Date: 10/22/20

Lesson 3.4 Perpendicular Lines

Learning Intent (Target): *Today I will* be able to discover properties of perpendicular lines.

Success Criteria: *I'll know I'll have it when* I'll be able to use theorems about perpendicular lines to determine the distance between a point and a line on the coordinate plane.

Accountable Team Task: *Therefore, I can* practice from interactive flip charts and geogebra investigations.

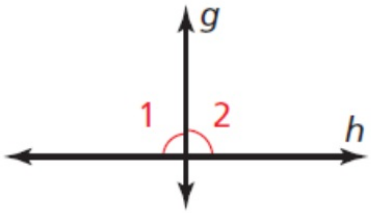
Theorems

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

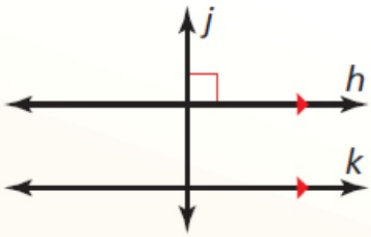


Theorem 3.11 Perpendicular Transversal Theorem

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

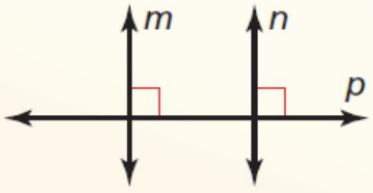


Theorem 3.12 Lines Perpendicular to a Transversal Theorem

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 $m \parallel n$.

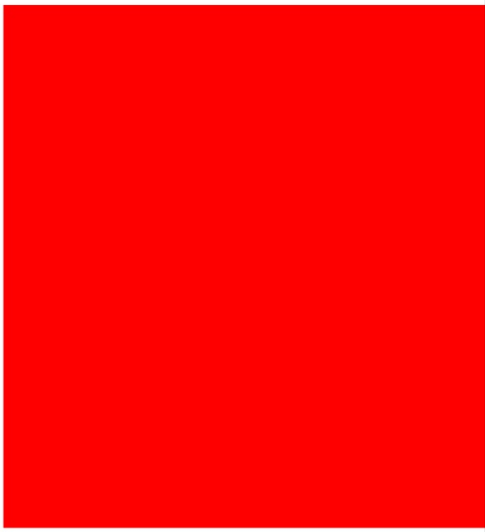
Proof Ex. 14, p. 153; Ex. 47, p. 162



Find the distance from point *A* to $\overleftrightarrow{BD}$.

Line BD contains the coordinates -1,-3 and 2,0.

Point A is located at -3,3



First find the slope of BD which is 1.

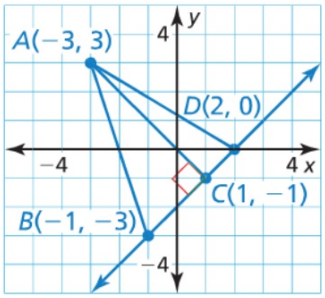
The shortest distance is a perpendicular line from -3, 3 to the line segment BD

The negative reciprocal is -1 so use that slope to draw the line from -3, 3 to line segment BD.

The line now intersects BD at 1,-1.

Next step is using the distance formula to solve (or pythagorean theorem)

Find the distance from point A to BD.



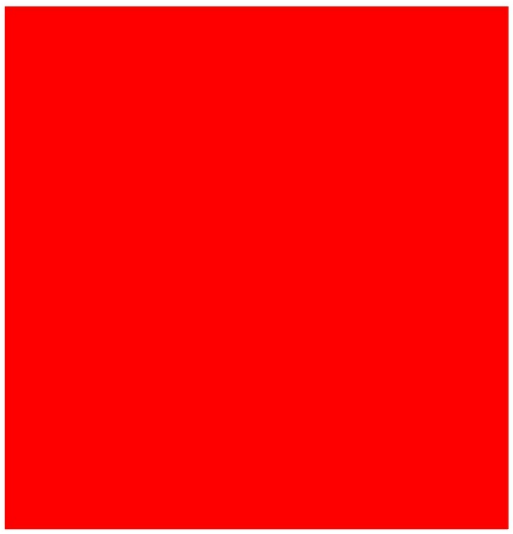
SOLUTION

Because $\overline{AC} \perp \overleftrightarrow{BD}$, the distance from point A to $\overleftrightarrow{BD}$ is AC. Use the Distance Formula.

$$AC = \sqrt{(-3 - 1)^2 + [3 - (-1)]^2} = \sqrt{(-4)^2 + 4^2} = \sqrt{32} \approx 5.7$$

▶ So, the distance from point A to $\overleftrightarrow{BD}$ is about 5.7 units.

1. Find the distance from point E to $\overleftrightarrow{FH}$.

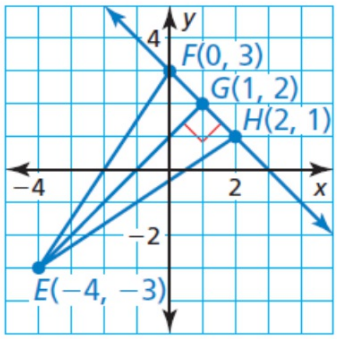


Line FH contains the coordinates 0,3 and 2,1.

Point E is located at -4,-3

Find the slope of FH first.
That is -1.
Next draw a perpendicular line from -4, -3 using the negative reciprocal which is 1.

The line now intersects at line FH at 1,2.



Use the distance formula or pythagorean theorem to solve for the distance. You should get about 7.1