



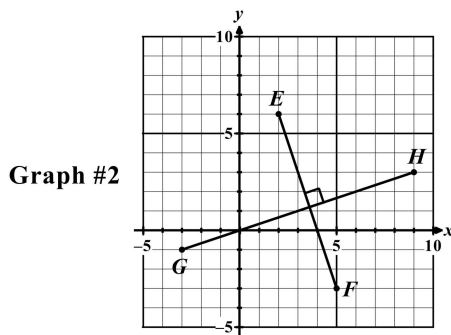
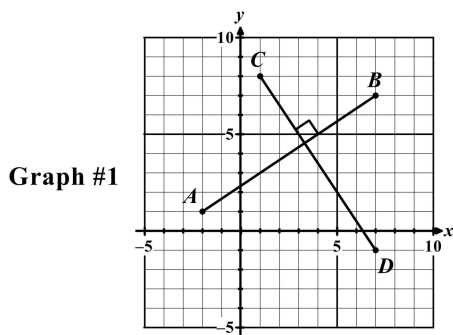
SLOPE AND PERPENDICULAR LINES

N-GEN MATH® GEOMETRY



We have now seen the relationship between **slope** and **parallel lines**. There is a less obvious relationship between the slopes of two lines or line segments that are **perpendicular** to one another.

Do now question In both graphs shown below, two perpendicular line segments have been graphed. Their endpoints are at $A(-2, 1)$, $B(7, 7)$, $C(1, 8)$, $D(7, -1)$, $E(2, 6)$, $F(5, -3)$, $G(-3, -1)$, and $H(9, 3)$.



- (a) Determine the slope of each of the line segments. Do so graphically or by using the slope formula. Express each slope as a fraction in simplest form.

Graph #1:

\overline{AB} :

\overline{CD} :

Graph #2:

\overline{EF} :

\overline{GH} :

- (b) Compare the slopes of segments that are perpendicular to one another. What observations can you make about them?

Slopes of Perpendicular Lines

Two lines, neither of which are horizontal nor vertical, are **perpendicular** to one another if **their slopes** are **negative reciprocals (neg. rec.)** of one another. If one slope is equal to $\frac{a}{b}$, then the other must be $-\frac{b}{a}$.

Exercise #2: If \overline{AB} has endpoints at $A(-2, 7)$ and $B(4, 15)$, then which of the following would be the slope of any line or line segment perpendicular to \overline{AB} ?

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

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

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

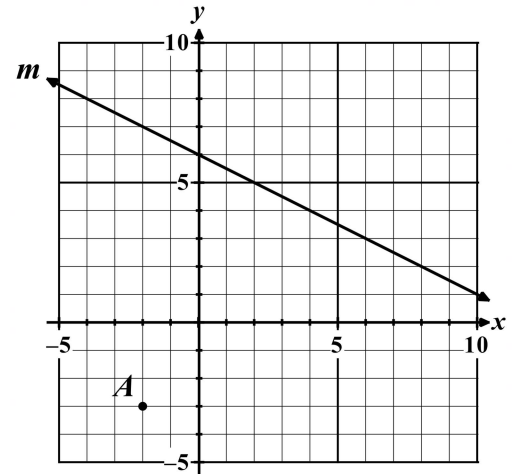
(4) 4



Exercise #3: A line can be drawn through point A perpendicular to line m shown below.

(a) What will be the slope of the perpendicular line? Justify.

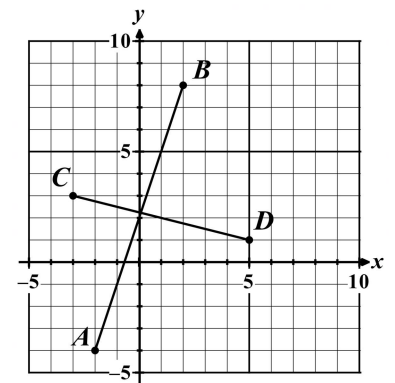
(b) At what point will this line intersect line m ? Show how you found your answer.



We can use our knowledge of **slopes of perpendicular lines** to determine if two lines or line segments are perpendicular or not.

Exercise #4: Two segments, \overline{AB} and \overline{CD} , have endpoints at $A(-2, -4)$, $B(2, 8)$, $C(-3, 3)$, and $D(5, 1)$.

Is $\overline{AB} \perp \overline{CD}$? Justify with numerical evidence.

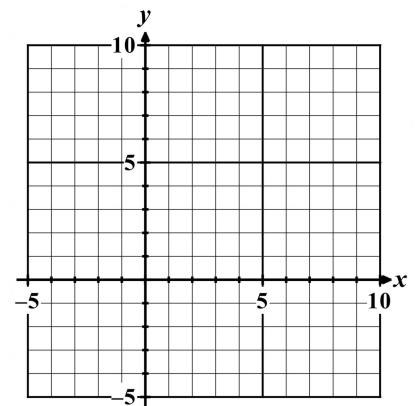


We will be using our knowledge of slopes to help determine if given shapes in the coordinate plane fall into certain categories.

Exit ticket The vertices of $\triangle EFG$ are located at $E(-4, -4)$, $F(8, 0)$, and $G(5, 9)$.

(a) Plot and label $\triangle EFG$.

(b) Use slopes to determine if $\triangle EFG$ is a right triangle.



Name: _____

Date: _____



SLOPE AND PERPENDICULAR LINES

N-GEN MATH[®] GEOMETRY HOMEWORK

FLUENCY

1. Each of the following represents the slope of a line. Give the slope of the line that would be perpendicular to the one with the given slope.

(a) $m = \frac{5}{2}$

(b) $m = -\frac{3}{4}$

(c) $m = \frac{1}{4}$

(d) $m = -3$

(e) $m = 1$

(f) $m = -\frac{5}{11}$

(g) $m = -\frac{1}{5}$

(h) $m = 2$

(i) $m = -\frac{8}{3}$

(j) $m = \frac{2}{7}$

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 \overline{EF} ?

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

(3) -3

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

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

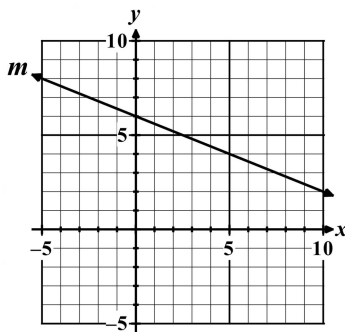
3. Which of the following would be the slope of a line that is perpendicular to line m shown graphed?

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

(3) $\frac{7}{3}$

(2) $\frac{5}{2}$

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



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

(1) 1

(2) -7

(3) 11

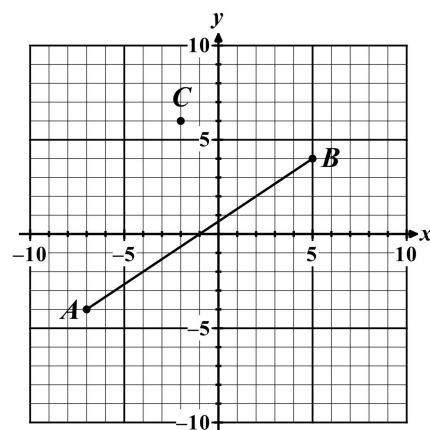
(4) -5



5. On the grid shown, \overline{AB} and point C are plotted.

(a) Draw a line through C parallel to \overline{AB} . State a point below that lies on this line besides C .

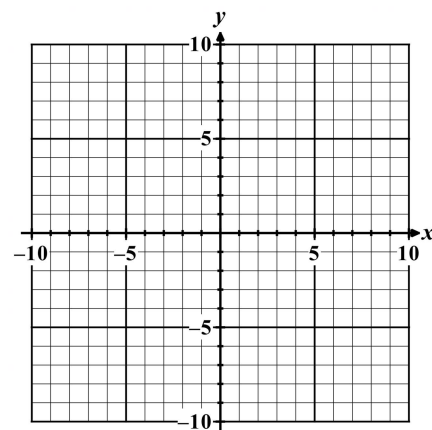
(b) Draw a line through C that is perpendicular to \overline{AB} . State a point below that lies on this line besides point C .



REASONING

6. If \overline{AB} passes through the points $A(3, -2)$ and $B(6, 13)$, and \overline{CD} passes through the points $C(-5, 8)$, and $D(5, 6)$, are \overline{AB} and \overline{CD} perpendicular? Justify your answer.

7. In $\triangle EFG$, the vertices are located at $E(-2, 7)$, $F(7, -8)$, and $G(-6, -3)$. Is $\triangle EFG$ a right triangle? Provide evidence for your yes/no answer. The use of the grid is encouraged but not required.



8. If point H lies on \overline{EF} of the triangle from #7 such that \overline{GH} is perpendicular to \overline{EF} , then what is the slope of \overline{GH} ? Explain.

