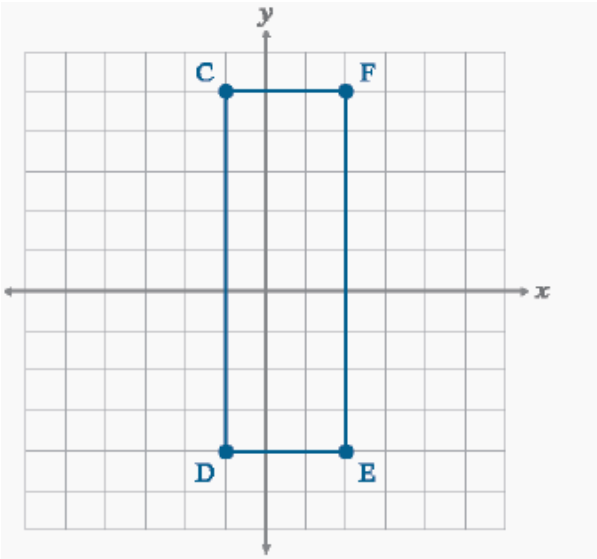
Part A: Relations and Functions

Practice 1

1.



Point D: $(-1, -4)$

2.

vertical: $\overline{CD}$ or $\overline{EF}$

horizontal: $\overline{CF}$ or $\overline{DE}$

3.

domain: {−4, −2, 0, 2, 4}

range: {0, 2, 4, 6, 8}

4.

x	y
−4	8
−2	6
0	4
2	2
4	0

5.

domain: {−1, 0, 1, 2}

range: {−3, −2, −1, 0, 3}

6.

x	y
−1	−3
0	−2
1	−1
1	3
2	0

7.
A. This is a function because it passes the vertical line test.
B. {(−4,0), (−1, −1) , (0, 0), (2, −1)}

8.
A. This is not a function. It fails the VLT when $x = 3$.
B. {(3,−1), (6, 4), (−2, 5), (−3, 2), (3, 0)}

9.
Problem 7 represents a function.
domain: {−4, −1, 0, 2}
range: {−1, 0}

10.
The x-coordinate represents the domain value. Other names for the domain include the x-value or input.

11.
Sample: If all x-values are unique (do not repeat), then the relation is a function.

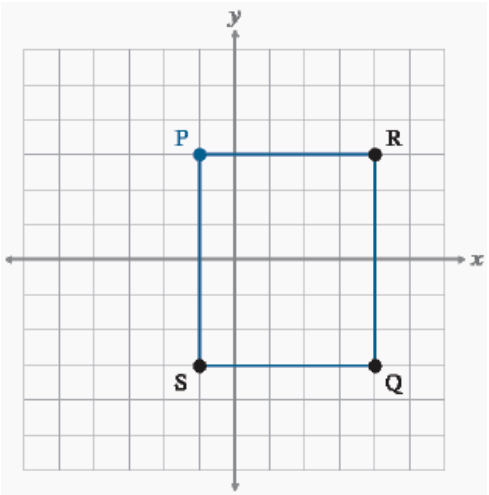
12.
Sample: This is a function because the domain does not repeat.
domain: $\{-2, -1, -\frac{1}{2}, 0, \frac{1}{2}, 1, 2\}$
range: $\{0, \frac{1}{2}, 1, 2\}$

13.
This is not a function because it fails the vertical line test.

14.
This is a function because all the domain values are unique.
domain: {−4, −2, 0, 2, 4}
range: {5}

Practice 2

1.



Point P: (–1, 3)

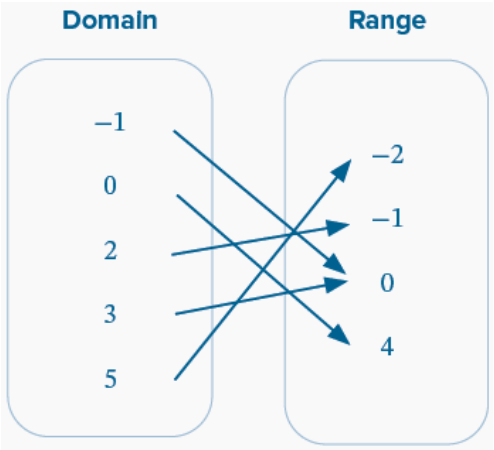
2.

vertical: $\overline{PS}$ or $\overline{QR}$
horizontal: $\overline{PR}$ or $\overline{QS}$

3.

domain: {–1, 0, 2, 3, 5}
range: {–2, –1, 0, 4}

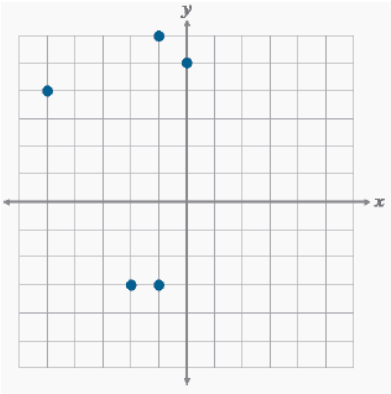
4.



5.

domain: {–5, –2, –1, 0}
range: {–3, 4, 5, 6}

6.



7.
A. This is a function because it passes the VLT (or domain values are unique/do not repeat).
B. R: {(−2, 1), (4, 3), (5,−2), (6, 2)}

8.
A. This graph fails the vertical line test when $x = -3$. Therefore, it is not a function.
B. R: {(−5, 6), (−3,1), (−3, 2), (3, 6), (9, 4)}

9.
Problem 7 represents a function.
domain: {−2, 4, 5, 6}
range: {−2, 1, 2, 3}

10.
The y-coordinate represents the range value.

11.
Sample: If the relation only has one arrow from each input (domain) to any output (range), then it is a function.

12.
Sample: This is not a function because the domain repeats for each range value.

13.
Sample: This is a function because the domain values are unique.
domain: $\{-4, -2, 0, \frac{1}{2}, 2\}$
range: $\{-2, 0, 2, \frac{5}{2}, 4\}$

14.

Sample: This is a function because the domain does not repeat.
domain: {–3, –2, –1, 0, 2}
range: {–1, 0, 2, 3}

Part B: Understanding Functions

Practice 1

1.
You can replace y with $f(x)$.

2.
$f(x) = \frac{3}{4}x - 2$

3.
$f(x) = -x$

4.
$g(x) = 10x$

5.
$g(x) = \frac{5}{8}x + \frac{17}{8}$

6.
$y = -6x + 11$

7.
$y = \frac{4}{3}x - 2$

8.
A. Dependent variable: m
Independent variable: p
B. (people attending, money collected), (p, m)
C. The money collected *depends* on the number of people attending.

9.
A. Dependent variable: w
Independent variable: r
B. (rate water running, water used), (r, w)
C. The water used *depends* on the rate the water is running.

10.

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

$g(0) = -\frac{1}{2}(0) + 1 = 1$

$g(1) = -\frac{1}{2}(1) + 1 = \frac{1}{2}$

$g(2) = -\frac{1}{2}(2) + 1 = 0$

x	$g(x)$
−1	$\frac{3}{2}$
0	1
1	$\frac{1}{2}$
2	0

11.

$h(-1) = 5 - (-1) = 6$

$h(0) = 5 - (0) = 5$

$h(1) = 5 - (1) = 4$

$h(2) = 5 - (2) = 3$

x	$h(x)$
−1	6
0	5
1	4
2	3

12.

$f(-8) = \frac{5}{8}(-8) + \frac{17}{8} = -\frac{23}{8}$

$f(0) = \frac{5}{8}(0) + \frac{17}{8} = \frac{17}{8}$

$f(1) = \frac{5}{8}(1) + \frac{17}{8} = \frac{22}{8} = \frac{11}{4}$

$f(8) = \frac{5}{8}(8) + \frac{17}{8} = \frac{57}{8}$

x	$f(x)$
−8	$-\frac{23}{8}$
0	$\frac{17}{8}$
1	$\frac{11}{4}$
8	$\frac{57}{8}$

13.
$f(2) = 3(2) - 2 = 6 - 2 = 4$
$f(-1) = 3(-1) - 2 = -3 - 2 = -5$
$f(5) = 3(5) - 2 = 15 - 2 = 13$

$f(3) = 3(3) - 2 = 9 - 2 = 7$
$f(3) = 9$ is *not* a solution to this function because it does not follow the function rule.

14.
$g(2) = (2)^2 = 4$
$g(-1) = (-1)^2 = 1$
$g(5) = (5)^2 = 25$

15.
A. (hour, miles) OR (time, distance)
B. $d(0.5) = 5(0.5) = 2.5$
$d(1.5) = 5(1.5) = 7.5$
$d(2) = 5(2) = 10$

Practice 2

1.
y; this is the dependent variable.

2.
$f(x) = x - 3$

3.
$f(x) = \frac{2}{5}x + \frac{1}{2}$

4.
$g(x) = 1.25x + 2650$

5.
$g(x) = -8x$

6.
$y = x$

7.
$y = 7.25x$

8.
A. Dependent variable: p
Independent variable: h
B. (hours worked, amount paid), (h, p)

C. The amount you get paid *depends* on the hours you work.

9.

A. Dependent variable: v
Independent variable: a

B. (angle of incline, velocity of ball), (a, v)

C. The velocity of the ball *depends* on the angle of incline.

10.

$f(-4) = 10(-4) = -40$

$f(\frac{1}{2}) = 10(\frac{1}{2}) = 5$

$f(8) = 10(8) = 80$

x	$f(x)$
-4	-40
$\frac{1}{2}$	5
8	80

11.

$f(-4) = \frac{3}{4}(-4) - 2 = -5$

$f(\frac{1}{2}) = \frac{3}{4}(\frac{1}{2}) - 2 = -\frac{13}{8} = -1\frac{5}{8}$ (improper is fine)

$f(8) = \frac{3}{4}(8) - 2 = 4$

x	$f(x)$
-4	-5
$\frac{1}{2}$	$-\frac{13}{8}$
8	4

12.

$h(-3) = \frac{-3}{3} = -1$

$h(-2) = \frac{-2}{3}$

$h(-1) = \frac{-1}{3}$

$h(0) = \frac{0}{3} = 0$

$h(1) = \frac{1}{3}$

x	$h(x)$
-3	-1
-2	$-\frac{2}{3}$
-1	$-\frac{1}{3}$
0	0

1	$\frac{1}{3}$

13.

$f(2) = \frac{4}{3}(2) = \frac{8}{3}$

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

$f(6) = \frac{4}{3}(6) = 8$

$f(3) = \frac{4}{3}(3) = 4$

$f(-3) = \frac{4}{3}(-3) = -4$

The ordered pair $(-3, -4)$ is a solution because it follows the function rule.

14.

$g(0) = \sqrt{0} = 0$

$g(4) = \sqrt{4} = 2$

$g(6) = \sqrt{6}$

15.

A. (rope jumped, donation), (r, d)

B. $d(r) = \$0.50r$

$d(50) = \$0.50(50) = \$25.00$

$d(100) = \$0.50(100) = \$50.00$

$d(275) = \$0.50(275) = \$137.50$

C. $d(r) = \$0.50r$

$d(1{,}000) = \$0.50(1{,}000) = \$500$

Tristan is incorrect. The function rule says he will earn \$500 not \$5,000.

Targeted Review

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

1.

$2(n - 7) = \frac{3}{4}n + \frac{7}{2}$

$2n - 14 = \frac{3}{4}n + \frac{7}{2}$

$4(2n - 14) = 4(\frac{3}{4}n + \frac{7}{2})$

$8n - 56 = 3n + 14$

$5n - 56 = 14$

$5n = 70$

$n = 14$

Multiplying through by the LCD is not required but can be helpful.

2.

$-\frac{1}{2}x - 4 \geq 3$ OR $\frac{1}{3}x + 5 > 2$

$-\frac{1}{2}x \geq 7$ OR $\frac{1}{3}x > -3$

$x \leq -14$ OR $x > -9$

3.

$72\ \text{cm}^2 \left(\frac{1\ in}{2.54\ cm}\right)^2 = 11.1\ldots\ \text{in}^2 \approx 11\ \text{in}^2$

4.

$$\frac{3}{8} = \frac{x}{2x+3}$$
$$3(2x + 3) = 8x$$
$$6x + 9 = 8x$$
$$9 = 2x$$
$$x = \frac{9}{2}$$

5.

Point A: (2, 3); QI
Point B: (−3, 2); QII
Point C: (1, −1); QIV
Point D: (−3, −2); QIII
Point E: (4, −1); QIV
Point F: (5, 6); QI

6.

(0, 6): G; on the y-axis
(−2, 0): M; on the x-axis
(−4, 4): R; QII
(2, −4): L; QIV
(0, 0): O; the origin
(−4, −4): K; QIII

7.

sometimes

8.

never

9.
ordered data set :{20, 21, 23, 24, 25, 26, 27, 29, 30}
Min: 20
Q1: 22
Med: 25
Q3: 28
Max: 30

10.
IQR: 28 – 22 = 6
lower < 22 – 1.5(6)
lower < 13
upper > 28 + 1.5(6)
upper > 37
This data set contains no outliers.

11.
$5x - \frac{2}{3}y = -4$
$\frac{-2}{3}y = -5x - 4$
$\frac{-3}{2}(\frac{-2}{3}y) = \frac{-3}{2}(-5x - 4)$
$y = \frac{15}{2}x + 6$

12. A
A. The mean will decrease.
B. The mean will increase.
C. The mean will stay the same.
D. Not enough information.
Distractor Rationale:
B. The mean cannot increase when the new element is less than the current mean.
C. The mean would stay the same if the new element was the same as the current mean.

13. B
A. 3
B. 300
C. 413
D. 800
Distractor Rationale:
A. This is the number of drivers in the ratio without using any other information in the problem.
C. This is the solution if you use $\frac{8}{3} = \frac{1{,}100}{x}$ rather than $\frac{11}{3} = \frac{1{,}100}{x}$.
D. This is the number of bus riders rather than drivers.
$\frac{drive}{total} = \frac{3}{11}$
$\frac{3}{11} = \frac{d}{1{,}100}$
$3{,}300 = 11d$

$300 = d$