

Chapter 1 – Expressions, Equations, and Functions

1.1 Variable Expressions

Answer Key

Answers

1. x
2. x
3. x
4. x
5. x or x
6. $\$2000x$ or $\$2000x$
7. $\$1.50x$
8. $50x$ or $50x$
9. $\$500 + \$100x$
10. $\$50 + \$0.25x$
11. six times x
12. four plus x minus six
13. sixteen squared
14. x divided by three minus eight
15. 225 raised to the $\frac{1}{2}$ power

1.2 Expressions with One or More Variables

Answers

1. $2(11\overline{2})$

2. $1.35\overline{2}$

3. $3(\frac{1}{4})$

4. $\frac{1}{4}\overline{2}$

5. $5(3) + 7 = 22$

6. $(\frac{1}{3})63 = 21$

7. $\$8.15(40) = \326

8. $\frac{43-11}{8} = 4$

9. $(-2)^2 + 3(-3) = -5$

10. $2(-3) + 3(2) = 0$

11. $4(5) + (-4) = 16$

12. $5(-3)(5) - 2(2) = -79$

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

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

15. $\frac{(-3)-4(2)}{3(5)+2(-4)} = -\frac{11}{7}$

16. $\frac{1}{-3+2} = -1$

17. $\frac{(-3)(2)}{(5)(-4)} = \frac{3}{10}$

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Answer Key

18. $8(-1)^3 = -8$

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19. $\frac{5(-1)^2}{6(-3)^3} = -\frac{5}{162}$

20. $3(-3)^2 - 5(4)^2 = -53$

21. $(-1)^2 - (2)^2 = -3$

22. $\frac{(-3)^3+(4)^3}{(-3)^3-(4)^3} = -\frac{37}{91}$

23. $2(-1)^2 - 3(-1)^2 + 5(-1) - 4 = -10$

24. $4(4)^3 + 3(4)^2 - 4 + 2 = 302$

25. $3 + \frac{1}{(-3)^2} = 3\frac{1}{9}$

26. $2(1.25)(3.14) = 7.85$

27. $(8.5)(11) = 93.50$

28. $16(\$0.99) = \15.84

29. $\frac{\$124}{\$4.75} = 26.1$ hours

30. $(10.5)^2 = 110.25$ miles

1.3 PEMDAS**Answers**

1. $8 - (19 - (2 + 5) - 7) = -11$

2. $2 \times 7 \times 11 - 12 \div 3 = 150$

3. $(3 + 7) \div (7 - 12) = -2$

4. $8 \times 5 + 6^2 = 76$

5. $9 \div 3 \times 7 - 2^3 + 7 = 20$

6. $8 + 12 \div 6 + 6 = 16$

7. $(7^2 - 3^2) \div 8 = 5$

8. $2(5)^5 = 50$

9. $3(5)^2 + 2(5) + 1 = 86$

10. $(1^2 - 2)^2 = 1$

1.4 Algebra Expressions with Fraction Bars

Answers

1. $\frac{2(3+(2-1))}{4-(6+2)} - (3 - 5) = 0$

2. $\left(\frac{(2+3)^2}{3-8}\right) - \left(\frac{3(10-4)}{7-4}\right) = -11$

3. $\frac{(6)(12)}{6+12} = 4$

4. $\frac{4(2)}{9(2)^2-3(2)+1} = \frac{8}{31}$

5. $\frac{4^2}{1+(-2)} + \frac{1^2}{1-(-2)} = -\frac{47}{3} = -15\frac{2}{3}$

6. $\frac{4(3)(2)(5)}{2^2-3^2} = -24$

7. $\frac{(-1)^2-(3)^2}{(-1)(3)-2(-1)(3-(-1))} = -\frac{8}{5}$

8. $\frac{(4)^2(18)}{3} = 96$

9. $\frac{10^2(50)}{3} = \frac{5000}{3} = 1666\frac{2}{3}$

10. $\frac{12^2(7)}{3} = 336$

11. $\frac{13^2(27)}{3} = 1521$

12. $\frac{16^2(90)}{3} = 7680$

1.5 Calculator use with Algebra Expressions**Answers**

1. $(250)^2 + 2(250) - (250)(-120) = 93,000$

2. $((0.02)(-0.025) - (0.025)^4)^2 = 2.5 \times 10^{-7}$

3.
$$\frac{\frac{1}{2} + \frac{3}{2} - (-1)}{\left(\frac{1}{2}\right)\left(\frac{3}{2}\right) + \left(\frac{3}{2}\right)(-1) + \left(\frac{1}{2}\right)(-1)} = -\frac{12}{5}$$

4.
$$\frac{(3 + (-5\boxed{2}))^2}{4(3)^2 - (-5\boxed{2})^2} = \frac{(3 - 5\boxed{2})^2}{36 - 25\boxed{2}^2} = \frac{-25\boxed{2}^2 + 30\boxed{2} - 9}{25\boxed{2}^2 - 36}$$

5. $\boxed{2} = \frac{4}{3}(\boxed{2})(9)^3 = 3,053.63\boxed{2}\boxed{2}$

6. $5 - 2 \cdot (6 - (4 + 2)) = 5$

7. $12 \div 4 + (10 - 3 \cdot 3 + 7) = 11$

8. $(22 - 32 - 5) \cdot (3 - 5) = 30$

9. $12 - (8 - 4) \cdot 5 = -8$

1.6 Patterns and Expressions

Answers

1. $x + 16$

2. $\frac{x}{8}$

3. $x - 42$

4. $3x$

5. $x - 7$

6. $x - 5.8$

7. $5x + 6$

8. $\frac{6}{x-12}$

9. $\frac{x}{-11}$

10. $4x - 27$

11. $\frac{9.6}{x}$

12. $10x - 2$

13. $\frac{x}{5x}$

14. $x - 35$

15. $(6)(-9)(x)$

16. Nine less than J .

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Answer Key

17. The quotient of n and fourteen.

18. Seventeen minus a .

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19. Sixteen less than the product of three and l .
20. One-half of the product of h and b .
21. The quotient of b and three, added to the quotient of z and two.
22. Four-point-seven minus the product of two and f .
23. The sum of five-point-eight and k .
24. The product of two and l , added to the product of two and w .
25. $\square = \frac{\$14.50}{\square}$
26. $\square = \square^2$
27. $\square = 15\square$
28. $\square = 16 - \square$
29. (Answers may vary) How tall would you be if you grew nine inches?
30. (Answers may vary) $\frac{7}{\square}$ is the inverse of $\frac{\square}{7}$.

1.7 Words that Describe Patterns

Answers

1. The company packages 43 games each day, plus 22 for each additional part-time worker hired.
 $\square = 43 + 22\square$
2. Employees make \$8 each day for travel expenses, plus \$7 for each hour worked. $\square = 8 + 7\square$
3. Two bacteria develop in the first hour and the number doubles each hour thereafter. $\square = 2^\square$
4. a) $\square = 2^\square$,
b) $2^{17} = 131,072$
5. $\square = \$20\square : \square = \$20(2,518) = \$50,360$

1.8 Equations that Describe Patterns

Answers

- Let x be the number of yards. $\$25 = \$10 + \$0.20x$
- Let x be the number of people. $\$324 = \$200 + \$4x$
- Let x be the number of miles. $\$100 = \$55 + \$0.45x$
- TRUE : $-12 + 3 = -9$
- FALSE : $\frac{3}{4}(\frac{4}{3}) + \frac{1}{2} \neq \frac{3}{2}$
- TRUE : $2.5(2) - 10.0 = -5.0$
- FALSE : $2(5 - 2(-5)) \neq 20 - 2((-5) - 1) : 2(15) \neq 20 - 10$
- $x = 7$
- $x = 16$
- $x = 8$
- $x = 101$
- $x = -348$
- $x = 5x : x = 5 * 7 = 35$ sliders
- $x = .27x : \$15,000 = .27x : x = \$55,555.56$
- $\$25 = \$1.75x : x = 14.3$ They can purchase 14 orders

1.9 Inequalities that Describe Patterns

Answers

1. A solution is the value or set of values that make a statement true.
2. An algebraic equation contains a variable and an equals sign : $x = 5$. An algebraic inequality contains a variable and an inequality sign : $x > 5$
3. $>, <, \neq, \leq, \geq$
4. Let x be the number of bus passengers : $x \leq 65$
5. Let x be the smaller integer : $x + (x + 1) < 54$
6. Let x be the amount invested : $0.05x \geq \$250$
7. Let x be the number of hamburgers : $\$0.49x \leq \3.00
8. TRUE : $2(12 + 6) \leq 8(12) : 36 \leq 96$
9. FALSE : $1.4(-9) + 5.2 > 0.4(-9) : -7.4 < -3.6$
10. FALSE : $-\frac{5}{2}(40) + \frac{1}{2} < -18 : 0.55 > -18$
11. TRUE : $80 \geq 10(3(0.4) + 2) : 80 \geq 32$
12. Answers may vary, but should total less than \$25, given each burger costs \$2.50 and each order of French fries costs \$1.75.
13. $\$1.59x < \$7.00 : x < 4.4$. If $x = 4$, then the cost is \$6.36, if $x = 5$, then the cost is \$7.95
14. $\$1000 + 0.06x > \$1200 + 0.05(x - 2000) : x > \$10,000$

1.10 Function Notation**Answers**

1. $f(x) = \frac{5}{6}x - 2$
2. $f(x) = x^2 + 2x - 3$
3. It allows the user to more easily differentiate between multiple applications of the same equation.
4. $f(x) = \$10x$
5. $f(x) = x - 1$
6. $f(x) = 2x : g(x) = 2x$, where x = the number of baskets Mayra makes and x = the number that Jackie makes.

1.11 Domain and Range of a Function

Answers

- The *domain* is the set of all input values of a function.
- FALSE : The *range* is the set of all possible **outputs** for the given variable.

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

x	$f(x)$
-5	-27
-4	-18
-3	-11
-2	-6
-1	-3
0	-2
1	-3
2	-6
3	-11
4	-18
5	-27

- $x \geq 0, y \geq 0$
- $x \geq 0, y \geq 15$
- $-\infty < x < \infty, -\infty < y < \infty,$
- $-\infty < x < \infty, y \geq 5$
- $-\infty < x < \infty : x \neq 0, -\infty < y < \infty : y \neq 0$

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9. Answers will vary : John makes $\$1/\sqrt{x}^2$ for mowing lawns, rounded to the nearest square yard.

10. $\sqrt{x} = \{-1, -4, -5, -4, -1\}$

11. $\sqrt{x} = \{-\frac{23}{4}, \frac{9}{4}, \frac{37}{4}\}$

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12.

Hours	5	10	15	20	25	30
Earnings	\$32.50	\$65.00	\$97.50	\$130.00	\$162.50	\$195.00

13.

Height	1 cm	2 cm	3 cm	4 cm	5 cm	6 cm
Area	4 cm ²	8 cm ²	12 cm ²	16 cm ²	20 cm ²	24 cm ²

14.

\square	-1	0	1	2	3	4	5
$\square(\square)$	1	$\sqrt{3}$	$\sqrt{5}$	$\sqrt{7}$	$2\sqrt{3}$	$\sqrt{11}$	$\sqrt{13}$

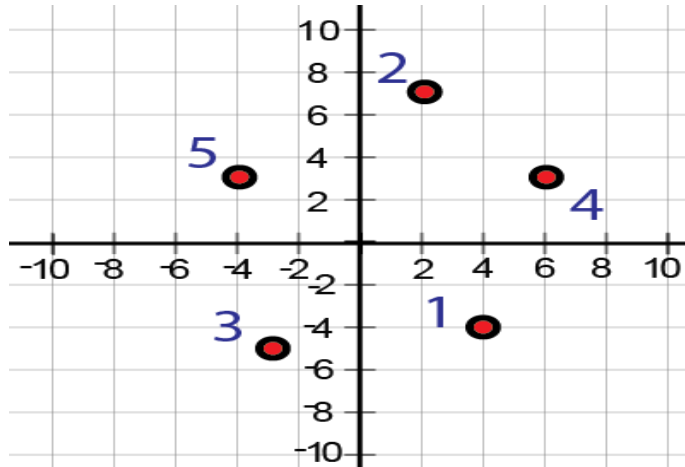
1.12 Functions that Describe Situations**Answers**

- a) $f(x) = \$515.85 + \$62x$
b) No, not a continuous function, and no negative weeks.
c) $\$515.85 + \$62x = \$1,795 : x \approx 20.63$ It would take 21 weeks
- $f(x) = x^2$
- $f(x) = 5x + 15$
- $f(x) = 24\left(\frac{1}{2}\right)^x$
- $f(x) = x - 1$
- $f(x) = \$40 + \$25x : f(3) = \$40 + \$75 = \$115$
- $\frac{\$2,500}{\$12.50} = 200$

1.13 Functions on a Cartesian Plane

Answers

1 - 5:

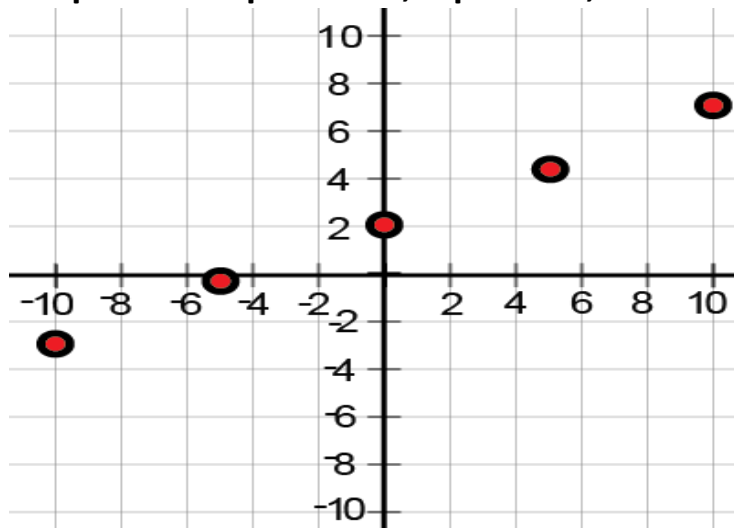


6. a) $(-6, 4)$
b) $(7, 6)$
c) $(-2, -8)$
d) $(-7, 4)$
e) $(5, 0)$

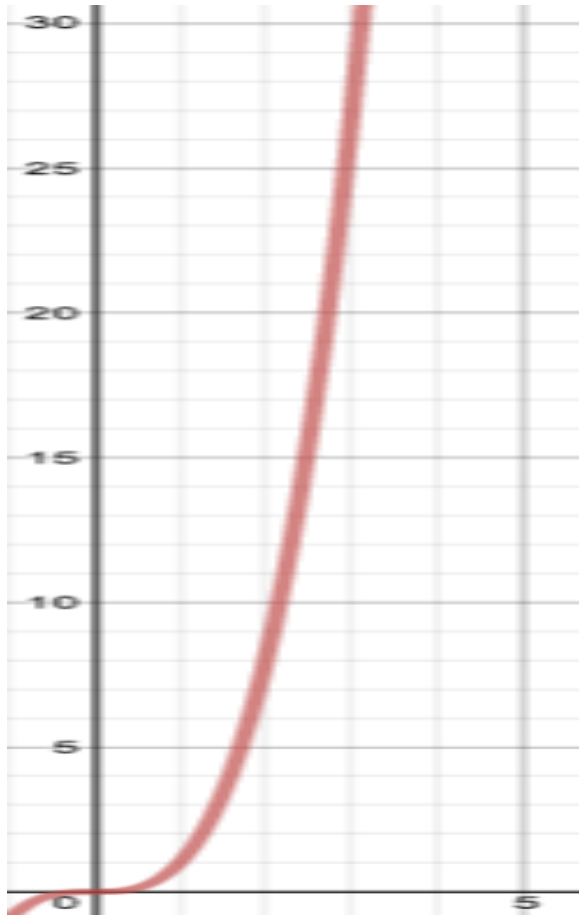
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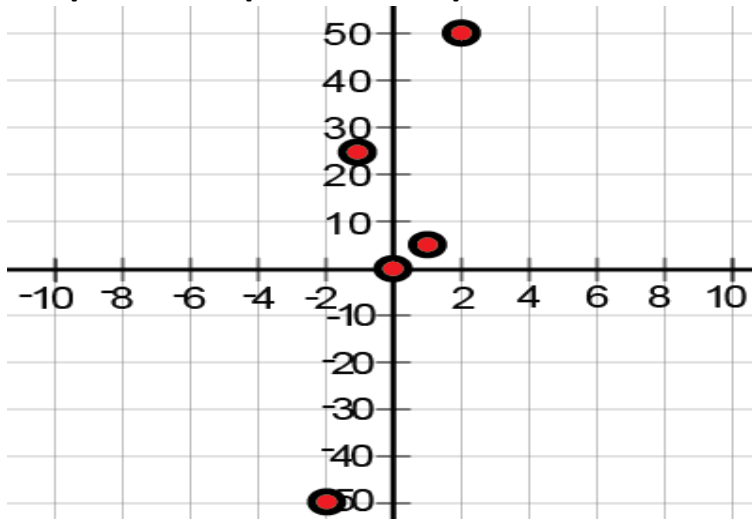
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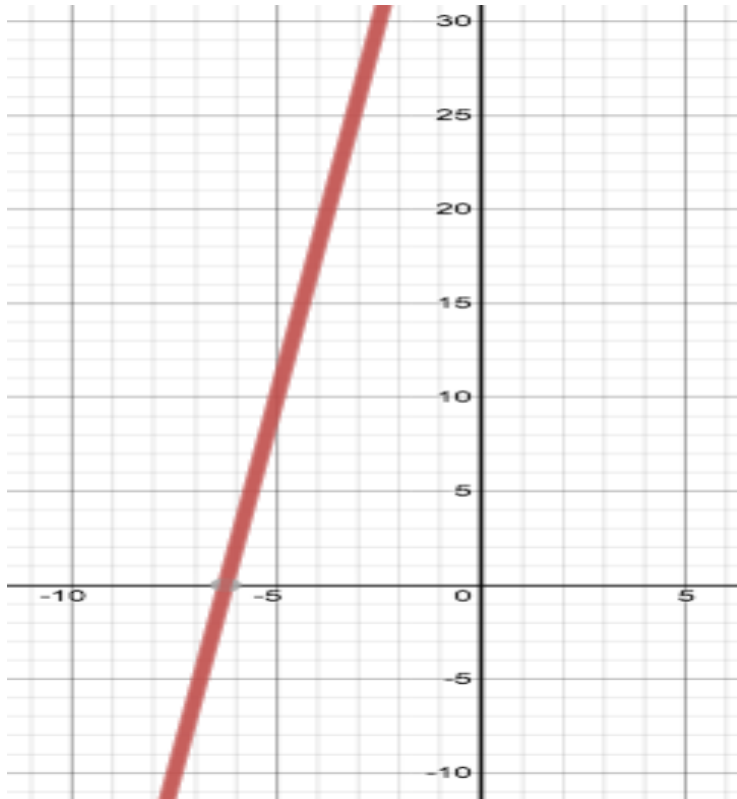
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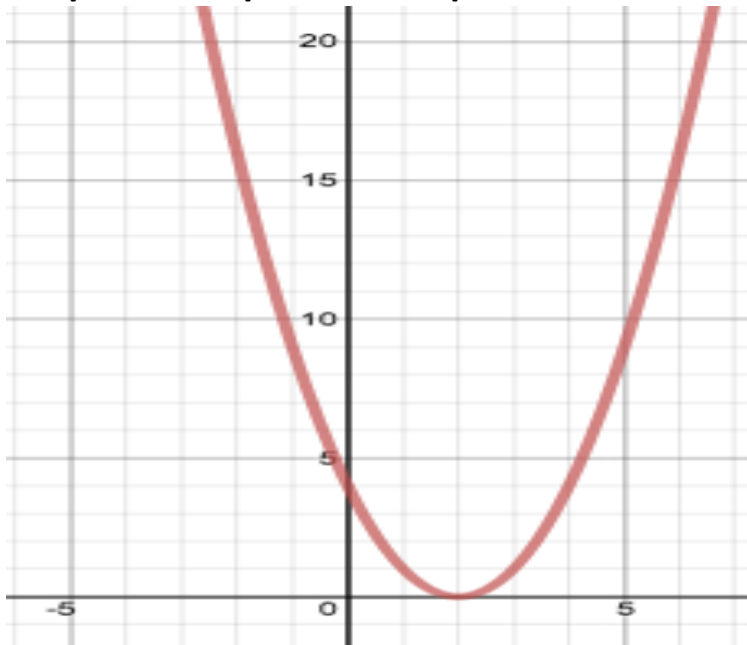
10.



11.

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12.



13. a) 27%

b) $\approx 35.5\%$

c) $\approx 22.5\%$

d) $\approx 23\%$

14. a) 62.5

b) ≈ 68

c) 73

d) 76

15. a) \$19,000

b) \$56,000

c) \$11,000

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d) \$36,000

Answer Key

1.14 Vertical Line Test

Answers

1. Yes, function
2. No, not a function
3. No, not a function
4. Yes, function
5. $y = \left| \frac{x}{2} \right|$
6. $y = \sqrt{x}$
7. Yes, function
8. No, not a function

1.15 Problem Solving Models

Answers

- 1) Understand the problem 2) Devise a plan – translate 3) Carry out the plan – solve 4) Check and interpret
- Answers may vary : drawing a diagram / making a table / looking for a pattern / guess and check / etc...
- a) Drawing a diagram and looking for a pattern or Making a table and drawing a graph. b) These strategies build on each other
- $\frac{660(300)}{36} = 5,500$ ears per hour
- It is difficult to usefully illustrate increasing or relative age with a diagram.
- Substitute your answer back into the question to verify that it works. Checking the solution ensures that you completed the math correctly.
- 8 women
- 8×1.5 and 5×10.5
- $\$35 * 1.0775 = \37.71
- $(1.05) = \$45,000 : \$42,857.14$

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11. $90 * .99 = \$89.10$

12. \$45.25

13. \$750.00

14. 8 rides

15. \$218.99

16.

1.16 Trends in Data

Answers

1. $60 + 12(8 - 1) = 144$

2. $50 + 400 - 100 = 225$; $175 = 50$; $35 = 0$; $5 = 0$

3. 23 squares

4. 7 weeks

5. 50 cents

6. 5.50 hours

7. 4 hours

8. $36x^2$