

## Just in Time Quick Check

### Standard of Learning 8.PFA.3

#### **Strand:** Patterns, Functions, and Algebra

#### **Standard of Learning 8.PFA.3**

**The student will represent and solve problems, including those in context, by using linear functions and analyzing their key characteristics (the value of the y-intercept ( $b$ ) and the coordinates of the ordered pairs in graphs will be limited to integers).**

*Students will demonstrate the following Knowledge and Skills:*

- a) Determine how adding a constant ( $b$ ) to the equation of a proportional relationship  $y = mx$  will translate the line on a graph.
- b) Describe key characteristics of linear functions including slope ( $m$ ), y-intercept ( $b$ ), and independent and dependent variables.
- c) Graph a linear function given a table, equation, or a situation in context.
- d) Create a table of values for a linear function given a graph, equation in the form of  $y = mx + b$ , or context.
- e) Write an equation of a linear function in the form  $y = mx + b$ , given a graph, table, or a situation in context.
- f) Create a context for a linear function given a graph, table, or equation in the form  $y = mx + b$ .

#### Just in Time Quick Check

#### Just in Time Quick Check Teacher Notes

**Supporting and Prerequisite SOL:** 7.PFA.1

### Just in Time Quick Check 8.PFA.3

1. Which is the equation for a line with a slope of -3 and a y-intercept of 4?

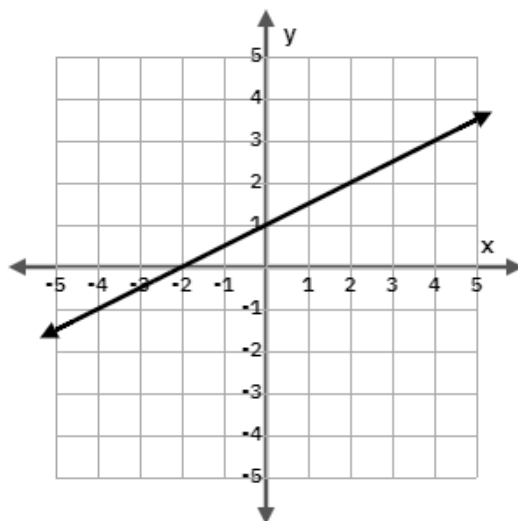
$$y = -4x + 3$$

$$y = -\frac{3}{4}x + 4$$

$$y = -3x + 4$$

$$y = -\frac{4}{3}x - 3$$

2. Write the equation of a line in slope-intercept form by identifying the slope and y-intercept for the linear function represented in the graph.



3. The line  $y = 2x$  is a straight line that passes through the origin and has a slope of 2.

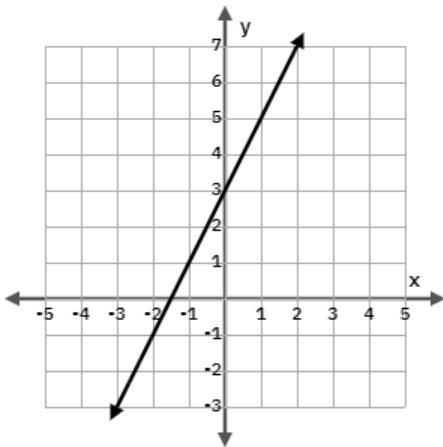
a) How does adding the constant  $b = 5$  change the graph of the line?

b) How does the line move if  $b = -5$  instead of  $b = 5$ ?

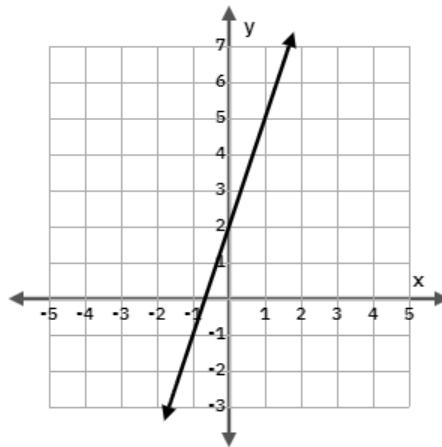
c) Does adding  $b$  affect the slope of the line?

4. Michelle and Christopher each graphed the linear function  $y = 3x + 2$  on a coordinate plane.

Michelle's graph:



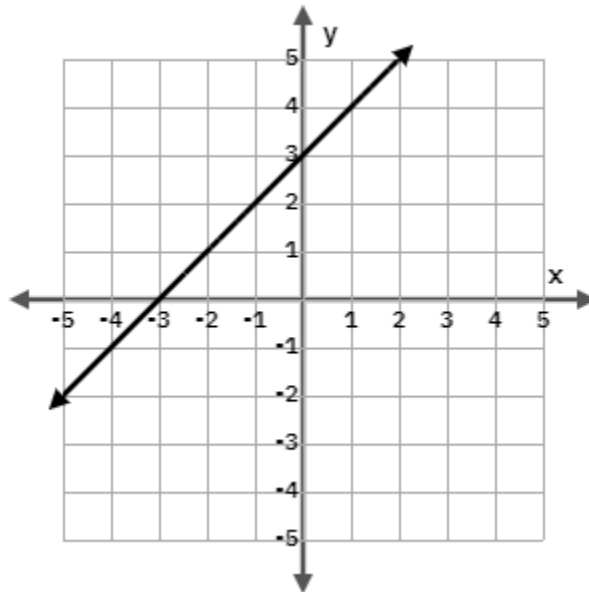
Christopher's graph:



Which graph correctly represents the linear function? Justify your answer.

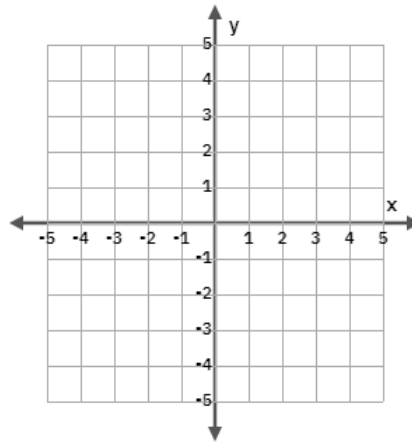
5. Which equation represents the graph of the linear function shown below? Explain your reasoning.

$y = -3x + 3$	$y = x + 3$
$y = -x + 3$	$y = \frac{1}{2}x + 3$



6. Graph the linear function represented by the algebraic sentence:

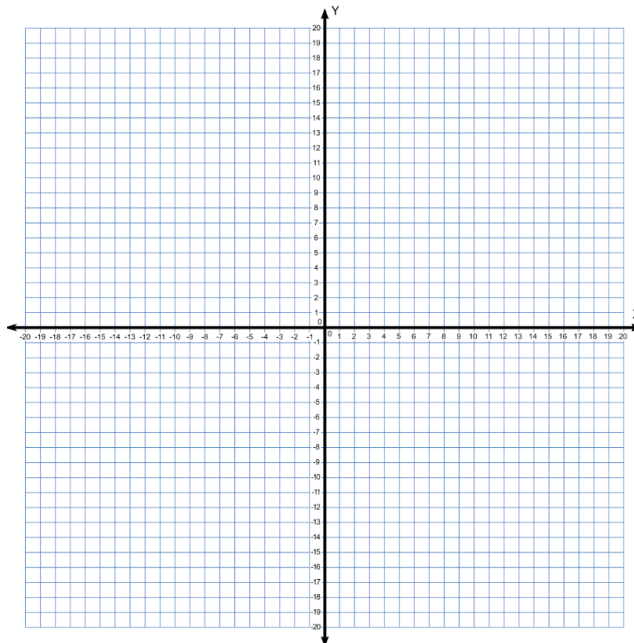
$y$  is equivalent to three times a number,  $x$ , decreased by one.



7. Write a verbal sentence to represent a linear function that contains the ordered pairs shown in table.

$x$	$y$
2	0
3	2
4	4

8. Alice runs a small bakery. She sells cookies for \$5 each and she has fixed expenses of \$15 for rent and utilities. Write an equation in slope-intercept form then graph the function below.



9. Create a contextual example from the following table.

$x$ (hours)	$y$ (degrees)
0	10
1	12
2	14
3	16
4	18
5	20

- a) Use the data in the table to write an equation in slope-intercept form.
- b) Create a real-world story that aligns with the equation created in part a).
- Examples of real-world examples can include money saved or spent, temperature changes, or distance traveled.
  - Use complete sentences to explain what  $x$  and  $y$  represent in your example.
    - The starting amount is \_\_\_\_\_, which means \_\_\_\_\_
    - The situation represents \_\_\_\_\_
    - As \_\_\_\_\_ increases by 1 \_\_\_\_\_ increases by \_\_\_\_\_, because \_\_\_\_\_

10. Create a table of values for the equation  $y = 2x + 3$  then create a real-world example that aligns with your equation.

$x$	$y$

### 8.PFA.3 Just in Time Quick Check Teacher Notes

#### Common Errors/Misconceptions and their Possible Indications

1. Which is the equation for a line with a slope of -3 and a y-intercept of 4?

$$y = -4x + 3$$

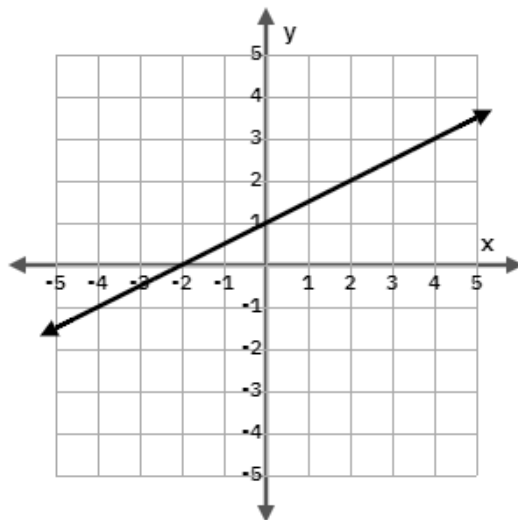
$$y = -\frac{3}{4}x + 4$$

$$y = -3x + 4$$

$$y = -\frac{4}{3}x - 3$$

*A common misconception is for students to reverse the y-intercept and the slope and incorrectly represent the equation as  $y = 4x - 3$ . These students would benefit from reviewing that the function of a linear equation is written in the form  $y = mx + b$ , where  $m$  represents the slope and  $b$  represents the y-intercept.*

2. Write the equation of a line in slope-intercept form by identifying the slope and y-intercept for the linear function represented in the graph.



*A common error students may make is writing the slope as 2. This may indicate that students believe the slope to be  $\frac{\text{change in } x}{\text{change in } y}$  instead of  $\frac{\text{change in } y}{\text{change in } x}$ . These students may benefit from experiences to build conceptual understanding of slope, perhaps through the use of slope triangles.*

3. The line  $y = 2x$  is a straight line that passes through the origin and has a slope of 2.  
a) How does adding the constant  $b = 5$  change the graph of the line?

*A common error students may make is stating that the slope changes when adding the constant  $b = 5$ . Students making this error do not recognize that the y-intercept changes from 0 to 5, but the slope or steepness of the graph remains unchanged.*

b) How does the line move if  $b = -5$  instead of  $b = 5$ ?

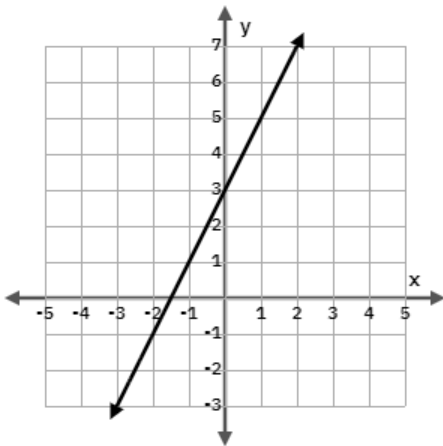
*Students may confuse the direction of the shift and believe that the graph is shifted horizontally to the left when  $b = -5$ . Students should be provided with multiple opportunities to graph translations of lines created by adding a constant,  $b$ .*

c) Does adding  $b$  affect the slope of the line?

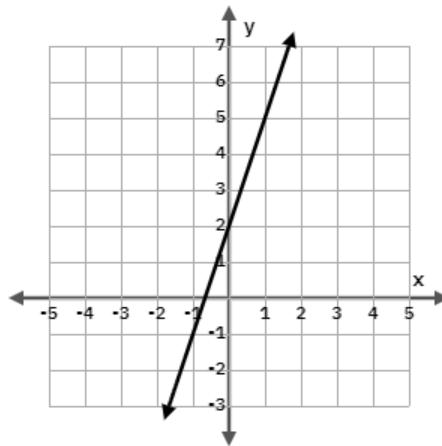
*Students may believe that the slope changes when adding  $b = 5$ , when the slope stays the same and the constant affects the  $y$ -intercept. Students should be provided with opportunities to graph translations of lines and discuss how the translations are related to adding a constant,  $b$ .*

4. Michelle and Christopher each graphed the linear function  $y = 3x + 2$  on a coordinate plane.

Michelle's graph:



Christopher's graph:

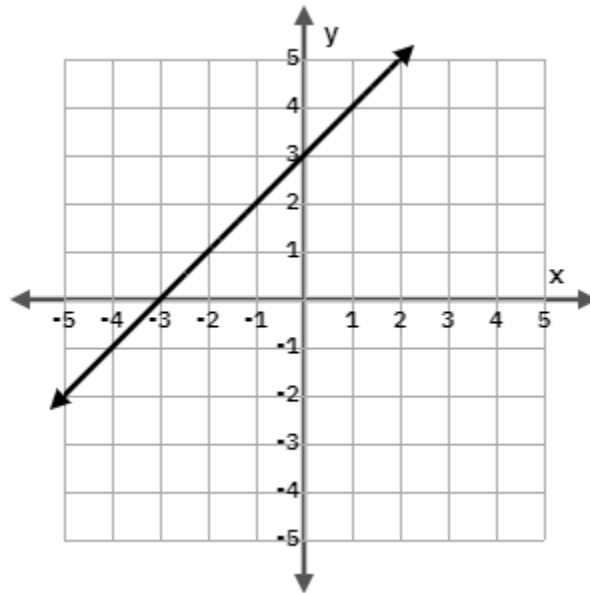


Which graph correctly represents the linear function? Justify your answer.

*A common error is for students to say that Michelle's work is correct because they have incorrectly reversed the values for slope and  $y$ -intercept. This may indicate that students do not have a strong conceptual understanding of the slope-intercept form of the equation for a line. These students could benefit from more exploration with linear functions that are connected to a context to reinforce that the  $y$ -intercept is represented by the constant,  $b$ , in the equation and the slope is the constant rate of change,  $m$ .*

5. Which equation represents the graph of the linear function shown below? Explain your reasoning.

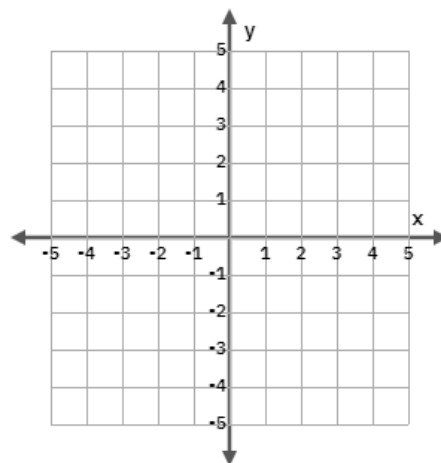
$y = -3x + 3$	$y = x + 3$
$y = -x + 3$	$y = \frac{1}{2}x + 3$



*A common error is for students to define the line using the equation  $y = x - 3$ . This indicates that students are looking at the x-intercept, rather than the y-intercept. Students could benefit from exploring how the constant,  $b$ , relates to the to the y-intercept in a series of lines that all have the same slope,  $m$ .*

6. Graph the linear function represented by the algebraic sentence:

$y$  is equivalent to three times a number,  $x$ , decreased by one.



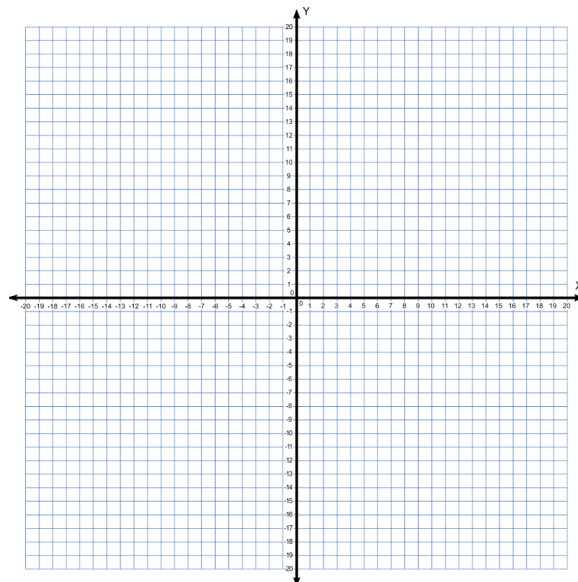
*One error commonly made by students is to create a graph that does not match the verbal description presented. This may indicate that students need additional support connecting verbal expressions and sentences to those represented symbolically. Students could benefit from extra practice with connecting all the different representations (e.g., verbal to algebraic before creating a graph or verbal to a table before creating a graph).*

7. Write a verbal sentence to represent a linear function that contains the ordered pairs shown in table.

x	y
2	0
3	2
4	4

*A common error that students may make is to write a verbal sentence that does not match the values in the table. Since the y-intercept is not provided in this table, students may assume that the y-intercept is 2 because of the ordered pair (2, 0). This could cause students to write a verbal description that reflects the linear function  $y = 2x + 2$ , indicating that the student needs reinforcement on the definition and location of the y-intercept on the coordinate plane. Students may benefit from practice locating the y-intercept on a graph and naming it by its ordered pair.*

8. Alice runs a small bakery. She sells cookies for \$5 each and she has fixed expenses of \$15 for rent and utilities. Write an equation in slope-intercept form then graph the function below.



*A common error some students may make is to record the equation  $y = 15x + 5$ . This may indicate that students do not understand that fixed expenses represent a one-time charge that appears as the  $y$ -intercept in the equation and that the charge per cookie is a rate of change that appears as the slope. Students may also record the equation as  $y = 5x + 15$ , indicating that students do not recognize that expenses would be deducted or subtracted in the equation. Students making these errors may benefit from additional practice identifying the slope and  $y$ -intercept in a practical situation.*

9. Create a contextual example from the following table.

$x$ (hours)	$y$ (degrees)
0	10
1	12
2	14
3	16
4	18
5	20

- a) Use the data in the table to write an equation in slope-intercept form.
- b) Create a real-world story that aligns with the equation created in part a).
- Examples of real-world examples can include money saved or spent, temperature changes, or distance traveled.
  - Use complete sentences to explain what  $x$  and  $y$  represent in your example.
    - The starting amount is \_\_\_\_\_, which means \_\_\_\_\_
    - The situation represents \_\_\_\_\_
    - As \_\_\_\_\_ increases by 1 \_\_\_\_\_ increases by \_\_\_\_\_, because \_\_\_\_\_

*Students may struggle to create a real-world example that matches the table and equation. Students may benefit from making connections to the equation they have written in slope intercept form,  $y = 2x + 10$ . Ask students to consider what the coefficient means in the equation and help them connect the slope to something that is occurring in real-life at a constant rate. Ask students to consider what the constant means in the equation and help them connect the  $y$ -intercept to a starting amount or fixed value.*

10. Create a table of values for the equation  $y = 2x + 3$  then create a real-world example that aligns with your equation.

$x$	$y$

*A common error students may make is incorrectly substituting their chosen  $x$  values into  $y = 2x + 3$ , resulting in incorrect values in the table. Students may also struggle to create a real-world example that aligns with the given equation. See teacher notes for question 9 for suggestions to assist with developing real-world examples.*