3.6 Prove Theorems About Perpendicular Lines
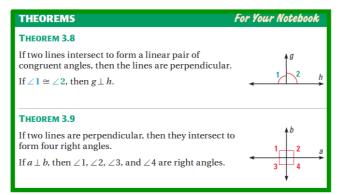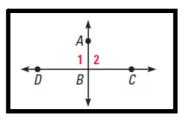
G.CO.9 Prove theorems about lines and angles.

G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometry software, etc.).

THEOREMS *For Your Notebook*

THEOREM 3.8

If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.

If $\angle 1 \cong \angle 2$, then $g \perp h$.

THEOREM 3.9

If two lines are perpendicular, then they intersect to form four right angles.

If $a \perp b$, then $\angle 1$, $\angle 2$, $\angle 3$, and $\angle 4$ are right angles.

EXAMPLE 1 Draw Conclusions:

In the diagram at the right, $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$.

What can you conclude about $\angle 1$ and $\angle 2$?
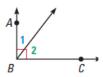

THEOREM *For Your Notebook*

THEOREM 3.10

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

If $\overrightarrow{BA} \perp \overrightarrow{BC}$, then $\angle 1$ and $\angle 2$ are complementary.
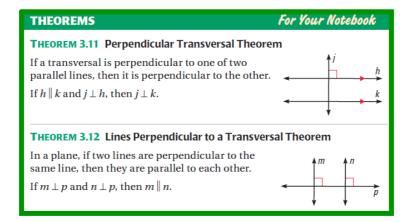

EXAMPLE 2

Prove that if two sides of two adjacent acute angles are perpendicular, then the angles are complementary.

Given: $\overrightarrow{ED} \perp \overrightarrow{EF}$
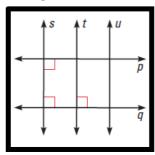
Prove: $\angle 7$ and $\angle 8$ are complementary.

STATEMENTS	REASONS

THEOREMS

THEOREM 3.11 Perpendicular Transversal Theorem

If a transversal is perpendicular to one of two
parallel lines, then it is perpendicular to the other.

If $h \parallel k$ and $j \perp h$, then $j \perp k$.

THEOREM 3.12 Lines Perpendicular to a Transversal Theorem

In a plane, if two lines are perpendicular to the
same line, then they are parallel to each other.

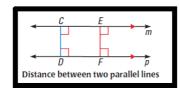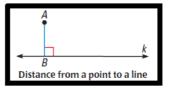If $m \perp p$ and $n \perp p$, then $m \parallel n$.

EXAMPLE 3

Determine which lines, if any, must be parallel in the diagram.

Explain your reasoning.

DISTANCE FROM A LINE - is the length of the _____ from
the point to the line. The _____ is
the _____ distance between the point
and the line.

Distance between two parallel lines

Distance from a point to a line

EXAMPLE 4   Find the distance between two parallel lines

SCULPTURE The sculpture below is drawn on a graph where units are measured in inches.
What is the approximate length of $\overline{SR}$, the depth of a seat?

$S\,(35, 120)$

$R\,(50, 110)$

$P\,(30, 80)$