Name: ___________________________________ Per.: ______

Interior Angle Sum Theorem

The **Interior Angle Sum Theorem** tells us that the total number of degrees in any given polygon depends on the number of triangles inside of it. Since each triangle has 180˚, if you multiply the number of triangles by 180˚ you will have determined the Interior Angle Sum. Remember, to determine the number of triangles, just subtract the number of sides by two.

The Interior Angle Sum Theorem: $\boxed{(n-2)(180) = \text{Total degree measure of any polygon}}$,
where n is the number of sides.

In order to determine the number of sides, you also need to know the names of polygons…

Triangle	3 sides	Octagon	8 sides
Quadrilateral	4 sides	Nonagon	9 sides
Pentagon	5 sides	Decagon	10 sides
Hexagon	6 sides	Undecagon	11 sides
Heptagon	7 sides	Dodecagon	12 sides

n-gon	Polygon with n sides

Determine the **Interior Angle Sum** of the polygon.

EXAMPLE Pentagon $(n-2)(180) = (5-2)(180)$ $= 3(180)$ $= \boxed{540^\circ}$	**EXAMPLE** 19-gon $(n-2)(180) = (19-2)(180)$ $= 17(180)$ $= \boxed{2060^\circ}$	**EXAMPLE** 22-gon $(n-2)(180) = (22-2)(180)$ $= 20(180)$ $= \boxed{3600^\circ}$
1. Decagon	2. Hexagon	3. 14-gon
4. Nonagon	5. Quadrilateral	6. Dodecagon
7. 17-gon	8. Octagon	9. 20-gon

The **Exterior Angle Sum** is a bit simpler. No matter how many sides a polygon has…
the **Exterior Angle Sum** is always **360˚.**

Determine the exterior angle sum.

EXAMPLE Pentagon $\boxed{360^\circ}$	**EXAMPLE** 19-gon $\boxed{360^\circ}$	**EXAMPLE** 22-gon $\boxed{360^\circ}$
10. Decagon	11. Hexagon	12. 14-gon
13. Nonagon	14. Quadrilateral	15. Dodecagon
16. 17-gon	17. Octagon	18. 20-gon

To determine the measure of any angle of a polygon, you use the interior angle sum. Just like you would add the angles of a triangle to equal 180˚, you add all of the angles of the polygon to equal the **interior angle sum**.

EXAMPLE

Determine the measure of each interior angle of a pentagon with angles $(2x-6)$, $(x+14)$, $(3x+32)$, $(7x+9)$, and $(7x+11)$.

Interior Angle Sum of a pentagon (5-sides): $(n-2)(180)=(5-2)(180)=3(180)=540^\circ$

Add the angles and set them equal to 540˚.

$$(2x-6)+(x+14)+(3x+32)+(7x+9)+(7x+11)=540^\circ$$
$$20x+60=540$$
$$20x=480$$
$$x=24$$

$(7x+9)$, and $(7x+11)$

$2x-6=2(24)-6=48-6=\boxed{42^\circ}$ $x+14=(24)+14=\boxed{38^\circ}$ $3x+32=3(24)+32=72+32=\boxed{104^\circ}$

$7x+9=7(24)+9=168+9=\boxed{177^\circ}$ $7x+11=7(24)+11=168+11=\boxed{179^\circ}$

19. Determine the measure of each interior angle of a pentagon with angles $(9x+3)$, $(2x+12)$, $(5x+63)$, $(3x+16)$, and $(6x+21)$.

20. Determine the measure of each interior angle of a quadrilateral with angles $(x+23)$, $(2x-16)$, $(3x+15)$, and $(4x+8)$.

21. Determine the measure of each interior angle of a hexagon with angles $(3x-13)$, $(4x+16)$, $(2x+7)$, $(x+52)$, $(5x+8)$, and $(5x+10)$.

22. Determine the measure of each interior angle of a hexagon with angles $(3x+28)$, $(6x-7)$, $(4x+42)$, and $(2x+27)$.