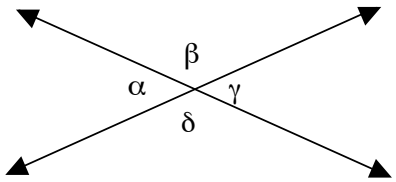
Lesson 6 Supplementary and Complementary Angles

Greek Letters

Figure 1

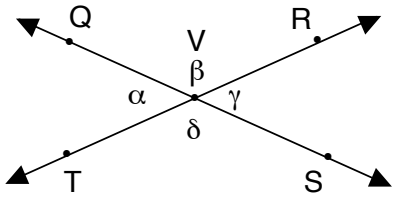


α = alpha
β = beta
γ = gamma
δ = delta

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 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.

If m∠β is 115°, then m∠δ is also 115°. If this is true, then do we have enough information to find the 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 also is 65°.

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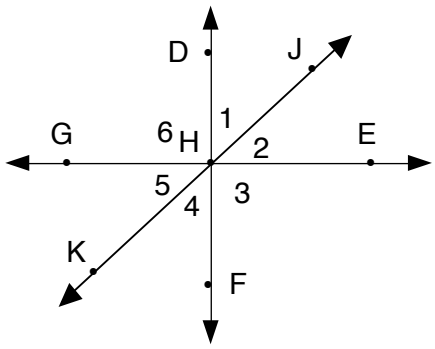
Supplementary Angles Two angles, like $\angle\alpha$ and $\angle\beta$, whose measures add up to 180°, or that make a straight angle (or straight line) are said to be supplementary. In our example they were adjacent to each other, but they don't have to be adjacent to be classified as supplementary angles.

Figure 3



All drawings are in the same plane unless otherwise noted.

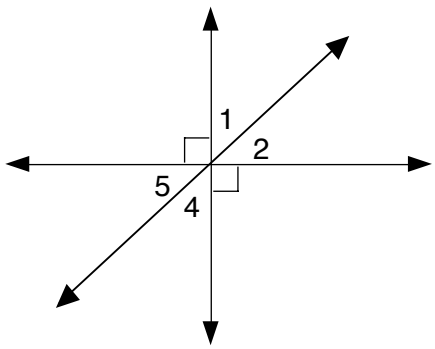
Given: $\overleftrightarrow{DF}$, $\overleftrightarrow{GH}$, and $\overleftrightarrow{KJ}$ all intersect at H.

$\overleftrightarrow{DF} \perp \overleftrightarrow{GE}$

Complementary Angles We can observe many relationships in Figure 3. $\angle 1$ is adjacent to $\angle 6$ 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 is in $\angle DHE$ and $\angle GHF$. Both of these are right angles because the lines are perpendicular. Therefore their measures are each 90°. Then $m\angle 1 + m\angle 2 = 90°$ and $m\angle 4 + m\angle 5 = 90°$. 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 Fig. 3)



In Figure 4, let's assume that $m\angle 1 = 47°$. Then $m\angle 2$ must be 43° since they add up to 90°. If $m\angle 1 = 47°$, then $m\angle 4$ must also be 47° since they are vertical angles, and $m\angle 5$ 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 not to get supplementary and complementary angles mixed up by thinking of the "s" in straight and the "s" in supplementary. The "c" in complementary may be like the "c" in corner. For those who use cassettes, a C-90 is a popular tape size.

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