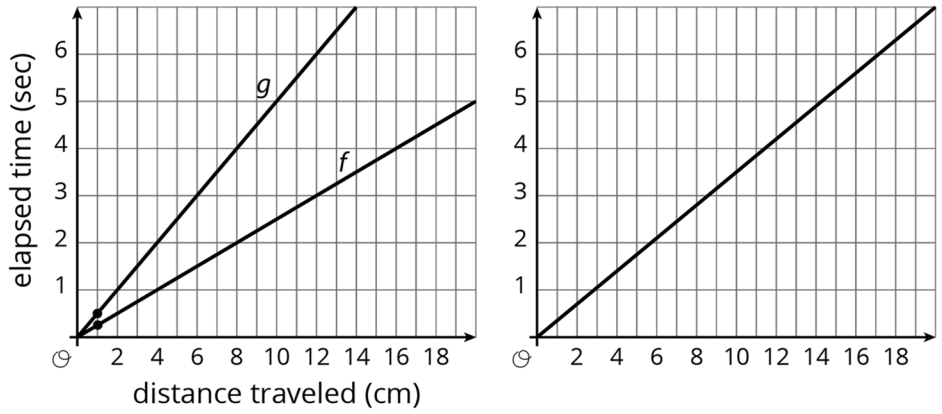
Let's Do Some Math Notice and Wonder	

Standards Unpacking		
Key	**Standard**	**Prerequisites/Vocabulary**
Put a box around the conceptual component of the standard. Underline the procedural/fluency component of the standard. Put a cloud around the application component of the standard.	**8.EE.5 -** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	What prior knowledge should my students have? What vocabulary/ notation should students know for this standard?
	8.EE.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.	What prior knowledge should my students have? What vocabulary/ notation should students know for this standard?

Put a box around the

of the standard.

Underline the procedural/fluency component of the standard.

Put a cloud around the

of the standard.

.

8.F.3 - Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; categorize functions as linear or nonlinear when given equations, graphs, or tables. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1, 1), (2, 4) and (3, 9), which are not on a straight line.

What prior knowledge should my students have?

What vocabulary/ notation should students know for this standard?

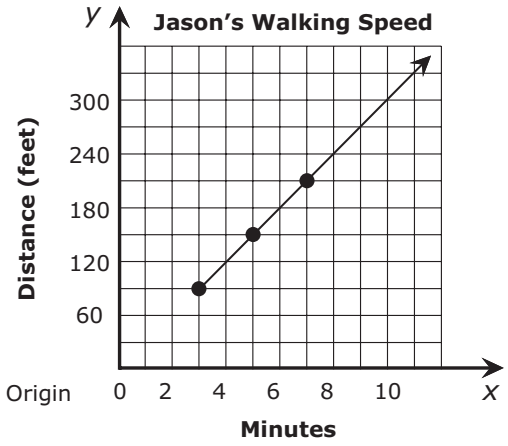
8.F.4 - Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

What prior knowledge should my students have?

What vocabulary/ notation should students know for this standard?

Directions: Complete the following SOLVE problem with your teacher. You will only complete the S Step.

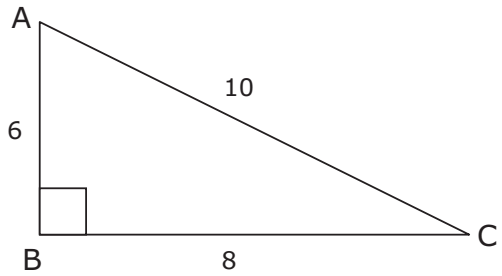
Jason was graphing the relationship between the distance he could walk in a certain number of minutes. He wanted to see if the relationship between the minutes walked and the distance was proportional. He chose the times of 3 minutes and 7 minutes to use to compare the relationship. Using what you know about the relationship between similar right triangles, what is the ratio of $\frac{\text{vertical leg}}{\text{horizontal leg}}$ or change in vertical over change in horizontal?



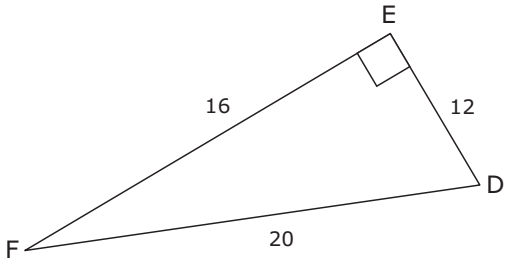
S Underline the question.
This problem is asking me to find the _____
_____.

Directions: Complete this page with your teacher and partner.

Triangle 1



Triangle 2

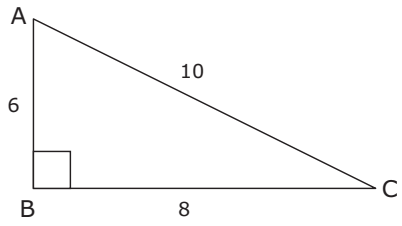


1. Triangle 1 and Triangle 2 are both right triangles. Explain how you know this.

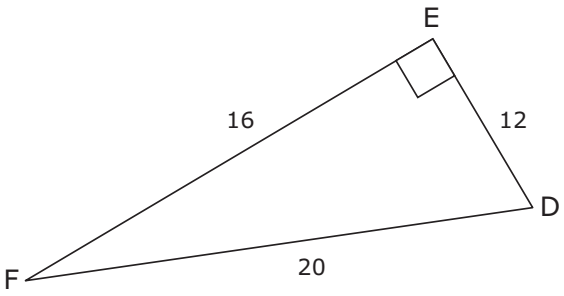
When we are trying to determine whether two triangles are similar, we can look at the measures of the corresponding sides.

Directions: Complete this page with your teacher and partner.

Triangle 1



Triangle 2



2. Explain the meaning of corresponding sides.

3. List the corresponding sides for Triangle 1 and Triangle 2.
$\overline{AB}$ corresponds to __ $\overline{BC}$ corresponds to __ $\overline{CA}$ corresponds to __

4. Once we have determined the corresponding sides, we are going to create a ratio to represent the relationship between the corresponding side lengths.
$\frac{\overline{AB}}{}$ = $\frac{\overline{BC}}{}$ = $\frac{\overline{CA}}{}$ =

5. What do you notice about the relationship between the numerator and the denominator in each of the ratios?

6. Simplify each of the ratios.
$\frac{\overline{AB}}{\overline{DE}} = \frac{6}{12} =$ $\frac{\overline{BC}}{\overline{EF}} = \frac{8}{16} =$ $\frac{\overline{CA}}{\overline{FD}} = \frac{10}{20} =$

7. What is the ratio between each of the corresponding side lengths of Triangle 1 and Triangle 2?

8. If each ratio can be simplified to _, what can we say about the relationship between the three ratios? _____. They are _____. Because these three ratios are equivalent, we can say that the relationship between them is _____.

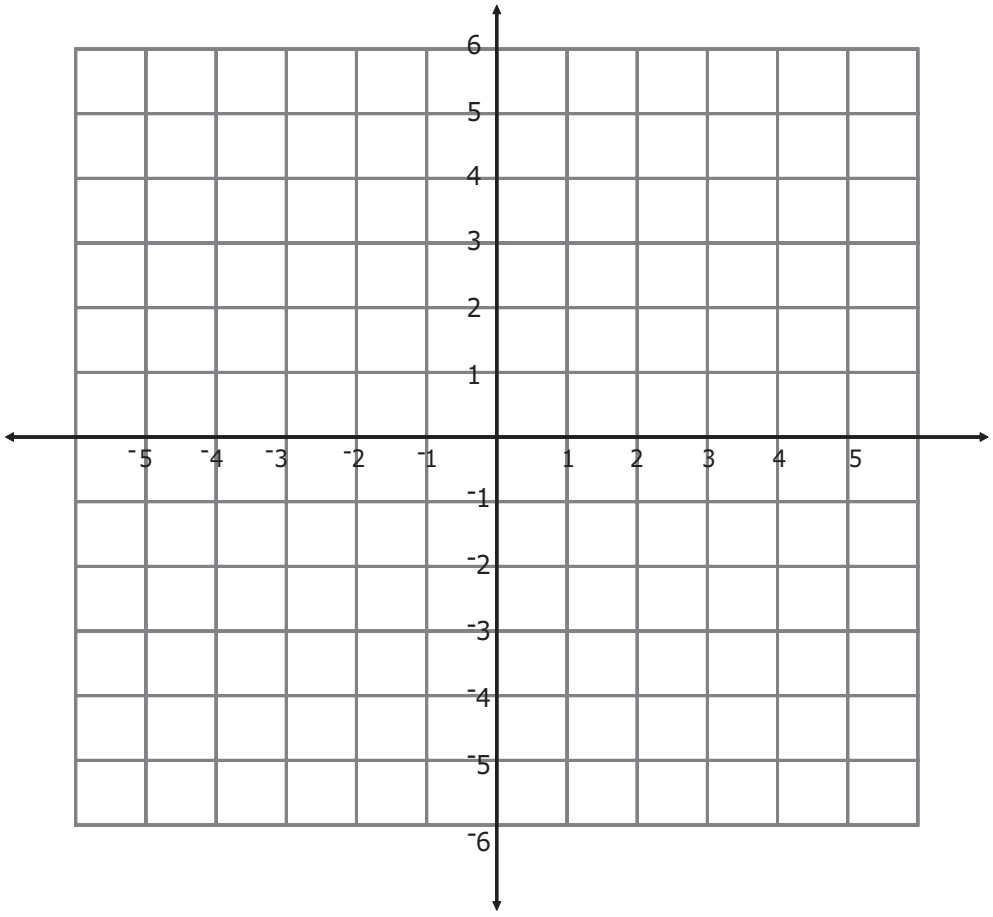
9. We can now say that Triangle 1 and Triangle 2 are similar triangles. Based on what you have discovered about the two triangles and the corresponding sides, create a definition of similar triangles with your partner.

Directions: Complete this page with your teacher and partner.

1. Graph the coordinates: *A* (2, 3), *B* (2, 0), and *C* (0, 0).

2. Graph the coordinates: *D* (0, 0), *E* (0, ¯6), and *F* (¯4, ¯6).

3. Connect points *A*, *B*, and *C*. Connect points *D*, *E*, and *F*. What do you notice about the figure that is formed by connecting each set of points?



Directions: Complete this page with your teacher and partner.

Use the triangles on the coordinate plane on S153 to complete the following chart and answer the questions about the relationship between the two triangles.

	Triangle *ABC*	**Triangle *DEF***
Length of Vertical Leg		
Length of Horizontal Leg		
Ratio of $\frac{\text{vertical leg}}{\text{horizontal leg}}$		

4. What are the corresponding sides of the two triangles?

5. Explain what you know about similar triangles.

6. Write the relationships between the corresponding sides as a proportion.

Now substitute in the values for the leg lengths to determine if the triangles are similar.

_____ Is this statement true? ___. What does this mean?

7. There is another relationship to explore with similar triangles. That relationship is the ratio between the _____ leg and the _____ leg of each triangle. What is the ratio of the $\frac{\text{vertical leg}}{\text{horizontal leg}}$ in Triangle *ABC*? __ What is the ratio of the $\frac{\text{vertical leg}}{\text{horizontal leg}}$ in Triangle *DEF*? __

8. What do you notice about the two ratios?

9. Is there a way to draw a line that will pass through the hypotenuse of both triangles? ___ Draw the line to pass through the hypotenuse of both triangles.

Directions: Complete this page with your teacher and partner.

10. Let's choose two points on that line that we have not used in our triangles. ($^{-}2$, $^{-}3$) and (4, 6). Mark them with stars.

Point 1	Point 2	Change in vertical distance	Change in horizontal distance	Ratio of $\frac{\text{vertical leg}}{\text{horizontal leg}}$
★ ($^{-}2$, $^{-}3$)	★ (4, 6)			
♥	♥			
♦	♦			

- Choose two other sets of points on the line.
- Mark the points you use with hearts and diamonds.
- Determine the change in vertical distance.
- Determine the change in horizontal distance.
- Write the change as a simplified ratio in the table above.

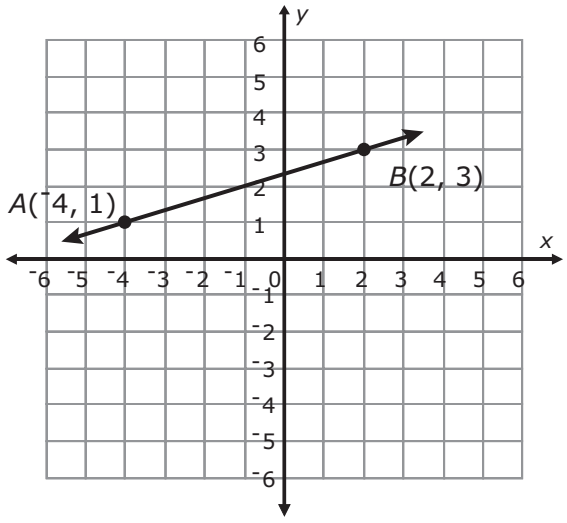
With your partner, make a prediction about the relationship between the vertical and horizontal distance of any two points on that line?

Was your prediction correct? ___ Explain.

What can you conclude about the ratio of the measure of the vertical leg over the horizontal leg no matter which two points you choose on the line?

Another name for the change in vertical over the change in horizontal is _____.

Directions: Complete this page with your teacher and partner.



1. Draw the vertical distance between the two points by moving up on the grid lines from Point *A* until you are horizontally even with Point *B*. (Draw this line in red.)

2. This line represents the change in the dependent variable or the __-values.

3. How many spaces did you move up when drawing the red line?

4. When you move up, the direction you are moving is represented with _____ numbers.

5. Draw the horizontal distance between the two points by moving to the right towards Point *B* on the grid lines from where you stopped your first dotted line. (Draw this line in blue.)

6. This line represents the change in the independent variable or the __-values.

7. How many spaces did you move to the right when drawing the blue line? _____

8. When you move to the right, the direction you are moving is represented with _____ numbers.

9. Complete the following ratios with your teacher:

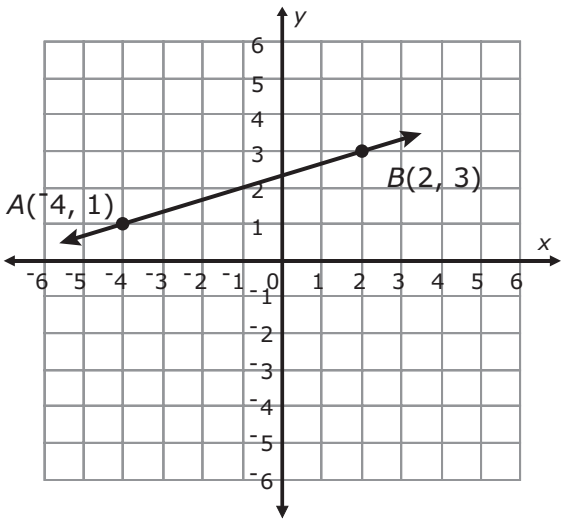
Rate of change: $\frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} =$

10. The comparison of the vertical distance and the horizontal distance can be written as a ratio. This ratio is known as the _____.

11. The rate of change of the given line is _____.

12. Another word we can use to describe the rate of change is the _____ of the line.

Directions: Complete this page with your teacher and partner.



1. Draw the vertical distance between the two points by moving down on the grid lines from Point *B* until you are horizontally even with Point *A*. (Draw this line in red.)

2. This line represents the change in the dependent variable or the ___-values.

3. How many spaces did you move down when drawing the red line? _____.

4. When you move down, the direction you are moving is represented with _____ numbers.

5. Draw the horizontal distance between the two points by moving to the left towards Point *A* on the grid lines from where you stopped your first dotted line. (Draw this line in blue.)

6. This line represents the change in the independent variable or the __-values.

7. How many spaces did you move to the left when drawing the blue line? _____

8. When you move to the left, the direction you are moving is represented with _____ numbers.

9. Complete the following ratios with your teacher:

Rate of change: $\frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} =$

10. The comparison of the vertical distance and the horizontal distance can be written as a ratio. This ratio is known as the _____.

11. The rate of change of the given line is _____ , which can be simplified _____.

12. Another word we can use to describe the rate of change is the _____ of the line.

13. What do you notice about the slope of the line on S163 and S164? _____.

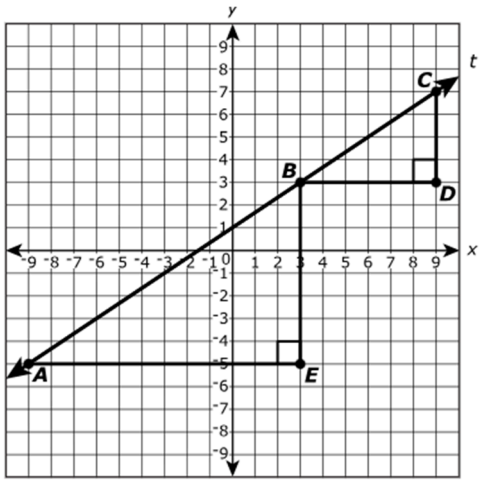
14. What conclusion can we draw after this activity?

Understanding Reasoning Questions Use this sheet as a reflection tool to support the understanding of the reasoning questions. After you engage/learn about the questions, use the tool to make notes around your take aways, implementation ideas, and ways to incorporate the rubric		
	Takeaways About the Questions	**Reflections on Implementation Ideas and the Rubric**
Takeaways About the Questions		
Understanding of How They Are Scored		
Reflections on Implementation Ideas and the Rubric		

Reasoning Question – 8.C.5 – 1

Used from: NJ Released Questions – 8.C.5-1 – Expressions and Equations – VH7137

Similar triangles ABE and BCD are shown on the coordinate plane. Line t passes through points A, B, and C



Part A

The slope of the segment *AB* is _____ the slope of segment *BC*.
(greater than, less than, equal to)

Part B

Use the ratios of the side lengths of triangle *ABE* and triangle *BCD* to explain your answer to Part A.

Part C

Write an equation for line *t*. Show or explain how you determined your equation.

Directions: Complete this page with your teacher and partner.

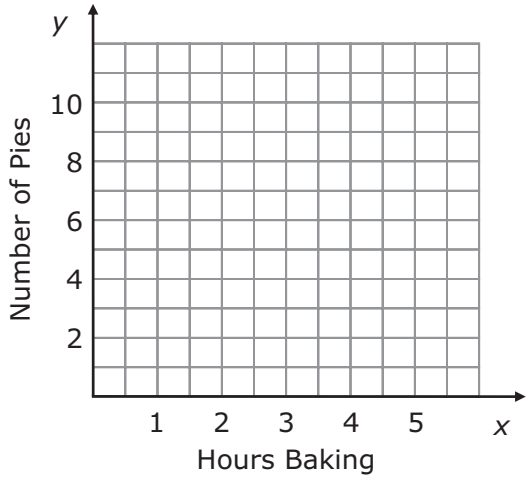
Verbal Description

Henry makes 10 pies in 5 hours.

Table

Hours	Number of Pies
1	
2	
3	
4	
5	

Graph



Equation

What does each one of these representations tell us?

What conclusion can we draw from this chart?

Directions: Complete this page with your teacher and partner.

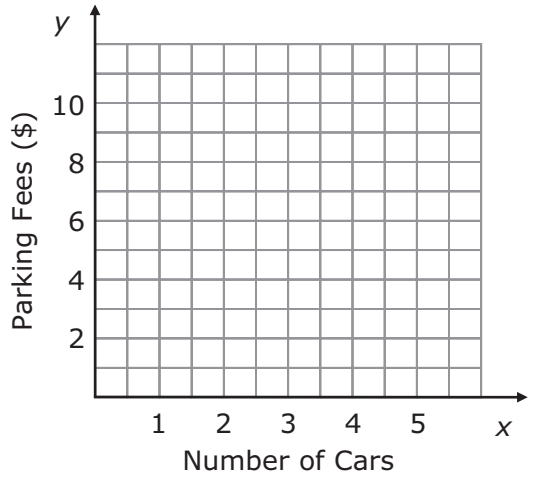
Verbal Description

The parking facility earns ___ per car.

Table

Number of Cars	Total Parking Fees ($)
	5
2	
5	25
8	

Graph



Equation

How is this situation different from the previous problem?

What conclusion can we draw from this chart?

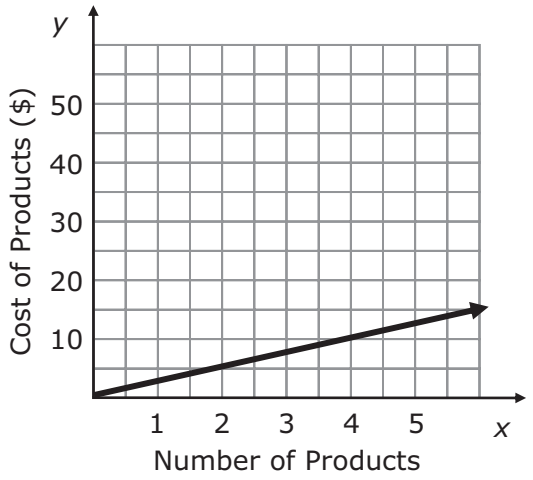
Directions: Complete this page with your teacher and partner.

Scenario 1: Profits that result from sales of Juice A and Juice B are being compared.

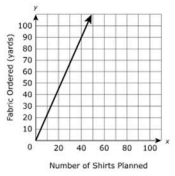
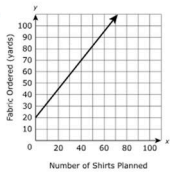
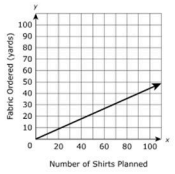
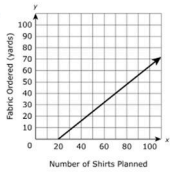
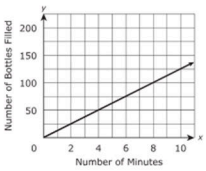
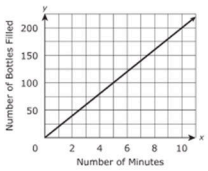
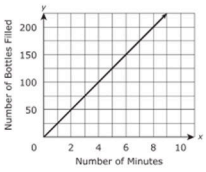
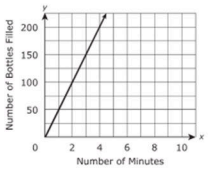
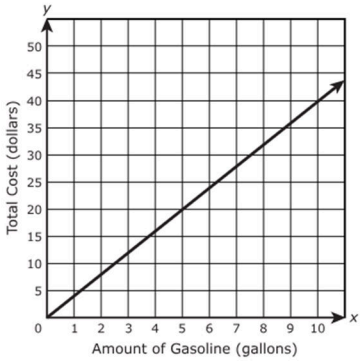
Sales of Juice A	Sales of Juice B
c = containers of juice p = total profit from sales $p = 3.35c$	<table><tr><th>Containers of Juice</th><th>Total Profit from Sales ($)</th></tr><tr><td>5</td><td>$16.25</td></tr><tr><td>6</td><td>$19.50</td></tr><tr><td>10</td><td>$32.50</td></tr><tr><td>12</td><td>$39.00</td></tr></table>
Profit per container sold:	Profit per bottle sold:

1. Which juice sales would benefit the company the most? Explain.

Scenario 2: Compare costs that result from production of Product A and Product B.

Cost of Product A	Cost of Product B
	p = number of products produced c = total cost of products $c = 2.94p$
Cost per product produced:	Cost per product produced:

2. Which product is less expensive to produce? Explain.

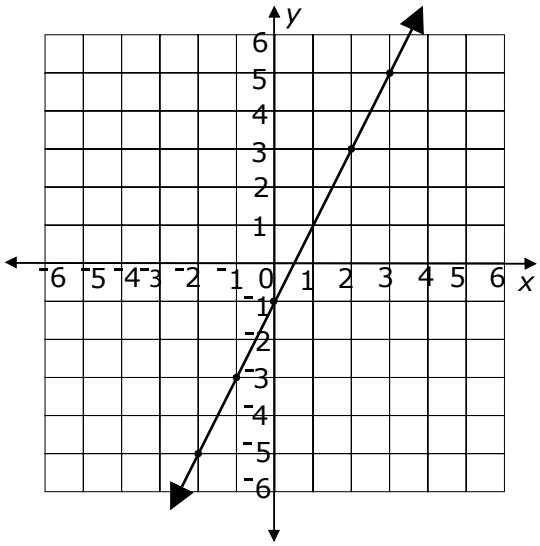
Proportional Relationships **Example 1**	For every 20 shirts Western Shirt Company plans to make, it orders 45 yards of fabric. Which graph represents the relationship between x, the number of shirts th company plans to make, and y, the number of yards of fabric it orders? ○ A.  ○ B.  ○ C.  ○ D. 
Proportional Relationships **Example 2**	The number of bottles a machine fills is proportional to the number of minutes the machine operates. The machine fills 250 bottles every 20 minutes. Which graph shows the number of bottles, y, the machine fills in x minutes? ○ A.  ○ B.  ○ C.  ○ D. 
Proportional Relationships **Example 2**	The graph and table show the amount of gasoline in gallons, x, and total cost in dollars, y, of gasoline at two gas stations. **Gas Station P**  **Gas Station M** x | y 5 | 19.00 10 | 38.00 15 | 57.00 Use the unit price of gasoline at both gas stations to determine which gas station charges more for gasoline (gallons). Be sure to include the unit prices in your answer. Show or explain your work.

Complete the four representations for the problem assigned to your group.

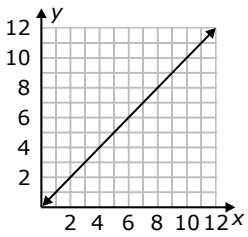
<table>
<tr>
<td>Verbal Description</td>
<td>Table of Values

<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>
Include the meaning of the values in your table.</td>
</tr>
<tr>
<td>Graph</td>
<td>Equation</td>
</tr>
</table>

Directions: Complete this page with your teacher and partner.

	Function 1	Function 2
	The output of a function is determined by finding half of the input and adding four.	
Function		
Rate of Change		
How do you determine the rate of change?		
What is another word for rate of change?		
Which function has the greater rate of change or slope?		

Directions: Complete this page with your teacher and partner.

<table>
<tr><th>Function</th><th>Rate of Change</th><th>How Did You Determine the Rate of Change?</th></tr>
<tr><td>1. The output of a function is determined by multiplying the input by five and subtracting three.</td><td></td><td></td></tr>
<tr><td>2. $y = 3x + 7$</td><td></td><td></td></tr>
<tr><td>3.
<table>
<tr><th>x</th><th>y</th></tr>
<tr><td>$^{-}1$</td><td>1</td></tr>
<tr><td>0</td><td>7</td></tr>
<tr><td>1</td><td>13</td></tr>
<tr><td>2</td><td>19</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>4.


</td><td></td><td></td></tr>
<tr><td colspan="3">5. Which of the functions represented above has the greatest rate of change? Explain your thinking and defend your answer.</td></tr>
</table>

Understanding Modeling Questions Use this sheet as a reflection tool to support the understanding of the modeling questions. After you engage/learn about the questions, use the tool to make notes around your take aways, implementation ideas, and ways to incorporate the rubric		
	Takeaways About the Questions	**Reflections on Implementation Ideas and the Rubric**
Takeaways About the Questions		
Understanding of How They Are Scored		
Reflections on Implementation Ideas and the Rubric		

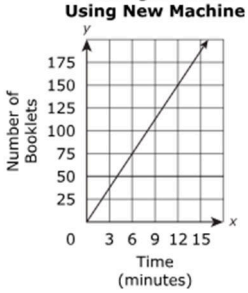
Think Quantities!	Think Structure!	Think Repetition!
What can I count? **What can I measure?** **How are the quantities related?** **How can I represent the quantities so I can see relationships?**	**How is this situation behaving?** **What kind of problem is this?** **Does the problem remind me of another I've solved?** **Will changing the form help?** **How can I chunk this expressions/number/visual?**	**Is there a process that keeps repeating?** **Am I counting /building/drawing in the same way each time?** **Do I keep repeating the same calculations?** **How can I use repetition to write a rule?**

Modeling Question – D.1

Used from: NJ Released Questions – 8.D.1 – Expressions and Equations – VF655990

A company uses a new machine and an old machine to print booklets. Each machine prints booklets at a constant rate. The graph and the equation represent the relationships between x, the number of minutes the machines print, and y, the number of booklets printed.

Printing Booklets Using New Machine



Printing Booklets Using Old Machine

$y = 9x$

The company uses both machines to print a total of 1,250 booklets. Both machines start printing at the same time. During printing, the old machine breaks down and stops printing. The new machine continues printing for an additional 14 minutes and completes the order.

What is the total number of minutes the new machine prints? Show or explain all your work.

Training Reflection			
What are your takeaways?			
Reasoning	**Modeling**	**Context**	**Precision**
What are your next steps as a result of this training?			