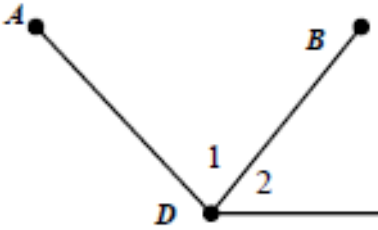
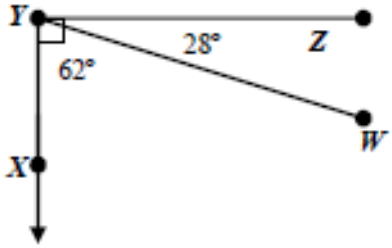
Angle Relationships

Adjacent angles are angles that share a common side and common vertex. They never overlap.



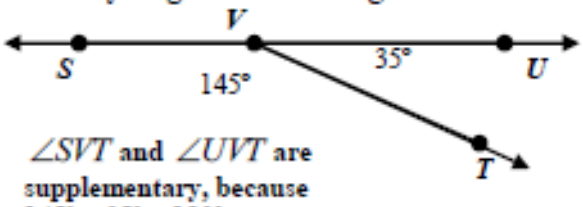
$\angle 1$ and $\angle 2$ are adjacent angles, because they share a common side: $\overline{DB}$.

Complementary angles are two angles with a sum of 90°.



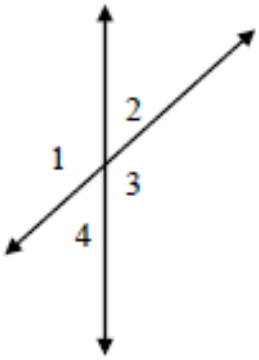
$\angle ZYW$ and $\angle XYW$ are complementary, because $62° + 28° = 90°$

Supplementary angles are two angles with a sum of 180°.



$\angle SVT$ and $\angle UVT$ are supplementary, because $145° + 35° = 180°$

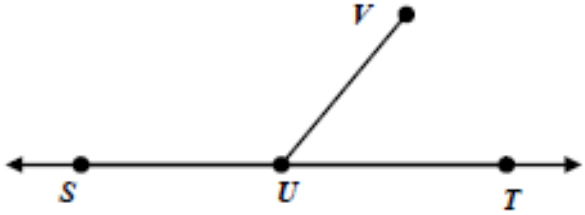
Vertical angles are the opposite angles formed when 2 lines intersect. Vertical angles are always *congruent*.



$\angle 1$ and $\angle 3$ are vertical angles, and $\angle 2$ and $\angle 4$ are vertical angles.

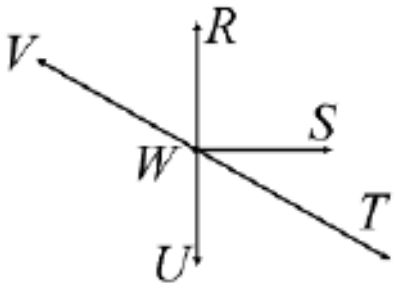
Therefore, $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$.

A **linear pair** is a pair of *adjacent angles* whose noncommon sides are opposite rays (rays going in opposite directions along the same line).



$\angle SUV$ and $\angle VUT$ are a linear pair because their noncommon sides, $\overrightarrow{US}$ and $\overrightarrow{UT}$ are opposite rays.

Practice



1. **Name a pair of acute vertical angles.**

2. **Name two linear pairs.**

3. **Name a pair of acute adjacent angles.**

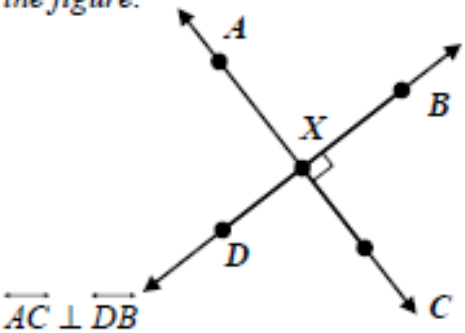
4. **Name a pair of supplementary angles.**

5. **Name an angle complementary to $\angle SWT$. (Assume that $\overline{RU} \perp \overline{SW}$.)**

6. **Name an angle supplementary to $\angle SWT$.**

7. **Find the measure of an angle and its supplement if one angle measures 42 degrees less than the other.**

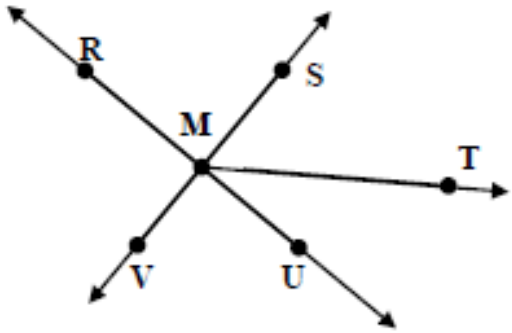
Perpendicular lines are lines that intersect at a right angle. The $\perp$ symbol is used to indicate perpendicular lines. A box is drawn at the vertex to indicate the right angle. *A right angle cannot be assumed unless the box is present in the figure.*



$\overleftrightarrow{AC} \perp \overleftrightarrow{DB}$

$\angle AXB \cong \angle BXC \cong \angle CXD \cong \angle DXA$

Things aren't always what they seem. For that reason, never *assume* anything about a figure that cannot be *proven* by studying the figure.



For example, $\overline{SV}$ may *appear* perpendicular to $\overline{RU}$ in the figure above. Even so, do not *assume* the line segments are perpendicular unless there is information to verify that assumption.

Example 1: If $m\angle SMT = 9x + 6$ and $m\angle TMU = 7x + 4$, find the measure of both angles so that $\angle SMT$ and $\angle TMU$ are complementary angles.

$m\angle SMT + m\angle TMU = 90°$ — 1. If the angles are *complementary*, then their sum is 90°

$(9x + 6) + (7x + 4) = 90$

$16x + 10 = 90$ — 2. Combine like terms.

$-10 \quad -10$ — 3. Additive Inverse.

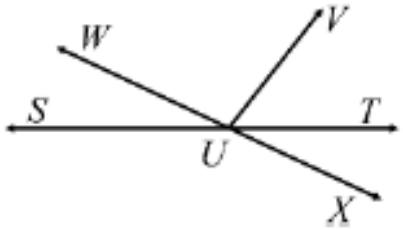
$\frac{16x}{16} = \frac{80}{16}$ — 4. Multiplicative Inverse

$x = 5$ — 5. Substitute 5 for x to find the measure of both angles.

$m\angle SMT = 9x + 6 \qquad m\angle TMU = 7x + 4$

$m\angle SMT = 9(5) + 6 \qquad m\angle TMU = 7(5) + 4$

$m\angle SMT = 51° \qquad m\angle TMU = 39°$



8. Using the figure above, determine whether $\angle VUT$ and $\angle XUT$ are complementary. Explain why or why not.

9. If $m\angle SUX = 7k + 4$ and $m\angle TUX = 9k$, find k.

10. If $\angle VUX = 12x - 18$, find x so that $\overline{UV} \perp \overline{WX}$.