5.2 Exercises

✔ CONCEPT CHECK

1. The ________ of a line is the ratio of the change in y-values to the change in x-values.

2. The ___________ form of an equation is $y - y_1 = m(x - x_1)$.

3. The ____________ form of an equation is $y = mx + b$.

4. ___________ lines have slopes that are negative reciprocals of each other.

5. _________ lines have slopes that are equal to each other.

PRACTICE

Find the slope of the line determined by each pair of points.

6. $(8,-3),(5,9)$

7. $(9,-2),(11,-2)$

8. $(8,3),(8,-3)$

9. $(1,1),\left(2,\frac{3}{2}\right)$

Find the slope and *y*-intercept of each linear equation.

10. $y = 2x - 7$

11. $y = -4x$

12. $2x + 4y = -5$

13. $-x + 2y = 3$

14. $y = 7$

15. $x = 10$

Find the slope-intercept form of the equation for the line passing through each pair of points.

16. $(12,83)$ and $(9,59)$

17. $(-8,76)$ and $(17,-74)$.

18. $\left(-\frac{5}{4},-\frac{13}{4}\right)$ and $\left(\frac{5}{3},-\frac{23}{6}\right)$

19. $(5.5,45)$ and $(-10,-85.2)$

20. Identify the slope and y-intercept, along with another point on the line $14x - 2y = 64$, given that $y = 7x - 32$ and $y - 24 = 7(x - 8)$ are equivalent equations.

21. Identify the slope and y-intercept, along with another point on the line $5x + 4y = 18$, given that $y = -\frac{5x}{4} + \frac{9}{2}$ and $y - \frac{5}{4} = -\frac{5}{4}\left(x - \frac{13}{5}\right)$ are equivalent equations.

22. Identify the slope and y-intercept, along with another point on the line $-22x + 6y = -74$, given that $y = \frac{11x}{3} - \frac{37}{3}$ and $y + \frac{49}{12} = \frac{11}{3}\left(x - \frac{9}{4}\right)$ are equivalent equations.

23. Identify the slope and y-intercept, along with another point on the line $19x + 5y = 7$, given that $y = -3.8x + 1.4$ and $y + 48 = -3.8(x - 13)$ are equivalent equations.

Find the equation for each line described. Write your answer in slope-intercept form.

24. A line passes through the point $(1, 7)$ and is parallel to a line with equation $y = 3x + 12$.

25. A line passes through the point $(-3, 5)$ and is parallel to a line with equation $y = -\frac{2}{3}x - 10$.

26. A line passes through the point $(0, -2)$ and is parallel to a line with equation $y + 5 = \frac{1}{2}(x + 5)$.

27. A line passes through the point $(6, 0)$ and is parallel to a line with equation $y - \frac{1}{2} = -\frac{1}{4}(x + 1)$.

28. A line passes through the point $(5, 3)$ and is perpendicular to a line with equation $y = 5x + 11$.

29. A line passes through the point $(-4, 8)$ and is perpendicular to a line with equation $y = -8x + 9$.

30. A line passes through the point $(0, 9)$ and is perpendicular to a line with equation $y - 3 = 2\left(x + \frac{1}{2}\right)$.

31. A line passes through the point $(-3, 0)$ and is perpendicular to a line with equation $y + 6 = \frac{3}{5}(x + 15)$.

Graph each line.

32. $y = x + 8$

33. $-2x = y - 6$

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

35. $y + 2 = -\frac{1}{3}(x + 12)$

36. $x = -5$

37. $y = 2.5$

APPLICATIONS

38. The following table provides the mileage and list price of pre-owned 2018 Hyundai Elantras being sold within a 50-mile radius. Round your answers to the thousandth, if necessary.

Pre-Owned 2018 Hyundai Elantra

Mileage (miles)	Price (dollars)
14,028	19,431
26,477	18,877
16,838	19,947
32,701	18,455
29,359	20,157
17,754	19,891
31,484	18,995

a. Use the car with the lowest mileage and the car with the highest mileage to create an equation to estimate the price the car should be. Let x be the mileage and y be the price.

b. Use this equation to estimate the price a dealership should use to sell a 2018 Hyundai Elantra with a mileage of 20,000 miles.

c. Explain some of the limitations of the equation created in part a.

39. The following table shows the mileage and list price of pre-owned 2018 Ford Focuses being sold within a 50-mile radius.

Pre-Owned 2018 Ford Focus

Mileage (miles)	Price (dollars)
50,868	14,717
72,208	13,907
37,385	14,839
90,696	12,889
25,344	16,250
45,069	13,863
28,908	16,895

a. Use the car with the lowest mileage and the car with the highest mileage to create an equation to estimate the price the car should be based on mileage. Let x be the mileage and y be the price.

b. Use this equation to estimate the price a dealership should use to sell a 2018 Ford Focus with a mileage of 50,000 miles.

c. How does the price obtained from the formula compare to the Ford Focus that has 50,868 miles? Explain why the prices might be similar or different.

40. Refer to the table from Exercise 38.

a. Use the car with the lowest price and the car with the highest price to create an equation to estimate the price the car should be based on mileage. Let x be the mileage and y be the price.

b. Use this equation to estimate the price a dealership should use to sell a 2018 Hyundai Elantra with a mileage of 20,000 miles.

c. Compare the answer from part b. to the answer from Exercise 38 part b. Explain why the values are similar or different.

41. Refer to the table from Exercise 39.

a. Use the car with the lowest price and the car with the highest price to create an equation to estimate the price the car should be based on mileage. Let x be the mileage and y be the price.

b. Use this equation to estimate the price a dealership should use to sell a 2018 Ford Focus with a mileage of 50,000 miles.

c. Compare the answer from part b. to the answer from Exercise 39 part b. Explain why the values are similar or different.

42. The following table shows the area of apartments along with the monthly rent.

Apartment Rent

Area (square feet)	Price (dollars)
504	1450
723	2180
465	1040
812	1970
389	930
637	1320
558	1290

a. Use the apartment with the smallest area and the apartment with the largest area to create an equation that can be used to estimate the price of rent based on the area. Let x be the area and y be the price.

b. Use this equation to estimate the price a landlord should use to rent out an apartment with an area of 500 square feet. Round your answer to the nearest cent.

c. How does the price obtained from the formula compare to the apartment that is 504 square feet large? Explain why the prices might be similar or different.

43. The local candy store has a bin of candies where customers can fill their own bag with whatever amount they'd like, and they are charged by depending on how much the bag weighs. The following table shows the size and price of several different bags.

Bag of Candies

Size (grams)	Price (dollars)
510	16.50
600	19.50
340	13.00
420	14.00
280	12.50
630	18.00
550	13.50

a. Use the smallest bag and the largest bag to create an equation that can be used to estimate the price of a bag based on size. Let x be the size and y be the price.

b. Use this equation to estimate how much a bag filled with 500 grams of candies would cost.

c. How does the price obtained from the formula compare to the 510-gram bag of candies? Explain why the prices might be similar or different.

44. Refer to the table from Exercise 42.

a. Use the apartment with the lowest price and the apartment with the highest price to create an equation that can be used to estimate the price of rent based on the area. Let x be the area and y be the price.

b. Use this equation to estimate the price a landlord should use to rent out an apartment with an area of 500 square feet.

c. Compare the answer from part b. to the answer from Exercise 42, part b. Explain why the values are similar or different.

45. Refer to the table from Exercise 43.

a. Use the bag with the lowest price and the bag with the highest price to create an equation that can be used to estimate the price of a bag based on size. Let x be the mass and y be the price.

b. Use this equation to estimate how much a bag filled with 500 grams of candies would cost.

c. Compare the answer from part b. to the answer from Exercise 43, part b. Explain why the values are similar or different.

46. A biologist does research on two populations of bacteria, one pathogenic and the other nonpathogenic. She knows that the nonpathogenic bacteria suppress the growth of the pathogenic bacteria. The biologist estimates the population growth for the two types of bacteria with the following equations.

a. Pathogenic: $y = 5 + \frac{t}{4}$

b. Nonpathogenic: $y = \frac{3t}{2}$

Graph each of the lines on the same graph and use the graph to determine the number of days t required for the nonpathogenic population to suppress the pathogenic population, if this happens at all.

47. Sandy started a flower-delivery business. At first, the expenses exceeded her income, so she hired an expert to estimate when the business would start to earn profit. Based on the provided data, the expert obtained two models describing the expenses and the income of the business.

a. Expenses: $y = \frac{3t}{2} + 1$

b. Income: $y = 2t - 3$

Plot the two functions on the same graph. Use the graph to determine the number of months t required for the flower-delivery business to begin to earn a profit.

48. The following equations represent the amount of a product that consumers want to buy (quantity demanded) and the amount that manufacturers are ready to sell (quantity supplied) depending on the price of the product.

a. Quantity demanded: $Q_d = 20 - 2P$

b. Quantity supplied: $Q_s = 3P + 10$

Plot the two functions on the same graph. Use the graph to determine the equilibrium price P (given in hundreds of dollars) where supply and demand meet.

49. Suppose that the addition of some element to an alloy increases the strength and decreases the thermal conductivity of the alloy. Expressed in the same units, these properties depend on the mass of the element x (in grams per 100 g of alloy) as follows.

a. Thermal conductivity: $y_t = 15 - \frac{x}{2}$

b. Strength: $y_s = \frac{1}{3}(x + 5)$

Graph each of the lines on the same graph and use the graph to determine the mass of the element needed to get an alloy of optimal properties.