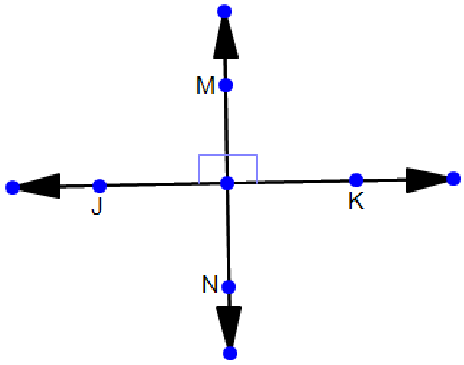
Perpendicular Lines

Definition

Perpendicular lines are two lines that intersect to form right angles (90° angles).



Because lines that form one right angle always form four right angles, you can conclude that two lines are perpendicular, by definition, once you know that any one of the angles they form is a right angle.

The definition of perpendicular lines can be used in the two ways shown below.

1) If $\overleftrightarrow{JK}$ is perpendicular to $\overleftrightarrow{MN}$ (written $\overleftrightarrow{JK} \perp \overleftrightarrow{MN}$), then each of the numbered angles is a right angle (a 90° angle).

2) If any of the numbered angles is a right angle (a 90° angle), then $\overleftrightarrow{JK} \perp \overleftrightarrow{MN}$.

The word perpendicular is also used for intersecting rays and segments. For example, if $\overleftrightarrow{JK} \perp \overleftrightarrow{MN}$ in the diagram, then $\overline{JK} \perp \overline{MN}$.

The definition of perpendicular lines is closely related to the following theorems. For the proofs of the theorems, see the exercises.

Theorem 1: Perpendicular Lines

If two lines are perpendicular, then they form congruent adjacent angles.

Theorem 2: Congruent Adjacent Angles

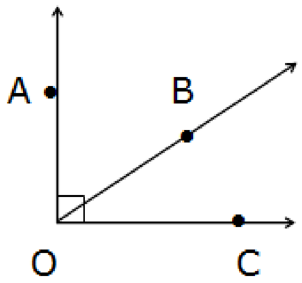
If two lines form congruent adjacent angles, then the lines are perpendicular.

Theorem 3: Perpendicular Outer Rays

If the outer rays of two acute adjacent angles are perpendicular, then the angles are complementary.

Example 1:

Given: $\overrightarrow{OA} \perp \overrightarrow{OC}$



Prove: $\angle AOB$ and $\angle BOC$ are complementary angles

Statements	Reasons
1) $\overrightarrow{OA} \perp \overrightarrow{OC}$	1) Given
2) $m\angle AOC = 90$	2) Def. of $\perp$ lines.
3) $m\angle AOB + m\angle BOC = m\angle AOC$	3) Angle addition postulate
4) $m\angle AOB + m\angle BOC = 90$	4)Substitution
5) $\angle AOB$ and $\angle BOC$ are com. angles	5) Def. of com. angles