Part A: Continuous and Discrete Functions

Practice 1

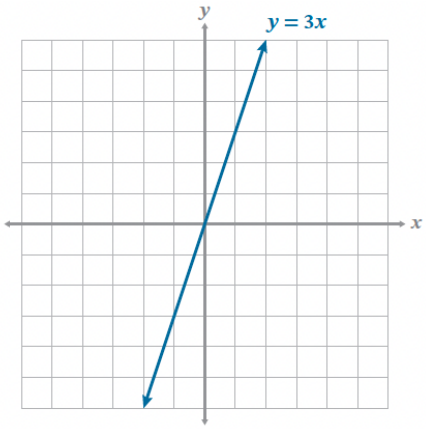
1. C
domain: [0, 4)
range: [−2, 2]

2. A
domain: (−∞, ∞)
range: (−∞, 0]

3. B
domain: [−2, 4]
range: [−3, 3]

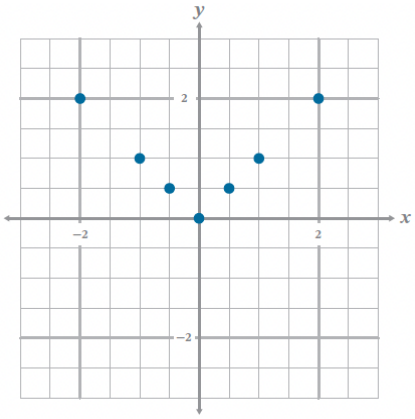
4.
No, Graph 3 fails the vertical line test so it is not a function. Graphs 1 and 2 are functions because they pass the vertical line test. This refers back to Lesson 7.

5.



domain: (−∞, ∞)
range: (−∞, ∞)

6.



domain: $\{-2, -1, -\frac{1}{2}, 0, \frac{1}{2}, 1, 2\}$

range: $\{0, \frac{1}{2}, 1, 2\}$

7.
Continuous: the domain is continuous over the interval.

8.
Discrete: The domain is a set of points. The graph will also be a set of points.

9.
Continuous: The domain is time, and time is continuous.

10.
Discrete: plants are a counted value.

11.
slope intercept form (hour, inch) $m = \frac{1}{2}$, $b = 2$

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

This is a continuous function because snow can be measured at any time and can be any fraction of an inch in height.

12.
Point-slope, (minutes, boxes) (8, 12), (28, 42)

$m = \frac{(42 - 12)}{(28 - 8)} = \frac{30}{20} = \frac{3}{2}$

$y - 42 = \frac{3}{2}(x - 28)$

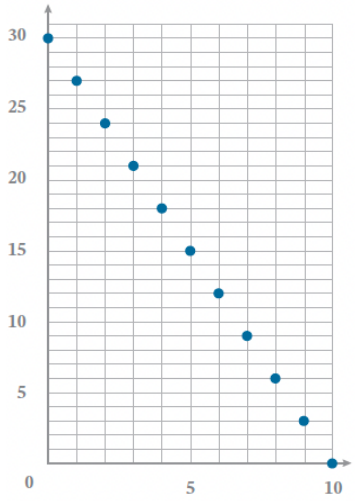
This is a discrete function because the whole box needs to be packed before it can be shipped.

13.
Slope-intercept, (hour, repair cost), $m = 49$, $b = 175$

$y = 49x + 175$

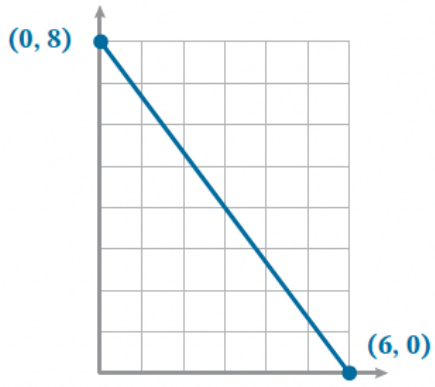
This is a continuous function because the shop can charge for part of an hour to complete the repairs.

14.
Slope-intercept form (day, money spent), $b = 30$, $m = -3$
$y = -3x + 30$
This is a discrete function because he is spending an exact amount each day and you cannot buy a part of a cup of coffee.



Hector will buy his last cup of coffee on day 10. The x-intercept is (10,0) which means on day 10, Hector has $0.

15.
standard form (pound, $) g = grapes, a = apples
$4g + 3a = 24$
This is a continuous function because you can purchase any combination of apples and grapes that fall on the graphed line.



Practice 2

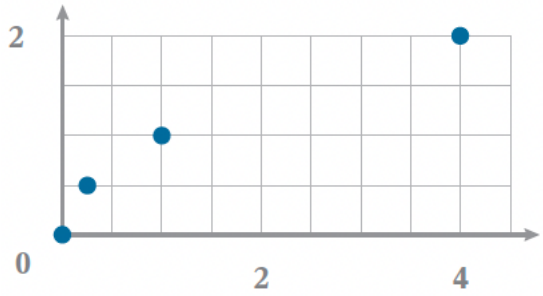
1. B
domain: $[-2, 2]$
range: $[-1, 3]$

2. C
domain: $(-\infty, 0]$
range: $(-\infty, \infty)$

3. A
domain: $(-\infty, \infty)$
range: $(-\infty, \infty)$

4.
No, Graph B (Q1) and C (Q2) fail the vertical line test so it is not a function. Graph A (Q3) is a function because it passes the vertical line test.

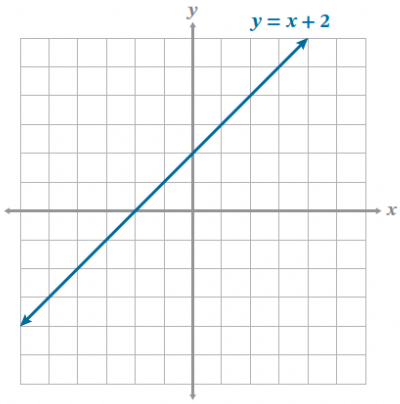
5.



domain: $\{0, \frac{1}{4}, 1, 4\}$

range: $\{0, \frac{1}{2}, 1, 2\}$

6.



domain: $(-\infty, \infty)$
range: $(-\infty, \infty)$

7.
Discrete: The domain is a set of points. The graph will also be a set of points.

8.
Continuous: the domain is continuous over the interval.

9.
Continuous: Partial speeds (47.62 mph) are possible.

10.
Discrete: Amount of questions can be counted.

11.
Slope-intercept (people, money), $m = 25$, $b = 500$
$y = 25x + 500$

12.
$(40, y)$
$y = 25(40) + 500$
$y = 1000 + 500$
$y = 1500$
The cost for 40 people will be $1500.

13.
Slope-intercept, (minutes, elevation in feet), $b = 14{,}360$ or $(0, 14360)$, $(75, 3110)$
$m = \frac{(14{,}360 - 3{,}110)}{(0 - 75)} = \frac{11{,}250}{-75} = -150$
$y = -150x + 14{,}360$

14.
The rate of change means that they descend 150 feet every minute.
−150 feet per minute

15.
Standard form, (songs, movies)
$x + 5y = 24$
$(0, y)$
$0 + 5y = 24$
$5y = 24$
$y = \frac{24}{5} = 4.8$
Brooke can purchase a maximum of 4 movies if she purchases 0 songs. This needs to be rounded down because 5 movies would be $25, which is over her budget.

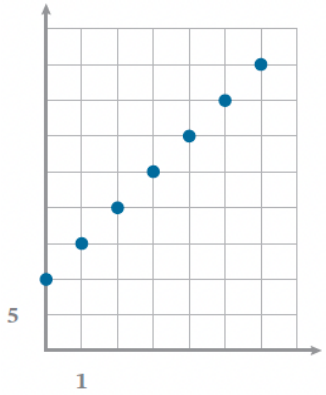
16.
$(9, 3)$
$(9) + 5(3) = 24$
$9 + 15 = 24$
Brooke would be able to purchase this combination of songs and movies because it is exactly $24.

17.
Point-slope, (day, money), $m = 17$, $(9, 283)$
$y - 283 = 17(x - 9)$
This is a discrete function because you have to rent a car for a number of days.

18.
The fee would be the y-intercept because this is the starting value for the equation.
$(0, y)$
$y - 283 = 17(0 - 9)$
$y = 17(-9) + 283$
$y = 130$
The rental fee is $130.

19.
This is a discrete function because fees are only charged once a month.

20.
Slope-intercept form, (month, $ money), $m = 5$, $b = 10$
$y = 5x + 10$



21.
The second quadrant has negative x-coordinates. The variable x represents time in months, and it is not possible to go backwards in time to join a gym.

22.
$(x, 65)$
$65 = 5x + 10$
$55 = 5x$
$x = 11$
Nicole would not be able to have a full year gym membership because there are 12 months in a year and her budget only allows for 11 months.

Part B: Arithmetic Sequences
Practice 1
1. not arithmetic

2. arithmetic,
$d = 2$. $a_5 = 10$, $a_6 = 12$, $a_7 = 14$

3. arithmetic,
$d = -0.5$. $a_5 = 4$, $a_6 = 3.5$, $a_7 = 3$

4. not arithmetic

5.
$a_1 = 2$
$d = -3$
$a_n = 2 - 3(n - 1)$
$a_5 = 2 - 3(5 - 1) = 2 - 3(4) = -10$
$a_{10} = 2 - 3(10 - 1) = 2 - 3(9) = -25$
$a_{12} = 2 - 3(12 - 1) = 2 - 3(11) = -31$

6.
$a_1 = -5$
$d = \frac{1}{3}$
$a_n = -5 + \frac{1}{3}(n - 1)$
$a_5 = -5 + \frac{1}{3}(5 - 1) = -5 + \frac{1}{3}(4) = -5 + \frac{4}{3} = -\frac{11}{3}$ or $-3\frac{2}{3}$
$a_{10} = -5 + \frac{1}{3}(10 - 1) = -5 + \frac{1}{3}(9) = -2$
$a_{12} = -5 + \frac{1}{3}(12 - 1) = -5 + \frac{1}{3}(11) = -5 + \frac{11}{3} = -\frac{4}{3}$ or $-1\frac{1}{3}$

7.
$\{1, -1, -3, -5\}$

8.
$\{1, 2, 3, 4\}$

9.
$a_1 = 1, d = -2$
$a_n = 1 - 2(n - 1)$

10.
$a_n = 1 - 2(n - 1)$
$a_n = 1 - 2n + 2$
$a_n = -2n + 3$

$y = -2n + 3$
$f(x) = -2n + 3$

11.
$a_n = a_1 + d(n - 1)$
$5 = a_1 + \frac{1}{3}(7 - 1)$
$5 = a_1 + \frac{1}{3}(6)$
$5 = a_1 + 2$
$a_1 = 3$

12.
$d = -4$, $a_{11} = -2$
$a_n = a_1 + d(n - 1)$
$-2 = a_1 - 4(11 - 1)$
$-2 = a_1 - 4(10)$
$-2 = a_1 - 40$
$a_1 = 38$

13.
{2, 5, 8, ...}

14.
$a_1 = 2$, $d = 3$
$a_n = 2 + 3(n - 1)$

15.
$a_{12} = 2 + 3(12 - 1)$
$a_{12} = 2 + 3(11)$
$a_{12} = 35$

16.
$a_n = 32$, $d = 32$
$a_n = 32 + 32(n - 1)$

17.
$a_{15} = 32 + 32(15 - 1)$
$a_{15} = 32 + 32(14)$
$a_{15} = 480$
Eliza will have moved 480 pounds total.

Practice 2

1.
not arithmetic

2.
not arithmetic

3.
arithmetic,
$d = -1$. $a_5 = -5$, $a_6 = -6$, $a_7 = -7$

4.
arithmetic,
$d = -5$. $a_5 = 0$, $a_6 = -5$, $a_7 = -10$

5.

$a_n = 26 - \frac{1}{2}(n - 1)$

$a_5 = 26 - \frac{1}{2}(5 - 1) = 26 - \frac{1}{2}(4) = 24$

$a_{10} = 26 - \frac{1}{2}(10 - 1) = 26 - \frac{1}{2}(9) = \frac{43}{2}$ or $21\frac{1}{2}$

$a_{12} = 26 - \frac{1}{2}(12 - 1) = 26 - \frac{1}{2}(11) = \frac{41}{2}$ or $20\frac{1}{2}$

6.

$a_n = -5 + 4(n - 1)$

$a_5 = -5 + 4(5 - 1) = -5 + 4(4) = 11$

$a_{10} = -5 + 4(10 - 1) = -5 + 4(9) = 31$

$a_{12} = -5 + 4(12 - 1) = -5 + 4(11) = -39$

7.

$a_1 = 201,\ d = 7, a_n = 264$

$a_n = a_1 + d(n - 1)$

$a_n = 201 + 7(n - 1)$

$264 = 201 + 7n - 7$

$264 = 7n + 194$

$70 = 7n$

$n = 10$

$a_{10} = 264$

8.

$d = 22, a_1 = 13{,}426$

$a_n = 13{,}426 + 22(45 - 1)$

$a_n = 13{,}426 + 22(44)$

$a_n = 14{,}394$

9.

$d = -0.25, a_{21} = 6$

$6 = a_1 - 0.25(21 - 1)$

$6 = a_1 - 0.25(20)$

$6 = a_1 - 5$

$a_1 = 11$

10.

$d = 4, a_1 = 10$

$a_n = 10 + 4(n - 1)$

11.

$a_n = 10 + 4(n - 1)$

$a_n = 10 + 4n - 4$

$a_n = 4n + 6$

$y = 4n + 6$

12.

Both d and m show the change in y over the change in x, or the slope.

13.

{see student work, terms should increase by $\frac{1}{5}$ each time}

14.

$a_n = a_1 + \frac{1}{5}(n - 1)$, a_1 will be determined by the sequence your student wrote in part a.

15.

Your student should substitute 9 for n and solve for a_n.

Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	10	11	10	11	7	12	10	10	13	7	13	10

1.

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

$y - y_1 = m(x - x_1)$

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

$y = 3x + 9 + 1$

$y = 3x + 10$

2.

$-3y = -2x - 6$

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

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

3.

Tripp is the faster painter. He paints pictures three times faster than Rook.

4.

$x = 4$ (vertical), $y = 5$ (horizontal)

5.

Yes, for every input (x) there is only one output (y).

6.

$y = -\frac{1}{4}x + 11$, through $(-3, 8)$;

$m = -\frac{1}{4} \perp \underline{m = 4, (-3, 8)}$

$y - 8 = 4(x - (-3))$

$y - 8 = 4x + 12$

$y = 4x + 20$

7.
(week, money remaining), $m = -25$, $b = 500$
Jimena was given \$500 to start the semester (0, 500). She spends \$25 per week on lunch or $m = \frac{-25}{1}$.

8.
Point-slope form, (weeks, money saved)
$m = 20$, (6, 520)
$y - 520 = 20(x - 6)$

9. D
A. $r = -0.91$
B. $r = -0.42$
C. $r = 0.43$
D. $r = 0.91$

Distractor Rationale:
A and B represent a negative correlation when the graph shows a positive correlation.
B and C represent a weak correlation when this is a strong correlation.

10. A
A. (2, −3)
B. (2, 1)
C. (2, 0)
D. (2, 3)

Distractor rationale:
B (common error: taking the constants to form an ordered pair)
C (common error: thinking the coefficient of x will be the correct solution)
D (common error: not checking the signs of the values)

(2, −3): $2(2) + (-3) = 1$	$4 - 3 = 1$	$1 = 1$
(2, 1): $2(2) + 1 = 1$	$4 + 1 = 1$	5 not equal 1
(2, 0): $2(2) + 0 = 1$	4 not equal 1	
(2, 3): $2(2) + 3 = 1$	$4 + 3 = 1$	7 not equal 1

11. A
A. $y = -0.1x + 1.15$
B. $y = -10x + 1.15$
C. $y = 0.1x + 1.15$
D. $y = 10x + 15$

Distractor Rationale:
B and D have slopes too large for the scale of the graph.
C and D represent positive slopes when the scatter plot has negative correlation.

12. B

A. $y = \frac{4}{3}x$

B. $y = \frac{3}{4}x$

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

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

Distractor Rationale:
A and C incorrectly calculate slope as run over rise.
C and D represent a negatively sloped function.
Using the points (0, 0) and (4, 3)

$m = \frac{(3-0)}{(4-0)} = \frac{3}{4}$

$b = 0$

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