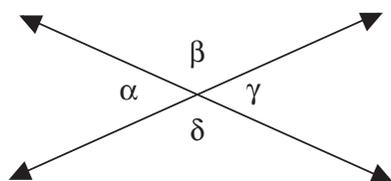


LESSON 6

Supplementary and Complementary Angles

Greek Letters

Figure 1



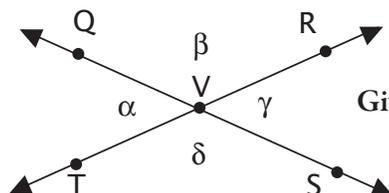
α = alpha
 β = beta
 γ = gamma
 δ = delta

Adjacent Angles

Angles that share a common side and have the same origin are called *adjacent angles*. They are side by side. In figure 1, α is adjacent to both β and δ . It is not adjacent to γ . In figure 1, there are four pairs of adjacent angles: α and β , β and γ , γ and δ , δ and α .

In figure 2, we added points so we can name the rays that form the angles. The common side shared by adjacent angles α and β is \overrightarrow{VQ} .

Figure 2

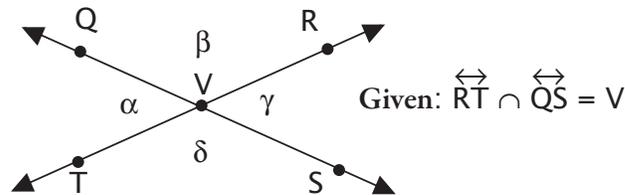


Given: $\overleftrightarrow{RT} \cap \overleftrightarrow{QS} = V$

Vertical Angles

Notice that $\angle\gamma$ is opposite $\angle\alpha$. Angles that share a common origin and are opposite each other are called *vertical angles*. They have the same measure and are congruent. $\angle\beta$ and $\angle\delta$ are also vertical angles.

Figure 2 (from previous page)

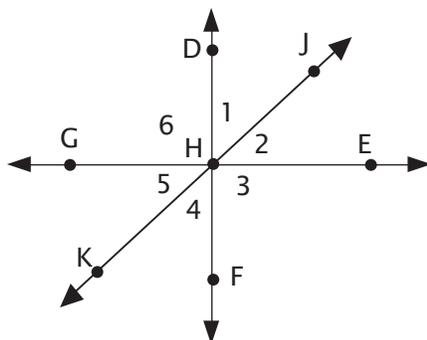


If $m\angle\beta$ is 115° , then $m\angle\delta$ is also 115° . If this is true, then do we have enough information to find $m\angle\alpha$? We know from the information given in figure 2 that \overleftrightarrow{RT} and \overleftrightarrow{QS} are lines. Therefore, $\angle RVT$ is a straight angle and has a measure of 180° . If $\angle RVQ$ ($\angle\beta$) is 115° , then $\angle QVT$ ($\angle\alpha$) must be $180^\circ - 115^\circ$, or 65° . Since $\angle RVS$ ($\angle\gamma$) is a vertical angle to $\angle QVT$, then it is also 65° .

Supplementary Angles

Two angles such as $\angle\alpha$ and $\angle\beta$ in figure 2, whose measures add up to 180° , or that make a straight angle (straight line), are said to be *supplementary*. In figure 2, the angles were adjacent to each other, but they don't have to be adjacent to be classified as supplementary angles.

Figure 3



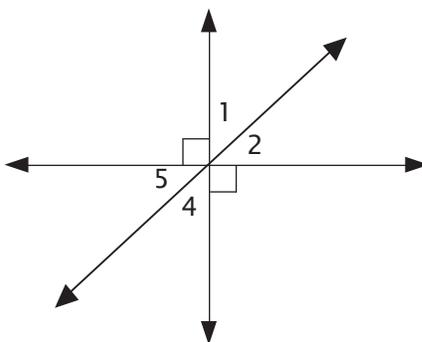
All drawings are in the same plane unless otherwise noted.

Given: \overleftrightarrow{DF} , \overleftrightarrow{GE} , and \overleftrightarrow{KJ} all intersect at H.
 $\overleftrightarrow{DF} \perp \overleftrightarrow{GE}$

Complementary Angles

We can observe many relationships in figure 3. Angle 1 is adjacent to both $\angle 6$ and $\angle 2$. Angle 3 and $\angle 6$ are vertical angles, as are $\angle 1$ and $\angle 4$. Angle 6 and $\angle 3$ are also right angles since $\overleftrightarrow{DF} \perp \overleftrightarrow{GE}$. The new concept here is the relationship between $\angle DHE$ and $\angle GHF$. Both of these are right angles because the lines are perpendicular; therefore their measures are each 90° . Then $m\angle 1 + m\angle 2 = 90^\circ$, and $m\angle 4 + m\angle 5 = 90^\circ$. Two angles whose measures add up to 90° are called *complementary angles*. Notice that from what we know about vertical angles, $\angle 1$ and $\angle 5$ are also complementary. Let's use some real measures to verify our conclusions.

Figure 4 (a simplified figure 3)



In figure 4, let's assume that $m\angle 1 = 47^\circ$. Then $m\angle 2$ must be 43° , since $m\angle 1$ and $m\angle 2$ add up to 90° . If $m\angle 1 = 47^\circ$, then $m\angle 4$ must also be 47° , since $\angle 1$ and $\angle 4$ are vertical angles. Also, $m\angle 5$ must be 43° . So $\angle 1$ and $\angle 5$ are complementary, as are $\angle 2$ and $\angle 4$. Remember that supplementary and complementary angles do not have to be adjacent to qualify.

It helps me to not get supplementary and complementary angles mixed up if I think of the *s* in straight and the *s* in supplementary. The *c* in complementary may be like the *c* in corner.