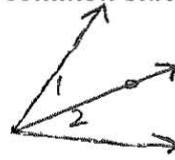


**Definitions:**

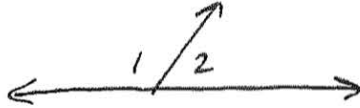
1) Adjacent Angles

If two angles have a common vertex and a common side but no common interior points, then they are adjacent angles.



2) Linear Pair

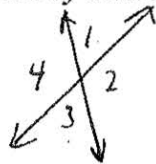
If two angles are adjacent and the noncommon sides are opposite rays, then they are a linear pair



$\angle 1$  and  $\angle 2$  form a linear pair.

3) Vertical Angles

If two nonadjacent angles are formed by intersecting lines, then they are vertical angles.



$\angle 1$  &  $\angle 3$ ,  $\angle 2$  &  $\angle 4$  are vertical  $\angle$ 's

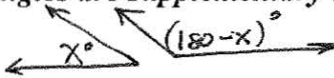
4) Complementary Angles

If two angles are complementary angles, then the sum of their measures is 90 degrees.



5) Supplementary Angles

If two angles are supplementary angles, then the sum of their measures is 180 degrees.



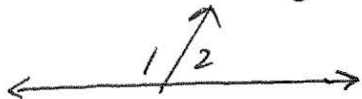
6) Perpendicular Lines



If two lines, segments, or rays are perpendicular, then they intersect to create 4 right angles.

**Theorems:** Statements that must be proven to be true. These can be used in proofs.

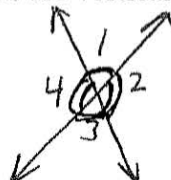
**Linear Pair Theorem:** If two angles form a linear pair, then they are supplementary.



$\angle 1$  supp to  $\angle 2$

Note: Is the converse true?  
No

**Vertical Angle Theorem:** If two angles are vertical, then they are Congruent ( $\cong$ ).



$\angle 1 \cong \angle 3$

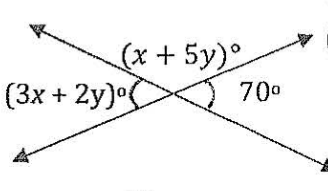
$\angle 2 \cong \angle 4$

Note: Is the converse true?  
No

## Formal Geometry

## 1.5 Examples

1) Find  $x$  and  $y$ .

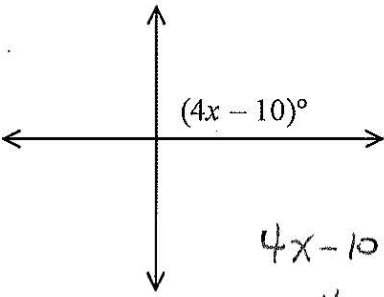


$$\begin{cases} 3x+2y=70 \\ (x+5y=110)-3 \end{cases}$$

$$\begin{array}{r} 3x+2y=70 \\ -3x-15y=-330 \\ \hline -13y=-260 \\ \boxed{y=20} \\ 3x+2(20)=70 \\ 3x=30 \\ \boxed{x=10} \end{array}$$

$$\begin{cases} 3x+2y=70 \\ x+5y+70=180 \end{cases}$$

2) Find  $x$  if the lines are perpendicular.



$$\begin{aligned} 4x-10 &= 90 \\ 4x &= 100 \\ \boxed{x=25} \end{aligned}$$

3) Find the supplement of the complement of  $36^\circ$ .

$$\begin{aligned} \text{Comp of } 36^\circ &= 54^\circ & 90-36 &= \boxed{54^\circ} \\ \text{supp of } 54^\circ &= \boxed{126^\circ} & 180-54 &= \boxed{126^\circ} \end{aligned}$$

4) The measure of the complement of an angle is ten more than three times the angle. Find the supplement of the angle.

$$\begin{aligned} \angle &= x^\circ \\ \text{Comp} &= (90-x)^\circ \\ \text{Supp} &= (180-x)^\circ \end{aligned} \quad \left\{ \begin{array}{l} 90-x = 3x+10 \\ 80 = 4x \\ 20 = x \end{array} \right. \quad \begin{aligned} \text{Supp} &= 180-20 \\ &= \boxed{160^\circ} \end{aligned}$$

5) The larger of two supplementary angles exceeds seven times the smaller by four. Find the measure of the larger angle.

$$\begin{aligned} \text{small } \angle &: x \\ \text{large } \angle &: 7x+4 \end{aligned} \quad \begin{aligned} x+7x+4 &= 180 \\ 8x+4 &= 180 \\ 8x &= 176 \\ x &= 22 \end{aligned} \quad \begin{aligned} 7(22)+4 & \\ 154+4 & \\ \boxed{158^\circ} & \end{aligned}$$

6) The supplement of an angle is four times the complement of the angle. Find the measure of the complement.

$$\begin{aligned} \angle &= x \\ \text{Comp} &= 90-x \\ \text{Supp} &= 180-x \end{aligned} \quad \left\{ \begin{array}{l} 180-x = 4(90-x) \\ 180-x = 360-4x \\ 3x = 180 \\ x = 60 \end{array} \right. \quad \begin{aligned} \text{Comp} &= 90-60 \\ &= \boxed{30^\circ} \end{aligned}$$

7) The measure of the supplement of an angle is 30 less than five times the complement. Find the complement.

$$\begin{aligned} \angle &= x \\ \text{Comp} &= 90-x \\ \text{Supp} &= 180-x \end{aligned} \quad \left\{ \begin{array}{l} 180-x = 5(90-x)-30 \\ 180-x = 450-5x-30 \\ 180-x = 420-5x \\ 4x = 240 \end{array} \right. \quad \begin{aligned} x &= 60 \\ \text{Comp} &= 90-60 \\ &= \boxed{30^\circ} \end{aligned}$$