Part A: Slope and Graphed Scenarios

Practice 1

1.

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

The variable m is the slope.
The variables (x_1, y_1) are the coordinates of one point on the line.
The variables (x_2, y_2) are the coordinates of another point on the line.

2.

$m = \frac{-4-4}{-8-8} = \frac{-8}{-16} = \frac{1}{2}$

3.

$m = \frac{3-(-1)}{-7-4} = \frac{3+1}{-11} = -\frac{4}{11}$

4.

$m = \frac{12-14}{-10-(-12)} = \frac{-2}{-10+12} = \frac{-2}{2} = -1$

5.

$m = \frac{50-75}{-10-(-15)} = \frac{-25}{-10+15} = \frac{-25}{5} = -5$

6.

$\frac{4}{7} = \frac{r-2}{9-(-5)}; \ \frac{4}{7} = \frac{r-2}{14}$

$4(14) = 7(r-2)$
$56 = 7r - 14$
$70 = 7r$
$r = 10$

7.

$\frac{5}{2} = \frac{6-1}{r-3}; \ \frac{5}{2} = \frac{5}{r-3}$

$5(r-3) = 2(5)$
$5r - 15 = 10$
$5r = 25$
$r = 5$

8.

The rate of change is \$35 per month. This means that each month (independent variable), Josie pays \$35 (dependent variable). (month, payment)

9.

(years, feet)
Point 1: (3, 7)
Point 2: (5, 12)

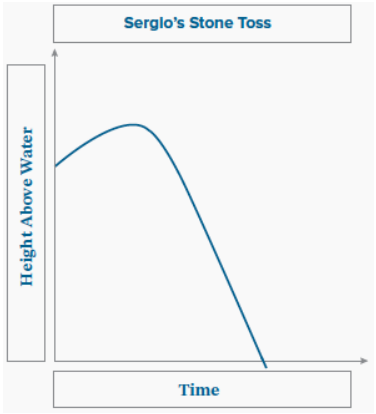
$m = \frac{(12-7)}{(5-3)} = \frac{5}{2}$

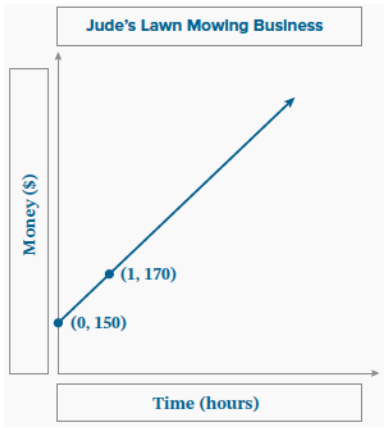
The tree will grow 5 feet every two years, or 2.5 feet per year.

10.
A. linear
B. (month, cost)
C. The cell phone was purchased for about $80 because (0, 80) represents 0 months with an $80 cost. The total cost of the phone increased every month the bill was due.
D. The bill (or rate of change) was about $50 a month.

11.
A. nonlinear
B. (years, percent depreciation)
C. The car starts at 100% of its value. Around year 20, the car is worth almost 0% of what it was purchased for.
D. not possible

12.
A. nonlinear
B. (hours, blood concentration)
C. A person took 3 doses of medicine in one day. Each dose lasted 8 hours until no medicine was in the blood (when the graph touched the *x*-axis).
D. not possible

13.


14.


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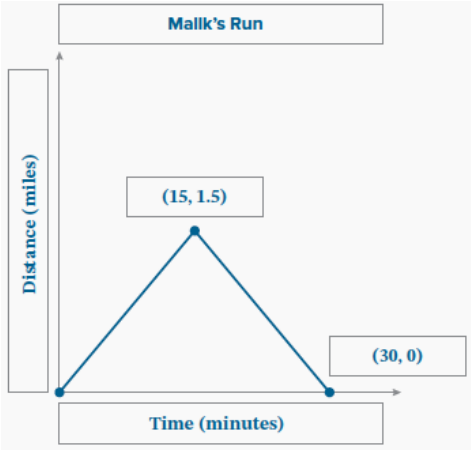


Practice 2

1.

$m = \frac{(-1-0)}{(5-2)} = \frac{-1}{3}$

2.

$m = \frac{(5-1)}{(-3-(-4))} = \frac{4}{1} = 4$

3.

$m = \frac{(-2-(-3))}{(-1-(-2))} = \frac{1}{1} = 1$

4.

$\frac{-2}{3} = \frac{-4-2}{r-(-7)}$; $\frac{-2}{3} = \frac{-6}{r+7}$

$-2(r+7) = 3(-6)$

$-2r - 14 = -18$

$-2r = -4$

$r = 2$

5.

$\frac{8}{1} = \frac{r-2}{0-3}$; $\frac{8}{1} = \frac{r-2}{-3}$

$8(-3) = 1(r-2)$

$-24 = r - 2$

$r = -22$

6.

(ounce, cost)

(6, 2.88), (14, 6.72)

$m = \frac{(6.72-2.88)}{(14-6)} = \frac{3.84}{8} = 0.48$

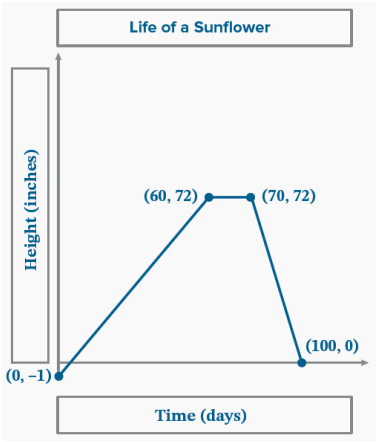
The cost per ounce is \$0.48 (or 1 ounce is \$0.48).

7.
(minutes, miles)
(55, 5), (220, 20)
$m = \frac{(20-5)}{(220-55)} = \frac{15}{165} = \frac{1}{11}$
Micah ran 1 mile every 11 minutes.

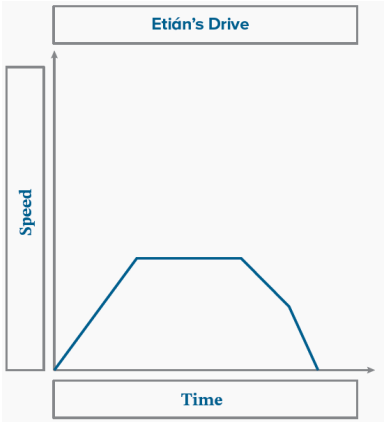
8.
A. linear
B. (month, pools cleaned)
C. The pool business started with 50 pools to clean in June. Their business steadily decreased until there were 0 pools to clean in November.
D. The rate of change is 10 fewer pools per month.

9.
A. nonlinear
B. (year, stock price)
C. The price of the tech company's stock before 1985 was nearly zero. The price of the tech company's stock was below $25 until about 2007. From 2007 on, the stock mostly increased year after year. The graph shows the price of the tech company's stock was about $160 in 2017.
D. not linear

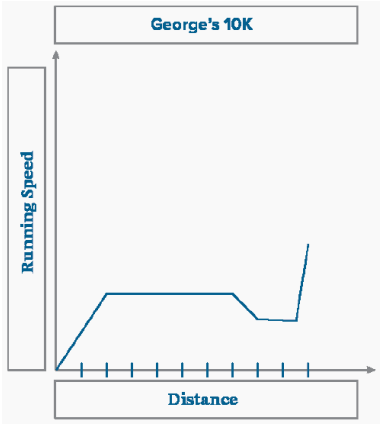
10.



11.



12.



13.
Creating a sketch helps you understand what a scenario looks like. When the sketch is labeled, it also helps make the independent and dependent variables clearer and shows how they relate to one another.

Part B: Point-Slope Form and Slope-Intercept Form

Practice 1

1.

$(-3, 5), m = \frac{2}{3}$

$y - 5 = \frac{2}{3}(x + 3)$

2.

A.

$y - 2 = -1(x - 0)$

B.

$y - 2 = -x$

$(0) - 2 = -x$

$-2 = -x$

$2 = x$

$x = 2$

point: (2, 0)

3.

A.

$m = \frac{-5-(-3)}{-2-(-7)} = \frac{-5+3}{-2+7} = \frac{-2}{5} = -\frac{2}{5}$

B.

Using $(-7, -3)$: $y - (-3) = -\frac{2}{5}(x - (-7))$

$y + 3 = -\frac{2}{5}(x + 7)$

Using $(-2, -5)$: $y - (-5) = -\frac{2}{5}(x - (-2))$

$y + 5 = -\frac{2}{5}(x + 2)$

4.
A.
$m = \frac{9-3}{10-2} = \frac{6}{8} = \frac{3}{4}$
B.
$y - 3 = \frac{3}{4}(x - 2)$

5.
m = 15 texts per hour; (hour, texts)
point: (8, 120)
$y - 120 = 15(x - 8)$

6.
m = \$12 per hour (hour, dollars)
point: (8, 150)
$y - 150 = 12(x - 8)$

7.
$y = -\frac{3}{4}x + 11$

8.
$y = 5x - \frac{6}{7}$

9.
$y = -x + 9$

10.
$y = 7.65x + 2.5$

11.
$y = -\frac{5}{8}x + 25$

12.
$y = 0x + 3$
(note: this is a horizontal line)

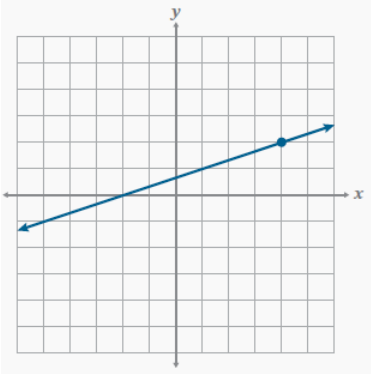
13.
Line a: $y = 2x + 1$

14.
Line b: $y = -2x + 1$

15.
Line c: $y = \frac{1}{2}x + 1$

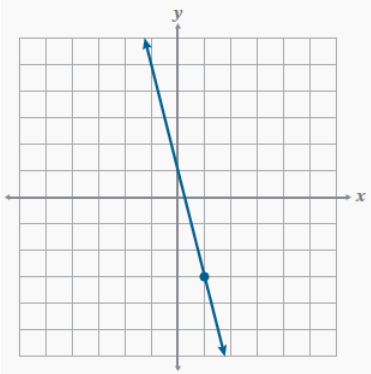
16.

$m = \frac{1}{3}, (4, 2)$



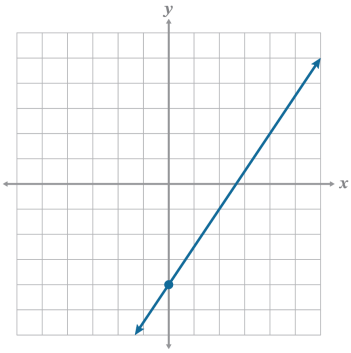
17.

$m = -4, (1, -3)$

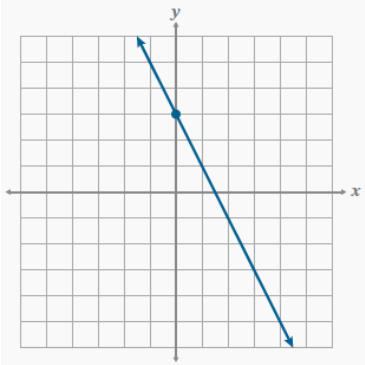


18.

$m = \frac{3}{2}, b = -4$



19.
$m = -2, b = 3$



20.
(month, money)
$m = 200, b = 1{,}200$
$y = 200x + 1{,}200$

Practice 2

1.
$(2, -2), m = -2$
$y + 2 = -2(x - 2)$

2.
$y + 2 = -\frac{2}{3}(x - 3)$

3.
A.
$y - 1 = \frac{3}{4}(x + 5)$
B.
$y - 1 = \frac{3}{4}((-1) + 5)$
$y - 1 = \frac{3}{4}(-1 + 5)$
$y - 1 = \frac{3}{4}(4)$
$y - 1 = 3$
$y = 4$
Note: The point is $(-1, 4)$.

4.
A.

$$m = \frac{5-3}{-1-0} = \frac{2}{-1} = -2$$

B.
Using (0, 3): $y - 3 = -2(x - 0)$
$y - 3 = -2x$
Using (−1, 5): $y - 5 = -2(x - (-1))$
$y - 5 = -2(x + 1)$

C.
The x-intercept ordered pair is always in the form $(a, 0)$, so substitute a for x and 0 for y.
Using $y - 3 = -2x$:
$(0) - 3 = -2(a)$
$-3 = -2a$
$\frac{3}{2} = a$
$(\frac{3}{2}, 0)$
Using $y - 5 = -2(x + 1)$:
$(0) - 5 = -2((a) + 1)$
$-5 = -2a - 2$
$-3 = -2a$
$\frac{3}{2} = a$
$(\frac{3}{2}, 0)$

5.
m = \$5 per bow; (bows, dollars)
point: (25, 125)
$y - 125 = 5(x - 25)$

6.
m = 45 bricks per hour; (hours, bricks)
point: (4, 270)
$y - 270 = 45(x - 4)$

7.
anything between $1\frac{1}{2}$ and $1\frac{2}{3}$

8.
The scales provide a measurement, but any values between the marked points are estimated.

9.
Sample: The scales on a graph provide a type of measurement, so the graph of a function can only provide estimates for any values that fall between marked points. However, an equation of a function uses numerical values, which are exact values.

10.
$f(x) = -\frac{2}{5}x + 4$

11.
$g(x) = 4x - 2$

12.
line c

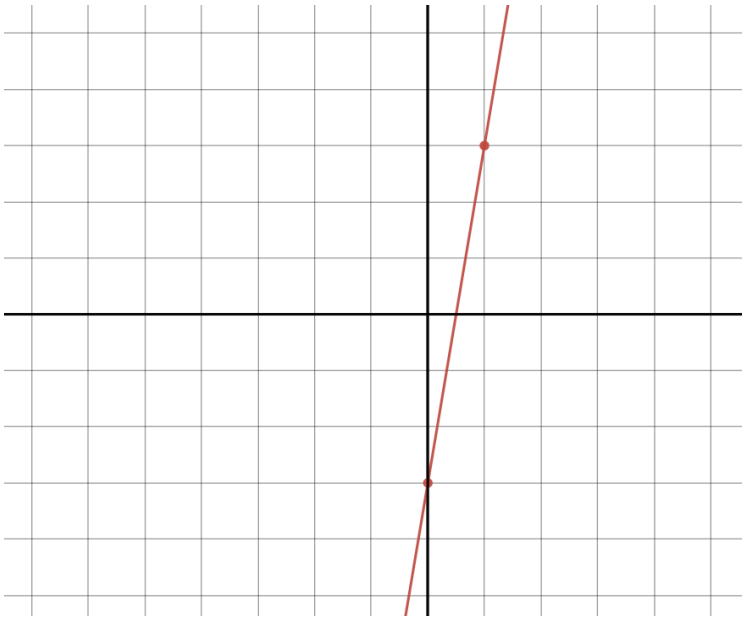
13.
line b

14.
line a

15.
line p: $m = 2(\frac{3}{1}) = 6$

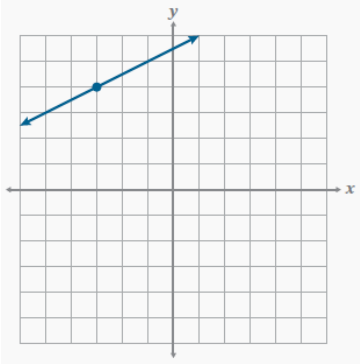
$b = \frac{1}{2}(-6) = -3$

$y = 6x - 3$



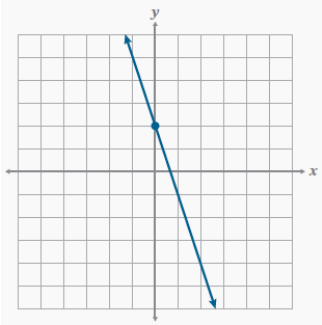
16.

$m = \frac{1}{2}$, $(-3, 4)$



17.

$m = -3$, $b = 2$



18.

(kWh, dollars)
$m = 0.10$, $b = 8.20$
$y = 0.10x + 8.20$

19.

$(x, 106.20)$
$106.20 = 0.10x + 8.20$
$98 = 0.10x$
$x = 980$ kWh were used

Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	8	8	8	7	8	7	7	7	2	6	8	7

1.
Line b is correct. When substituting $x = 2$ into $f(x) = 3x$, $f(2) = 3(2) = 6$. The only line that has the point (2, 6) is line b.

2.
Two different lines share each of those points at the given values of x.

3.
The x- and y-intercept are both (0, 0) because the point goes through the origin.

4.

x	y
−2	−4
−1	−2
0	0
1	2

5.
$m = \frac{2}{1} = 2$

6.
domain: {−2, −1, 0, 1}
range: {−4, −2, 0, 2}

7.
This is not a function because it fails the vertical line test. There is at least one value of x that has more than one corresponding y-value. For example, $x = 0$ has two solutions, $y = 5$ and $y = -4.6$.

8.
Sample: No, the first ordered pair, in function notation, is written as $f(-2) = 4$, which means that when −2 is the input value, 4 is the output value. The second ordered pair, written in function notation, is $f(4) = -2$, which means that when 4 is the input value, −2 is the output. (Note: the words input and output can be replaced with x and y.)

9.
$-5y = -6x + 2$
$y = \frac{-6x+2}{-5}$

10.
{0, 2, 3, 3, 3, 4, 5, 7}
min = 0, Q1 = 2.5, Q2 (med) = 3, Q3 = 4.5, max = 7
Q3 – Q1 = 4.5 – 2.5 = 2
IQR = 2

11. D
$f(x) = 12x - 7$
A. -7
B. $\frac{1}{2}$
C. 7
D. 14

Distractor Rationale:
A. This is the y-intercept
B. This is the slope
C. This ignores the sign of the y-intercept or forgets to multiply the x-intercept by 2 when solving for x.
$f(x) = \frac{1}{2}x - 7$
x-intercept: $(a, 0)$
$0 = \frac{1}{2}a - 7$
$7 = \frac{1}{2}a$
$14 = a$

12. B

A. $\{\frac{1}{2}, 1, \frac{5}{4}\}$

B. $\{-\frac{1}{2}, 1, \frac{5}{4}\}$

C. $\{-\frac{1}{2}, 1, \frac{4}{5}\}$

D. $\{\frac{1}{2}, 1, 5\}$

Distractor Rationale:

A. The sign of $\frac{1}{2}$ is incorrect

C. $\frac{4}{5}$ is not an element of the range given the domain.

D. $\frac{1}{2}$ and 5 are not elements of the range given the domain.

$h(x) = \frac{1}{2}x + 1$

$h(-3) = \frac{1}{2}(-3) + 1$	$-\frac{3}{2} + 1$	$-\frac{1}{2}$
$h(0) = \frac{1}{2}(0) + 1$	$0 + 1$	1
$h(\frac{1}{2}) = \frac{1}{2}(\frac{1}{2}) + 1$	$\frac{1}{4} + 1$	$\frac{5}{4}$