

5.1 Exercises

✓ CONCEPT CHECK

- Linear equations are equations where the variable has an exponent of ____.
- The value of the _____ variable changes with respect to the value of the _____ variable.
- When any number makes an equation true, the equation has _____ solutions.
- When solving a formula for a specific variable, treat the variables as if they are _____.
- A function is a set of _____ where each value of the dependent variable is associated with a unique independent variable.

💡 PRACTICE

Solve each equation for the variable.

- $4 = -6w$
- $\frac{-7}{4}x = -2$
- $-2(4v + 4) = -8v + 7$
- $z + 0.2z - 3.6 = 5.8(z - 3)$
- $2(x + 5) - 2 = 4(x + 2) - 2x$
- $3.2x - 1 = 2(1.6x + 1)$
- $3(x + 2) - 1.2 = 1.2x + 4.8 + 1.8x$
- $10.3z - 9.3z - 5.4 = 5.5$
- $\frac{4}{y} = \frac{4}{y-1}$
- $\frac{y-1}{6} = \frac{y+1}{3}$
- $\frac{x-10}{10} = \frac{x-7}{8}$
- $\frac{1}{2} = \frac{x-1}{2x-2}$

Solve each formula for the indicated variable.

18. Solve $P = R - C$ for C .

19. Solve $v = k + gt$ for k .

20. Solve $L = 2\pi rh$ for r .

21. Solve $I = Prt$ for r .

22. Solve $A = \frac{1}{2}bh$ for h .

23. Solve $V = \pi r^2 h$ for h .

Evaluate each function for the given value. Round your answer to the nearest hundredth, if necessary.

24. Find $f(7)$ for $f(x) = x^3 - 12$.

25. Find $f(-2)$ for $f(t) = t^3 + 5$.

26. Find $f(10)$ for $f(x) = x^2 - 2x + 3$.

27. Find $f(9)$ for $f(t) = t^2 + 100t - 125$.

28. Find $f(5)$ for $f(x) = \begin{cases} 2x, & x < 0 \\ x + 7, & x \geq 0 \end{cases}$.

29. Find $f(1.5)$ for $f(t) = \begin{cases} 15 - 2t, & t \leq 5 \\ 8t - 5, & t > 5 \end{cases}$.

30. Find $f\left(\frac{1}{3}\right)$ for $f(x) = \log 3x$.

31. Find $f(4)$ for $f(x) = \log 3x$.

32. Use your knowledge of real numbers to determine how their properties limit the domain and range of the function $f(x) = \sqrt{x+7}$.

33. Use your knowledge of real numbers to determine how their properties limit the domain and range of the function $f(x) = 2x^2 + 5$.

APPLICATIONS

Solve. Round your answer to the nearest hundredth, if necessary.

34. When setting up a store front in an online marketplace, the seller needs to pay a base fee of \$15 for the website space and \$0.50 per item listed. A seller wants to spend no more than \$40 to list items in the online store. Solve the equation $\$40 = \$15 + \$0.50x$ for x to determine the maximum number of items the seller can list.

35. A carnival costs \$20 to enter and each carnival game costs \$1.50 to play. Sam wants to win a stuffed animal for his date, but only wants to spend a total of \$50 on non-food purchases. Solve the equation $\$50 = \$20 + \$1.50x$ for x to determine how many attempts he can make at winning his date a stuffed animal.
36. The Reynold's want to build a decorative fence around their vegetable garden. A garden fence needs to be 72 inches tall to keep out deer. They select a solid base frame that is 24 inches tall and a mesh fence with 2-inch squares for the top of the fence. Determine how many squares high the mesh needs to be by solving the equation $72 = 24 + 2x$ for x .
37. The Geology department is raising money for scholarships by hosting the annual Sedimental Evening Dinner. The music department provides free entertainment, and the hospitality management department hosts as part of student course requirements. The department would like to raise \$3000 for scholarship and will spend \$760 on food and decorations. The dining hall can accommodate 80 guests. Solve the equation $\$3000 = 80x - \760 to determine the price the department should charge per guest.
38. Suppose corn chips cost 22.5 cents per ounce. Use the given equation to determine how many ounces are in the bag of chips if a bag costs \$3.03.

$$\frac{\$0.225}{1 \text{ oz}} = \frac{\$3.03}{x \text{ oz}}$$

39. Suppose cereal cost 24.5 cents per ounce. Use the given equation to determine the cost of a box of cereal if a bag contains 20 oz.

$$\frac{\$0.245}{1 \text{ oz}} = \frac{\$x}{20 \text{ oz}}$$

40. An entry level civil engineer's annual pay is \$62,348 based on 52 weeks per year. Due to the economy, his company is having to cut back on the number of weeks that it employs its civil engineers. The firm plans on cutting the work year to 49 weeks and keep the same rate of pay. Use the given equation to determine how much should the civil engineer expect his annual pay to decrease. Round your answer to the nearest dollar.

$$\frac{\$62,348}{52 \text{ weeks}} = \frac{\$x}{49 \text{ weeks}}$$

41. You're making dessert, but your recipe needs adjustment. Your peanut butter cookie recipe makes 4 dozen cookies, but you need 1 dozen cookies. The recipe requires $1\frac{1}{2}$ cups of butter, 3 teaspoons of almond extract, and $2\frac{1}{2}$ cups of peanuts. Use the given equations to determine how much of each of these ingredients are necessary for 1 dozen cookies. Simplify your answer.

a. butter: $\frac{1\frac{1}{2} \text{ cups}}{4 \text{ dozen}} = \frac{x}{1 \text{ dozen}}$

b. almond extract: $\frac{3 \text{ teaspoons}}{4 \text{ dozen}} = \frac{x}{1 \text{ dozen}}$

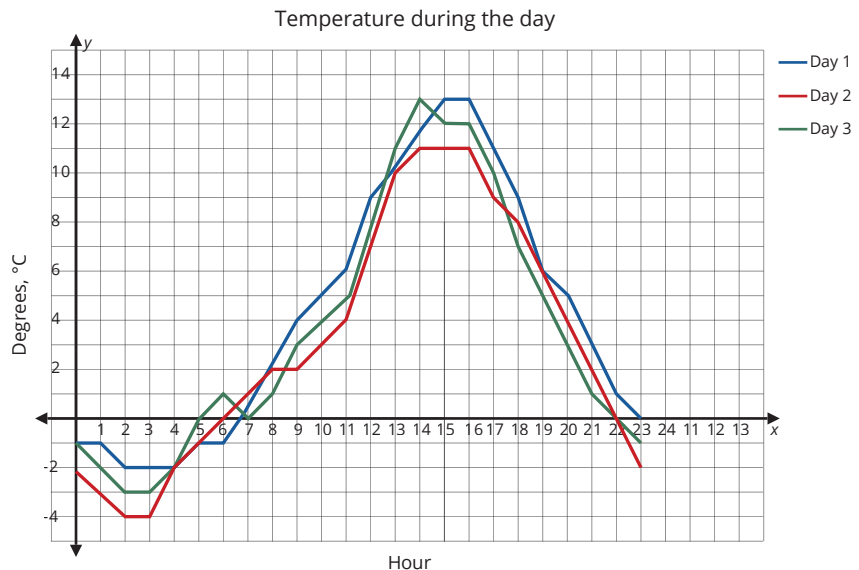
c. peanuts: $\frac{2\frac{1}{2} \text{ cups}}{4 \text{ dozen}} = \frac{x}{1 \text{ dozen}}$

42. In business, profit for producing and selling an item is modeled by the equation $P = R - C$, where P is the profit earned, R is the revenue earned from sales, and C is the cost to produce the item. Find the revenue earned by the company if they made a profit of \$3.2 million and incurred a cost of \$1.8 million.

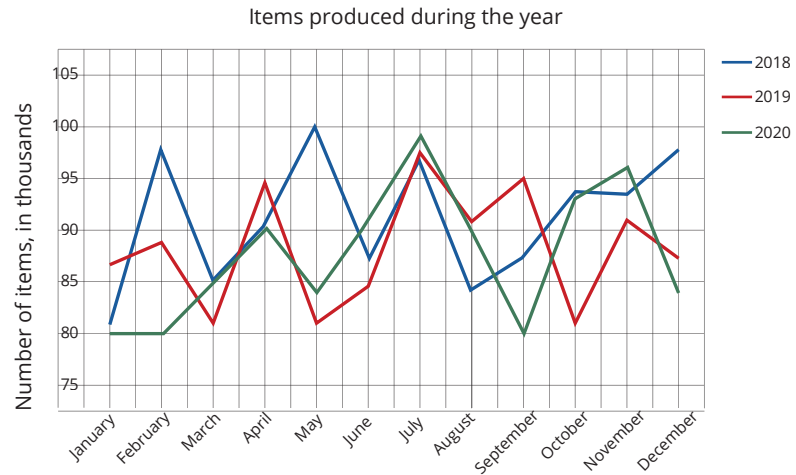
43. The distance traveled by an object can be described by $d = rt$, where r is the objects rate (or speed) and t is the amount of time the object traveled. If you need to drive a distance of 105 miles and can travel at an average speed of 60 miles per hour, how many hours will the trip take?

44. The following graph displays the change in air temperature over the last three days. Determine if the following statements about the graph are true or false. If false, explain why.

- a. The graph of Day 2 has a domain between -4 and 11 , inclusive.
- b. The graph of Day 1 and the graph of Day 3 have the same range.
- c. The range of Day 3's graph is a subset of the combined range of Day 1's graph and Day 2's graph.



45. The following graph shows the number of items (in thousands) produced by a factory each year from 2018 to 2020. Determine if the following statements about the graph are true or false. If false, explain why.
- The ranges of all three graphs are the same.
 - The domains of all three graphs are the same.
 - The range of the 2019 graph is a subset of the range of the 2020 graph.



46. The function M represents the number of a specific model of car manufactured by an automotive company in the year 2022 based on sales of that model car in the year 2021. What can you say about the domain and range of the function M ?
47. The function C represents the cost of a wedding reception where the price to rent the venue is \$7000 and the price of food and decorations depends on the number of people attending. The venue has a maximum capacity of 150 guests. What can you say about the domain and range of the function C ?



WRITING & THINKING

48. Consider the function $f(x) = x^2$.
- Describe the domain and range of the function f .
 - Explain how the range would be affected if the domain was restricted to nonnegative real numbers.
 - Explain how the range would be affected if the domain was restricted to integers.