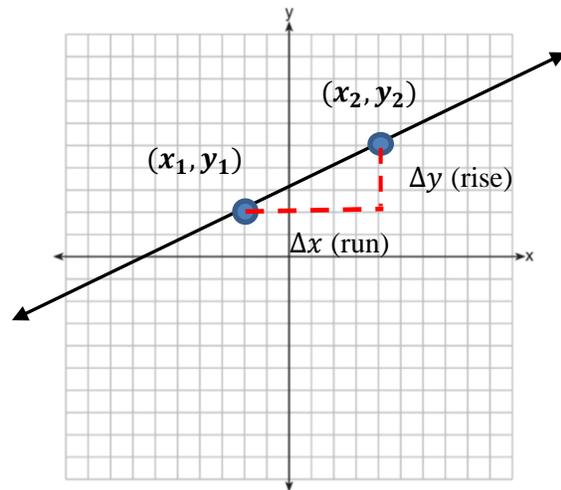# Notes: All Linear Equations Practice

Rate of Change / Slope: The rate of change or slope between two distinct points (x_1, y_1) and (x_2, y_2) is

$$\frac{Change\ of\ dependent\ variable}{Change\ of\ independent\ variables} = \frac{Change\ of\ y}{Change\ of\ x} = \frac{\Delta y}{\Delta x} = \frac{Vertical\ Change}{Horizontal\ Change} = \frac{Rise}{Run}$$

$$\frac{y_2 - y_1}{x_2 - x_1}$$

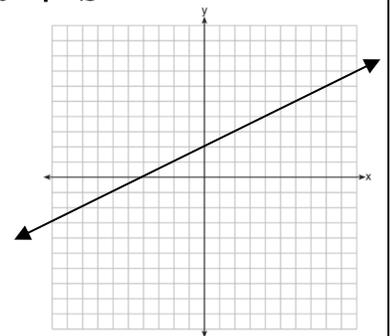**Slope-Intercept Form of a Line:** $y = mx + b$
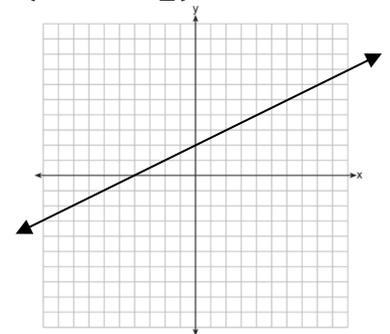
m:

b:

x and y:

Point-Slope Form of a Line: $y - y_1 = m(x - x_1)$
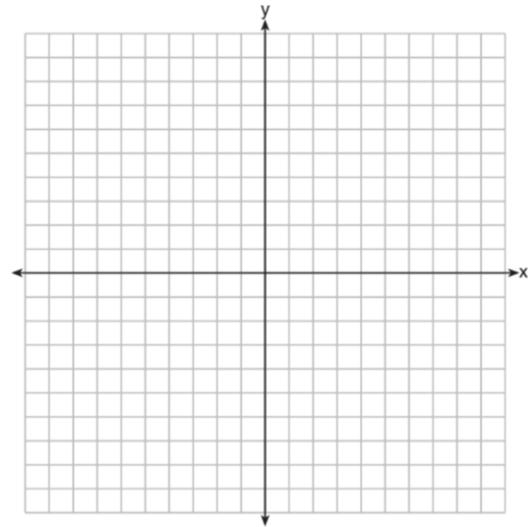
m:

x_1 and y_1:

x and y:

What Should I Be Able to Do?

- I can write a linear equation in slope-intercept form from a mathematical description, an x-y table, a graph, or a real-world description.

- I can graph a linear equation.

- I can find the rate of change of any linear relation.

Without a Calculator: Graph $y = -2x + 3$.
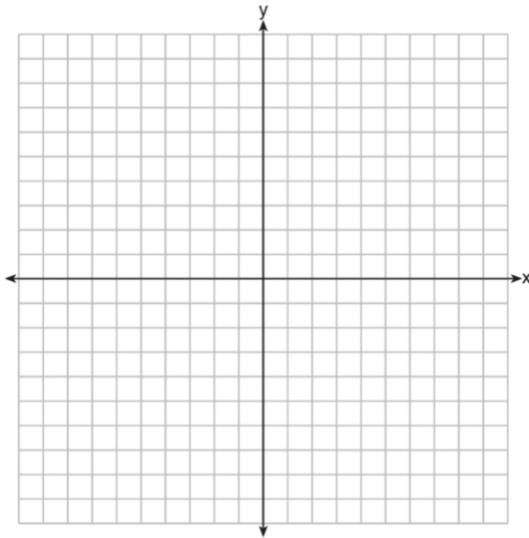
x	$-2x + 3$	y

With a Calculator
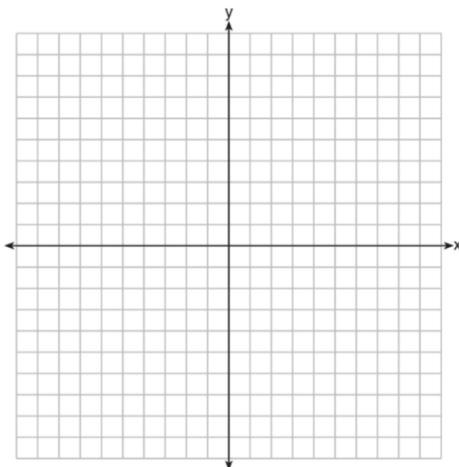
Is the point $(-24, 59)$ a solution to the equation?

Is the point $(-24, 59)$ on the line?

Do Now: Find the equation of each linear relation in $y = mx + b$ form.

1) $4x - 6y = 17$

2) *the output is three less than twice the input*

3) *passes through $(-4,7)$ with slope $= 3$*

4) *A line that passes through $(2,5)$ and $(4,9)$.*

5)

x	−1	0	3	5	10
y	−9	−4	11	21	46

6)

A car leaves Albany, NY, and travels west toward Buffalo, NY. The equation $D = 280 - 59t$ can be used to represent the distance, D, from Buffalo after t hours. In this equation, the 59 represents the

(1) car's distance from Albany
(2) speed of the car
(3) distance between Buffalo and Albany
(4) number of hours driving

b) What does the y-intercept represent?

7) In 2013, the United States Postal Service charged $0.46 to mail a letter weighing up to 1 oz. and $0.20 per ounce for each additional ounce. Which function would determine the cost, in dollars, y, of mailing a letter weighing x ounces where x is an integer greater than 1?

(1) $y = 0.46x + 0.20$ (3) $y = 0.46(x - 1) + 0.20$
(2) $y = 0.20x + 0.46$ (4) $y = 0.20(x - 1) + 0.46$

Classwork: All Linear Equations Practice

Find the equation of each linear relation in $y = mx + b$ form.

1) $passes\ through\ (-3,11)\ with\ slope = -\frac{1}{2}$ 2) $passes\ through\ (3,0)\ and\ (0,-5)$

3)

x	y
-3	-5
-1	-6
1	-7
3	-8

4)

5)

The graph of a linear equation contains the points $(3,11)$ and $(-2,1)$.
Which point also lies on the graph?

(1) $(2,1)$ (3) $(2,6)$

(2) $(2,4)$ (4) $(2,9)$

6) Latrell and Patrick were doing their algebra homework. They were asked to write the equation of the line that passes through the points $(-5,8)$ and $(10,2)$. Latrell wrote $y = -\frac{2}{5}x + 10$ and Patrick wrote the equation $y + 8 = -\frac{2}{5}(x - 5)$. Who is incorrect? Explain your reasoning.

7) Which equation has the greatest y-intercept?

(1) $y = 3x$
(2) $2x + 3y = 12$
(3) the line that has a slope of 2 and passes through $(1, -4)$

(4)
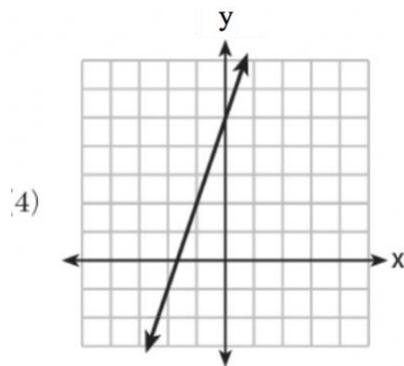
8) In your own words, describe what a means for a line to have a constant rate of change.

_____

_____

_____

_____

9) Each day, a local dog shelter spends an average of $2.40 on food per dog. The manager estimates the shelter's daily expenses assuming there is at least one dog in the shelter, using the equation $y = 30 + 2.40x$.

Which statement regarding the equation $y = 30 + 2.40x$ are correct?

I. x represents the number of dogs at the shelter per day.
II. x represents the number of volunteers at the shelter per day.
III.   30 represents the shelter's total expenses per day.
IV.   30 represents the shelter's nonfood expenses per day

(1) I and III   (2) II and III
(3) I and IV   (4) II and IV

10) On the set of axes below, graph the function $y = -\frac{5}{3}x - 2$.
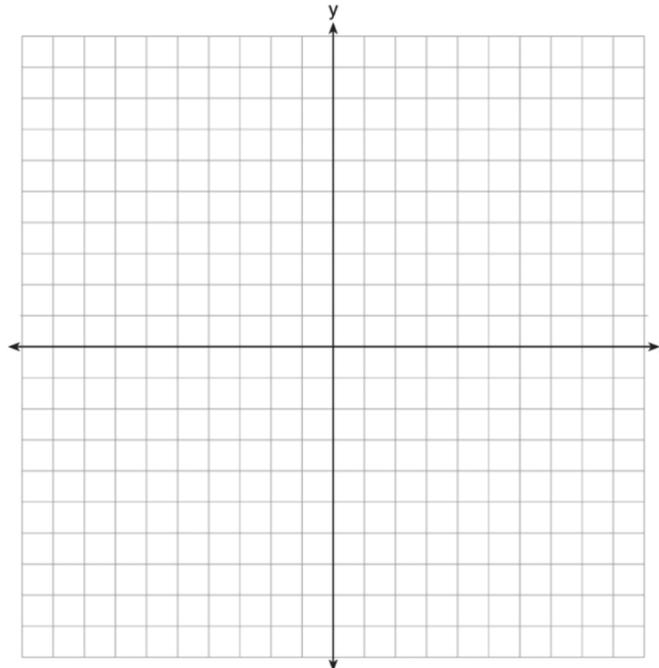
Is the point (-6,8) a solution to the equation? Explain your answer based on the graph drawn.

11)

The table below shows the year and the number of households in a building that had high-speed broadband internet access.

Number of Households	11	16	23	33	42	47
Year	2002	2003	2004	2005	2006	2007

For which interval of time was the average rate of change the *smallest*?

(1) 2002 – 2004   (3) 2004 – 2006

(2) 2003 – 2005   (4) 2005 – 2007

12)

The solution of an equation with two variables, x and y, is

(1) the set of all x values that make $y = 0$

(2) the set of all y values that make $x = 0$

(3) the set of all ordered pairs, (x,y), that make the equation true

(4) the set of all ordered pairs, (x,y), where the graph of the equation crosses the y-axis

13) The table below represents the height of a bird above the ground during flight, with y representing height in feet and x representing time in seconds.

x	y
0	6.71
3	6.26
4	6
9	3.41

Calculate the average rate of change from 3 to 9 seconds, in feet per second.

14) Write a linear equation that is perpendicular to the line $y = \frac{3}{2}x - 5$.

15) Write a linear equation that is parallel to the line $3x - 8y = 24$.

16) A grocery store sells packages of meat by the pound. What is the most appropriate set of numbers to use to measure the pounds?

(1) integers

(3) positive integers

(2) rational numbers

(4) positive rational numbers

17)

The width of a rectangle is 4 less than half the length. If ℓ represents the length, which equation could be used to find the width, w?

(1) $w = \frac{1}{2}(4 - \ell)$

(3) $w = \frac{1}{2}\ell - 4$

(2) $w = \frac{1}{2}(\ell - 4)$

(4) $w = 4 - \frac{1}{2}\ell$

18)

When solving $p^2 + 5 = 8p - 7$, Kate wrote $p^2 + 12 = 8p$. The property she used is

(1) the associative property

(2) the commutative property

(3) the distributive property

(4) the addition property of equality

19)

The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

Age (years)	Average Pupil Diameter (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?

(1) 2.4

(3) −2.4

(2) 0.04

(4) −0.04

20)

Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200°F.
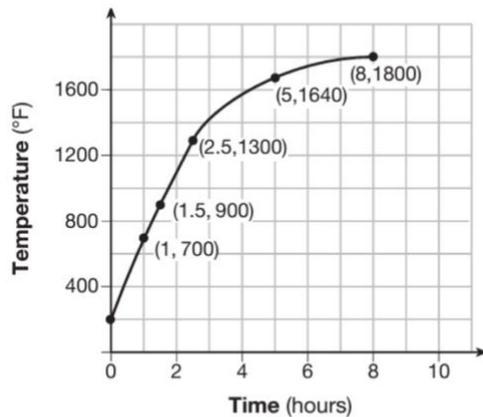
During which time interval did the temperature in the kiln show the greatest average rate of change?

(1) 0 to 1 hour

(3) 2.5 hours to 5 hours
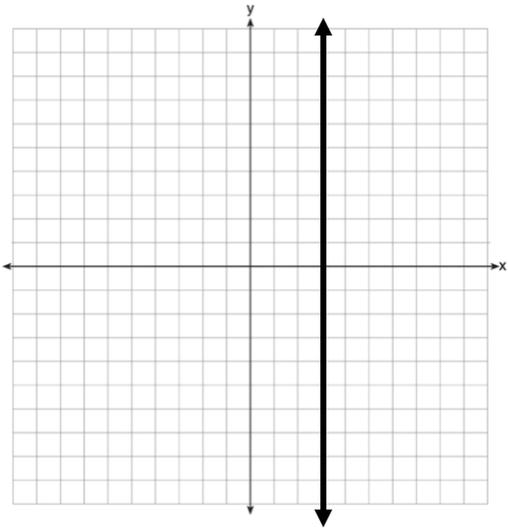
(2) 1 hour to 1.5 hours

(4) 5 hours to 8 hours

21)

Three times the sum of a number and four is equal to five times the number, decreased by two. If x represents the number, which equation is a correct translation of the statement?
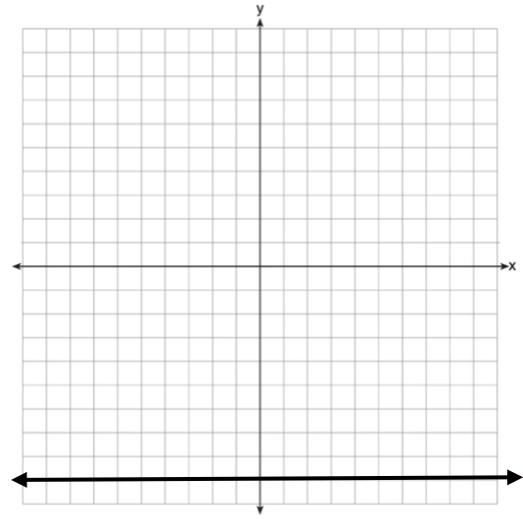
(1) $3(x + 4) = 5x - 2$

(3) $3x + 4 = 5x - 2$

(2) $3(x + 4) = 5(x - 2)$

(4) $3x + 4 = 5(x - 2)$

22) Find the equation and slope of each line.

a)

b)

23)

In 2008, the leading cell phone company had a plan that charged a fixed base fee which included calls and texts while including an overage charge for the amount of texts used beyond the plan. The cell phone plan charged a base fee of $85 and an overage charge of $0.10 per text that exceeded 100 texts. If C represents the cost and t represents the total number of texts, which equation could represent this plan when more than 100 texts are used?

(1) $C = 85 + 0.10(100 - t)$
(2) $C = 100 + 85(0.10t)$
(3) $C = 85 + 0.10(t - 100)$
(4) $C = 85 + 10(100 - t)$

24) What are all of the quadrants of the standard (x, y) coordinate plane that contain points on the graph of the equation $-14x + 7y = -19$

25)

Which equation represents a line that is parallel to the y-axis?

(1) $x = 5$ (3) $y = 5$

(2) $x = 5y$ (4) $y = 5x$

26)

Which equation represents a line parallel to the x-axis?

(1) $y = -5$ (3) $x = 3$

(2) $y = -5x$ (4) $x = 3y$

27)

Which expression results in a rational number?

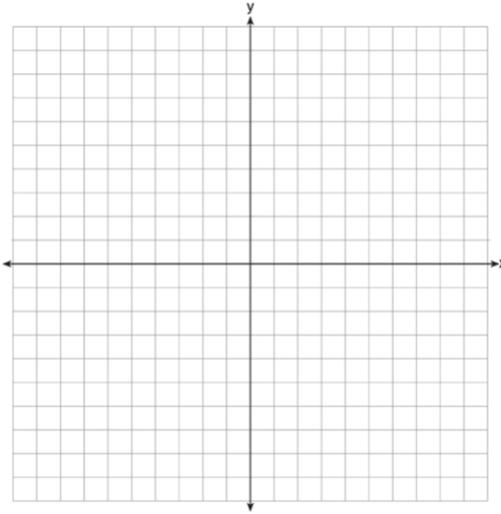(1) $\sqrt{2} \cdot \sqrt{18}$ (3) $\sqrt{2} + \sqrt{2}$

(2) $5 \cdot \sqrt{5}$ (4) $3\sqrt{2} + 2\sqrt{3}$

28) Algebraically prove that $\triangle ABC$ is a right triangle given the vertices $A\,(4,9), B(-1,1)$, and $C(7,-4)$.

29) On the set of axes below, graph the function $y = -\frac{\sqrt{7.2}}{\sqrt{5}}x - 1.5$.

Is the point $(12, -12.9)$ a solution to the equation? Justify or explain your answer.

30) For some real number W, the graph of the line $y = (W + 3)x - 8$ in the standard (x, y) coordinate plane passes through $(8, 10)$. What is the slope of this line?

31) Suppose that the graph of balloon's height over a certain period of time is a linear relation. How is the balloon's height effected if the slope of the line is positive?

How is the balloon's height effected if the slope of the line is negative?

How is the balloon's height effected if the slope of the line is zero?

How is the balloon's height effected if the slope of the line is undefined?

32) Write the following linear equation in slope-intercept form.

$$y\left(\frac{81}{16}\right)^{-3/4} + x\left(\frac{9 - \sqrt{10}}{-3 + \sqrt{6}}\right) = 1$$

32)

Tanya is making homemade greeting cards. The data table below represents the amount she spends in dollars, *y*, in terms of the number of cards she makes, *x*.

x	*y*
4	7.50
6	9
9	11.25
10	12

Write a linear equation that represents the data.

Explain what the slope and y-intercept of your equation mean in the given context.