Task: Distance from Memphis, TN	8ᵗʰ Grade

John is driving to Memphis, TN. The table below shows the distance he is from Memphis after starting his drive.

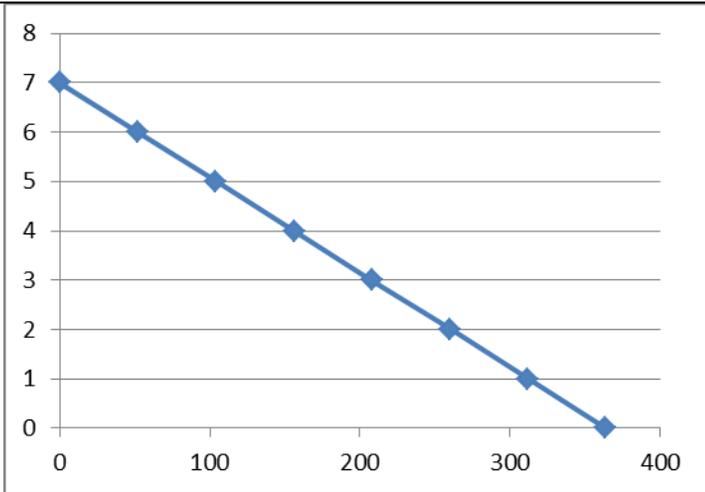| distance from Memphis, TN in miles	time since drive began in hours
364	0
260	2
104	5

a) If this pattern continues, how long will it take to get to Memphis? Explain how you decided.

b) Create a graph for this situation. Be sure to label the axes and use an appropriate scale.

c) How fast is John driving? How did you decide? What are the units for his speed?

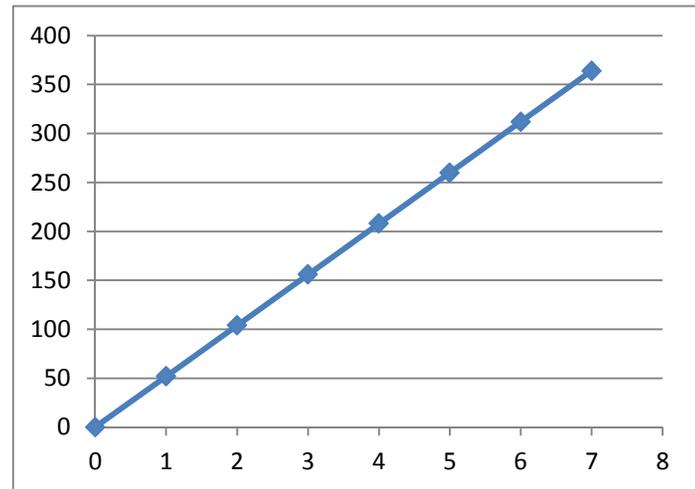d) Billy thinks an equation for the line in the graph is   -52(y-3) =x – 208 .

   Find a way to show Billy if he is correct or incorrect.

Teacher Notes:
In part b students may make a graph by reversing the table and using time for the x axis. Pay close attention to student's scaling of the graph.

Common Core State Standards for Mathematical Content	**Common Core State Standards for Mathematical Practice**
8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. **8.EE.B.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Essential Understandings
• Functions provide a tool for describing how variables change together. Using a function in this way is called *modeling*, and the function is called a *model*. • Functions can be represented in multiple ways—in algebraic symbols, situations, graphs, verbal descriptions, tables, and so on—and these representations, and the links among them, are useful in analyzing patterns of change. • Some representations of a function may be more useful than others, depending on how they are used. • Linear functions have constant rates of change.

Explore Phase

Possible Solution Paths	**Assessing and Advancing Questions**
a) Students may complete the table until they have a distance of zero.	Assessing – How did you determine the other numbers in the table, besides what was given? Advancing – Can you tell me how far John was from Memphis at 9 hours? At 6.5 hours?
Students may find the rate of 52 miles per hour and then divide 364 by 52 = 7 hours	Assessing – How did you come up with 52 miles per hour? Advancing – Is there another way to do this without dividing?
b)	

	Assessing – How did you decide on the scale you used? Advancing – Would the graph look different if we changed the scale on the x axis?
	Assessing – How did you decide on the scale you used? Advancing – Would the graph look different if we changed the scale on the y axis?
c) Speed = distance/time. Students could do (364 – 104)/(0 – 5) = 52 miles per hour	Assessing - Can you show me how you knew that the units were miles per hour? Advancing - Did you have to use the number you used to determine the answer? Show me how you could do what you did using another number?

Students may use the slope of the graph they made to determine the speed.	Assessing – How did you determine the speed from the graph? Advancing – Could you always do this if you were given a graph that involved distance and time?

d) Students may plug in the point (364, 0) and (260, 2) into the equation to see if the equation matches the table.
$-52(0\text{-}3) = 364 - 208$ $-52(2\text{-}3) = 260 - 208$
   $156 = 156$ $52 = 52$
 	
Students may also solve write the equation in slope intercept form to see if the equation matches the graph.
 	
$-52(y\text{-}3) = x - 208$
$-52y + 156 = x - 208$
   -156 -156
    $-52y = x - 364$
    -52 -52
      $y = -1/52x + 7$
	Assessing - How did you know to put (364, 0) into the equation? What other ordered pair could you put into the equation?
	
	Advancing - What is the significance of the 3 and the 208 in the equation Billy came up with?
	
	Assessing – Why did you solve the equation for y?
	         What does the -1/52 represent?
	         What does the 7 represent?
	
	Advancing – Is it always best to solve linear equations for y?

Possible Student Misconceptions

a) Students may get confused because the table is not the way they are accustomed to.	Assessing – Do you know a formula for speed from this or any other class?

	Advancing – How could we use this formula for this question?
b) Scaling may be a major issue because they are given such a blank slate.	Assessing - How did you decide on your scale? Advancing - How can we change this scale to make this easy for people to understand?
c) Students may stick to the slope formula and get the speed as 1/52.	Assessing - How did you determine 1/52? Advancing - What would 1/52 mean in terms of this problem? Is this really the speed?
d) Students may not know how to check to see if this correct.	Assessing – Do you have any information on this page where you are given values for the variables in Billy's equation? Advancing - How can we use these values to help see if Billy is correct?
Entry/Extensions	**Assessing and Advancing Questions**
If students can't get started….	Assessing - How far did he drive in the first two hours? In the first five hours? Advancing - How can we use this information to help us continue in the problem?
If students finish early….	Assessing - For this graph to be linear what had to happen in the story? Advancing – What would happen to the graph if we added in bathroom breaks and a stop for gas and to eat? Could we graph this?
Discuss/Analyze	

Whole Group Questions

a) Is there anything unique about this table? Do we have to keep the table as it is or could we change the way it looks and still do this problem?

b) Are we sure our graph should be a line? How do we know? What is the significance of the point where the line crossed the y axis? The x-axis? (Show both possible graphs) How can these graphs be correct, yet one has positive slope and one has negative?

c) Was the speed you found positive or negative? What is the significance of this? When you are riding in your car can your speed be negative?

d) Is this the only possible equation for the line? Is there a simpler one? What is the significance of the y-3 in the equation? The -52? The x – 208? Did it matter which graph we refer to as to if the equation is correct?