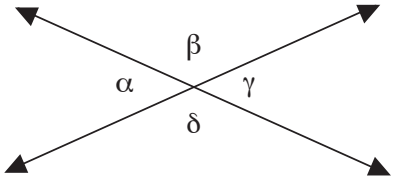
LESSON 6

Supplementary and Complementary Angles

Greek Letters

Figure 1



α = alpha

β = beta

γ = gamma

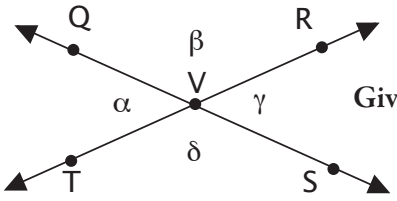
δ = delta

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

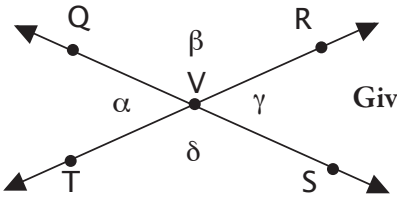


Given: $\overleftrightarrow{RT} \cap \overleftrightarrow{QS} = V$

Vertical Angles

Notice that ∠γ is opposite ∠α. Angles that share a common origin and are opposite each other are called ***vertical angles***. They have the same measure and are congruent. ∠β and ∠δ are also vertical angles.

Figure 2 (from previous page)



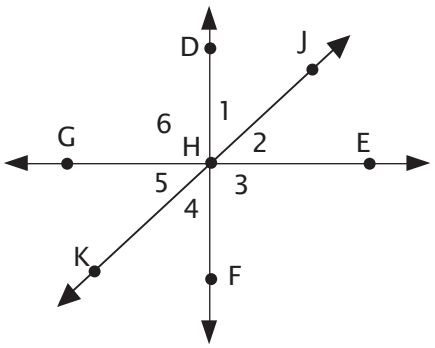
Given: $\overleftrightarrow{RT} \cap \overleftrightarrow{QS} = V$

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

Supplementary Angles

Two angles, such as ∠α and ∠β 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



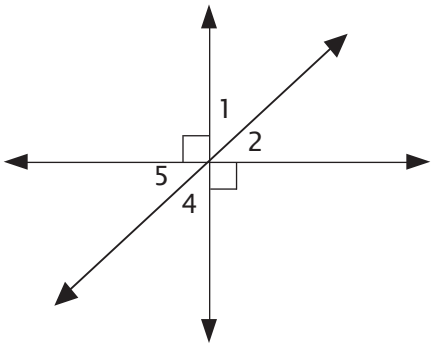
All drawings are in the same plane unless otherwise noted.

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 ∠6 and ∠2. Angle 3 and ∠6 are vertical angles, as are ∠1 and ∠4. Angle 6 and ∠3 are also right angles since $\overleftrightarrow{DF} \perp \overleftrightarrow{GE}$. The new concept here is the relationship between ∠DHE and ∠GHF. Both of these are right angles because the lines are perpendicular; therefore their measures are each 90°. Then m∠1 + m∠2 = 90°, and m∠4 + m∠5 = 90°. Two angles whose measures add up to 90° are called ***complementary angles***. Notice that from what we know about vertical angles, ∠1 and ∠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∠1 = 47°. Then m∠2 must be 43°, since m∠1 and m∠2 add up to 90°. If m∠1 = 47°, then m∠4 must also be 47°, since ∠1 and ∠4 are vertical angles. Also, m∠5 must be 43°. So ∠1 and ∠5 are complementary, as are ∠2 and ∠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.