## Unit 1 Learning Goal

**GEO.B.1.PointsLinesPlanes**
Identify points, lines, planes and angles and describe the relationships between them to include drawing and constructions.

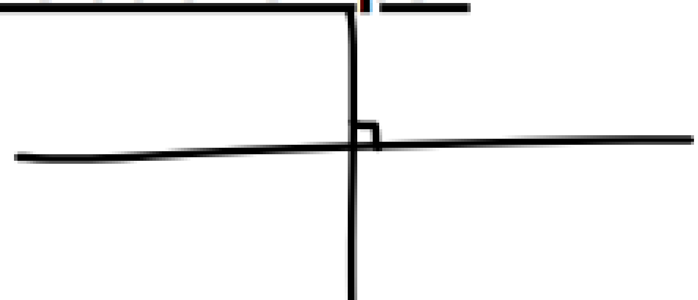
comp = 90°
supp = 180°

## Lesson 1-7 Learning Target

- I can identify and use adjacent, vertical, complementary, supplementary, linear pairs, and perpendicular lines to solve problems

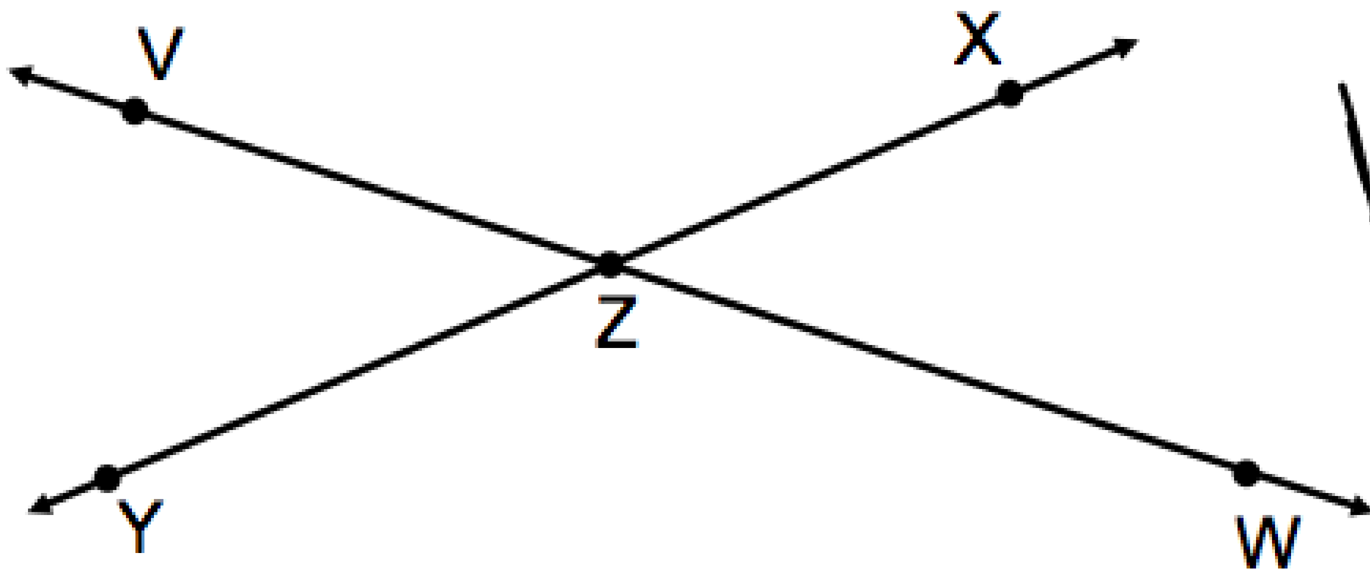
- I can determine what information can and cannot be assumed from a diagram

## Lesson 1-7: "Angle Relationships"

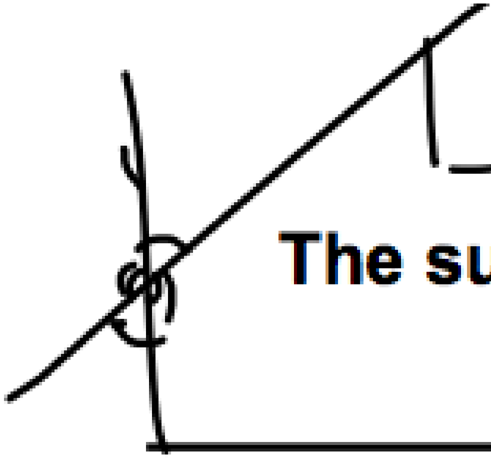


**Perpendicular lines** are special intersecting lines that form right angles. Not all lines that intersect are perpendicular lines. When two lines intersect, they form four angles. These angles are not necessarily right angles.

Certain pairs of angles formed by intersecting lines have special names that are used to describe the relationship between the angles.



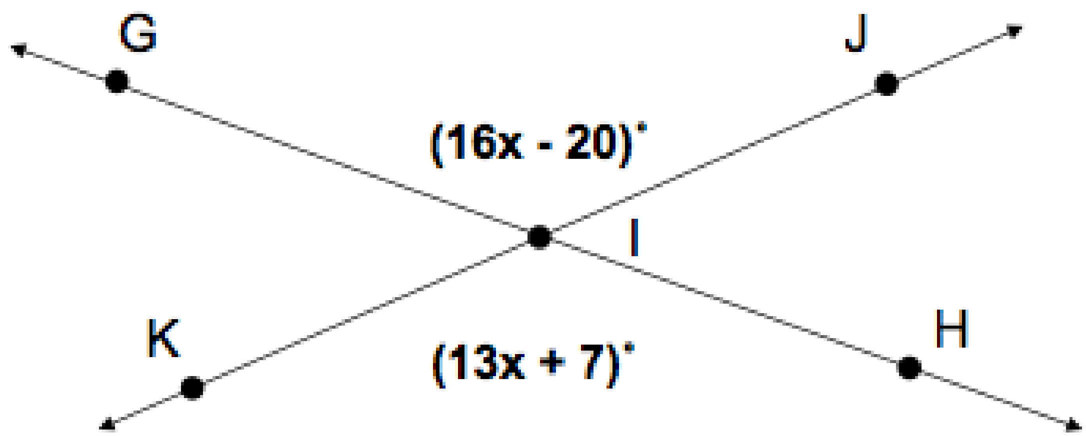

| Special Name | Definition | Examples |
|---|---|---|
| **adjacent angles** | angles in the same plane that have a common vertex and a common side, but no common interior points | ∠VZX and ∠XZW<br>∠XZW and ∠WZY<br>∠WZY and ∠YZV<br>∠YZV and ∠VZX |
| **vertical angles** | two nonadjacent angles formed by two intersecting lines | ∠VZY and ∠XZW<br>∠VZX and ∠YZW |
| **linear pair** | adjacent angles whose noncommon sides are opposite rays | ∠VZX and ∠XZW<br>∠XZW and ∠WZY<br>∠WZY and ∠YZV<br>∠YZV and ∠VZX |

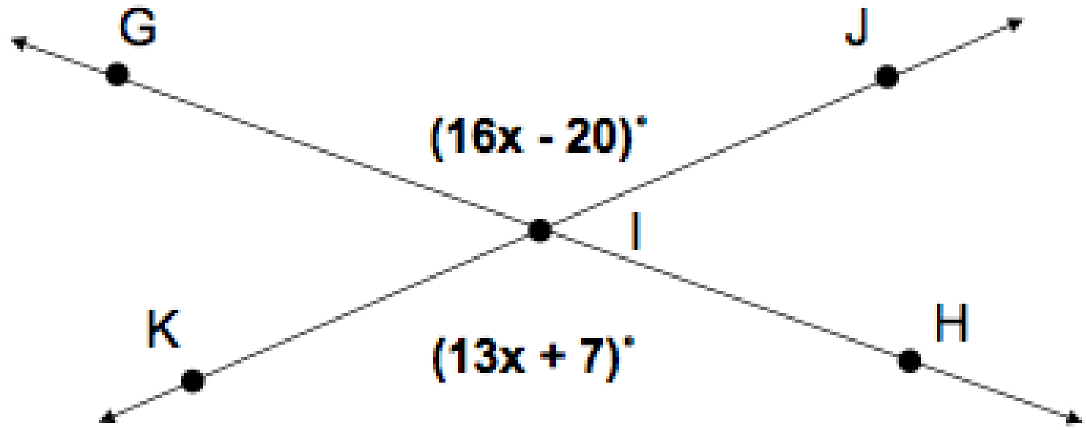


**Verticle angles are congruent.**

**The sum of the measures of the angles in a linear pair is 180.**

In the figure, $\overleftrightarrow{GH}$ and $\overleftrightarrow{JK}$ intersect at I. Find the value of x and the measure of <JIH.






$\angle JIH$

$16x - 20 = 13x + 7$

$3x = 27$

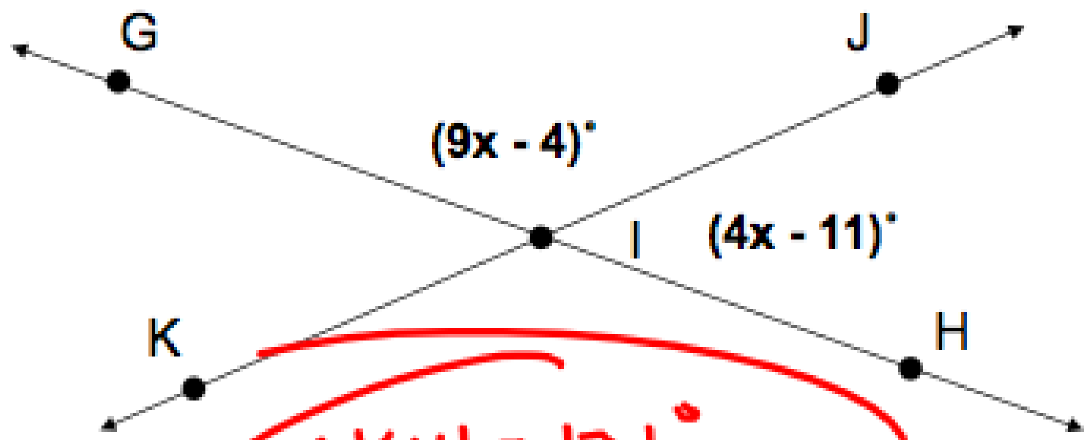
$x = 9$

$13(9) + 7$

$117 + 7$

$= 124^\circ$

$180 - 124 = 56^\circ$




$\angle KIH = 131^\circ$

**Find the value of x and the measure of <KIH.**

$$(9x - 4) + (4x - 11) = 180$$

$$13x - 15 = 180$$

$$13x = 195$$

$$\underline{\underline{x = 15}}$$

$$9(15) - 4$$

$$135 - 4$$

$$= 131^\circ$$

**Supplementary Angles**: Two angles whose measures have a sum of 180˚

**Complementary Angles**: Two angles whose measures have a sum of 90˚

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★ The measure of the complement of an angle is 3.5 times smaller than the measure of the supplement of the angle. Find the measure of the angle.

$$3.5(90-x) = 180-x$$

$$315-3.5x = 180-x$$

$$135 = 2.5x$$

$$\frac{135}{2.5} = \frac{2.5x}{2.5}$$

$$54^\circ = x$$

☆

The measure of the supplement of an angle is 60 less than three times the measure of the complement of the angle. Find the measure of the angle.

$$180 - x = 3(90 - x) - 60$$

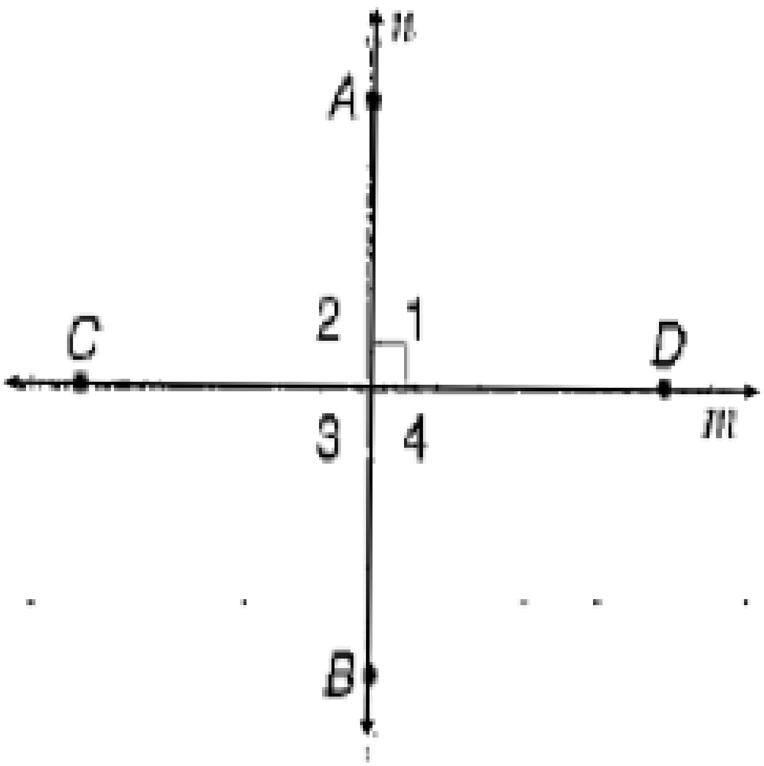
$$180 - x = 270 - 3x - 60$$

$$180 - x = 210 - 3x$$

$$180 + 2x = 210$$

$$2x = 30$$

$$x = 15^\circ$$




Perpendicular lines are two lines that intersect to form a right angle. In the figure at the left, lines $m$ and $n$ are perpendicular. To indicate this, we write $m \perp n$, which is read, "$m$ is perpendicular to $n$." Line segments and rays can be perpendicular to lines or other line segments and rays if they intersect to form a right angle. For example, in the figure, $\overleftrightarrow{AB} \perp \overline{CD}$, $\overline{DC} \perp \overrightarrow{BA}$ and $\overline{AB} \perp \overline{DC}$.

**Perpendicular lines intersect to form four right angles.**

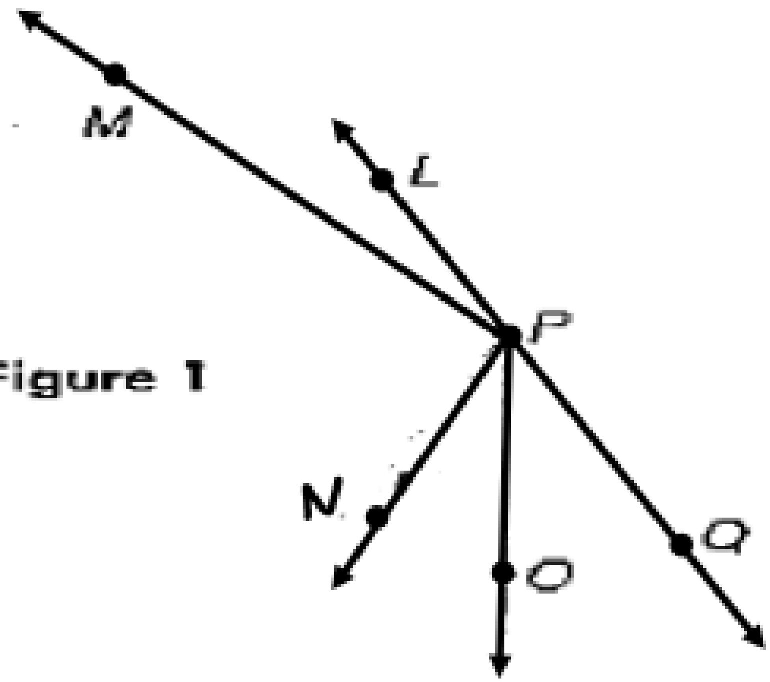



Figure 1

| Can Be Assumed from Figure 1 | Cannot Be Assumed from Figure 1 |
|---|---|
| All points shown are coplanar. | $\overline{PN} \perp \overline{PM}$ |
| $L$, $P$ and $Q$ are collinear. | $\angle QPO \cong \angle LPM$ |
| $\overrightarrow{PM}$, $\overrightarrow{PN}$, $\overrightarrow{PO}$, and $\overleftrightarrow{LQ}$ intersect at $P$. | $\overline{LP} \cong \overline{PQ}$ |
| $P$ is between $L$ and $Q$. | $\overline{PQ} \cong \overline{PO}$ |
| $N$ is in the interior of $\angle MPO$. | $\angle QPO \cong \angle OPN$ |
| $\angle LPQ$ is a straight angle. | $\angle OPN \cong \angle LPM$ |
| $\angle LPM$ and $\angle MPN$ are adjacent angles. | $\overline{PO} \cong \overline{PN}$ |
| $\angle LPN$ and $\angle NPQ$ are a linear pair. | $\overline{PN} \cong \overline{PL}$ |
| $\angle QPO$ and $\angle OPL$ are supplementary. | |

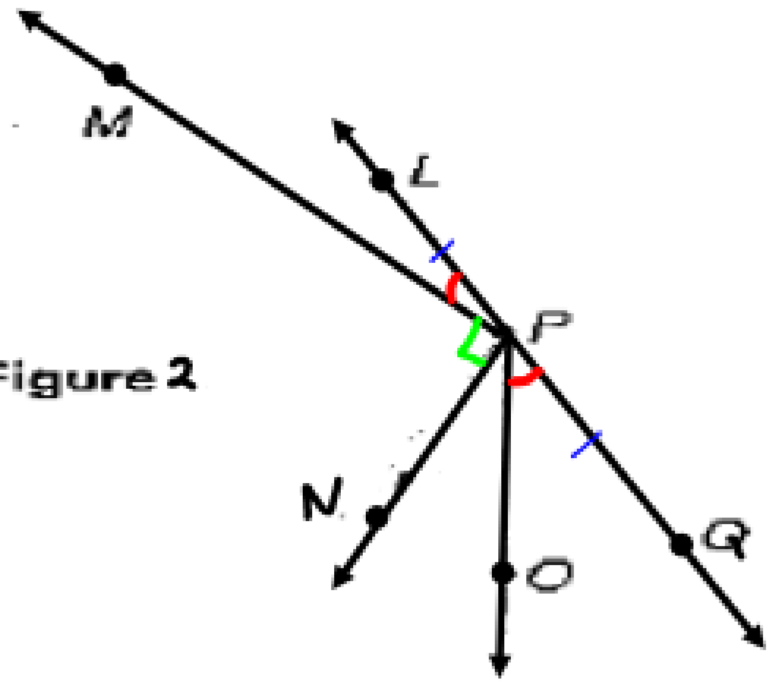



Figure 2

Now we can assume some relationships that could not be assumed in Figure 1

→ $\overrightarrow{PN} \perp \overrightarrow{PM}$

→ $\angle QPO \cong \angle LPM$

→ $\overline{LP} \cong \overline{PQ}$