Honors Geometry
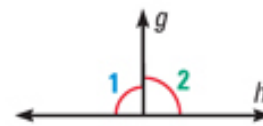
Notes Section 3.6

Prove Theorems about Perpendicular Lines

THEOREM 3.8

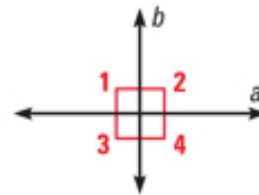If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.

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

THEOREM 3.9

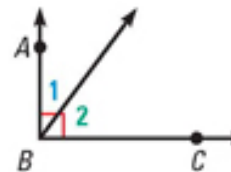If two lines are perpendicular, then they intersect to form four right angles.

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

THEOREM 3.10

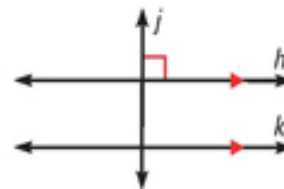If two sides of two adjacent acute angles are perpendicular, then the angles are complementary.

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

THEOREM 3.11 Perpendicular Transversal Theorem

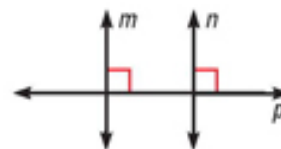If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other.
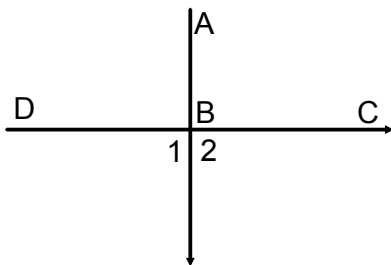
If $h \parallel k$ and $j \perp h$, then $j \perp k$.

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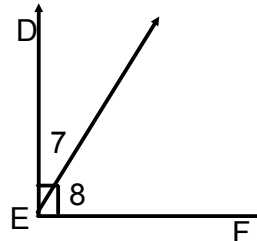
If $m \perp p$ and $n \perp p$, then $m \parallel n$.

EXAMPLE 1   AB ⊥ BC. What can you conclude about ∠1 and ∠2?

```
            A
            |
D           |B          C
————————————+————————————→
           1|2
            |
            ↓
```

EXAMPLE 2   Complete the following proofs.

a) Given: ED ⊥ EF

```
D
|  ↗
|  7
|↗
|◹ 8
E————————————→
      F
```

Prove: ∠7 and ∠8 are complementary

1. ED ⊥ EF   1. _____

2. ∠DEF is a right angle   2. _____

3. m∠DEF = 90°   3. _____

4. m∠7 + m∠8 = m∠DEF   4. _____

5. m∠7 + m∠8 = 90°   5. _____

6. ∠7 and ∠8 are complementary 6. _____

a) Given: ∠1 and ∠2 are complementary

   Prove: BA ⊥ BC
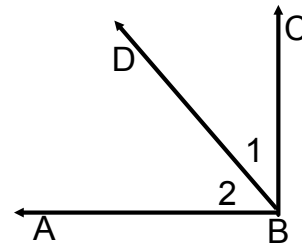
1. ∠1 and ∠2 are complementary   1. _____

2. m∠1 + m∠2 = 90°   2. _____

3. m∠ABC = m∠1 + m∠2   3. _____

4. m∠ABC = 90°   4. _____

5. ∠ABC is a right angle   5. _____

6. BA ⊥ BC   6. _____

EXAMPLE 3   Determine which line, if any, must be parallel in the diagram. Explain.
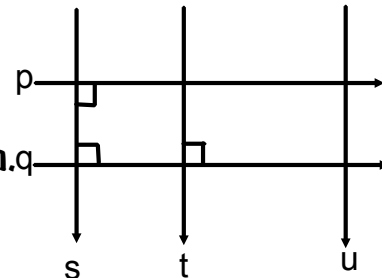
EXAMPLE 4   The sculpture is drawn on a graph where units are measured in inches. What is the approximate length of SR, the depth of a seat?