

Name: _____

Date: _____

UNIT 7

LESSON 2

AIM: WHAT IS THE RELATIONSHIP BETWEEN SLOPES AND PERPENDICULAR LINES?

Do Now:

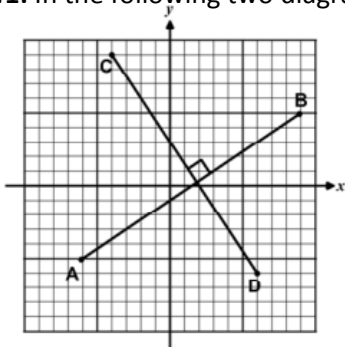
1. Given points A (-2,4) and B (4,8), which of the following represents the slope of \overline{AB} ?

- A. 2
- B. $\frac{2}{3}$
- C. $-\frac{2}{3}$
- D. $\frac{3}{2}$

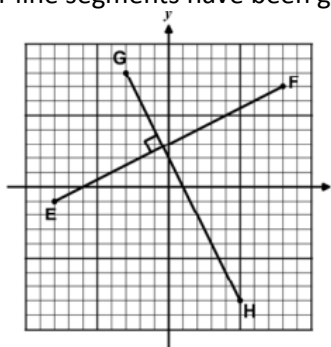
2. A line contains the points (4,-1) and (x,-6) and has a slope of $-\frac{5}{2}$. Find the value of x.

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.

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



Graph #1



Graph #2

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

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

Discovery	Example
Perpendicular lines have _____ slopes!	$m = \frac{1}{2}$ then $\perp m =$

Example #2: Line segment AB has endpoints of A(-3, 7) and B(3,15) . Which of the following would be the slope of a line perpendicular to AB ?

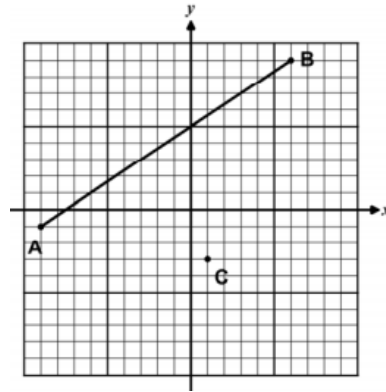
(A) $\frac{4}{3}$

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

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

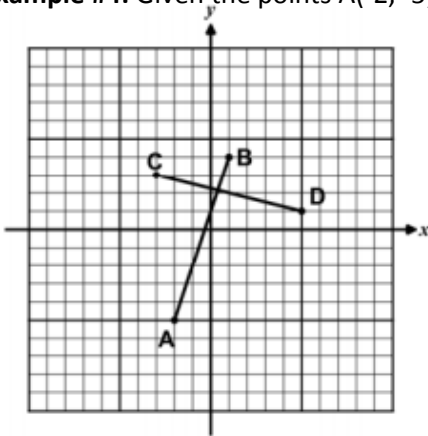
(D) $\frac{3}{7}$

Example #3: If a line was drawn through point C in the diagram such that it is perpendicular to AB, at what coordinate point would the two lines intersect?

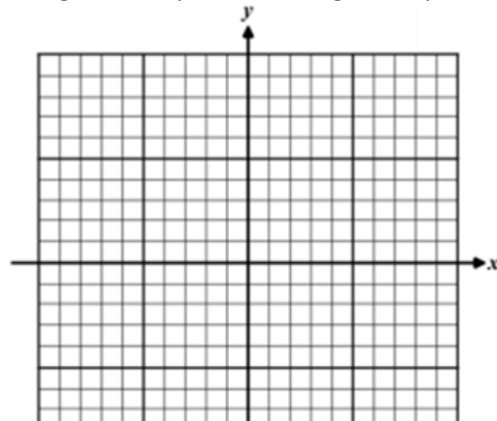


Because of the role of right angles in figures such as right triangles and rectangles, perpendicularity will be extremely important for us. This simple test with slopes will help us determine if right angles are present.

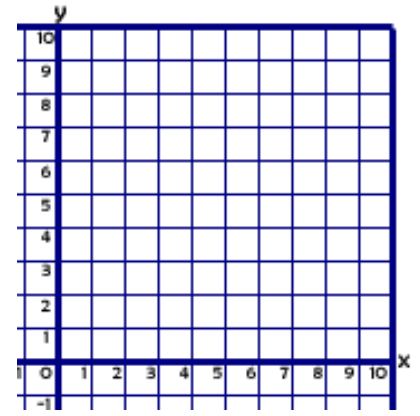
Example #4: Given the points A(-2, -5) B(1, 4) C(-3,3) and D (5, 1) is $AB \perp CD$? Justify your answer.



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



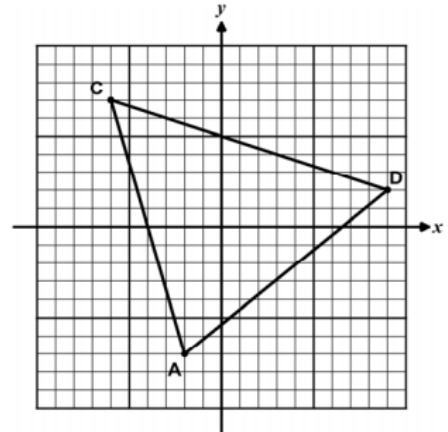
Example #6: Given triangle PQR with coordinates P(4,2) , Q(5, 6), R(x, 5). Determine the value of x that makes triangle PQR a right triangle with a right angle at Q, then justify your solution.



Altitude

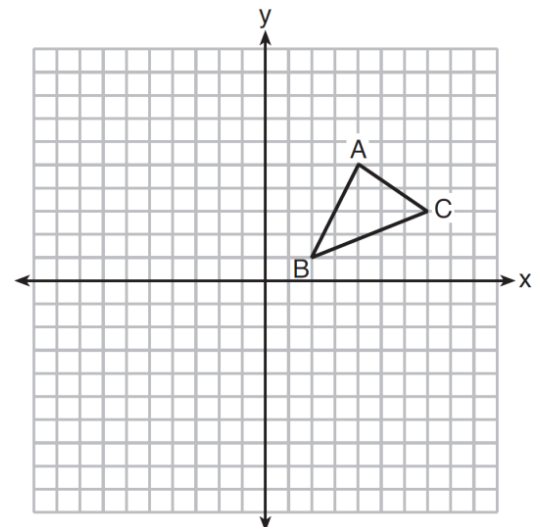
Altitude is drawn _____ to the opposite side. ($\perp m$)

Example #7: In the diagram shown, $\triangle ADC$ has vertices $A(-2,-7)$, $D(9,2)$, and $C(-6,7)$. What is the slope of the altitude drawn from C to \overline{AD} ?



Practice NYTS (Now You Try Some!)

1. In the diagram shown, $\triangle ABC$ has vertices $A(4, 5)$, $B(2, 1)$, and $C(7, 3)$. What is the slope of the altitude drawn from A to \overline{BC} ?



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

(a) $m = \frac{4}{3}$

(b) $m = -\frac{3}{7}$

(c) $m = 1$

3. 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) $\frac{2}{3}$

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

(3) -3

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

4. 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 ?

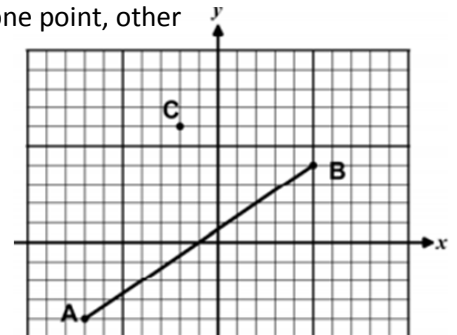
(1) 1

(2) 11

(3) -7

(4) -5

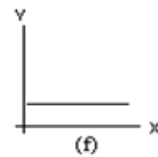
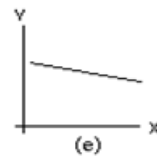
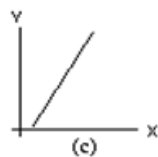
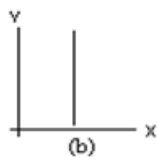
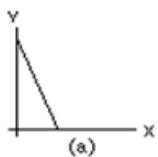
5. On the following grid, AB is shown with along with point C . Draw two lines on this grid that pass through C , one of which is parallel to AB and one that is perpendicular to AB . Give the coordinates of one point, other than C , that lies on each line.



Point that lies on parallel line: _____

Point that lies on perpendicular line: _____

6. For a-f, identify whether the slope is (P)ositive, (N)egative, (Z)ero or (U)ndefined.



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UNIT 7

LESSON 2 HOMEWORK

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

(a) $m = -\frac{1}{3}$

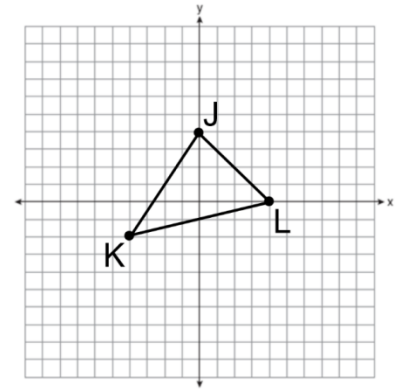
(b) $m = \frac{4}{5}$

(c) $m = 4$

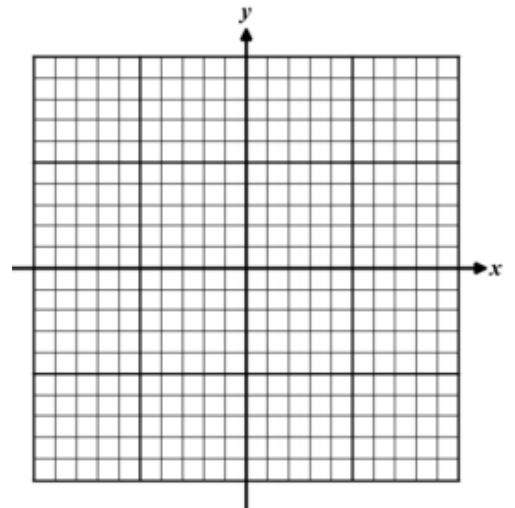
2. Are the lines \overline{AB} and \overline{CD} perpendicular if the points defining the line have coordinates of $A(3, -2)$, $B(6, 13)$, $C(-5, 8)$ and $D(5, 6)$? Justify your answer.

3. In the diagram shown, $\triangle JKL$ has vertices $J(0, 4)$, $K(-4, -2)$, and $L(4, 0)$.

What is the slope of the altitude drawn from J to \overline{KL} ?



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



5. The slope of \overline{QR} is $\frac{x-1}{4}$ and the slope of \overline{ST} is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of x .