

Algebra 1 Unit 3 Practice

LESSON 14-1

Use the table for Items 1 and 2.

Canoe Rental	
Days	Cost (\$)
1	52
3	78
5	104
7	130

- Use function notation to write a linear function that gives the cost C in dollars of renting a canoe for t days.
- Identify the rate of change for this linear function. What does the rate of change represent in this situation?
- A flight from Houston to Chicago is approximately 940 miles. A plane making this flight is traveling at an average rate of 485 miles per hour. Which function represents the plane's distance D in miles from Chicago t hours after leaving Houston?
 - $D(t) = 940 + 485t$
 - $D(t) = 940 - 485t$
 - $D(t) = \frac{t}{485} + 940$
 - $D(t) = \frac{t}{485} - 940$

- Liam says that the value of his car over the years, shown in the table below, can be represented by a linear function. Do you agree or disagree? Justify your answer.

Liam's Car Value	
Year	Value (\$)
0	14,000
2	10,120
5	6240

- Reason quantitatively.** A chef uses the function $T(w) = 25w + 20$ to determine the time T in minutes for cooking a chicken that weighs w pounds. Interpret the rate of change of this linear function.

LESSON 14-2

A nursery sells bulk garden soil using the following pricing chart. Use the table for Items 6–9.

Soil Purchased	Price
less than 700 lb	\$3.50 for each 100 lb
at least 700 lb	\$2.10 + \$3.20 for each 100 lb

- Write a function to determine the cost $C(w)$ in dollars of buying less than 700 pounds of garden soil. Identify the reasonable domain and range.

7. Write a function to determine the cost $C(w)$ in dollars of buying at least 700 pounds of garden soil. Identify the reasonable domain and range.
8. Teri will need 800 pounds of garden soil over the next few months. She is trying to decide how much to purchase at once. Which of the following statements is true?
- A. It will cost Teri more to purchase 200 lb four times than 400 lb twice.
- B. It will cost Teri less to purchase 800 lb at once than 400 lb twice.
- C. It will cost Teri more to purchase 800 lb at once than 700 lb in one purchase and 100 lb in a second purchase.
- D. It will cost Teri less to purchase 400 lb twice than 700 lb in one purchase and 100 lb in a second purchase.
9. Write a piecewise-defined function that can be used to determine the cost $C(w)$ in dollars of w pounds of garden soil.
10. **Model with mathematics.** A baby red panda has a mass of about 100 grams at birth and gains about 13 grams per day for the first 2 weeks. From the beginning of week 3 to the end of week 4, a baby red panda gains about 22 grams per day. Write a piecewise-defined function that gives a baby red panda's approximate mass $M(a)$ as a function of its age a in days for the first 4 weeks of its life. By how much does the baby panda's mass increase between the beginning of week 3 and the end of week 4?

LESSON 14-3

11. The following function gives the amount $A(w)$ in dollars Teresa has saved w weeks after she started saving money for a bicycle. What is $A(8)$, and what does it represent in this situation?

$$A(w) = \begin{cases} 10w, & \text{when } 0 < w \leq 5 \\ 20w - 50, & \text{when } 5 < w \leq 8 \\ 10w + 30, & \text{when } w > 8 \end{cases}$$

Use the following function for Items 12 and 13.

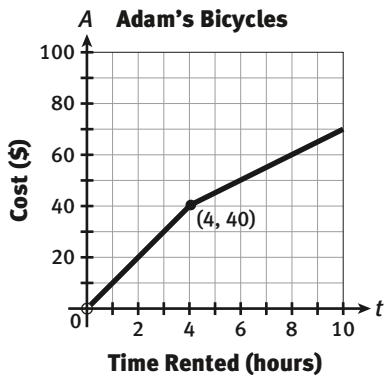
$$f(x) = \begin{cases} -x - 3, & \text{when } x \leq -2 \\ \frac{1}{2}x, & \text{when } -2 < x \leq 2 \\ 2x - 3, & \text{when } x > 2 \end{cases}$$

12. What is $f(4)$?
- A. -5 B. 1
C. 2 D. 5
13. Sketch a graph of the function.
14. **Critique the reasoning of others.** Alan says that $f(4) = 7$ for the piecewise-defined function $f(x) = \begin{cases} 3x - 5, & \text{when } x < 4 \\ -x - 3, & \text{when } x \geq 4 \end{cases}$. Explain the error that Alan made, and give the correct value of $f(4)$.

LESSON 14-4

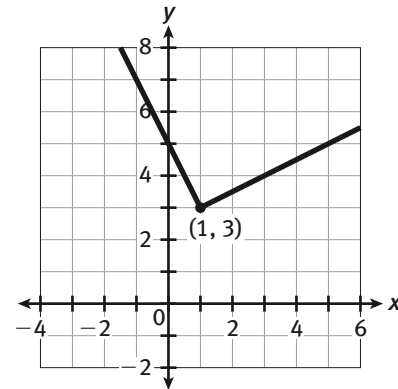
The function $V(t) = \begin{cases} 10t, & \text{when } 0 < t \leq 4 \\ 5t + 20, & \text{when } t > 4 \end{cases}$ gives the

cost in dollars of renting an electric bicycle at Valdez Bikes for t hours. The graph shows the function $A(t)$, which gives the cost in dollars of renting an electric bicycle at Adam's Bicycles for t hours. Use this information for Items 15 and 16.



15. Compare the function $V(t)$ for Valdez Bikes with the function $A(t)$ for Adam's Bicycles. State the similarities and differences.
16. Compare the cost of renting an electric bicycle from Valdez Bikes compared to Adam's Bicycles. Which of the following statements is true?
- It will always cost more to rent an electric bicycle from Adam's Bicycles.
 - It will cost less to rent an electric bicycle from Valdez Bicycles after 3 hours.
 - It will cost more to rent an electric bicycle from Adam's Bicycles after 4 hours.
 - For the first 5 hours, it will cost the same to rent an electric bicycle from either business.

The graph shows the piecewise-defined function $f(x)$. Use the graph for Items 17 and 18.



17. Write an equation for $f(x)$.

18. Compare $f(x)$ to the function

$$g(x) = \begin{cases} -x + 4, & \text{when } x < 4 \\ -\frac{1}{2}x + \frac{7}{2}, & \text{when } x \geq 4 \end{cases}$$

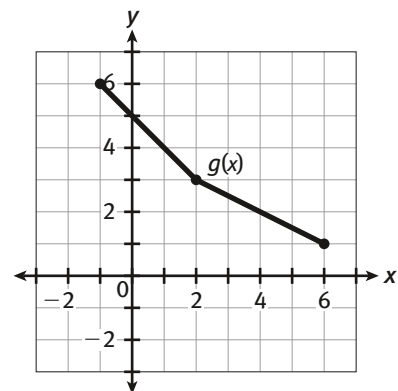
Describe the similarities and differences.

19. **Look for and make use of structure.** Consider the

$$\text{function } f(x) = \begin{cases} -x + 5, & \text{when } x \leq 2 \\ -\frac{1}{2}(x - 2) + 3, & \text{when } x > 2 \end{cases} \text{ and}$$

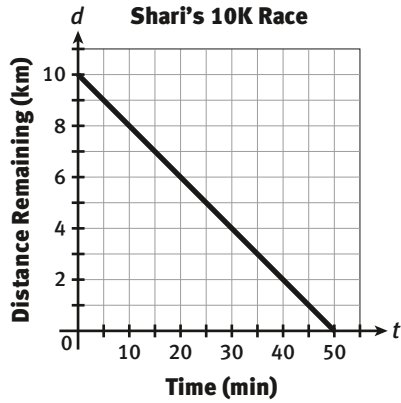
the function $g(x)$ shown in the graph below.

Represent the functions in the same form, and then describe the similarities and differences between the functions.



LESSON 15-1

The graph shows how long it took Shari to run a 10K race. Use the graph for Items 20–24.



20. Write an equation that gives the distance d in kilometers Shari has left to run after she has been running for t minutes.
21. a. What is the slope of the line? Interpret the meaning of the slope in the context of the situation.
- b. Explain why the slope is negative.
22. How long did it take Shari to finish the race? Explain how you determined your answer.

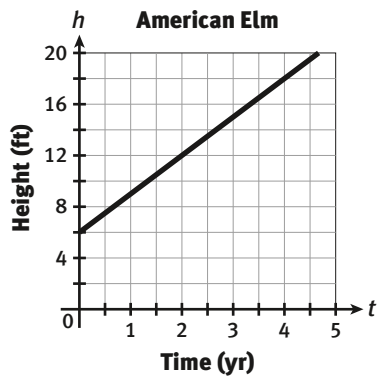
23. The graph passes through the point $(20, 6)$. What is the meaning of this point in the context of the situation?
- A. Shari ran 6 kilometers in 20 minutes.
- B. After 20 minutes, Shari had 6 kilometers left to run.
- C. After 6 kilometers, Shari had 20 minutes of running left.
- D. In the first 20 minutes, Shari ran at a rate of 6 kilometers per minute.
24. **Make sense of problems.** Jody ran in the same race as Shari. The table shows information about Jody's race.

Jody's 10K Race	
Time (min)	Distance Remaining (km)
0	10
5	8.75
10	7.5
15	6.25

If Jody continued to run at the same pace shown in the table, by how many minutes did she beat Shari? Explain how you determined your answer.

LESSON 15-2

The graph shows the predicted growth of an American elm tree that is planted under ideal conditions when it is 6 feet tall. Use the graph for Items 25–29.



25. At what average rate is the height of an American elm expected to change under ideal conditions? Justify your answer.
26. Under good conditions, an American elm tree that is initially 6 feet tall is predicted to grow an average of 2 feet per year. Draw a line on the graph representing growth under good conditions.
27. **Reason abstractly.** Write an equation for the line you graphed in Item 26. Interpret the meaning of the constant and the coefficient of t in terms of the context.
28. A 6-foot American elm was planted in better than good conditions, but less than ideal conditions. Which of the following is the most reasonable prediction for this tree's height after 4 years?
- A. 14 feet B. 16 feet
C. 18 feet D. 20 feet

29. An 18-foot American elm was planted as a 6-foot tree in better than good conditions, but less than ideal conditions. How long ago might that tree have been planted? Explain how you determined your answer.

LESSON 15-3

Carly makes and sells beaded bracelets at craft fairs. She already has 8 bracelets, and each additional bracelet takes her between 2 and 3 hours to make. She is preparing for a craft fair in 2 weeks. Use this information for Items 30–34.

30. Which equation represents the number of bracelets b Carly will have if she works t hours making bracelets in the next 2 weeks and averages one bracelet every 2 hours?
- A. $b = \frac{1}{2}t + 8$
B. $b = \frac{1}{2}(t + 8)$
C. $b = 2t + 8$
D. $b = 2(t + 8)$
31. Write an equation that represents the number of bracelets b Carly will have if she works t hours making bracelets in the next 2 weeks and averages one bracelet every 3 hours.

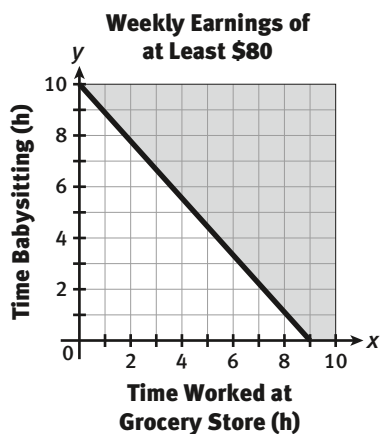
32. For your answers in Items 30 and 31, interpret the meanings of the coefficients of t and the constants of the equations in this context.

33. **Attend to precision.** Graph the equations from Items 30 and 31 on the same coordinate grid. Be sure to include appropriate scales and labels.

34. On your graph from Item 33, draw a vertical line segment that connects the graphs at $t = 18$. Describe what the segment represents in words and with an inequality.

LESSON 16-1

35. Brigit earns \$10 per hour for bagging groceries at a grocery store and \$8 per hour for babysitting. She wants to earn at least \$80 this week. The linear inequality shown in the graph represents this situation, where x is the number of hours she works at the grocery store and y is the number of hours she babysits. Which ordered pair is a solution of the linear inequality?



A. (2, 7)

B. (3, 6)

C. (6, 2)

D. (8, 3)

Jesse has a \$30 gift card to a sandwich shop. Regular sandwiches cost \$4, and large sandwiches cost \$6. Use this information for Items 36–38.

36. **Model with mathematics.** Let x represent the number of regular sandwiches Jesse buys and y represent the number of large sandwiches he buys. Write an inequality that models the numbers of sandwiches Jesse could buy with the card.

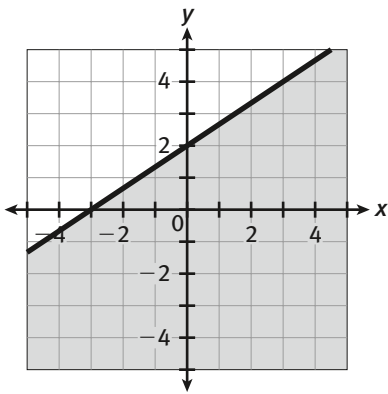
37. Explain why Jesse could not buy 2 regular sandwiches and 5 large sandwiches with the gift card.

38. Suppose Jesse buys 1 regular sandwich and 2 large sandwiches with the gift card. How many more of each size sandwich do you think Jesse should buy? Explain.

LESSON 15-2

39. Graph the linear inequality $x - 2y < 2$ on a coordinate plane.

40. Which inequality is graphed below?



- A. $y < -\frac{3}{2}x + 2$ B. $y < -\frac{2}{3}x + 2$
 C. $y \leq \frac{2}{3}x + 2$ D. $y \leq \frac{3}{2}x + 2$

Dale's car gets 20 miles per gallon in the city and 25 miles per gallon on the highway. The inequality $\frac{1}{20}x + \frac{1}{25}y \leq 5$ represents the distance Dale can drive on 5 gallons of gasoline, where x is the number of miles he drives in the city and y is the number of miles he drives on the highway. Use this information for Items 41 and 42.

41. Graph the linear inequality on a coordinate plane.
42. Identify the x -intercept and y -intercept of the boundary line of the inequality. What do they represent in this situation?
43. **Look for and make use of structure.** Write a series of steps explaining how to graph a linear inequality in two variables, x and y .

LESSON 17-1

44. Solve the following system of equations by graphing.

$$y = -2x + 4$$

$$y = \frac{1}{3}x - 3$$

45. What is the solution of the following system of equations?

$$2x + y = 0$$

$$x + 2y = 3$$

- A. $(-5, 4)$ B. $(-1, 2)$
 C. $(0, 0)$ D. $(2, -4)$

46. The perimeter of a wheat field is 640 yards. The length of the field is 3 times the width. The system $2\ell + 2w = 640$ and $\ell = 3w$ represents this situation, where ℓ is the length of the field in yards and w is the width in yards. Graph the system to determine the solution. What does this solution represent?

47. **Critique the reasoning of others.** Regina says that the solution of the following system of equations is $(4, 4)$. Is she correct? Explain your reasoning.

$$x - 4y = -12$$

$$2x + y = -6$$

LESSON 17-2

Use the following system of equations for Items 48 and 49.

$$y = 3x - 6$$

$$y = -2x + 14$$

48. Solve the system of equations using tables of values.

49. Use appropriate tools strategically. Explain how you could use a graphing calculator to check the solution of the system of equations.

50. Solve the following system of equations.

$$3x - y = -11$$

$$2x + y = 1$$

Blackburn Web Hosting charges \$5.69 per month plus a one-time set-up fee of \$25. Randall Web Hosting charges \$9.49 per month plus a one-time set-up fee of \$6. Use this information for Items 51–53.

51. Let y represent the total cost in dollars of using a web hosting service for x months. Which system of equations can be used to find the number of months for which the total cost of using Blackburn Web Hosting is the same as the total cost of using Randall Web Hosting?

A. $y = 5.69x + 25$
 $y = 9.49x + 6$

B. $y = 5.69(x + 25)$
 $y = 9.49(x + 6)$

C. $y + 25 = 5.69x$
 $y + 6 = 9.49x$

D. $5.69y = 9.49x$
 $y + 25 = x + 6$

52. What is the solution of the system of equations, and what does the solution of the system represent in the context of the problem?

53. What method did you use to solve the system of equations, and why did you choose this solution method?

LESSON 17-3

54. Which method could you use to eliminate one of the variables from the following system of equations?

$$4x - 6y = 18$$

$$3x + 4y = 5$$

A. Multiply the first equation by 2 and the second equation by 3. Then add the equations.

B. Multiply the first equation by 3 and the second equation by 4. Then add the equations.

C. Multiply the first equation by 4 and the second equation by -6 . Then add the equations.

D. Multiply the first equation by 5 and the second equation by 18. Then add the equations.

55. Write a scenario that could be represented by the following system of equations. Solve the system and interpret the meaning of the solution in the context of your scenario.

$$x + 2y = 9$$

$$2x + 3y = 14$$

A 4-fluid-ounce serving of orange juice contains 60 calories, and a 4-fluid-ounce serving of grapefruit juice contains 50 calories. A juice company wants to sell a mixture of orange juice and grapefruit juice. Each bottle of the mixed juice will hold 16 fluid ounces and contain 224 calories. Use this information for Items 56 and 57.

56. Write a system of equations that can be used to find the number of fluid ounces of orange juice and the number of fluid ounces of grapefruit juice in each bottle. Be sure to define the variables you use.

57. Solve the system and explain what the solution means in this context.

58. Persevere in solving problems. A chemist has two solutions of sulfuric acid, one with a concentration of 10% acid and one with a concentration of 30% acid. How many milliliters of each solution will the chemist need to mix to produce 500 milliliters of a sulfuric acid solution with a concentration of 25%? Explain how you determined your answer.

LESSON 17-4

59. The graph of a system of two linear equations consists of two parallel lines. How many solutions does this system have?

- A.** none **B.** exactly one
C. exactly two **D.** infinitely many

60. Solve and graph the following system. How many solutions exist to the system of equations? Explain.

$$\begin{aligned}y &= -2x + 1 \\4x + 2y &= -4\end{aligned}$$

61. Look for and make use of structure. Write each equation in the following system in slope-intercept form. What do the results tell you about the number of solutions the system has? Explain.

$$\begin{aligned}2y - 2 &= x + 4 \\3x - 6y &= -18\end{aligned}$$

62. Duke Electric charges \$65 for the first hour of labor and \$60 for each additional hour. Spence Electrical charges \$60 per hour of labor plus a flat fee of \$12. Is there a job length for which the total charge for Duke Electric is the same as the total charge for Spence Electrical (not including parts)? Use a system of linear equations to explain your answer.

63. Tanner is 120 feet to the east of Kaye on a jogging trail. Kaye begins jogging from west to east at an average speed of 8 feet per second. After 15 seconds, Tanner begins jogging in the same direction as Kaye at an average speed of 8 feet per second. Is there a time at which Kaye will pass Tanner? Use a system of equations to explain your answer.

LESSON 17-5

64. Determine the number of solutions of the following system of equations without graphing the system. Explain how you determined your answer.

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

$$2x - 3y = 12$$

65. Describe the relationship between the lines of the following system of equations without graphing the system. Explain how you determined your answer.

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

$$x - 2y = 6$$

66. Write a system of equations that is independent and consistent. Justify your answer.

67. Which of the following systems is inconsistent?

A. $x - 3y = 6$
 $2x - 6y = 12$

B. $6x + 2y = 3$
 $3x + 6y = 9$

C. $x + y = 3$
 $3x + y = 9$

D. $3x + y = 3$
 $9x + 3y = 6$

68. **Look for and make use of structure.** Write a set of rules that can be used to classify a system of two linear equations based on the slopes and y -intercepts of the lines.

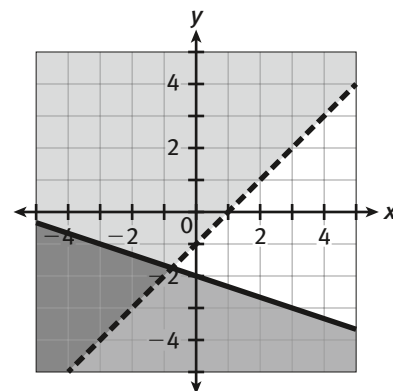
LESSON 18-1

69. Solve the following system of inequalities by graphing.

$$x - 2y \leq -2$$

$$3x + y > -1$$

Use the system of inequalities shown in the graph for Items 70–72.



70. Which ordered pair is a solution of the system of inequalities?

A. $(-3, 0)$

B. $(-2, -2)$

C. $(-1, -3)$

D. $(1, -1)$

71. Write a system of inequalities whose solution is shown by the doubly shaded region.

- 72. Critique the reasoning of others.** Chad claims that the ordered pair $(-2, -3)$ is a solution of the system of inequalities. Is Chad's claim correct? Explain your reasoning.

- 73.** Name three ordered pairs that are solutions of the following system of inequalities.

$$y > -2x - 3$$
$$2x - y > 1$$

LESSON 18-2

- 74.** Graph the following system of inequalities, and describe the solution region.

$$y < -\frac{2}{3}x + 2$$
$$2x + 3y > -3$$

- 75.** Which best describes the solutions of the following system of inequalities?

$$3x + y < -1$$
$$y < -3x + 3$$

- A.** The solution region lies between the parallel boundary lines.
- B.** The solution region lies outside the parallel boundary lines.
- C.** The solutions are the same as the solutions of $3x + y < -1$.
- D.** The solutions are the same as the solutions of $y < -3x + 3$.

A 300-seat theater must make at least \$3500 in ticket sales for each performance in order to make a profit. Regular tickets cost \$20, and discounted tickets cost \$14. A maximum of 100 discounted tickets are sold to each performance. Use this information for Items 76–78.

- 76. Model with mathematics.** The inequality $x + y \leq 300$ is one of the inequalities in the system that represents this situation. Identify the meaning of each variable and write the remaining inequalities that describe the situation.

- 77.** Sketch a graph of the system of inequalities.

- 78.** Give an ordered pair from the solution region that makes sense in the context of the problem and an ordered pair from the solution region that does not make sense in the context of the problem. Explain your reasoning.