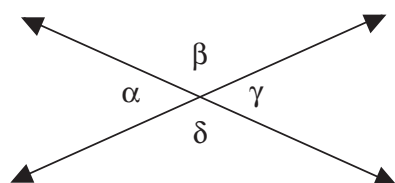


LESSON 6

Supplementary and Complementary Angles

Greek Letters

Figure 1



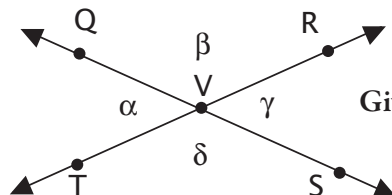
α = alpha
 β = beta
 γ = gamma
 δ = delta

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

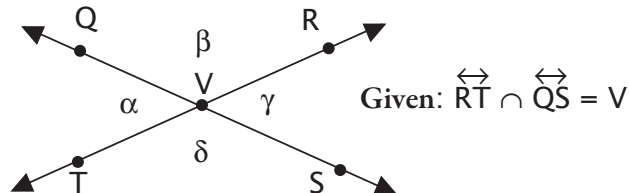


Given: $\overleftrightarrow{RT} \cap \overleftrightarrow{QS} = V$

Vertically Opposite Angles

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

Figure 2 (from previous page)

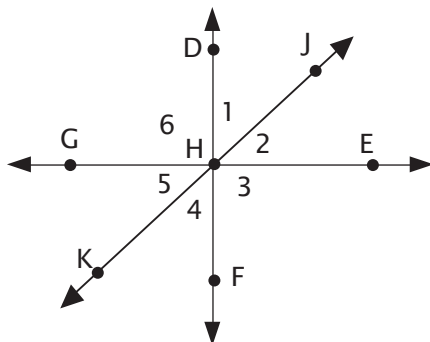


If $\angle\beta$ is 115° , then $\angle\delta$ is also 115° . If this is true, then do we have enough information to find the measure of $\angle\alpha$? We know from the information given in figure 2 that $\overleftrightarrow{RT}$ and $\overleftrightarrow{QS}$ are lines. Therefore, $\angle RVT$ is a 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



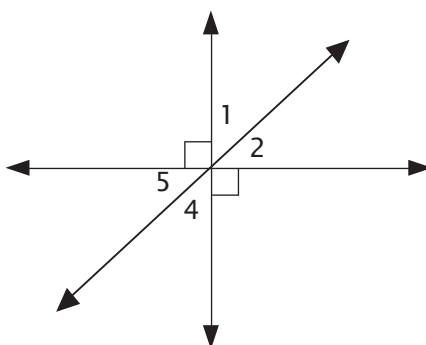
All drawings are in the same plane unless otherwise noted.

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 vertically opposite 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 $\angle 1 + \angle 2 = 90^\circ$, and $\angle 4 + \angle 5 = 90^\circ$. Two angles whose measures add up to 90° are called *complementary angles*. Notice that from what we know about vertically opposite 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 $\angle 1 = 47^\circ$. Then $\angle 2$ must be 43° , since $\angle 1$ and $\angle 2$ add up to 90° . If $\angle 1 = 47^\circ$, then $\angle 4$ must also be 47° , since $\angle 1$ and $\angle 4$ are vertically opposite angles. Also, $\angle 5$ 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.

