## 3.4 Proofs with perpendicular lines

Critical thinking:
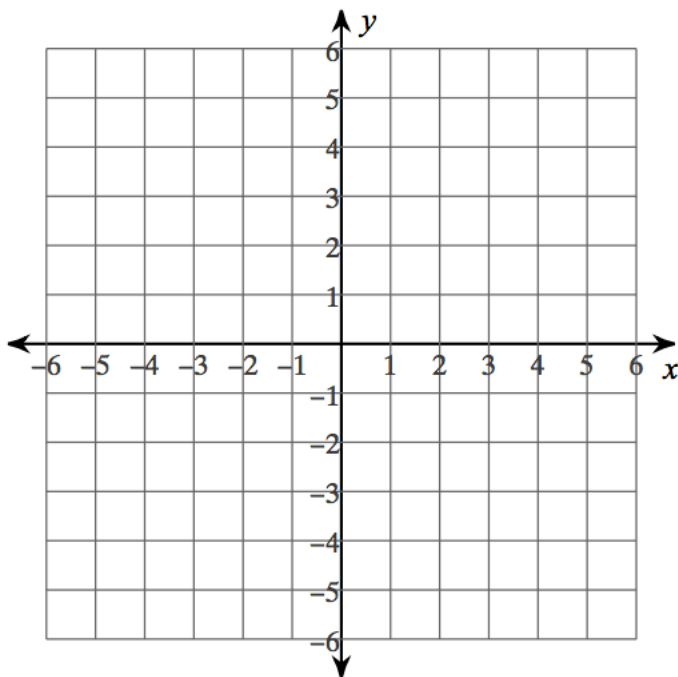
Complete the following sentence:

"The shortest distance between two points is _____ "

Ex1:

Determine the distance from the point A(4 , 2) to the following points:

B(-3 , 5 )        C( -3 , 2)        D( -3 , -2)        E(-3, -6)



What can you conclude from the distances?

Using the above statement what can you conclude about the distance from a point to a line?
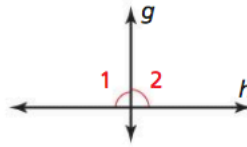
Key theorems to remember!

## ◉ Theorems

### Theorem 3.10   Linear Pair Perpendicular Theorem

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

If $\angle 1 \cong \angle 2$, then $g \perp h$.
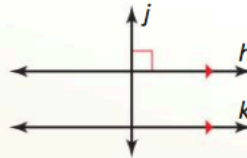
*Proof* Ex. 13, p. 153

### Theorem 3.11   Perpendicular Transversal Theorem

In a plane, if a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other line.

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

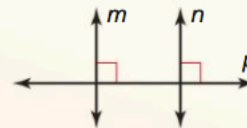*Proof* Example 2, p. 150; Question 2, p. 150

### 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 $m \parallel n$.

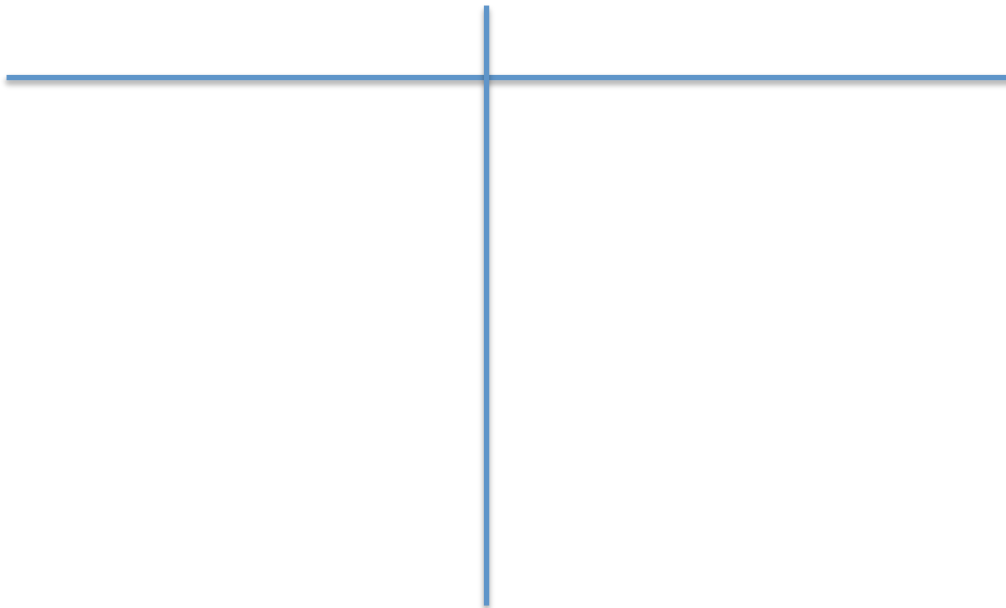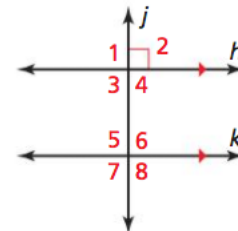*Proof* Ex. 14, p. 153; Ex. 47, p. 162

Write a two-column proof:

Use the diagram to prove the Perpendicular Transversal Theorem.

**SOLUTION**

**Given**   $h \parallel k, j \perp h$

**Prove**   $j \perp k$

Construction Worksheet: