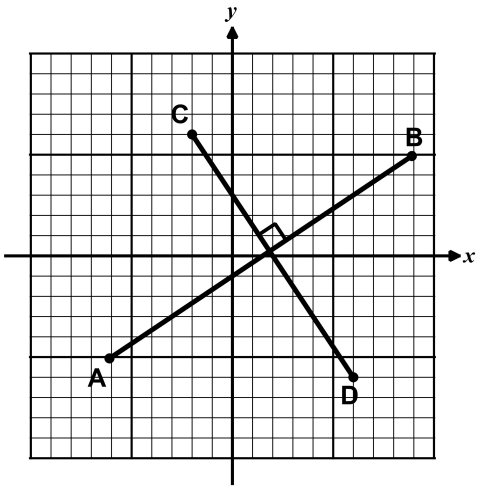
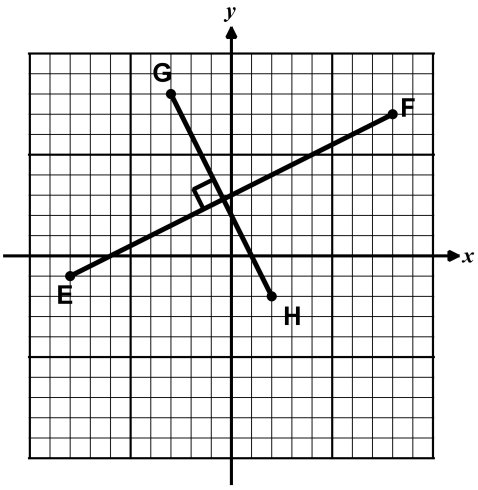
Name: _____ Date: _____

SLOPE AND PERPENDICULARITY
COMMON CORE GEOMETRY

We saw in the last lesson that two lines with **equal slopes** are **parallel**. There is also a connection between lines that are perpendicular and their slopes. We will explore this in the first exercises.

***Exercise* #1:** In the following two diagrams, two perpendicular line segments have been given.





(a) Determine the slopes of both line segments in both graphs. Label each slope.

Graph #1 Graph #2

(b) List as many observations as you can about the slopes of these perpendicular lines.

SLOPES OF PERPENDICULAR LINES

Two perpendicular lines that are neither vertical nor horizontal have slopes whose values are **negative reciprocals** of one another.

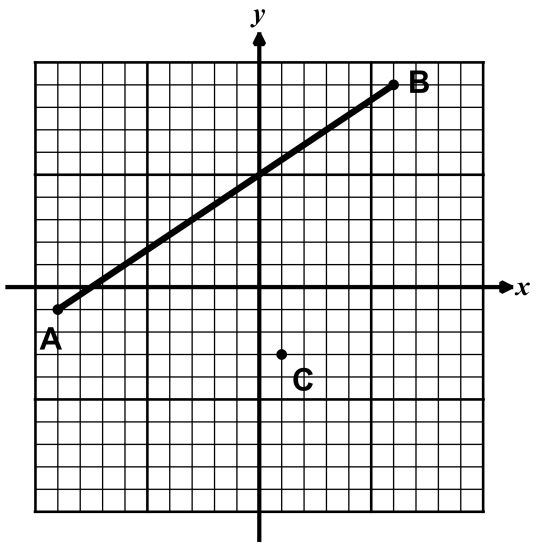
***Exercise* #2:** Line segment $\overline{AB}$ has endpoints of $A(-3, 7)$ and $B(3, 15)$. Which of the following would be the slope of a line perpendicular to $\overline{AB}$?

(1) $\frac{4}{3}$ (3) $-\frac{2}{5}$

(2) $-\frac{3}{4}$ (4) $\frac{3}{7}$

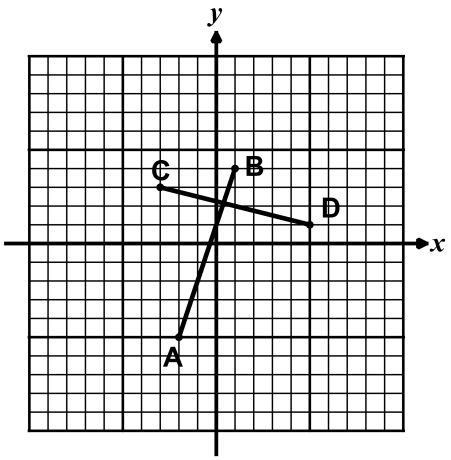
_____

***Exercise* #3:** If a line was drawn through point C in the diagram such that it is perpendicular to $\overline{AB}$, at what coordinate point would the two lines intersect?

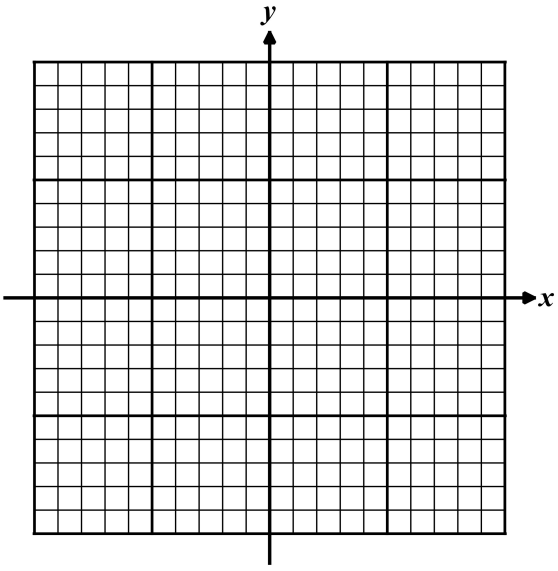


Because of the role of right angles in figures such as right triangles and rectangles, perpendicularity will be extremely important for us. This simple test with slopes will help us determine if right angles are present.

***Exercise* #4:** Given the points $A(-2,-5), B(1,4), C(-3,6),$ and $D(5,4)$, is $\overline{AB} \perp \overline{CD}$? Provide numerical evidence.



***Exercise* #5:** In ΔABC, $A(-5,-7)$, $B(7,-3)$ and $C(4,6)$. Is ΔABC a right triangle? Justify. Use of the grid is optional (but advised).



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SLOPE AND PERPENDICULARITY
COMMON CORE GEOMETRY HOMEWORK

PROBLEM SOLVING

1. If each of the following represents the slope of a line (or line segment), give the slope a line that is perpendicular to it.

   (a) $m = \frac{4}{3}$ (b) $m = -\frac{3}{7}$ (c) $m = 4$ (d) $m = -\frac{1}{3}$ (e) $m = 1$

2. A line passes through the points $E(-1, 4)$ and $F(3, -2)$. Which of the following is the slope of a line that is perpendicular to $\overleftrightarrow{EF}$?

   (1) $\frac{2}{3}$ (3) -3

   (2) $\frac{1}{3}$ (4) $-\frac{3}{2}$

   _____

3. A line segment whose endpoints are $(3, 9)$ and $(7, k)$ is perpendicular to a line whose slope is -2. Which of the following is the value of *k*?

   (1) 1 (3) 11

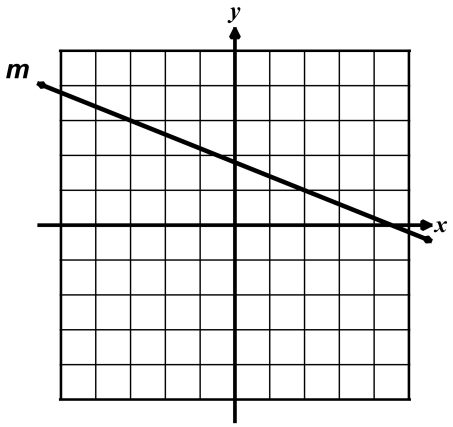
   (2) -7 (4) -5

   _____

4. Given line *m* graphed on the grid shown, which of the following would be the slope of a line perpendicular to *m*?

   (1) $-\frac{3}{2}$ (3) $\frac{7}{3}$

   (2) $\frac{5}{2}$ (4) $-\frac{3}{4}$



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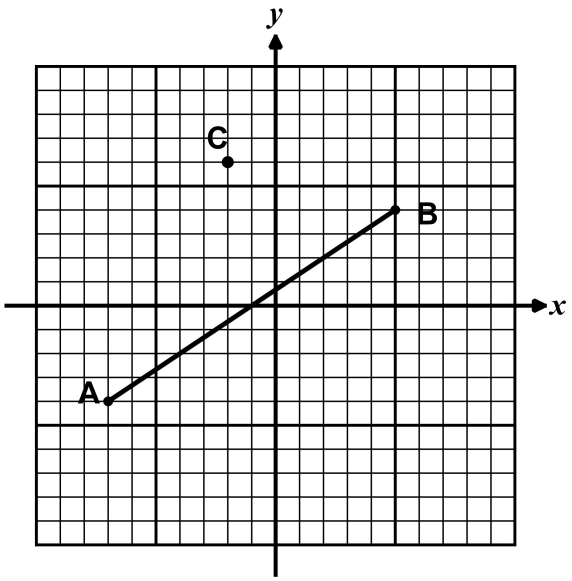
5. On the following grid, $\overline{AB}$ is shown with along with point *C*. Draw two lines on this grid that pass through *C*, one of which is parallel to $\overline{AB}$ and one that is perpendicular to $\overline{AB}$. Give the coordinates of one point, other than *C*, that lies on each line.



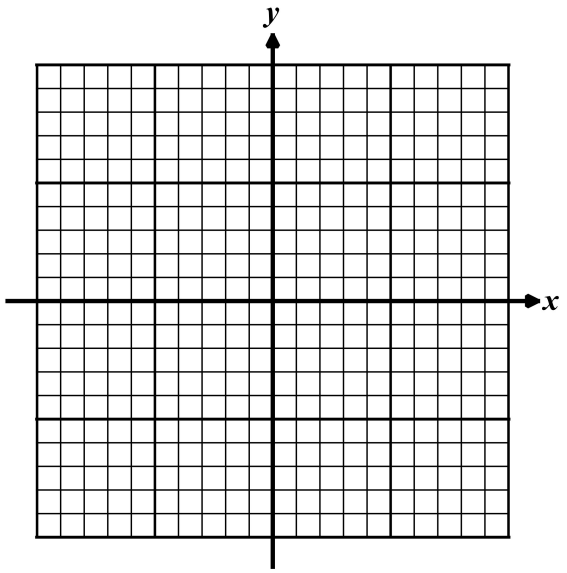
Point that lies on parallel line: _____

Point that lies on perpendicular line: _____

REASONING

6. Are the lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ perpendicular if the points defining the lines have coordinates of $A(3,-2)$, $B(6,13)$, $C(-5,8)$ and $D(5,6)$? Justify your answer.

7. In ΔEFG, $E(-2,7)$, $F(7,-8)$ and $G(-6,-3)$. Is ΔEFG a right triangle? Provide proof of your yes/no answer. The use of the grid at the right is optional.



8. If point *H* lies on $\overline{EF}$ of the triangle above such that $\overline{GH}$ is perpendicular to $\overline{EF}$, then what is the slope of $\overline{GH}$? Show how you arrived at your answer.