Geometry H
Section 1.5 & 2.7 Notes

Name : Key
Date : ____________ Period : ____

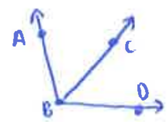
LEARNING TARGETS

- I can identify special angle pairs.
- I can find measures of complementary and supplementary angles.

The graphic organizer below outlines the different possibilities for a pair of angles.

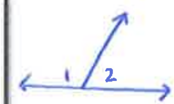
Angle pairs can be

adjacent— two angles next to each other that share a common vertex and a common side



$\angle ABC$ and $\angle CBD$ are adjacent

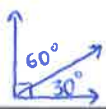
linear— two adjacent angles that form a line



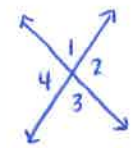
$m\angle 1 + m\angle 2 = 180°$

complementary— two angles that sum to 90°

Ex:



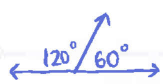
vertical— two angles across from each other when two lines cross to form an X



$\angle 1$ and $\angle 3$
$\angle 2$ and $\angle 4$

supplementary— two angles that sum to 180°

Ex:



Example 1: Use complements and supplements

a) The measure of an angle is twice the measure of its complement. Find the measure of each angle.

$x \quad = \quad 2 \cdot \quad (90 - x)$

$x = 2(90 - x)$

$x = 180 - 2x \Rightarrow 3x = 180 \Rightarrow x = 60$

one angle = 60°
other angle = 30°

↳ since these angles are complementary, they sum to 90°

b) $\angle A$ and $\angle B$ are complementary angles. $\angle C$ and $\angle D$ are supplementary angles. Find the measures of the four angles, if $m\angle A = 2x°$, $m\angle B = 6y°$, $m\angle C = (6x + y)°$, and $m\angle D = (4x + 2y)°$

$\angle A + \angle B = 90$

$2x + 6y = 90$ —— Make into a system —— $6x + y + 4x + 2y = 180$

$\angle C + \angle D = 180$

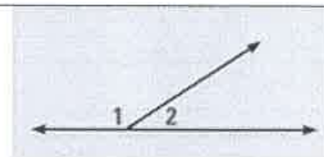
$10x + 3y = 180$

$$\begin{cases} 2x + 6y = 90 \\ -2(10x + 3y = 180) \end{cases} \Rightarrow$$

$2x + \cancel{6y} = 90$
$-20x - \cancel{6y} = -360$
$-18x = -270$
$\boxed{x = 15}$

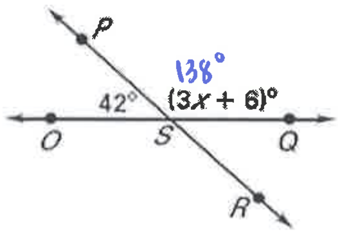
$2(15) + 6y = 90$
$30 + 6y = 90$
$6y = 60$
$\boxed{y = 10}$

$m\angle A = 2(15) = 30°$
$m\angle B = 6(10) = 60°$
$m\angle C = 6(15) + 10 = 100°$
$m\angle D = 4(15) + 2(10) = 180°$

Linear Pair Postulate (LPP)	
If two angles form a linear pair, then they are <u>supplementary</u>.	 $m\angle 1 + m\angle 2 = 180°$

Example 2: Use the Linear Pair Postulate

a) Solve for x in the diagram.



$\angle OSQ$ is a straight angle, so:

$42 + 3x + 6 = 180$

$3x + 48 = 180$

$3x = 132$

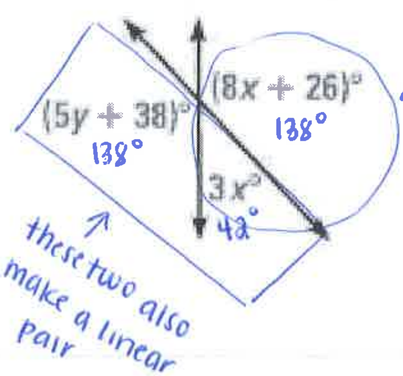
$\boxed{x = 44}$

check by plugging into $\angle PSQ$:

$3(44) + 6 = 138°$

so $42 + 138 = 180$ ✓

b) Find the values of x and y in the diagram.



these two angles make a linear pair

$8x + 26 + 3x = 180$

$11x + 26 = 180$

$11x = 154$

$\boxed{x = 14}$

$5y + 38 + 42 = 180$

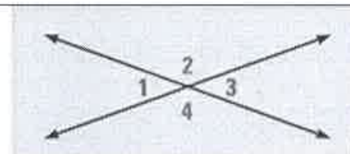
$5y + 80 = 180$

$5y = 100$

$\boxed{y = 20}$

Extension...find the measures of the angles in example 6b, what do you notice about the measures of the vertical angles?

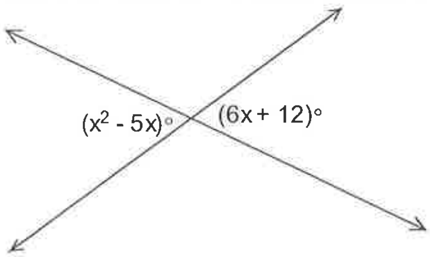
Since $(5y+38)°$ and $(8x+26)°$ are the vertical angles, and both of them are 138°, we can conclude that vertical angles have the same measure

Vertical Angles Theorem (VAT)	
Vertical angles are congruent.	 $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$

$m\angle 1 = m\angle 3$ and $m\angle 2 = m\angle 4$

Example 6: Use the Vertical Angles Theorem.

7) a) Find the value of x and the measure of each angle in the diagram below.



$x^2 - 5x = \cancel{6x} + 12$
$\quad -6x \;\; \cancel{-6x}$

$x^2 - 11x = \cancel{12}$
$\quad -12 \;\; \cancel{-12}$

$x^2 - 11x - 12 = 0$

$(x-12)(x+1) = 0$

$x - 12 = 0, \; x + 1 = 0$

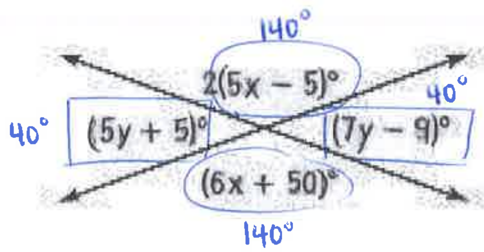
$\boxed{x = 12, \; x = -1}$

check:

$x = 12: \; (12)^2 - 5(12) = \boxed{84°}$
$6(12) + 12 = \boxed{84°}$

$x = -1: \; (-1)^2 - 5(-1) = \boxed{6°}$
$6(-1) + 12 = \boxed{6°}$

b) Find the values of *x* and *y*, and then find the measure of each angle in the diagram below.



$2(5x - 5) = 6x + 50$ ← vertical angles

$10x - 10 = 6x + 50$

$4x - 10 = 50$

$4x = 60$

$\boxed{x = 15}$

$5y + 5 = 7y - 9$

$5 = 2y - 9$

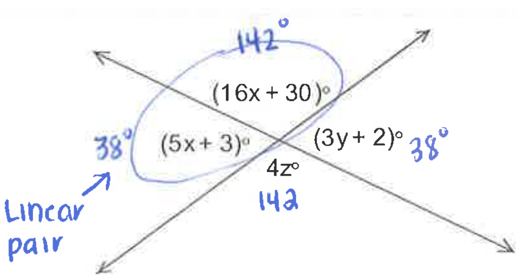
$14 = 2y$

$\boxed{y = 7}$

$\boxed{\text{Angles: } 140°, 40°, 140°, 40°}$

Putting it all together!

8) a) Find the values of *x*, *y*, and *z*, and then find the measure of each angle in the diagram below.



$16x + 30 + 5x + 3 = 180$ ← linear pair

$21x + 33 = 180$

$21x = 147$

$\boxed{x = 7}$

$38 = 3y + 2$ ← vertical angles

$36 = 3y$

$\boxed{y = 12}$

$4z = 142$ ← vertical angles

$\boxed{z = 35.5}$