$

$\frac{-360^\circ}{-20} = \frac{-20n}{-20}$

$18 = n$