EXERCISE SETS

from

Transition to College Mathematics

In Support of Kentucky's College and Career Readiness Program

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Northern Kentucky University | Kentucky Online Testing (KYOTE) Group
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Contents

Chapter 1: Foundations of Algebra

1.1: Signed Numbers, Exponents, and Order of Operations

Simplify without using a calculator.

1. $3-4-5$

2. $3-(4-5)$

3. $7+2\cdot 8$

4. $(7+2)\cdot 8$

5. $-2(6-9)-1$

6. $-2\cdot 6-9-1$

7. $-9(2-5)-7$

8. $-9\cdot 2-(5-7)$

9. $30\div 2\cdot 5$

10. $30\div(2\cdot 5)$

11. $(30\div 2)\cdot 5$

12. $6-8\div 2$

13. $(6-8)\div 2$

14. $6-(8\div 2)$

15. $48\div 8\div 2$

16. $48\div(8\div 2)$

17. $(48\div 8)\div 2$

18. $3\cdot 5-3\cdot 7$

19. $3(5-7)$

20. $3\cdot(5-3)\cdot 7$

Simplify without using a calculator.

21. 3^4

22. 5^3

23. 2^5

24. 7^2

25. $(-4)^2$

26. -4^2

27. $(-2)^3\cdot(-3)^2$

28. $-2^3\cdot(-3)^2$

29. $(2-7)^2$

30. 2^2-7^2

31. $(3-5)^3$

32. 3^3-5^3

33. $-7+3\cdot 2^2$

34. $-7+(3\cdot 2)^2$

35. $(-7+3)\cdot 2^2$

36. $8-2\cdot 3^2$

37. $(8-2)\cdot 3^2$

38. $8-(2\cdot 3)^2$

39. $20\div 2^2$

40. $(20\div 2)^2$

41. $3\cdot 5^2$

42. $(3\cdot 5)^2$

43. $3^2\cdot 5^2$

44. $(3+5)^2$

45. 3^2+5^2

46. $-6+5\cdot(-3)^2$

47. $(-6+5)\cdot(-3)^2$

48. $-6-5\cdot 3^2$

Find the value of the algebraic expression at the specified values of its variable or variables.

49. $x^2-2x-5;\ x=-3$

50. $4-x;\ x=-3$

51. $x-2(1-3x);\ x=-1$

52. $x^3-4x^2-5x;\ x=-1$

53. $(x-y)^2;\ x=1, y=-3$

54. $x-(y-x^2);\ x=-3, y=2$

55. $-x+3y^2;\ x=-6, y=-2$

56. $3+xy^2;\ x=-5, y=-2$

57. $(3+x)y^2;\ x=-5, y=-2$

58. $3+(xy)^2;\ x=-5, y=-2$

1.2: Prime Numbers, GCF, and LCM

Find the prime factorization of the given positive integer.

1. 35

2. 63

3. 88

4. 120

5. 78

6. 84

7. 68

8. 210

9. 112

10. 675

11. 612

12. 693

Find the greatest common factor (*GCF*) *and the least common multiple* (*LCM*) *of the following pairs of numbers.*

13. 9, 12

14. 13, 17

15. 8, 18

16. 14, 25

17. 6, 15

18. 12, 90

19. 50, 60

20. 54, 84

21. 45, 75

22. 28, 42

23. $2^4 \cdot 3^2$, $2 \cdot 3^4$

24. $2^3 \cdot 3^2$, $2^2 \cdot 3 \cdot 5$

25. $3^2 \cdot 5 \cdot 7$, $3 \cdot 7^2 \cdot 13$

26. $5^2 \cdot 11$, $5 \cdot 7 \cdot 11^2$

27. $2^4 \cdot 5^2 \cdot 17$, $2^2 \cdot 5^3$

28. $2^4 \cdot 3^2$, $5^2 \cdot 13$

Find the greatest common factor (*GCF*) *and the least common multiple* (*LCM*) *of the following pairs of expressions. Treat the variables as prime numbers.*

29. a^2b^3, ab^7

30. $x^3y^2z^5$, $x^5y^9z^2$

31. a^7bc^3, a^2b^5

32. x^3y^5w, xz^4w^8

33. $6x^3$, $15x^7$

34. $12xy$, $9x^3$

35. $8a^2b^7,\ \ 15a^4b^2$

36. $24y^{13},\ \ 60y^{10}$

37. $51x^2w,\ \ 27w^5$

38. $9x^3,\ \ 8y^3$

39. $16ab^2,\ \ 52a^2b^5$

40. $48x^7y^3,\ \ 28y^7zw$

Find the greatest common factor (*GCF*) *and the least common multiple* (*LCM*) *of the following triples of expressions. Treat the variables as prime numbers.*

41. $8xy^2,\ \ 20x^3yw,\ \ 12x^4y^3w^5$

42. $21a^3b^9,\ \ 9a^7b^5,\ \ 15a^5b^{12}$

43. $18b^4c^3,\ \ 24c^6d^2,\ \ 42bc^2d^7$

44. $8x^5,\ \ 9x^{12},\ \ 6x^7$

1.3: Fractions

Reduce the given fraction to lowest terms.

1. $\frac{6}{15}$

2. $\frac{27}{48}$

3. $\frac{12}{18}$

4. $\frac{21}{66}$

5. $\frac{2^3 \cdot 3^2}{2^2 \cdot 3^4 \cdot 5}$

6. $\frac{2 \cdot 3^4}{2^3 \cdot 3^5 \cdot 7}$

7. $\frac{2 \cdot 3^7 \cdot 5}{2^5 \cdot 3^5 \cdot 7}$

8. $\frac{2 \cdot 3^7 \cdot 5}{2^5 \cdot 3^5 \cdot 5^2}$

9. $\frac{a^7 b^2}{a^3 b^9}$

10. $\frac{a^5 b^2 c}{a^2 b^7 c^4}$

11. $\frac{6xy}{21x^3}$

12. $\frac{24x^2 y^5}{16x^3 y^8 z^3}$

Write the mixed number to an improper fraction.

13. $7\frac{3}{4}$

14. $2\frac{4}{7}$

15. $5\frac{2}{3}$

16. $6\frac{7}{8}$

Write the improper fraction as a mixed number.

17. $\frac{15}{4}$

18. $\frac{38}{7}$

19. $\frac{40}{9}$

20. $\frac{52}{3}$

Add (or subtract) the fractions without a calculator and express the answer in reduced form. Specify the least common denominator (LCD) in each case.

21. $\frac{2}{3}+\frac{3}{4}$

22. $\frac{5}{6}+\frac{7}{15}$

23. $\frac{1}{6}-\frac{3}{2}$

24. $\frac{9}{4}-\frac{7}{10}$

25. $\frac{5}{3}+\frac{13}{2^2\cdot 3}$

26. $\frac{5}{2^3\cdot 3}+\frac{7}{2^2\cdot 3^2}$

27. $\frac{1}{2^2\cdot 5}-\frac{1}{2\cdot 5^2}$

28. $\frac{5}{2\cdot 7}+\frac{3}{2^2}$

29. $\frac{3}{a}+\frac{2}{b}$

30. $\frac{3}{ab}-\frac{2}{b^2}$

31. $\frac{1}{2a^2}+\frac{1}{6a}$

32. $\frac{2}{3b}-\frac{5}{6b^2}$

33. $\frac{a}{2}+\frac{b}{5}$

34. $\frac{a}{18}-\frac{b}{15}$

35. $\frac{x}{7}-\frac{y}{5}$

36. $\frac{x}{12}+\frac{y}{8}$

Perform the indicated calculations.

37. $\frac{2}{5}+\frac{5}{6}$

38. $\frac{2}{5}\cdot\frac{5}{6}$

39. $\frac{7}{8}-\frac{1}{6}$

40. $\frac{7}{8}\div\frac{1}{6}$

41. $3\frac{3}{5}+1\frac{2}{5}$

42. $4\frac{2}{3}-3\frac{3}{4}$

43. $3-\frac{2}{5}$

44. $\frac{3}{4}\div\frac{9}{8}$

45. $\frac{3}{4}\cdot\frac{8}{15}$

46. $\frac{2}{3}\div\frac{7}{6}$

47. $1\frac{3}{5}\cdot 3\frac{1}{4}$

48. $2\frac{3}{7}\div 1\frac{5}{7}$

49. $\left(-\frac{2}{3}\right)^2$

50. $\left(\frac{2}{-3}\right)^2$

51. $\left(\frac{-2}{3}\right)^2$

52. $-\left(\frac{2}{3}\right)^2$

53. $3-\frac{2}{5}$

54. $1\frac{2}{7}+8$

55. $\frac{3+5}{4-16}$

56. $-4+\frac{3-6}{3+2}$

57. $\frac{-6-2(-5)}{3-10}$

58. $\frac{2}{3}-\frac{(-2)5}{8-5}$

59. $\left(-\frac{3}{4}\right)^3$

60. $\left(\frac{3}{4}\right)^3$

61. $\left(-\frac{1}{2}\right)^3\cdot\left(\frac{2}{3}\right)^2$

62. $\frac{2+3}{2^4-3^2}$

63. $2-\left(\frac{3}{5}\right)^2$

64. $\frac{3^2+4^2}{3+4}$

Find the value of the algebraic expression at the specified values of its variables.

65. $\frac{x^2-y^2}{x-y};\quad x=3, y=-1$

66. $\frac{2x-y}{y};\quad x=3, y=-8$

67. $\frac{1}{x}+\frac{1}{y};\quad x=4, y=3$

68. $\frac{1}{x}-\frac{1}{y};\quad x=-5, y=7$

69. $\frac{x}{y^3}-y^2;\quad x=-5, y=-2$

70. $\frac{x-(2-y)}{x+y};\quad x=-2, y=-4$

71. $\frac{6xy-y^2}{y^2};\quad x=2, y=-2$

72. $\frac{x^2-(y-y^3)}{2x+y};\quad x=-4, y=-1$

1.4: Decimals and Percentages

Round each number to the nearest tenth, nearest hundredth and nearest thousandth.

1. 2.76381 **2.** 251.3517 **3.** 37.469 **4.** 0.7528

Write each decimal number as a fraction in reduced form.

5. 2.8 **6.** 0.025 **7.** 1.52 **8.** 0.65

Write each fraction or mixed number in decimal form.

9. $\frac{3}{8}$ **10.** $4\frac{5}{8}$ **11.** $\frac{5}{6}$ **12.** $7\frac{3}{5}$

Write each fraction as a percentage.

13. $\frac{1}{20}$ **14.** $\frac{3}{50}$ **15.** $1\frac{2}{5}$ **16.** $\frac{5}{16}$

Write each percentage as a decimal.

17. 5% **18.** 6.3% **19.** 0.45% **20.** 0.075%

Problems involving percentages

21. What is $2\frac{1}{2}\%$ of 16,000?

22. What is 0.04% of 24,000?

23. What is $5\frac{3}{8}\%$ of 750?

24. The number 4 is what percent of 32?

25. The number 7 is what percent of 80?

26. The number 35 is what 20 percent of what number?

27. The number 12 is 0.80 percent of what number?

28. The number 500 is $2\frac{3}{4}$ percent of what number?

1.5: Number Line and Absolute Value

Perform the indicated calculation.

1. $|-7|$ **2.** $-|7|$ **3.** $-|-(2-5)|$ **4.** $-5-|3-8|$

Find the value of the algebraic expression at the specified values of its variable.

5. $|3-(1-x)|;\quad x=-9$ **6.** $|x^2-x^3|;\quad x=-2$

7. $|-x-x^2|;\quad x=-3$ **8.** $|-1+2(x-5)|;\quad x=3$

Place the numbers x *and* y *on a number line and find the distance between them. Check the answer by calculating* $|x-y|$.

9. $x=5, y=2$ **10.** $x=5, y=-2$ **11.** $x=-5, y=-2$ **12.** $x=-5, y=2$

13. $x=3, y=7$ **14.** $x=-4, y=-8$ **15.** $x=2, y=-7$ **16.** $x=-5, y=1$

Determine which of the two fractions is the largest (to the right of the other on the number line) by writing them as equivalent fractions with the same LCD.

17. $\frac{2}{5}, \frac{3}{8}$ **18.** $\frac{4}{9}, \frac{5}{11}$ **19.** $-\frac{5}{6}, -\frac{3}{4}$ **20.** $-\frac{7}{18}, -\frac{5}{12}$

21. $\frac{3}{15}, \frac{1}{6}$ **22.** $\frac{5}{12}, \frac{6}{14}$ **23.** $-\frac{17}{6}, -\frac{49}{18}$ **24.** $\frac{25}{4}, \frac{73}{12}$

For the number pair a, b *in each exercise, write* $a<b$, $a>b$, *or* $a=b$ *depending on which of the three relationships is true.*

25. $\frac{1}{3}, 0.33$ **26.** $0.24, \frac{2}{7}$ **27.** $3\frac{4}{5}, \frac{12}{5}$ **28.** $7\frac{3}{8}, \frac{59}{8}$

29. $-1\frac{5}{16}, -\frac{5}{4}$ **30.** $-\frac{15}{13}, -\frac{45}{39}$ **31.** $4.375, 4.357$ **32.** $-7.43, -7.435$

33. $-\frac{2}{3}, -0.666$ **34.** $-\frac{3}{4}, -\frac{7}{9}$ **35.** $0.0357, 0.00753$ **36.** $-0.158, -0.0581$

Find the median of the given set.

37. $\left\{\frac{1}{6}, \frac{5}{36}, \frac{1}{9}, \frac{1}{4}, \frac{5}{18}, \frac{7}{36}, \frac{2}{9}\right\}$

38. $\{-0.103, -0.132, -0.12, -0.137, -0.1, -0.117\}$

1.6: Applications Using Units, Rates, and Proportions

1. John bought an iPad for \$480 and paid \$31.20 in sales tax. What was the sales tax rate?

2. A man tips a server \$3.00 on meal costing \$14.50. What percentage of this cost is the tip? Round to the nearest tenth of a percent.

3. The price of a shirt is reduced from \$27 to \$20. What is percentage decrease in the price? Round to the nearest hundredth of a percent.

4. **(a)** A woman whose annual salary is \$55,400 gets a 4% raise. What is her new annual salary? **(b)** If her annual salary is x dollars and she gets a 4% raise, what is her new annual salary in terms of x?

5. **(a)** Jennifer bought a pair of running shoes selling for \$75. If the sales tax was 5.8%, what was the total cost of the purchase? **(b)** If the shoes sold for x dollars, what would the total cost of the purchase be in terms of x?

6. **(a)** A coat that sells for \$240 is marked down 20%. What is the sales price of the coat? **(b)** If the coat sells for x dollars, what would the sales price of the coat be in terms of x?

7. **(a)** The Dow Jones Industrial Average drops 0.25% on one day. If the average is 12, 600 at the beginning of the day, what is this average at the end of the day? **(b)** If the average is x at the beginning of the day, what is this average at the end of the day in terms of x?

8. Mark wanted to buy a new car for \$22,000. The salesman told him that with rebate and discounts he could lower the price by 25%. What is the sale price of the car? What is the final cost of the car if Kentucky sales tax of 6% is added?

9. Mark wanted to buy a new car for x dollars. The salesman told him that with rebate and discounts he could lower the price by 25%. What is the sale price of the car in terms of x? What is the final cost of the car in terms of x if Kentucky sales tax of 6% is added?

10. **(a)** Emily got a job at Big Bob's Storage. Her weekly salary is \$700. What is her weekly take home pay if she must pay 13% federal tax and 6% sales tax on her salary? **(b)** If her weekly salary is x dollars, what is her take home pay in terms of x?

11. **(a)** A woman makes 15% more than her husband. If her husband's annual salary is \$45,000, what is the combined annual income of the couple? **(b)** If her husband's annual salary is x dollars, what would the couple's combined annual income be in terms of x?

12. **(a)** A man invests \$10,000 in two certificates of deposit, \$6,000 in the first account earning 5% annual interest and the rest in the second account earning 4% annual interest. How much annual interest does the man earn on this investment? **(b)** If he invests x dollars in the first account and the rest in the second account, express the annual interest he earns on this investment in terms of x.

13. John has \$1400 in his savings account and withdraws $\frac{2}{7}$ of it. How much is left in his account?

14. Beth has \$5400 in her savings account and withdraws $\frac{1}{6}$ of it. The next day, she withdraws $\frac{2}{9}$ of what remains. How much is left in her account after these two transactions?

15. Diana has x dollars in her savings account and withdraws $\frac{1}{6}$ of it. The next day, she withdraws $\frac{2}{9}$ of what remains. How much is left in her account after these two transactions in terms of x?

16. David wanted to buy a new suit selling for \$400. He negotiated with the salesperson and the price was reduced by $\frac{1}{5}$. He then bought the suit and paid a sales tax that was $\frac{3}{50}$ of the sales price. How much did he pay for the suit?

17. **(a)** Mary got a sales job at her father's company. She was paid \$9 per hour plus a 5% commission on her sales. Last week she worked 40 hours with sales of \$5560. How much was she paid? **(b)** If she worked *h* hours with sales of *S* dollars, write an expression for the amount, A, she was paid in terms of *h* and *S*.

18. **(a)** Lisa's job pays \$8 per hour, but if she works more than 35 hours per week she is paid $1\frac{1}{2}$ times her regular salary for the overtime hours. How much is she paid if she works hours 42 hours in one week? **(b)** If she works x overtime hours in one week, how much is she paid in terms of x?

19. **(a)** A plumber charges \$55 an hour for his labor and his assistant charges \$30. If the plumber works twice as long as his assistant on a job, and his assistant works 4 hours, how much did they charge for their labor altogether? **(b)** If the assistant works x hours, how much did they charge for their labor in terms of x?

20. **(a)** A girl has twice as many nickels as dimes, and 3 more quarters than dimes, in her piggy bank. If she has 8 dimes in her bank, how much money, in dollars, does she have in her bank? **(b)** If she has n dimes in her bank, how much money, in dollars, does she have in her bank in terms of n?

21. **(a)** Michael has only \$5 bills and \$20 bills in his wallet. If he has 3 more \$20 bills than \$5 bills, and he has 7 \$20 bills, how much money, in dollars, does he have in his wallet? **(b)** If he has n \$20 bills, then how much money, in dollars, does he have in his wallet in terms of n?

22. Two cars pass one another going in opposite directions along a long straight road. The westbound car is going 60 miles per hour and the eastbound car is going 66 miles per hour. How far apart are the two cars after 5 minutes?

23. Two cars are initially 10 miles apart on the same straight road and are moving towards each other, one car going 30 miles per hour and the other 36 miles per hour. How far apart are the two cars 2 minutes later?

24. Two trees are standing side-by-side in the sunlight. One is 50 feet tall and the other is 20 feet tall. If the taller tree casts an 18-foot shadow, what is the length, in feet, of the shadow of the shorter tree?

25. The Body Mass Index (BMI) for two people of the same height is proportional to their weight. **(a)** If a man 6 feet tall and weighing 180 pounds has a BMI of 24.4, what is the BMI of a man 6 feet tall and weighing 200 pounds? Round the answer to the nearest tenth. **(b)** What is the weight of a man 6 feet tall with a BMI of 30? Round the answer to the nearest pound.

26. The Body Mass Index (BMI) for two people of the same height is proportional to their weight. **(a)** If a woman 5 feet, 4 inches tall and weighing 130 pounds has a BMI of 22.3, what is the BMI of a woman 5 feet, 4 inches tall and weighing 140 pounds? **(b)** What is the weight of a woman 5 feet, 4 inches tall with a BMI of 28? Round the answer to the nearest pound.

27. The time it takes a trained runner to run a 10K is proportional to the time it takes him to run a 5K. Suppose a runner has a 10K time of 37 minutes, 15 seconds and a 5K time of 18 minutes. What is the best approximation to the time it takes his friend to run a 5K if his friend runs the 10K in 39 minutes, 15 seconds? Write the answer in minutes and seconds, rounded to the nearest second.

28. A box of Oaties contains 28 grams of cereal and 140 milligrams of sodium. How many milligrams of sodium are in 5 grams of Oaties?

29. A box of Crunchies contains 59 grams of cereal and 46 grams of carbohydrates. How many grams of carbohydrates are in 6 grams of Crunchies?

30. Northern Kentucky University President Geoffrey Mearns ran a marathon (26.2 miles) in 2 hours and 16 minutes to qualify for the Olympic trials in 1984. How fast did he run in feet per second? Round your answer to the nearest hundredth. *Hint*: 5280 feet =1 mile

31. A woman is walking at the rate of 90 yards per minute. How fast is she going in feet per second?

32. A man can run 1 mile in 6 minutes. How fast is this measured in feet per second? How fast is this measured in miles per hour? *Hint*: 5280 feet=1 mile

33. A car is going 80 kilometers per hour. How fast is this measured in miles per hour? Round the answer to the nearest tenth of a mile per hour. *Hint*: 1 kilometer $\approx$ 0.621 miles

34. A car is going 90 kilometers per hour. How fast is this measured in meters per second?

35. How many minutes does it take for a woman to walk 1200 feet if she walks at the rate of 4 feet per second?

36. How many minutes does it take a man to walk a mile if he walks at the constant rate of 4 feet per second? *Hint*: 5280 feet =1 mile

37. How many centimeters are in $\frac{5}{8}$ of a meter?

38. How many meters are in $\frac{3}{7}$ of a kilometer? Round your answer to the nearest hundredth of a meter.

39. How many centimeters are in 2 kilometers?

40. How many seconds are in 3 hour and 15 minutes?

41. How many inches are in 3 yards, 2 feet and 7 inches?

42. How many inches are in one meter? *Hint*: 1 inch $\approx$ 2.54 centimeters

43. A car gets 25 miles per gallon. How many gallons of gas are needed for the car to go 180 miles?

44. A car gets 25 miles per gallon. How many gallons of gas are needed for the car to go 300 kilometers? *Hint*: 1 kilometer $\approx$ 0.621 miles

Chapter 2: Basic Geometry

2.1: Properties of Simple Geometric Figures

1. What is the area, in square centimeters, of a rectangle whose length is 120 centimeters and whose width is 80 centimeters?

2. What is the area, in square inches, of a circle whose diameter is 9 inches?

3. What is the length, in feet, of a rectangle whose width is 7 feet and whose area is 63 square feet?

4. What is the perimeter, in inches, of a rectangle whose length is 12 feet and whose area is 96 square inches?

5. What is the perimeter of a square whose area is 144 square feet?

6. One angle of a triangle has measure 26 degrees and another has measure 35 degrees. What is the measure, in degrees, of the third angle?

7. **(a)** What is the perimeter, in centimeters, of a rectangle whose width is 7 centimeters and whose length is 4 centimeters more than its width? **(b)** What is the perimeter, in centimeters, of a rectangle whose width is n centimeters and whose length is 4 centimeters more than its width, in terms of n?

8. **(a)** What is the area, in square centimeters, of a rectangle whose width is 8 centimeters and whose length is 6 centimeters more than half its width? **(b)** What is the area, in square centimeters, of a rectangle whose width is n centimeters and whose length is 6 centimeters more than half its width, in terms of n?

9. **(a)** What is the perimeter, in feet, of a rectangle whose width is 6 feet and whose length is 3 feet more than twice its width? **(b)** What is the perimeter, in feet, of a rectangle whose width is n feet and whose length is 3 feet more than twice its width, in terms of n?

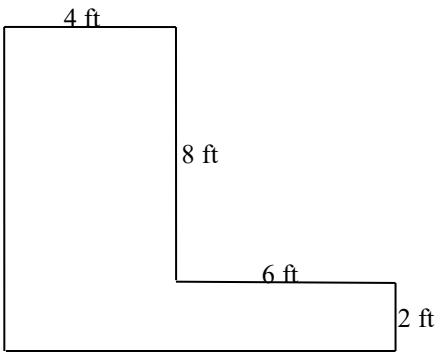
10. **(a)** What is the area, in square feet, of a rectangle whose width is 6 feet and whose length is 2 feet more than three times its width? **(b)** What is the area, in square feet, of a rectangle whose width is n feet and whose length is 2 feet more than three times its width, in terms of n?

11. **(a)** What is the area of a triangle, in square meters, whose base is 7 meters and whose height is half its base? **(b)** What is the area of a triangle, in square meters, whose base is b meters and whose height is half its base, in terms of b?

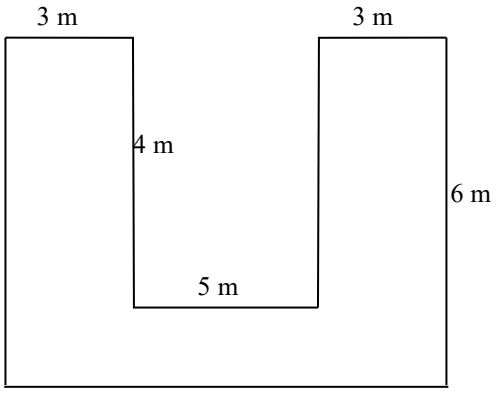
12. **(a)** Janis wants to carpet her living room, which measures 15 feet by 12 feet. She picked out a nice Berber style that cost $2 per square foot. How much will it cost to carpet her living room? **(b)** If the room is L feet by W feet, write an expression for the cost, C, to carpet the living room in terms of L and W.

13. **(a)** A circle is inscribed inside a square of side length 8 centimeters. What is the area, in square centimeters, inside the square and outside the circle? Round your answer to the nearest tenth of a square centimeter. **(b)** A circle is inscribed inside a square of side length s centimeters. What is the area, in square centimeters, inside the square and outside the circle in terms of s?

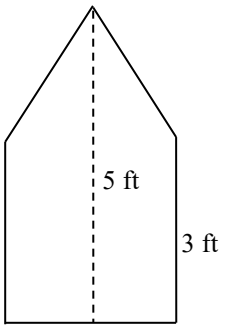
14. The figure below is a diagram of a floor that needs to be carpeted. **(a)** What is the area, in square feet, of the region that needs to be carpeted? **(b)** What is the length, in feet, of the boundary of this region? **(c)** What is the cost of carpeting this region if the carpet selected costs $2.50 per square foot?



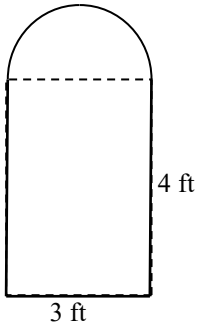
15. The figure below is a diagram of a floor that needs to be tiled. **(a)** What is the area, in square meters, of the region that needs to be tiled? **(b)** What is the length, in meters, of the boundary of this region? **(c)** What is the cost of tiling this region if the tile selected costs $12.00 per square meter?



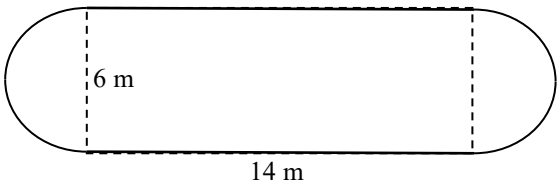
16. The metal plate shown consists of a square with a triangle on top. How much does the plate weigh, in pounds, if the metal weighs 2.5 pounds per square foot?



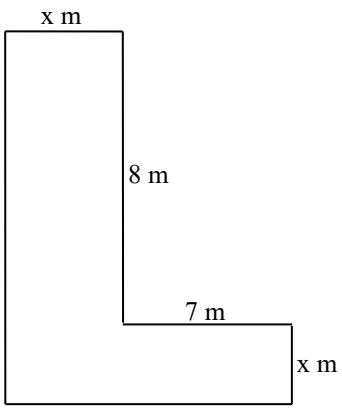
17. The figure below is a diagram of a window in the shape of a semicircle atop a rectangle of length 3 feet and height 4 feet. **(a)** What is the area, in square feet, enclosed by the window? **(b)** What is the distance, in feet, around the boundary of the window?



18. The figure below is a diagram of a garden plot in the shape of a rectangle of length 14 meters long and 6 meters wide with semicircles adjoined on each end.
(a) A landscaping company charges $1.50 per square meter to tend the garden for each month during the summer. How much, in dollars, does the landscaping company charge each month to care for the garden? Round the answer to the nearest cent. **(b)** A fence costing $20 per meter is built around the boundary of the garden. What is the cost, in dollars, of the fencing? Round your answer to the nearest cent.



19. **(a)** Express the area, in square meters, enclosed by figure below in terms of x. **(b)** Express the length, in meters, of the boundary of this figure in terms of x.



2.2: Coordinate Geometry

1. Plot the following pairs of points in the coordinate plane and find the distance between them in each case.

a) $(2,3), (7,3)$ **b)** $(-2,5), (-2,-3)$ **c)** $(-8,5), (-2,5)$

d) $(-9,1), (6,1)$ **e)** $(0,-4), (0,2)$ **f)** $(-5,0), (-1,0)$

g) $\left(\frac{2}{5},2\right), \left(\frac{8}{3},2\right)$ **h)** $\left(-\frac{2}{3},-1\right), \left(\frac{7}{4},-1\right)$ **i)** $\left(3,\frac{5}{6}\right), \left(3,-\frac{15}{8}\right)$

2. Sketch the rectangle in the coordinate plane whose vertices are $(-2,5)$, $(3,5)$, $(3,1)$ and $(-2,1)$. Find its area and its perimeter.

3. Sketch the rectangle in the coordinate plane whose vertices are $(-7,-2)$, $(-3,-2)$, $(-3,-5)$ and $(-7,-5)$. Find its area and its perimeter.

4. Sketch the circle in the coordinate plane given that the line segment connecting $(0,2)$ and $(6,2)$ is a diameter of the circle. Find two additional points that lie on the circle. Find the area and the circumference of the circle.

5. Sketch the circle in the coordinate plane given that the line segment connecting $(8,1)$ and $(3,1)$ is a diameter of the circle. Find two additional points that lie on the circle. Find the area and the circumference of the circle.

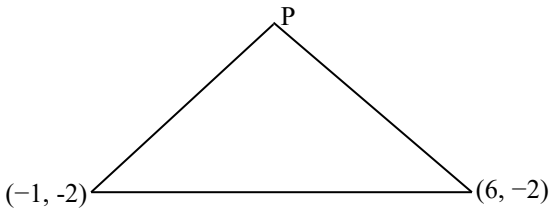
6. Sketch the triangle in the coordinate plane whose vertices are $(-6,0)$, $(-1,0)$ and $(-3,-4)$. Find its area.

7. Sketch the triangle in the coordinate plane whose vertices are $(5,4)$, $(-2,4)$ and $(-1,2)$. Find its area.

8. Sketch the polygon in the coordinate plane whose vertices are $(-2,5)$, $(4,5)$, $(4,-2)$, $(1,-6)$, $(-2,-2)$ and back to $(-2,5)$, and whose edges are line segments connecting successive pairs of vertices. Find the area enclosed by this polygon.

9. **(a)** What are the coordinates of the vertices P and Q of the rectangle below if its area is 35? **(b)** What are the coordinates of the vertices P and Q of the rectangle below if its perimeter is 22?

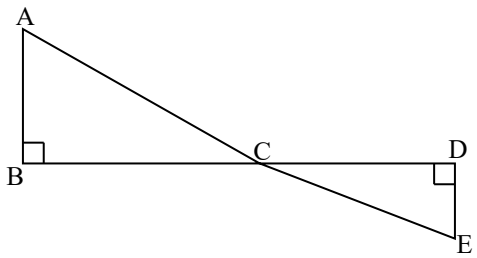
10. What is the y-coordinate of the vertex P of the triangle below if its area is 14?



2.3: Pythagorean Theorem and Similar Triangles

1. A woman 5 feet tall stands next to her daughter who is 4 feet tall on a sunny day. If the woman's shadow has length 3 feet, what is the length, in feet, of her daughter's shadow?

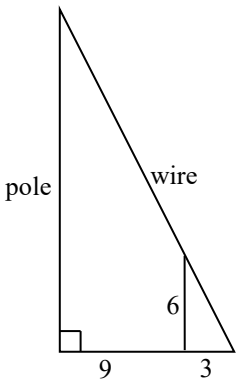
2. In the figure below, AB has length 6 feet, BC has length 8 feet and CD has length 7 feet. If angles A and D are right angles, what is the length of DE rounded to the nearest tenth of a foot?



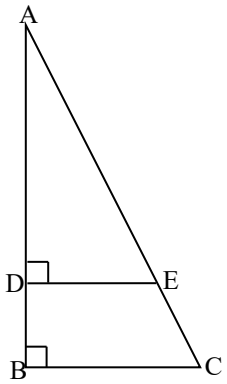
3. If the two sides of a right triangle both have length 5 inches, what is the length, in inches, of the hypotenuse?

4. If the hypotenuse of a right triangle has length 9 centimeters and one of its sides has length 5 centimeters, what is the length of its other side, in centimeters?

5. In the figure below, a wire is stretched from the top of a pole to the ground. A man 6 feet tall stands 9 feet from the base of the pole and 3 feet from where the wire is attached to the ground so that his head touches the wire. What is the height of the pole?



6. In the triangle shown below, AD has length 7 inches, AB has length 9 inches and DE has length 4 inches. If angles B and D are right angles, what is the area of triangle ABC rounded to the nearest tenth of a square inch?

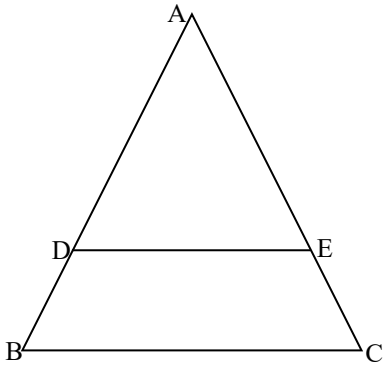


7. Two cyclists leave an intersection together. One goes north at 15 feet per second and the other goes east at 9 feet per second. How far apart are the two cyclists after one minute? Round your answer to the nearest foot.

8. An equilateral triangle has side length 10 centimeters. Find its area in square centimeters. *Hint*: The altitude of an equilateral triangle is the perpendicular bisector of its base.

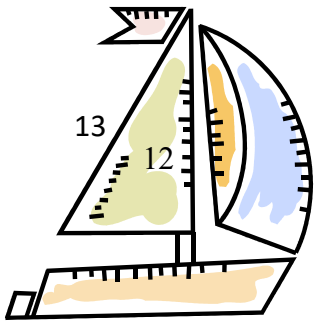
9. A plywood surface is in the shape of an isosceles triangle with two sides of length 9 feet and base of length 6 feet. How much will this plywood surface cost if plywood costs $12 per square foot? Round your answer to the nearest cent. *Hint*: The altitude of an isosceles triangle is the perpendicular bisector of its base.

10. In the figure below, ABC is an isosceles triangle, DE is parallel to BC, AD has length 10 inches, AB has length 12 inches and DE has length 8 inches. What is the area of triangle ABC to the nearest square inch?

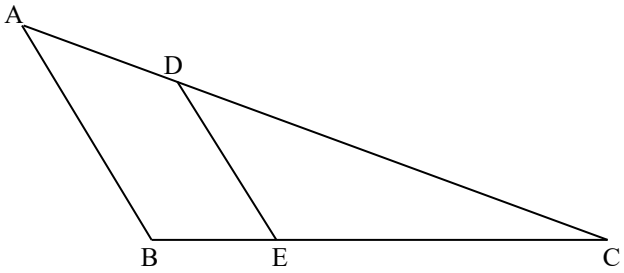


11. A truck crosses an intersection going north at 40 miles per hour. One half hour later, a car crosses the same intersection going east at 50 miles per hour. How many miles apart are the car and the truck 15 minutes after the car leaves the intersection?

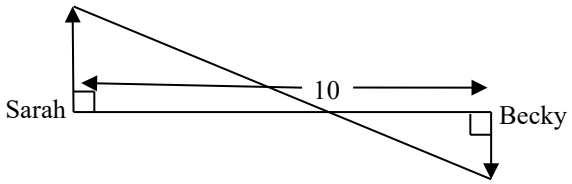
12. The sail on the sailboat shown below forms a right triangle whose hypotenuse has length 13 feet and whose vertical side has length 12 feet. If cloth for the sail costs $10 per square foot, what is the cost of the sail?



13. In the figure below, DE is parallel to AB, AB has length 8 centimeters, BE has length 5 centimeters, and EC has length 7 centimeters. What is the length of DE rounded to the nearest tenth of a foot?



14. Becky is 10 miles east of Sarah when both begin running as shown in the figure below. Sarah runs north at 8 miles per hour and Becky runs south at 7 miles per hour. How far apart are the two girls 30 minutes later?



Chapter 3: Exponents

3.1: Integer Exponents

Simplify the expression, writing it without any negative exponents.

1. $(-2x^4)^3$

2. $(6y)^3$

3. $(-3a^4bc^5)^2$

4. $-3(-2x^2)^3$

5. $(-7a^4)^2$

6. $a^2(a^4b^3c)^5$

7. $\dfrac{(xy^2z^3)^4}{(x^3y^2z)^3}$

8. $\dfrac{(2y^3)^4}{2y^5}$

9. $\dfrac{(2a^3)^2(3a^4)}{(a^3)^4}$

10. $\left((-x^3y)^2z^4\right)^3$

11. $\left(\dfrac{-u^2v^3}{4u^4v}\right)^2$

12. $\left(\dfrac{2xy^6z}{xy^2z^3}\right)^3$

13. $(2x^3)^{-3}$

14. $(ab^2)^{-7}$

15. u^3u^{-9}

16. $(-2x^5)^{-2}$

17. $(x^2y^{-3})^{-4}$

18. $(-u^{-4})^3(2u^5)^{-2}$

19. $(-4x^2y^{-7})^3$

20. $\left(-3x^{-2}y\right)^2(2x^3y^{-4})^{-2}$

21. $(-2a^3b^{-4}c^{-7})^3$

22. $\dfrac{a^{-3}b^4}{a^{-5}b^5}$

23. $\left(\dfrac{a^{-1}}{5b^4}\right)^2$

24. $\left(\dfrac{-2a^4}{b^2}\right)^{-3}$

25. $\left(\dfrac{9y}{y^{-5}}\right)^{-1}$

26. $\left(\dfrac{x^6}{4x^2}\right)^{-2}$

27. $\left(\dfrac{x^8}{x^{-2}}\right)^3\left(\dfrac{x^{-3}}{2x}\right)^2$

28. $\dfrac{(-a^2b^3)^{-2}}{a^{-4}b^2}$

29. $\left(\dfrac{x^{-1}yz^{-2}}{x^{-8}y^{-5}z}\right)^{-1}$

30. $\left(\dfrac{xy^{-2}z^{-3}}{x^2y^3z^{-4}}\right)^{-3}$

31. $(3ab^2c)\left(\dfrac{2a^2b}{c^3}\right)^{-2}$

32. $\dfrac{1}{4}x^2y^{-5}\left(3\dfrac{x^{-4}}{y^{-2}}\right)^2$

33. $\left(\dfrac{x^5}{2y^{-3}}\right)^3\left(\dfrac{6x^{-8}}{y}\right)^2$

Find the value of the algebraic expression at the specified values of its variable or variables without using a calculator. Simplify the expression before evaluating. Check your answer using a calculator.

34. $x^3x^{-4}; \quad x=5$

35. $(x^{-2})^3; \quad x=-2$

36. $(2x^{-1})^3; \quad x=3$

37. $(x^2+y^2)^{-1}; \quad x=-1, y=2$

38. $x^{-2}+y^{-2}; \quad x=1, y=2$

39. $(x+y)^{-1}; \quad x=3, y=5$

40. $x^{-1}+y^{-1}; \quad x=3, y=5$

41. $\left(\frac{x}{y}\right)^{-2}; \quad x=-2, y=3$

42. $\left(\frac{x}{y}\right)^{-2}; \quad x=1, y=3$

43. $\frac{x^2}{x^{-3}}; \quad x=-2$

44. $\frac{x^{-3}}{x^{-2}}; \quad x=7$

45. $\left(\frac{x^{-2}}{y}\right)^{-1}; \quad x=3, y=7$

3.2: Square Roots

Simplify the expression. Assume that all variables represent positive numbers.

1. $\sqrt{12x^6}$ **2.** $\sqrt{32x^2y^{10}}$ **3.** $\sqrt{81x^9}$ **4.** $\sqrt{25x^5y^9}$

5. $\sqrt{24z^7}$ **6.** $\sqrt{18y^3z^{12}}$ **7.** $\sqrt{8x^5y^{17}}$ **8.** $\sqrt{3x^8y^5z^7}$

9. $\sqrt{\dfrac{20}{x^{20}}}$ **10.** $\sqrt{\dfrac{x^6}{y^{10}z^2}}$ **11.** $\sqrt{\dfrac{32x^3}{9y^2}}$ **12.** $\sqrt{\dfrac{y^9z^{13}}{w^{12}}}$

13. $\sqrt{72x^5y^9}$ **14.** $\sqrt{\dfrac{49}{8x^5}}$ **15.** $\sqrt{\dfrac{27y^8}{8z^3}}$ **16.** $\sqrt{\dfrac{52y^8}{45z^{12}}}$

17. $\sqrt{\dfrac{18x^5}{2x^{-2}}}$ **18.** $\sqrt{\dfrac{x^5yz^8}{x^2y^{-5}}}$ **19.** $\sqrt{\dfrac{9x^{-2}y^6}{45x^{-7}y^2}}$ **20.** $\sqrt{\dfrac{33x^2y^6}{9x^{-3}}}$

Find the value of the algebraic expression at the specified values of its variable or variables in simplified form without a calculator. Simplify the expression before evaluating. Check your answer using a calculator.

21. $\sqrt{x^3y^4};\quad x=3, y=2$ **22.** $\sqrt{x^3y^5};\quad x=4, y=7$

23. $\sqrt{44x^5};\quad x=7$ **24.** $\sqrt{98x^6};\quad x=2$

25. $\sqrt{\dfrac{18x^5}{2x^{-2}}};\quad x=4$ **26.** $\sqrt{\dfrac{x^3y^{-4}}{x^7y^{-2}}};\quad x=3, y=5$

3.3: Roots and Rational Exponents

Simplify the expression. Assume that all variables represent positive numbers.

1. $\sqrt[3]{8x^{11}}$ **2.** $\sqrt[3]{16x^{7}}$ **3.** $\sqrt[3]{40x^{6}y^{5}}$ **4.** $\sqrt[3]{72x^{10}y^{5}}$

5. $\sqrt[3]{\dfrac{48}{y^{12}}}$ **6.** $\sqrt[3]{\dfrac{64x^{25}}{y^{8}}}$ **7.** $\sqrt[3]{\dfrac{54x^{18}}{y^{27}}}$ **8.** $\sqrt[3]{\dfrac{32x^{28}}{27y^{15}}}$

Write each radical expression as an exponential expression and each exponential expression as a radical expression.

9. $\dfrac{1}{\sqrt{3}}$ **10.** $\sqrt[3]{7^{2}}$ **11.** $\sqrt{5^{3}}$ **12.** $\dfrac{1}{\sqrt[3]{x^{7}}}$

13. $x^{2/3}$ **14.** $7^{-5/2}$ **15.** $x^{3/5}$ **16.** $x^{-5/3}$

Evaluate each expression without a calculator. Check your answer using a calculator.

17. $\sqrt[3]{\dfrac{8}{27}}$ **18.** $\sqrt[3]{-64}$ **19.** $\sqrt[5]{32}$ **20.** $\sqrt[4]{\dfrac{1}{16}}$

21. $\sqrt[3]{-\dfrac{54}{2}}$ **22.** $\dfrac{\sqrt[3]{-27}}{\sqrt[3]{8}}$ **23.** $\dfrac{\sqrt[5]{-3}}{\sqrt[5]{96}}$ **24.** $\dfrac{\sqrt[3]{5}}{\sqrt[3]{40}}$

25. $8^{1/3}$ **26.** $64^{1/4}$ **27.** $(-32)^{1/5}$ **28.** $81^{1/2}$

Find the value of the algebraic expression at the specified values of its variable or variables without using a calculator. Check your answer using a calculator.

29. $x^{2/3};\quad x=8$ **30.** $x^{3/4};\quad x=16$

31. $(x^{3}y)^{1/2};\quad x=2,\ y=4$ **32.** $x^{4/3};\quad x=8$

33. $\left(\dfrac{x^{4}}{y^{2}}\right)^{3/2};\quad x=2,\ y=3$ **34.** $(x^{2}-y)^{3/2};\quad x=5,\ y=-7$

35. $(x^{3}+y^{3})^{5/2};\quad x=1,\ y=2$ **36.** $(xy^{2})^{-2/3};\quad x=2,\ y=-2$

37. $(x^{2}+y^{2})^{-1/2};\quad x=3,\ y=4$ **38.** $\left(\dfrac{x^{2}}{y^{2}}\right)^{-5/2};\quad x=3,\ y=2$

Chapter 4: Polynomials

4.1: Add and Subtract Polynomials

Perform the indicated operations and simplify.

1. $(4x-3)-(7x-5)$

2. $9-3(1-4y)$

3. $(2x^2-5x+8)+(5x^2-7x-12)$

4. $(3x^2-5x+8)-(8x^2-7x-11)$

5. $(x^2-3x)-(x^3-x^2-6x+1)$

6. $2(3t+1)-4(1-3t)$

7. $2x(x^2-1)+4(x^3-5x)$

8. $-3(5t^2-4)-t(2t-1)$

9. $4(x^2-x+5)-3(x^2-4x-3)$

10. $y^2(1-y)+3y(y^2-5y+1)$

11. Add x^3-3x^2+5x-7 and x^4-4x^3-x+9

12. Add $1-3y+5y^2$ and $4+8y-12y^2-6y^3$

13. Subtract x^2-2x-5 from $6x^2+5x-9$

14. Subtract $-5x^2+7x-3$ from x^3+4x^2-3

15. $\frac{1}{5}x+\frac{3}{5}x$

16. $\frac{7}{3}x^3-\frac{2}{3}x^3$

17. $t+\frac{1}{4}t$

18. $\frac{3}{8}t+2t$

19. $\frac{1}{3}x+\frac{3}{4}x+x$

20. $\frac{3}{8}x^2-\frac{1}{6}x^2$

21. $\frac{5x}{6}+\frac{3x}{4}$

22. $3x^2-\frac{x^2}{3}+\frac{4x^2}{5}$

23. $\left(x^2-\frac{3}{2}x+\frac{1}{4}\right)-\left(\frac{2}{5}x^2-\frac{5}{8}x+\frac{1}{3}\right)$

24. $\left(\frac{2x^2}{5}-\frac{x}{2}+\frac{5}{6}\right)-\left(\frac{1}{2}x^2-\frac{x}{8}-\frac{2}{3}\right)$

4.2: Multiply Polynomials

Perform the indicated operations and simplify.

1. $3x^2(x^4-2x^3-x+5)$

2. $x^2y^3(x^4-x^2y^2+y^4)$

3. $2a^5(a^3-3a^2b-4b^3)$

4. $(x+3)(x-2)$

5. $(3t-2)(5t+4)$

6. $(t-2)(5t+6)$

7. $2(3x+1)(x+5)$

8. $(x^2+y^2)(x^2-y^2)$

9. $(5y-4)(y-3)$

10. $3(2x-1)(4x+7)$

11. $(3x-2)^2$

12. $(3x-2)(3x-2)$

13. $(x^2-2y^3)(x^2-2y^3)$

14. $(x^2-2y^3)^2$

15. $(1-3x)^2$

16. $(a+b)^2$

17. $(y+2)(y^2-3y+4)$

18. $(a-b)(a^2+ab+b^2)$

19. $(x+2)^3$

20. $(x^3+2y^5)(x^3-2y^5)$

21. $(x^3+2y^5)(x^3+2y^5)$

22. $(x+3y)(x^2-6xy+9y^2)$

23. $(x+1)(x+1)^2$

24. $(2a-3)(a^2+a+1)$

25. $(2x-1)^3$

26. $(a+b)^3$

4.3: Factor Polynomials

Find the greatest common factor (GCF) of the terms in the expression. Write the expression by factoring out the GCF in each of its terms and then use the distributive law to write the expression in factored form.

1. $4x^3+8x$

2. $10y+15$

3. $24x^3-8x^5$

4. $a^2b^5+a^3b^3$

5. $3a^2b-7a^3b^4$

6. $27x^5y^4-18x^2y^3$

7. $45t^5-30t^3$

8. $5s^2t^2-st$

9. $6y^2(x+1)+8y(x+1)$

10. $x(5x-1)+3(5x-1)$

11. $4a(a-1)-7(a-1)$

12. $18x^2y^2(x-y)+12xy^3(x-y)$

13. $9a^2b+6ab^3+15a^4b^2$

14. $x^4+3x^3-18x^2$

15. $8x^2-20x+32$

16. $12a^6b^2-9a^5b^3+15a^4b^4$

17. $24x^2(x+2)+30x(x+2)+15(x+2)$

18. $9x^3(2y-1)-8x^5(2y-1)+18x^7(2y-1)$

Factor the trinomial.

19. x^2+2x-3

20. x^2-5x+4

21. x^2-x-6

22. $x^2-7x+10$

23. $x^2-5x-24$

24. $x^2-11x+18$

25. $x^2-8xy+7y^2$

26. x^2-4y^2

27. $a^2+ab-12b^2$

28. $x^2-14xy+24$

29. $9s^2-16t^2$

30. $a^2-4ab-21b^2$

31. $t^2+3t-40$

32. $x^2-8xy-48y^2$

33. $y^2+2y-24$

34. x^2-81

Complete the factorization.

35. $2x^2+5x-3=(2x\quad)(x\quad)$

36. $6x^2+7x-5=(3x\quad)(2x\quad)$

37. $6x^2-11x-2=(6x\quad)(x\quad)$

38. $8x^2-2x-15=(4x\quad)(2x\quad)$

39. $8x^2-26x+15=(4x\quad)(2x\quad)$

40. $5x^2-13x+6=(5x\quad)(x\quad)$

41. $12x^2+16x-3=(6x\quad)(2x\quad)$

42. $12x^2+41x+35=(4x\quad)(3x\quad)$

43. $5x^2-23x+24=(5x\quad)(x\quad)$

44. $5x^2+14x-24=(5x\quad)(x\quad)$

Factor the trinomial.

45. $2x^2+5x-3$

46. $2y^2-19y-10$

47. $3a^2+8a+5$

48. $5x^2+7x-6$

49. $3t^2+13t-10$

50. $3y^2-2y-1$

51. $4x^2-4x-3$

52. $4x^2-11x-3$

53. $9a^2-18a-16$

54. $4y^2+12y+9$

55. $6x^2-x-12$

56. $2y^2-11y+14$

57. $6b^2+7b-3$

58. $4s^2-9s+2$

59. $15x^2+16x+4$

60. $8t^2+5t-22$

61. $2x^2+xy-6y^2$

62. $2s^2-11st+5t^2$

63. $6a^2-7ab+2b^2$

64. $9x^2+24xy+16y^2$

Factor the expression completely.

65. $12x^3+18x$

66. $6a^4b^2-9a^3b^3$

67. $x^2-8x+15$

68. $9x^2-36x-45$

69. $3x^2-27$

70. $2t^2+5t+3$

71. $10x^4 - 35x^3 + 15x^2$

72. $2x^4 - 18x^2$

73. $a^4b^3 - a^2b^5$

74. $12y^3 + 50y^2 + 28y$

75. $6x^3 + 45x^2 + 21x$

76. $12a^2 + 36ab + 27b^2$

77. $2x^3y^2 + 13x^2y^2 + 15xy^2$

78. $14t^5 - 38t^4 + 20t^3$

79. $x^6y^2 - 9x^4y^4$

80. $6x^2 - xy - 12y^2$

81. $6x^2 - xy - 12y^2$

82. $3x^2 + 10xy - 24y^2$

83. $5ab^2x^2 - 10ab^2x - 15ab^2$

84. $24a^2 - 18ab + 3b^2$

85. $x^4 + 5x^2 + 6$

86. $2x^4 - 5x^2 + 3$

87. $x^4 - y^4$

88. $a^6(a+1)^2 + a^7(a+1)$

89. $(x-2)(x+5)^2 + (x-2)^2(x+5)$

90. $x^2(x^2-1) - 9(x^2-1)$

91. $9x^4 - 49$

92. $5a^3 - 125a$

93. $x^2(x-3) - 4(x-3)$

94. $a^2(x-y) - b^2(x-y)$

95. $5x^4 - 80y^4$

96. $4x^2 + 24xy + 36y^2$

Chapter 5: Rational Expressions

5.1: Simplify Rational Expressions

Find the greatest common factor (GCF) of the numerator and the denominator of each rational expression. Write the expression by factoring out the GCF in both the numerator and the denominator. Then divide out the GCF to write the rational expression in simplified form.

1. $\dfrac{45a^3b^4}{9a^5b}$

2. $\dfrac{8a^{10}b^3}{6a^5b}$

3. $\dfrac{3x(x-1)^2}{5x^2(x-1)}$

4. $\dfrac{24x^3y^5}{30y^3z^2}$

5. $\dfrac{x^2(x+3)^3}{x^7(x+3)(2x-1)}$

6. $\dfrac{15(x+1)^3(x-1)}{48(x+1)^5(2x+3)}$

Simplify the rational expression.

7. $\dfrac{18x^4y^7}{24x^8y^4z}$

8. $\dfrac{6(x+4)^3(x-2)^2}{30(x+4)^2}$

9. $\dfrac{4(a-b)(a+b)^2}{7(b-a)(a+b)^2}$

10. $\dfrac{(x-2)(3x+5)^2}{(2-x)(3x+5)^3}$

11. $\dfrac{x^3+3x^2}{x^2+2x^4}$

12. $\dfrac{3x^2-15x}{12x-60}$

13. $\dfrac{a^2b^2+a^2b^4}{a^2b^2+a^4b^2}$

14. $\dfrac{x^2y}{x^2y+x^4y^2}$

15. $\dfrac{x^3yz+xy^3z+xyz^3}{x^2y^2z^2}$

16. $\dfrac{6t^4-18t^3}{4t^2-12t}$

17. $\dfrac{t^3-2t^2+t}{t^2-t}$

18. $\dfrac{2a^2b^2-10a^6b^8}{2a^2b^2}$

19. $\dfrac{x^2-4}{x+2}$

20. $\dfrac{x^2+4x+3}{x+1}$

21. $\dfrac{x^2+6x+8}{x^2+5x+4}$

22. $\dfrac{(a-3)^2}{a^2-9}$

23. $\dfrac{x^2+2x-3}{x^2+x-6}$

24. $\dfrac{6x+12}{x^2+5x+6}$

25. $\dfrac{4x^2-4}{12x^2+12x-24}$

26. $\dfrac{4y^3+4y-8y}{2y^3+4y-6y}$

27. $\dfrac{y^2-y-12}{y^2+5y+6}$

28. $\dfrac{2x^2+5x-3}{3x^2+11x+6}$

29. $\dfrac{x^2+2xy+y^2}{3x^2+2xy-y^2}$

30. $\dfrac{2x^2+6xy+4y^2}{4x^2-4y^2}$

31. $\dfrac{6x+12}{4x^2+6x-4}$

32. $\dfrac{x^7+4x^6+3x^5}{x^4+3x^3+2x^2}$

33. $\dfrac{3x^2+12x+12}{9x^2-36}$

34. $\dfrac{t^3+t^2}{t^2-1}$

35. $\dfrac{t^2-3t-18}{2t^2+5t+3}$

36. $\dfrac{2t^4-t^3-6t^2}{2t^2-7t+6}$

5.2: Multiply and Divide Rational Expressions

Perform the multiplication or division and simplify.

1. $\dfrac{x^2}{4y}\cdot\dfrac{2x^3}{y^2}$

2. $-\dfrac{y}{8}\cdot\dfrac{10}{y^3}$

3. $\dfrac{a^2}{a+2}\cdot\dfrac{6a+12}{a^2}$

4. $\dfrac{8a-6}{5a+20}\cdot\dfrac{2a+8}{4a-3}$

5. $\dfrac{x^3}{y}\div\dfrac{x^5}{y^2}$

6. $\dfrac{2a+3}{a^3}\div\dfrac{6a+9}{a^4}$

7. $\dfrac{x-1}{(x+3)^2}\div\dfrac{1-x}{(x+3)^3}$

8. $\dfrac{4x-1}{3x+2}\cdot\dfrac{9x^2+6x}{1-4x}$

9. $\dfrac{3x^2}{x^2-9}\cdot\dfrac{x+3}{12x}$

10. $\dfrac{2x^2+7x-4}{2x^2-3x+1}\cdot\dfrac{3-x}{x-3}$

11. $\dfrac{x^2-x-6}{x^2-1}\cdot\dfrac{x+1}{x-3}$

12. $\dfrac{x^2+5x+6}{x^2+2x}\cdot\dfrac{x^3+x}{x^2+4x+3}$

13. $\dfrac{x^2y+3xy^2}{x^2-9y^2}\cdot\dfrac{x^2-2xy-3y^2}{5x^2y}$

14. $\dfrac{2x^2+3x+1}{x^2+2x-15}\div\dfrac{x^2+6x+5}{2x^2-7x+3}$

15. $\dfrac{x^4}{x+2}\div\dfrac{x^3}{x^2+4x+4}$

16. $\dfrac{3x^2+2x-1}{x^2-1}\cdot\dfrac{x^2-2x+1}{3x^2-7x+2}$

17. $\dfrac{2a^2-ab-b^2}{a^2-2ab+b^2}\cdot\dfrac{2a^2+ab-3b^2}{2a^2+3ab+b^2}$

18. $\dfrac{x^2-2x-15}{x^2-4x-5}\cdot\dfrac{x^2+8x+7}{x^2+7x+12}$

5.3: Add and Subtract Rational Expressions

Suppose the expressions given are denominators of rational expressions. Find their least common denominator (LCD).

1. $x^4y^5,\ x^2y^7z$

2. $2a^3b^5, 3a^6b^2$

3. $12(x-1), 9(x-1)^3$

4. $(x+2)^3(x+3), (x+3)^2(x+4), (x+4)^5$

5. $x^2+5x+6,\ (x+2)^2$

6. $15x^2(y+1),\ 21x(y+1)^3$

7. $x^2-25,\ x^2+8x+15$

8. $t(t^2-1), t^3(t+1),\ t^2(t-1)$

Write each pair of rational expressions as equivalent rational expressions with their LCD as the denominator for both.

9. $\frac{7}{2x^2}, \frac{5}{3x^2}$

10. $\frac{1}{4ab^2}, \frac{1}{a^3b}$

11. $\frac{1}{12x^2y^3}, \frac{1}{18x^5y}$

12. $\frac{x+1}{4xy}, \frac{5y}{6x^2}$

13. $\frac{3}{x(x-1)}, \frac{7}{(x-1)^2}$

14. $\frac{x}{4x+4}, \frac{1}{x^2-1}$

15. $\frac{x}{x^2+4x+3}, \frac{x+5}{x^2+3x+2}$

16. $\frac{x+3}{x^2-x-2}, \frac{6x}{x^2-4x+4}$

Perform the addition or subtraction and simplify. Identify the LCD in each case.

17. $\frac{y}{7x^2}-\frac{4}{7x^2}$

18. $\frac{4}{(x+1)^2}+\frac{9}{(x+1)^2}$

19. $\frac{x}{4}+\frac{2x}{3}$

20. $\frac{1}{2a}+\frac{4}{3a}$

21. $\frac{1}{s}+\frac{1}{t}$

22. $\frac{2}{3x}-\frac{1}{6y}$

23. $\frac{3}{c^3}-\frac{4}{c^4}$

24. $\frac{5}{6a^2b}+\frac{2}{9ab^2}$

25. $\frac{3}{x}+\frac{5}{x+2}$

26. $\frac{1}{x-1}-\frac{1}{x+1}$

27. $5+\frac{4}{x-2}$

28. $\frac{3x}{x^2-4}-\frac{1}{x-2}$

29. $\frac{1}{2r}+\frac{1}{3s}+\frac{1}{4t}$

30. $\frac{2x-1}{3}-\frac{x-4}{5}$

31. $x-\frac{x}{x+7}$

32. $\frac{3}{x}+\frac{2}{x-1}-\frac{5}{x^2-x}$

33. $\frac{1}{a}+\frac{1}{a^2}+\frac{1}{a^3}$

34. $\frac{x}{x^3-x^2}+\frac{1}{x^3}$

35. $\frac{3}{x-5}+\frac{4}{5-x}$

36. $\frac{x}{x^2+x-6}+\frac{x+1}{x^2+7x+12}$

37. $\frac{2}{x^2+2x-15}-\frac{1}{x^2-5x+6}$

38. $\frac{7x-1}{x^2-9x+20}-\frac{1}{x-5}$

39. $\frac{1}{x+1}-\frac{2}{(x+1)^2}+\frac{3}{x^2-1}$

40. $\frac{t+1}{2t^2+5t-3}+\frac{t+3}{2t^2-3t+1}$

Chapter 6: Linear Equations & Inequalities

6.1: Solve Linear Equations in One Variable

Solve the equation for x.

1. $3x-5=13$
2. $6-2x=-8$
3. $5=3x-9$
4. $-2=4-x$
5. $3x+7=5x-11$
6. $9x+4=-4x-7$
7. $2(3x-7)=8x+10$
8. $4(x-1)=6(3-2x)$
9. $5=3-(4-2x)$
10. $7x-(1-4x)=12$
11. $5(2-x)-4(1-3x)=6$
12. $5-2(3x-8)=3-x$
13. $\frac{x}{5}=\frac{2}{7}$
14. $\frac{3}{4}x=8$
15. $0.05x=3$
16. $\frac{4x}{0.01}=\frac{200}{3}$
17. $\frac{2x}{7}=\frac{10}{3}$
18. $6\pi x=27$
19. $4x-3\pi=7x+6\pi$
20. $\frac{2x-3}{5}=\frac{x+1}{6}$
21. $\frac{3x-5}{4}=x+\frac{1}{2}$
22. $\frac{5x-1}{3}=2x-3$
23. $\frac{x+1}{3}=\frac{7x+2}{4}$
24. $4.35x+32=5.75x-17$
25. $0.05x=x-190$
26. $0.07x+0.05(1000-x)=65$
27. $25=\frac{5}{3}(x-12)$
28. $16=\frac{4}{7}x-8$
29. $\frac{1}{4}x-\frac{2}{3}=1$
30. $\frac{7}{5}x-7=2.8$

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

32. $18\pi+6\pi x=420$

33. $x+\frac{1}{2}x=5-\frac{1}{3}x$

34. $\frac{2x}{3}+\frac{3x}{4}=1$

35. The perimeter P of a rectangle of length l and width w is $P=2l+2w$. If the perimeter of a rectangle is 116 inches and its length is 31 inches, what is its width in inches?

36. The area A of a triangle of base b and height h is $A=\frac{1}{2}bh$. If the base of a triangle is 15 centimeters and its area is 165 square centimeters, what is its height in centimeters?

37. The volume V of a cone of base radius r and height h is $V=\frac{1}{3}\pi r^2 h$. If the base radius is 5 inches and the volume is 700 cubic inches, what is the height in inches?

38. The formula for calculating a z-score for a sample score of x is $z=\frac{x-\bar{x}}{s}$ where $\bar{x}$ is the mean of the sample and s is the standard deviation. Find the sample score x if $\bar{x}$=70, s=10 and z=–2.4.

39. The formula $C=\frac{5}{9}(F-32)$ expresses a temperature in degrees Fahrenheit as a temperature in degrees Celsius. Find the temperature in degrees Fahrenheit if the temperature in degrees Celsius is **a) 15 b) –10**.

40. The surface area S of a cylinder is $S=2\pi r^2+2\pi rh$ where r is the base radius and h is the height. If the base radius is 5 inches and the surface area is 250 square inches, what the height in inches?

6.2: Solve Multivariable Linear Equations for One of Their Variables

Solve the equation for the indicated variable.

1. $2x+3y=6;\ for\ y$

2. $5x=8x-7z;\ for\ x$

3. $ax+by=c;\ for\ y$

4. $V=\frac{4}{5}xyz;\ for\ z$

5. $\frac{3}{2}ab=9;\ for\ a$

6. $PV=nRT;\ for\ R$

7. $L=\frac{3}{5}F+9$

8. $s=\frac{a-rz}{1-r};\ for\ z$

9. $a^2x=bx+c;\ for\ x$

10. $bx-(c-x)=a+d;\ for\ x$

11. $a-(3b-cy)=dy;\ for\ y$

12. $\frac{3a}{c}=\frac{a-1}{d};\ for\ a$

13. $\frac{x-a}{5}=\frac{y-b}{3};\ for\ x$

14. $\frac{2x-3}{c}=\frac{x+1}{d};\ for\ x$

15. $R=\frac{4}{9}(T-12);\ for\ T$

16. $3x=2y(1-x);\ for\ x$

17. $\frac{3}{4}x+\frac{2}{3}y=5;\ for\ x$

18. $a[b-(1-3cx)]=dx;\ for\ x$

19. $\frac{x+3}{a}+\frac{y+1}{b}=1;\ for\ x$

20. $z=\frac{ax-b}{c};\ for\ x$

21. The perimeter P of a rectangle of length l and width w is $P=2l+2w$. Solve this equation for w.

22. The area A of a triangle of base b and height h is $A=\frac{1}{2}bh$. Solve this equation for b.

23. The circumference C of a circle of radius r is $C=2\pi r$. Solve this equation for r.

24. The volume V of a cone of base radius r and height h is $V=\frac{1}{3}\pi r^2h$. Solve this equation for h.

25. The formula $F=\frac{9}{5}C+32$ expresses a temperature in degrees Celsius C as a temperature in degrees Fahrenheit F. Solve this equation for C.

26. The formula for calculating a z-score for a sample score of x is $z = \frac{x - \bar{x}}{s}$ where $\bar{x}$ is the mean of the sample and s is the standard deviation. Solve this equation for x.

27. The length L of a spring with natural length L_0 and with a weight of W pounds hanging from it is $L = \frac{4}{7}W + L_0$. Solve this equation for W.

28. The formula $F = \frac{GmM}{r^2}$ is Newton's Law of Gravitation, where F is the force of attraction between two bodies, one of mass m and the other of mass M, a distance r apart and where G is the gravitational constant. Solve this equation for m.

29. The volume V of a pyramid with square base of side length L and height h is $V = \frac{L^2 h}{3}$. Solve this equation for h.

30. The surface area S of a cylinder is $S = 2\pi r^2 + 2\pi rh$ where r is the base radius and h is the height. Solve this equation for h.

6.3: Applications of Linear Equations

1. The length of a rectangle is 2 feet longer than its width. If its width is x feet, find its area and its perimeter in terms of x.

2. The width of a rectangle is half its length. If its length is x feet, find its area and its perimeter in terms of x.

3. The length of a rectangle is 3 feet longer than twice its width. If its width is x feet, find its area and its perimeter in terms of x.

4. If the length of a rectangle is l meters and its area is A square meters, find its width in terms of l and A.

5. If the length of a rectangle is l meters and its perimeter is P meters, find its width in terms of l and P.

6. The height of a triangle is 3 times longer than its base. If its base is b inches, find its area in terms of b.

7. If the height of a triangle is h centimeters and it area is A square centimeters, find its base b in terms of h and A.

8. The average of three numbers x, y and z is A. Find z in terms of A, x and y.

9. **(a)** If x is the smallest of three consecutive odd integers, what is the sum S of these three integers in terms of x? **(b)** If x is between the smallest and largest of three consecutive odd integers, what is the sum S of these three integers in terms of x?

10. A Corvette going east at x miles per hour and a Mustang going west at 5 miles per hour faster than the Corvette pass each other on a long straight highway. How many miles apart are the two cars 10 minutes after passing each other, in terms of x?

11. Chuck goes on a trip in his Prius hybrid. He goes x miles and averages 50 miles per gallon of gas. If gas costs \$3.50 per gallon, how much did he pay for gas on this trip in terms of x?

12. Hannah earns \$12 per hour at her job, but earns one and a half times that rate for overtime hours in excess of 35 hours per week. How much does she earn one week if works x overtime hours, in terms of x?

13. A master carpenter makes twice as much per hour as his assistant. On one job, the assistant work 5 hours more than the carpenter. If the assistant makes x dollars per hour and works h hours on this job, how much altogether are they paid for the job, in terms of x and h?

14. Beth works out by running x miles from her house each day at the rate of 8 miles per hour and walking back home at the rate of 3 miles per hour. How many hours does it take her to complete this workout in terms of x?

15. A woman earning a salary of x dollars per year gets a $3\frac{1}{2}\%$ raise. **(a)** What is her raise in terms of x? **(b)** What is her new annual salary in terms of x?

16. A shirt selling for x dollars is marked down 15%. What is the new price of the shirt in terms of x?

17. A man invests x dollars in an account paying 4% annual interest and twice as much in an account earning 6% interest. **(a)** How much does the man invest in these two accounts altogether in terms of x? **(b)** How much annual interest does the man earn from these accounts in terms of x?

18. Janis invests $4,000 dollars, part in a savings account earning 2.5% annual interest and the rest in a certificate of deposit earning 4.5% annual interest. If she invested x dollars in the savings account, how much interest did she earn on her investment in terms of x?

19. A coin purse contains nickels, dimes and quarters. It contains x quarters, twice as many dimes as quarters, and 3 more nickels than quarters. **(a)** How many coins does the purse contain in terms of x? **(b)** How much money, in cents, does the purse contain in terms of x?

20. Chris has only $5, $10, and $20 bills in his wallet. It contains x $10 bills, 4 more than twice as many $20 bills as $10 bills and 7 more $5 bills as $10 bills. **(a)** How many bills does are in his wallet in terms of x? **(b)** How much money, in dollars, is in the wallet in terms of x?

21. Select Blend coffee contains 35% Columbian coffee and Premium Blend coffee contains 75% Columbian coffee. If x pounds of Brand A coffee is blended with y pounds of Brand B coffee, how many pounds of Columbian coffee is in this mixture, in terms of x and y?

22. The sum of four consecutive even integers is 140. What are the four integers?

23. A company president makes 80% more than her vice president. Their combined annual salary is $630,000. What is the annual salary of these two executives?

24. A car dealer reduces the price of a Ford Focus by 20%. What was the price of the car before this reduction if the current price is $14, 560?

25. In 2011, Jay Bruce of the Cincinnati Reds hit 3 more home runs than his teammate Joey Votto. Together they hit 61 home runs. How many home runs did each player hit?

26. In the 2011-2012 University of Kentucky national championship season, freshman stars Anthony Davis, Michael Kidd-Gilchrist and Terrence Jones combined to score 1,512 points. If Kidd-Gilchrist scored 7 more points than Jones and Davis scored 91 more points than Kidd-Gilchrist, how many points did each player score?

27. A student has scores of 84 and 92 on the first two tests in her Algebra II class. What score does she need to get on the third test to make the average on the three tests 90 so that she can get an A in the course?

28. The grade in a geometry class consists of 100 points for homework, 100 points each for two exams and 200 points for the final exam. Students who earn 90% or more of the total points possible earn an A. Gail has 95 points on homework, 82 points on the first exam and 88 points on the second exam. What is the minimum score on the final exam that she needs to earn an A?

29. A rectangular garden has length 35 feet and surrounded by 88 feet of fencing. What is the area of the garden?

30. A rectangle is 4 inches longer than it is wide and has a perimeter of 160 inches. What are the length and width of the rectangle?

31. A rectangle is twice as long as it is wide and has a perimeter of 300 feet. What is the area of the rectangle?

32. A rectangular field with length 28 feet and area 672 square feet is to be enclosed by a fence. How much will it cost to purchase the fence if it sells for $3.50 per linear foot?

33. A man is four times older than his daughter. The sum of their ages is 45. How old is his daughter?

34. A woman is twice as old as her son and 12 years ago, she was three times older than her son. How old is her son?

35. Joanne invests a total of $7,000 in two accounts, the first paying a simple annual interest rate of 4% and the second a simple annual interest rate of 6%. After one year the total interest earned on this investment is $375. How much did she invest in each account?

36. A coin purse contains nickels, dimes and quarters worth $4.35. There are twice as many nickels as dimes and 3 more quarters than dimes. How many coins of each type are in the purse?

37. An envelope contains $1, $5, $10 and $20 bills worth $210. There are 12 more $1 bills as $5 bills, twice as many $10 bills as $5 bills, and an equal number of $10 and $20 bills. How many bills of each type are in the envelope?

38. Financial consultant E. Z. Money has a client who has invested $40,000 in an account yielding 4% annual interest. She wants her client to invest in another account yielding 7% annual interest to ensure that the annual interest earned from the two accounts combined is 5%. How much should be invested in the account yielding 7% annual interest?

39. Romeo and Juliet have a lover's quarrel. They stomp off in opposite directions with Juliet walking 2 feet per second faster than Romeo. At what rate, in feet per second, is each of them walking if they are 480 feet apart after one minute?

40. Sleazy, the little-known eighth dwarf in the classic Snow White story, is appropriately named. When Snow White walked into the woods one day at 4 feet per second, Sleazy followed her half a minute later walking briskly at 6 feet per second. How long will it take for Sleazy to catch up with Snow White?

41. Speedy is another dwarf who hangs out with Sleazy. He stays fast by running at 7 miles per hour from his tiny cottage and then walking back along the same path at 3 miles per hour. How many miles does he travel if this workout takes 1 hour to complete?

42. Two cars are 30 miles apart and moving towards each other on the same highway. One car is going 10 miles per hour faster than the other. How fast is each of the cars going if they pass each other 15 minutes later?

43. Curly, Larry and Moe all work for the same company and they compare their annual salaries. Curly makes 20% more than Moe and Larry makes 30% more than Moe. Altogether they make $183,750 per year. How much per year does each man make?

44. Chemistry professor M. T. Beaker wants to mix a solution containing 60% acid with a solution containing 30% acid to produce a 300-milliliter mixture containing 50% acid. How many milliliters of each solution should he use?

45. Professor Beaker has a 50-milliliter solution containing 60% acid. How many milliliters of pure water should he add to this solution to produce a solution containing 40% acid?

46. Select Blend coffee contains 35% Columbian coffee and Premium Blend coffee contains 75% Columbian coffee. A store manager wants to mix these two brands of coffee to obtain a 30-pound mixture containing 50% Columbian coffee. How many pounds of each brand should he use?

47. Thrifty Blend coffee does not contain any Columbian coffee and Premium Blend coffee contains 75% Columbian coffee. A store manager wants to mix 20 pounds of Premium coffee with some Thrifty Blend coffee to obtain mixture containing 50% Columbian coffee. How many pounds of Thrifty Blend should he use?

48. Thrifty Blend coffee sells for $2.00 a pound and Premium Blend coffee sells for 3.50 a pound. A store manager wants to mix these two blends to produce a 30-pound mixture that sells for $2.50 a pound. How many pounds of each blend should she mix?

49. A master carpenter makes $55 an hour and his assistant makes $30 an hour. On one job, the assistant works 5 hours longer than the carpenter and together they earn $2,020 in wages. How many hours did each man work?

50. A married couple takes their three children to a ball game. A ticket for a child costs 40% less than a than a ticket for an adult. If the cost of admission for the family is $133, what is the cost of a ticket for an adult?

6.4: Solve Linear Inequalities in One Variable

Solve the linear inequality. Graph its solution set and express it in interval notation.

1. $3x-7\geq 11$

2. $1-2x<5$

3. $19-4x<0$

4. $5x-1\leq 2x-7$

5. $4x+12\geq 9x+8$

6. $-(2x-3)\leq 0$

7. $-3x\geq -7$

8. $3x+11\leq 6x+8$

9. $-7x-3x+23>3$

10. $\frac{3}{4}x\geq 1$

11. $\frac{x}{7}-5<2$

12. $0.2(x-3)<4$

13. $\frac{2x}{3}<3.8$

14. $2-(1-3x)\geq 5-2(3-x)$

15. $\frac{1}{2}\left(x-\frac{1}{3}\right)>2$

16. $7x+1\leq 3-(2x-4)$

17. $\frac{3}{4}x-\frac{2}{5}x>1$

18. $2(1-3x)\leq 3(2+x)$

19. $0.01x+2.6\geq 1.3$

20. $-\frac{5}{3}x-18>x+\frac{1}{3}x$

21. $\frac{1}{3}x-\frac{1}{4}x\leq 5-x$

22. $\frac{5x}{12}\geq \frac{7x}{18}+\frac{1}{6}$

Chapter 7: Lines

7.1: Slopes and Graphs of Lines

Construct a table containing the given point and at least four other points on the line as in Example 2. Sketch its graph.

1. A line of slope 1 passing through the point $(2,1)$.

2. A line of slope -1 passing through the point $(3,1)$.

3. A line of slope -2 passing through the point $(4,-1)$.

4. A line of slope 0 passing through $(-1,-2)$.

5. A line with no slope passing through $(4,5)$.

6. A line of slope 0 passing through $(4,5)$.

7. A line of slope $\frac{1}{2}$ passing through $(2,4)$.

8. A line of slope $-\frac{1}{2}$ passing through $(0,0)$.

9. A line of slope $\frac{2}{3}$ passing through $(0,0)$.

10. A line of slope -1 passing through $(-2,3)$.

11. A line of slope $-\frac{1}{4}$ passing through $(0,1)$.

12. A line of slope 3 passing through $(-1,-3)$.

Find the slope of the line (if it exists) through the given pair of points and sketch its graph. Find two additional points on the line and place the coordinates of all four points on the graph as in Example 3.

13. $(0,0), (2,1)$

14. $(1,2), (2,1)$

15. $(0,0), (3,-1)$

16. $(2,3), (2,5)$

17. $(-1,0), (-1,3)$

18. $(3,1), (6,4)$

19. $(-4,0),(0,2)$

20. $(0,0),(4,3)$

21. $(3,-5),(3,2)$

22. $(4,-2),(4,3)$

23. $(-1,0),(-3,0)$

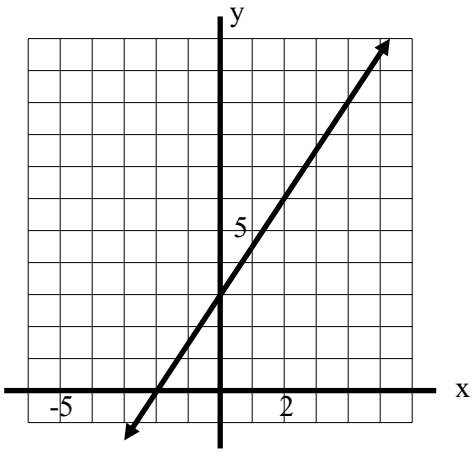
24. $(-2,3),(3,-2)$

25. $(-3,-1),(1,-2)$

26. $(1,1),(4,3)$

Find the slope of the line whose graph is shown.

27.



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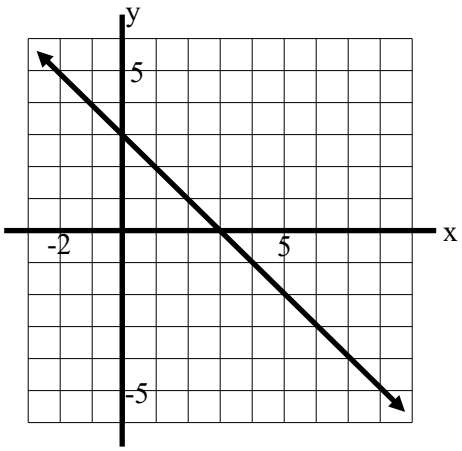

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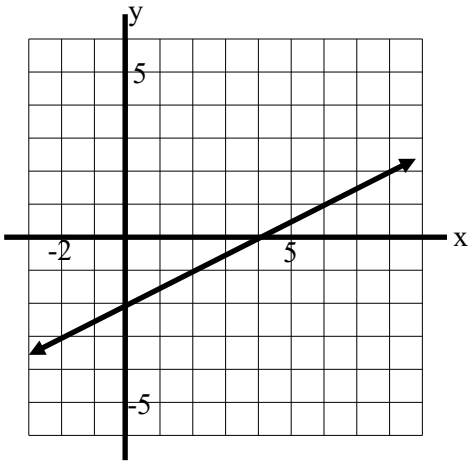

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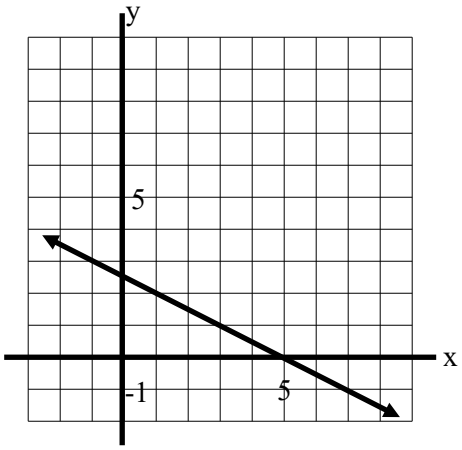

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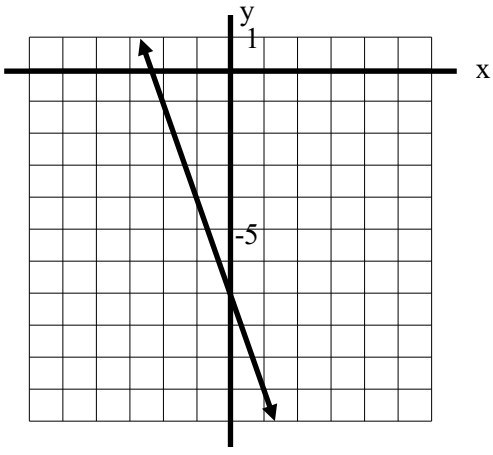

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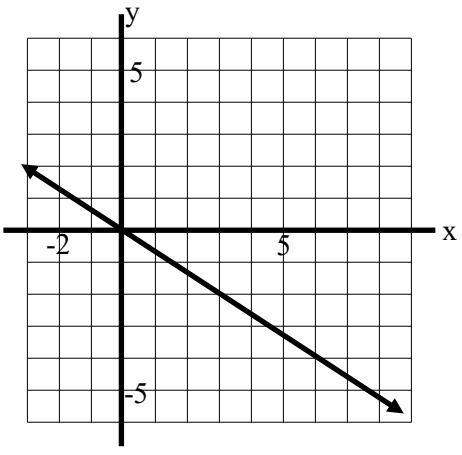


7.2: Equations and Graphs of Lines

Find the x- and y-intercepts of the line with the given equation and sketch its graph. Calculate the slope of the line using the two points where the line intersects the axes. Check your answer by placing the equation of the line in slope-intercept form.

1. $2x+3y=6$

2. $3x-4y=12$

3. $-3x+2y=18$

4. $x+2y=8$

5. $2x+y=-4$

6. $x-3y=-9$

Find the equation of the line in slope-intercept form that satisfies the given conditions.

6. Through $(3,2)$, with slope 2

7. Through $(-4,4)$, with slope -1

8. Through $(1,3)$ and $(5,1)$

9. Through $(-2,3)$ and $(3,-5)$

9. Through $(-3,-1)$ and $(1,5)$

10. Through $(-1,2)$ and $(6,4)$

11. Through $(-1,-2)$, with slope $\frac{2}{5}$

12. Through $(4,-5)$, with slope $-\frac{3}{4}$

13. Slope 2, with x-intercept: -3

14. Slope $\frac{7}{3}$, with y-intercept: 1

15. x-intercept -1 and y-intercept 4

16. x-intercept 3 and y-intercept 5

Sketch the graph of the line. Find at least three points on the line and place the coordinates of these points on your graph.

17. $y=-x+3$

18. $y=2x-5$

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

20. $y=\frac{5}{2}x+1$

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

22. $y=-\frac{3}{5}x-2$

Find the slope and the x- and y-intercepts of the line and sketch its graph. Find at least three points on the line and place the coordinates of these points on your graph.

23. $x+y=4$

24. $3x-2y=6$

25. $2x-5y=0$

26. $y=-3$

27. $5x+3y+15=0$

28. $5x+8=0$

29. $-2x+3y+9=0$

30. $4x+5y-10=0$

31. $3y-7=0$

32. $3y-7x=0$

33. $\frac{1}{3}x+\frac{1}{2}y=1$

34. $\frac{3}{4}x-\frac{1}{2}y=6$

35. $\frac{2}{5}x-y=1$

36. $2x+\frac{1}{3}y+4=0$

37. A line has equation $y=mx+1$, where m is a real number. What is the slope of the line if it passes through the point $(3,-1)$?

38. A line has equation $y=mx-5$, where m is a real number. What is the slope of the line if its x-intercept is 2?

39. A line has equation $ax+3y=5$, where a is a real number. What is the x-intercept of the line if it passes through the point $(2,-1)$?

40. A line has equation $2x+by=3$, where b is a real number. What is the slope of this line if it passes through the point $(-1,2)$?

41. A line has equation $y=-2x+b$, where b is a real number. What is the y-intercept of the line if its x-intercept is 3?

42. A line has equation $-2x+4y=c$, where $c$is a real number. What is the slope of the line if it passes through the point $(-1,-3)$?

43. A line with slope 2 passes through the point $(-3,-1)$. What is its y-intercept?

44. A line with slope -2 passes through the point $(2,3)$. What is its x-intercept?

45. A line with y-intercept -3 passes through the point $(-3,4)$. What is its slope?

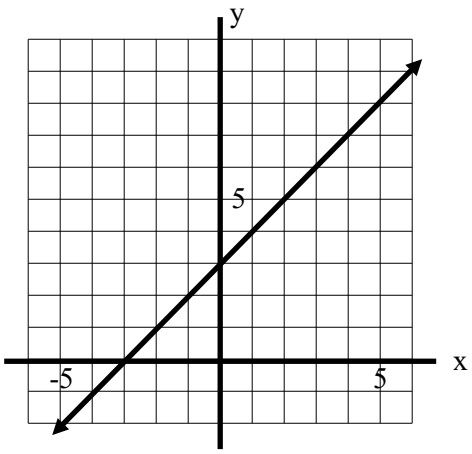
46. A line with x-intercept 4 passes through the point $(3,5)$. What is its slope?

47. A line with x-intercept -2 passes through the point $(3,3)$. What is its y-intercept?

48. A line with y-intercept -5 passes through the point $(-2,2)$. What is its x-intercept?

Find the slope-intercept form of the equation of the line whose graph is shown.

49.



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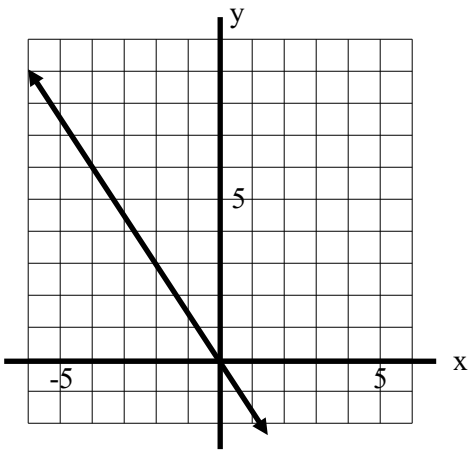

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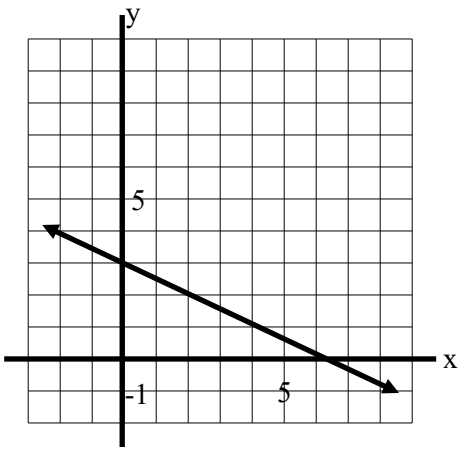

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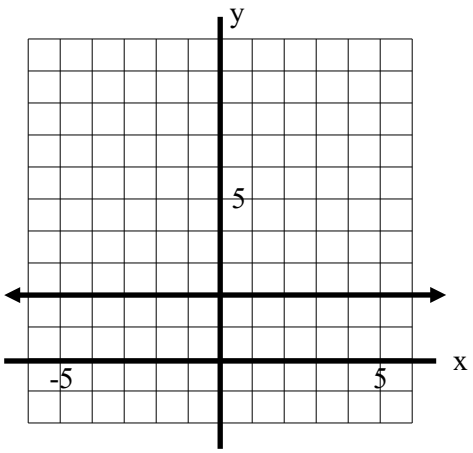

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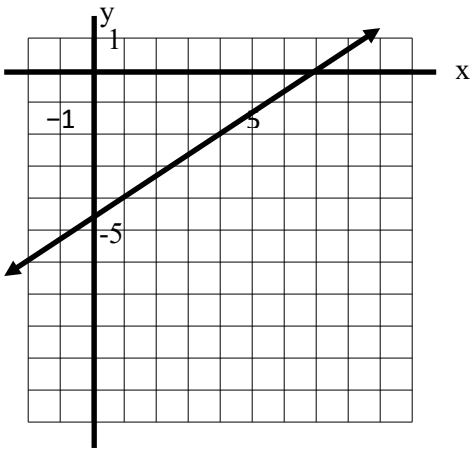

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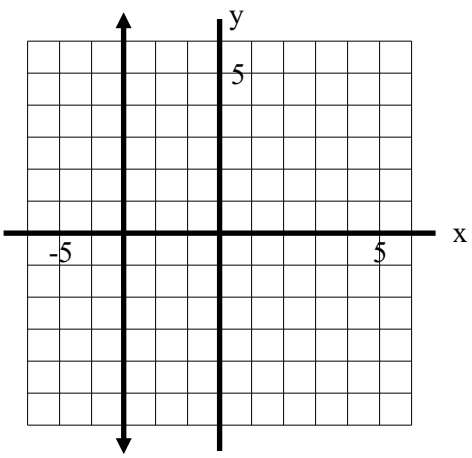

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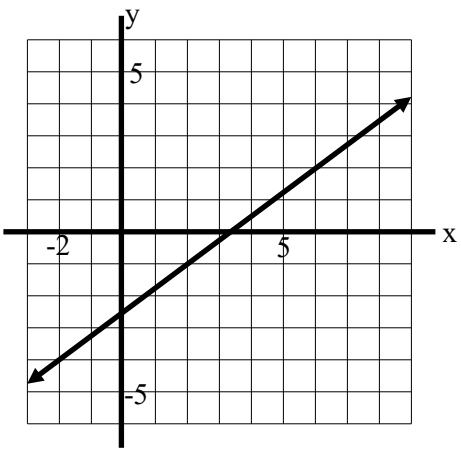

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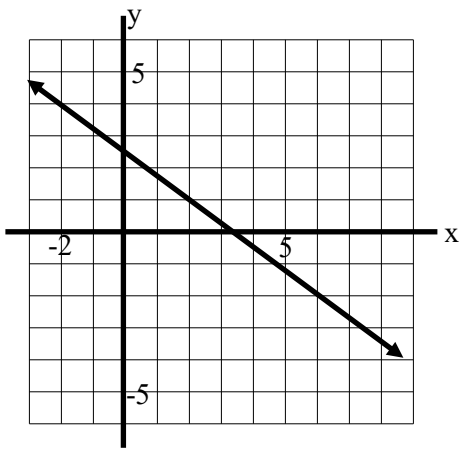

7.3: Parallel and Perpendicular Lines

In exercises 1-8, determine whether the given lines are parallel, perpendicular, or neither. Justify your answer.

1. $x-4y=6$ *and* $-2x+8y=12$

2. $x+3y=9$ *and* $-2x-3y=18$

3. $4x+2y=10$ *and* $x-2y=4$

4. $3x-4y=12$ *and* $4x-3y=24$

5. $2x-3y=6$ *and* $y=\frac{3}{2}x+5$

6. $7x-5y=35$ *and* $y=-\frac{5}{7}x$

7. $3x+5y=15$ *and* $y=-\frac{3}{5}x+7$

8. $8x-3y=0$ *and* $y=-\frac{3}{8}x-12$

9. Find an equation of the line through $(-1,4)$ that is parallel to the line $y=3x-2$.

10. Find an equation of the line through $(-2,3)$ that is parallel to the line $y=7$.

11. Find an equation of the line through $(-2,3)$ that is parallel to the line $x=-5$.

12. Find an equation of the line through $(2,1)$ that is perpendicular to the line $y=\frac{2}{3}x+1$.

13. Find an equation of the line with x-intercept -5 that is parallel to the line $2x+3y=6$.

14. Find an equation of the line with y-intercept 2 that is perpendicular to the line $3x-4y=0$.

15. Find an equation of the line through $(1,2)$ that is parallel to the line $y=-\frac{3}{5}x-4$.

16. Find an equation of the line through $(-4,5)$ that is perpendicular to the y-axis.

17. Find an equation of the line through $(-4,5)$ that is perpendicular to the x-axis.

18. Find an equation of the line through $(4,3)$ that is parallel to $x+3y+1=0$.

19. Find an equation of the line through $(-1,-3)$ that is perpendicular to $-5x+3y-15=0$.

20. Find an equation of the line through $(0,0)$ that is parallel to the line through $(4,-1)$ and $(-6,5)$.

21. Find an equation of the line through $(5,4)$ that is perpendicular to the line through $(-1,2)$ and $(3,7)$.

22. Find an equation of the line through $(-3,-4)$ that is perpendicular to the line through $(2,5)$ and $(2,0)$

23. Find an equation of the line through $(-3,-4)$ that is parallel to the line through $(2,5)$ and $(2,0)$.

24. Find an equation of the line with x-intercept 2 that is parallel to the line through $(-1,-2)$ and $(3,5)$.

25. Find an equation of the line with y-intercept 3 that is perpendicular to the line through $(2,-3)$ and $(-2,2)$.

26. Find an equation of the line with x-intercept 2 perpendicular to the line through $(-1,4)$ and $(3,4)$.

27. A quadrilateral has vertices $(2,2)$, $(8,2)$, $(10,5)$ and $(4,5)$. Plot these points and sketch the quadrilateral. Use slopes to determine whether the quadrilateral is a parallelogram. Justify your answer.

28. A quadrilateral has vertices $(1,1)$, $(7,4)$, $(5,10)$ and $(-1,7)$. Plot these points and sketch the quadrilateral. Use slopes to determine whether the quadrilateral is a parallelogram. Justify your answer.

29. A quadrilateral has vertices $(-1,-2)$, $(6,0)$, $(8,7)$ and $(1,4)$. Plot these points and sketch the quadrilateral. Use slopes to determine whether the quadrilateral is a parallelogram. Justify your answer.

30. A triangle has vertices $(0,0)$, $(4,1)$ and $(-2,8)$. Plot these points and sketch the triangle. Use slopes to determine whether the triangle is a right triangle. Justify your answer.

31. A triangle has vertices $(-3,-1)$, $(3,3)$ and $(-9,8)$. Plot these points and sketch the triangle. Use slopes to determine whether the triangle is a right triangle. Justify your answer.

32. A triangle has vertices $(2,1)$, $(4,-1)$ and $(4,5)$. Plot these points and sketch the triangle. Use slopes to determine whether the triangle is a right triangle. Justify your answer.

33. A quadrilateral has vertices $(1,1)$, $(3,3)$, $(2,4)$ and $(0,2)$. Plot these points and sketch the quadrilateral. Use slopes to determine whether the quadrilateral is a rectangle. Justify your answer.

34. Plot the points $(1,0)$, $(3,4)$ and $(6,10)$. Use slopes to determine whether these points lie on the same line. Justify your answer.

35. Plot the points $(1,4)$, $(3,2)$ and $(6,-2)$. Use slopes to determine whether these points lie on the same line. Justify your answer.

Chapter 8: Quadratic Equations & Functions

8.1: Solve Quadratic Equations

Solve the quadratic equation by factoring. Solve the same equation by using the quadratic formula to check your answers.

1. $x^2-5x+6=0$

2. $x^2-2x=3$

3. $x^2+7x+12=0$

4. $x^2+4x+4=0$

5. $x^2+5x-14=0$

6. $x^2=4x+12$

7. $2x^2+5x-3=0$

8. $3x^2-x-2=0$

Use the discriminant of the given quadratic equation to determine how many real number solutions it has. If it has real solutions, use the quadratic formula to find them.

9. $x^2+2x-5=0$

10. $x^2-3x=1$

11. $x^2+8=0$

12. $x^2-6x+9=0$

13. $x^2+6x+1=0$

14. $x^2-6x+4=0$

15. $2x^2+4x+2=0$

16. $2x^2=3x+5$

17. $3x^2-2x+1=0$

18. $3x^2=6x-9$

Solve the given quadratic equation by finding all its real number solutions.

21. $x^2+x-6=0$

22. $x^2-8x+15=0$

23. $x^2+11x+28=0$

24. $(x-1)^2-4=0$

25. $x^2+3x+1=0$

26. $2x^2+x-3=0$

27. $2x^2-16=0$

28. $4x^2-4x-15=0$

29. $\left(x+\frac{1}{2}\right)^2=1$

30. $x^2-2x+2=0$

31. $x^2-4x+4=0$

32. $x^2-4x+2=0$

33. $(x-5)^2=2$

34. $x^2+8=0$

35. $x^2=6x-9$

36. $3x^2-13x-10=0$

37. $\left(x-\frac{3}{2}\right)^2-\frac{1}{4}=0$

38. $x^2+x=2$

39. $3x^2-5x-1=0$

40. $2x^2-x-\frac{1}{2}=0$

41. $4x^2-x-5=0$

42. $4(x+1)^2=3$

43. $(x+2)^2+4=0$

44. $x^2-2x-35=0$

8.2: Completing the Square

Complete the square for the given quadratic expression

1. x^2+2x

2. x^2-4x

3. x^2+5x

4. x^2-7x

5. x^2-x

6. $2x^2+12x$

7. $3x^2-12x$

8. $3x^2+9x$

9. $4x^2+24x$

10. $2x^2+x$

11. $2x^2-5x$

12. $3x^2-2x$

13. $-x^2+4x$

14. $-2x^2+3x$

Solve the given quadratic equation by completing the square

15. $x^2+2x=0$

16. $x^2-x=0$

17. $x^2-2x-3=0$

18. $x^2-4x+3=0$

19. $x^2+6x+4=0$

20. $2x^2-4x-1=0$

21. $4x^2-4x-3=0$

22. $x^2-4x-2=0$

23. $2x^2+8x+1=0$

24. $3x^2-6x-1=0$

25. $x^2+4x-1=0$

26. $4x^2-3x-4=0$

27. $x^2+2x+5=0$

28. $(x+3)(x-1)=1$

29. $4x^2-4x+1=0$

30. $(x-2)(x+4)=-7$

31. $x^2-2x+3=0$

32. $x^2+5x+5=0$

8.3: Graph Quadratic Function

A quadratic function in vertex form is given in exercises 1-12. In each case:

(a) *Find its vertex and its maximum or minimum value.*

(b) *Find its* x*- and* y*-intercepts.*

(c) *Sketch its graph. Place the coordinates of the points corresponding to the vertex and the intercepts on the graph.*

1. $y=(x+2)^2-9$

2. $y=(x-5)^2-4$

3. $y=-(x+2)^2+1$

4. $y=2(x-3)^2-8$

5. $y=2(x+1)^2+4$

6. $y=3(x-2)^2-6$

7. $y=-2(x+1)^2+5$

8. $y=-(x-4)^2-1$

9. $y=-\frac{1}{2}\left(x+\frac{3}{2}\right)^2+\frac{15}{8}$

10. $y=\left(x-\frac{5}{2}\right)^2-\frac{9}{4}$

11. $y=4(x+1)^2-8$

12. $y=\frac{1}{2}\left(x-\frac{3}{2}\right)^2-\frac{25}{8}$

A quadratic function is given in exercises 13-24. In each case:

(a) *Write its equation in vertex form by completing the square.*

(b) *Find its vertex and its maximum or minimum value.*

(c) *Find its* x*- and* y*-intercepts.*

(d) *Sketch its graph. Place the coordinates of the points corresponding to the vertex and the intercepts on the graph.*

13. $y=x^2+4x$

14. $y=x^2-2x-3$

15. $y=-x^2+10x$

16. $y=x^2+4x+3$

17. $y=3x^2-6x-1$

18. $y=x^2+x-1$

19. $y=-x^2+4x-1$

20. $y=-2x^2+8x-6$

21. $y = -x^2 + 4x - 5$

22. $y = 2x^2 + 6x$

23. $y = x^2 + 2x - 2$

24. $y = 2x^2 + 4x + 3$

8.4: Applications of Quadratic Equations

1. The sum of the squares of two consecutive odd integers is 74. Find the two integers.

2. The sum of squares of two consecutive integers is 85. Find the two integers.

3. Two numbers have a sum of 21 and a product of 104. Find the numbers.

4. The length of a rectangular garden is twice its width and its area is 578 square feet. What are the length and width of the garden?

5. One leg of a right triangle is three times longer than its other leg. What are the lengths of the two legs if the hypotenuse is $7\sqrt{10}$ inches long?

6. The hypotenuse of a right triangle is twice as long as one of its legs and the other leg has length $9\sqrt{3}$ centimeters. What is the length of the hypotenuse?

7. One leg of a right triangle is 3 times longer than its other leg. What are the lengths of the two legs and the hypotenuse if the area of the triangle is 96 square inches?

8. A rectangle is 10 meters longer than it is wide and its area is 875 square meters. What are the length and width of the rectangle?

9. A rectangle of length 8 inches and width 5 inches is cut from a square piece of cardboard. If the area of the remaining cardboard is 321 square inches, what is the length of the square piece of cardboard?

10. The length of a rectangle is 2 feet longer than it is wide and its area is 224 square feet. What is its perimeter?

11. A rectangle is 24 feet long. The length of the diagonal between opposite corners of the rectangle is 12 feet more than its width. What is its width?

12. A rectangle has a perimeter of 160 centimeters and an area of 1500 square centimeters. What are the length and width of the rectangle?

13. The length of the diagonal between opposite corners of a rectangle is 20 inches and its length is 4 inches longer than its width. What is the perimeter of the rectangle?

14. The length of the diagonal between opposite corners of a rectangle is twice its width and its length is 27 feet. What is the area of the rectangle?

15. A fence costing \$20 per foot is purchased to enclose a rectangular field whose length is 4 feet longer than its width and whose area is 437 square feet. What is the total cost of the fence?

16. A sail is in the form of a right triangle with the vertical leg 4 feet longer than the horizontal leg and with hypotenuse $4\sqrt{13}$ feet. What is the cost of the material used to make the sail if this material costs \$10 per square foot?

Chapter 9: Systems of Linear Equations

9.1: Solve Systems of Linear Equations by Graph

Solve the given system of equations by graphing. Sketch the graph of each equation in the system on the same set of axes. Determine whether the system has a unique solution, no solution or infinitely many solutions. If it has a unique solution, estimate that solution from the graph and determine whether your estimate is correct.

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

2. $\begin{aligned} 2x+3y&=10 \\ x-y&=0 \end{aligned}$

3. $\begin{aligned} 3x+4y&=12 \\ 3x+4y&=24 \end{aligned}$

4. $\begin{aligned} x+y&=1 \\ -x+y&=3 \end{aligned}$

5. $\begin{aligned} 2x+y&=6 \\ x+2y&=6 \end{aligned}$

6. $\begin{aligned} x-2y&=4 \\ -2x+4y&=-8 \end{aligned}$

7. $\begin{aligned} x-y&=3 \\ x+3y&=7 \end{aligned}$

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

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

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

11. $\begin{aligned} 6x+4y&=12 \\ 9x+6y&=18 \end{aligned}$

12. $\begin{aligned} x+y&=3 \\ x-2y&=-9 \end{aligned}$

9.2: Solve Systems of Linear Equations Analytically

Solve the given system by substitution.

1. $\begin{aligned} x+2y&=5 \\ y&=2x+1 \end{aligned}$

2. $\begin{aligned} 3x+2y&=0 \\ x&=y-5 \end{aligned}$

3. $\begin{aligned} x&=3y-7 \\ x&=-y+1 \end{aligned}$

4. $\begin{aligned} y&=2x-3 \\ y&=-3x+17 \end{aligned}$

5. $\begin{aligned} x-y&=3 \\ 3x+y&=5 \end{aligned}$

6. $\begin{aligned} x+y&=8 \\ 3x-2y&=-1 \end{aligned}$

7. $\begin{aligned} 2x+y&=5 \\ -x+3y&=8 \end{aligned}$

8. $\begin{aligned} 3x+4y&=1 \\ 2x-y&=19 \end{aligned}$

9. $\begin{aligned} 2x+3y&=10 \\ 2x+y&=-6 \end{aligned}$

10. $\begin{aligned} 3x+2y&=5 \\ x+y&=4 \end{aligned}$

11. $\begin{aligned} 2x+4y&=-9 \\ x-3y&=8 \end{aligned}$

12. $\begin{aligned} 3x-4y&=3 \\ 6x-y&=13 \end{aligned}$

Solve the given system by elimination.

13. $\begin{aligned} x+2y&=11 \\ 3x-2y&=1 \end{aligned}$

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

15. $\begin{aligned} x+y&=7 \\ 2x-y&=5 \end{aligned}$

16. $\begin{aligned} 5x-3y&=4 \\ -5x+7y&=-16 \end{aligned}$

17. $\begin{aligned} 2x+3y&=-1 \\ 4x+2y&=2 \end{aligned}$

18. $\begin{aligned} 3x-4y&=6 \\ -9x+5y&=-18 \end{aligned}$

19. $\begin{aligned} 5x-3y&=0 \\ 3x+y&=14 \end{aligned}$

20. $\begin{aligned} x+5y&=1 \\ x-3y&=9 \end{aligned}$

21. $\begin{aligned} 3x-2y&=4 \\ 5x-3y&=7 \end{aligned}$

22. $\begin{aligned} 2x+3y&=12 \\ 7x-5y&=11 \end{aligned}$

23. $\begin{aligned} 4x-3y&=5 \\ 2x+6y&=5 \end{aligned}$

24. $\begin{aligned} 4x-10y&=-1 \\ 8x+5y&=8 \end{aligned}$

Solve the given system using either substitution or elimination.

25. $\begin{aligned} 4x-3y&=5 \\ x&=-1 \end{aligned}$

26. $\begin{aligned} 7x-2y&=15 \\ y&=-3 \end{aligned}$

27. $\begin{aligned} 6x-3y&=27 \\ x-8y&=12 \end{aligned}$

28. $\begin{aligned} -2x+5y-11&=0 \\ x-3y+6&=0 \end{aligned}$

29. $\begin{aligned} x+y-9&=0 \\ 4x-5y&=0 \end{aligned}$

30. $\begin{aligned} y&=-3x+12 \\ y&=2x+2 \end{aligned}$

31. $\begin{aligned} x&=7y+10 \\ x&=-2y+1 \end{aligned}$

32. $\begin{aligned} 2x-4y&=5 \\ 3x+5y&=2 \end{aligned}$

33. $\begin{aligned} 3x-8y+4&=0 \\ 6x+4y-7&=0 \end{aligned}$

34. $\begin{aligned} x&=2y-5 \\ 5x+6y+1&=0 \end{aligned}$

35. $\begin{aligned} y&=-5x+1 \\ 10x-3y&=7 \end{aligned}$

36. $\begin{aligned} x+y&=1 \\ 2x-y&=3 \end{aligned}$

37. $\begin{aligned} 2x-3y&=6 \\ -4x+6y&=9 \end{aligned}$

38. $\begin{aligned} 3x-5y&=0 \\ y&=\frac{3}{5}x+1 \end{aligned}$

39. $\begin{aligned} 3x-4y&=5 \\ -9x+12y&=-15 \end{aligned}$

40. $\begin{aligned} 3x+2y&=6 \\ y&=-\frac{3}{2}x+3 \end{aligned}$

Solve the given system by graphing. Confirm your answer by solving the system analytically using either substitution or elimination.

41. $\begin{aligned} x+y&=3 \\ 2x-y&=0 \end{aligned}$

42. $\begin{aligned} 2x-3y&=9 \\ x+2y&=1 \end{aligned}$

43. $\begin{aligned} y&=x+3 \\ y&=2x-1 \end{aligned}$

44. $\begin{aligned} 2x+y&=-1 \\ x-2y&=-8 \end{aligned}$

Chapter 10: Additional Topics

10.1: Functions

Evaluate the function at the indicated values.

1. $f(x)=x^2-2x+5;\ x=-2,-1,0,1,2$

2. $f(x)=x^3+x;\ x=-2,-1,0,1,2$

3. $f(x)=\sqrt[3]{x^2};\ x=-2,-1,0,1,2$

4. $f(x)=|1-x|;\ x=-3,-1,1,3,5$

5. $f(x)=\dfrac{1-2x}{1+2x};\ x=-2,-1,0,1,2$

6. $f(x)=\dfrac{|x+1|}{x+1};\ x=-4,-3,-2,0,1,2$

7. $f(x)=\sqrt{2x+1};\ x=-\dfrac{1}{2},0,\dfrac{1}{2},\dfrac{3}{2},\dfrac{5}{2},4$

8. $f(x)=\dfrac{x^2-1}{x^2+1};\ x=-2,-1,0,1,2$

9. $f(x)=\sqrt{x^2+x-2};\ x=-5,-3,-2,1,2,5$

10. $f(x)=x+\dfrac{1}{x^2+1};\ x=-2,-1,0,1,2$

11. $f(x)=\dfrac{1}{2x+1}+\dfrac{1}{2x-1};\ x=-2,-1,0,1,2$

12. $f(x)=\sqrt{|x-1|};\ x=-3,-2,-1,0,1,2,3$

Find the domain of the given function.

13. $f(x)=\dfrac{1}{x+4}$

14. $f(x)=\sqrt{x-2}$

15. $f(x)=x^2-4x+4$

16. $f(x)=\dfrac{x+2}{x^2-1}$

17. $f(x)=\dfrac{2x-4}{x^2+2x-15}$

18. $f(x)=\sqrt{5-x}$

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

20. $f(x)=\dfrac{x-1}{\sqrt{3x-1}}$

21. $f(x)=\dfrac{x^2+5x+6}{2x^2-x-1}$

22. $f(x)=\sqrt{|x-3|}$

23. $f(x)=\dfrac{1}{\sqrt{|x-3|}}$

24. $f(x)=\dfrac{x^2-1}{x^2+6x}$

25. $f(x)=\sqrt{3x-5}$

26. $f(x)=\dfrac{1}{\sqrt{3x-5}}$

27. $f(x)=\dfrac{1}{3x^2-x-14}$

28. $f(x)=\dfrac{\sqrt{x}+1}{\sqrt{x}-1}$

Find a function f *with the given domain.*

29. $Domain(f)=(-\infty,-2]$

30. $Domain(f)=[3,\infty)$

31. $Domain(f)=\{x\in R: x\neq 2\}$

32. $Domain(f)=\{x\in R: x\neq 2, x\neq -2\}$

33. $Domain(f)=\left[\dfrac{7}{3},\infty\right)$

34. $Domain(f)=\{x\in R: x\neq 0, x\neq 5\}$

35. $Domain(f)=(2,\infty)$

36. $Domain(f)=[-2,5)\cup(5,\infty)$

10.2: Solve Rational, Radical and Absolute Value Equations

Solve the given equation.

1. $\frac{1}{x}=\frac{3}{x+4}$

2. $\sqrt{x-1}=2$

3. $\frac{1}{x}+\frac{1}{5x}=6$

4. $|3x|=12$

5. $\frac{\sqrt{2x-1}}{3}=1$

6. $\frac{1}{x+1}-\frac{1}{3}=\frac{1}{3x+3}$

7. $|2x-5|=7$

8. $3\sqrt{3x+1}-5=7$

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

10. $|x-4|=0.01$

11. $\sqrt{\frac{5-2x}{3}}=2$

12. $\frac{1}{x}-\frac{1}{2}=\frac{3}{4}$

13. $\frac{1}{2x-1}+\frac{5}{2}=\frac{3}{4x-2}$

14. $\left|\frac{x-3}{5}\right|=2$

15. $4\sqrt{7-3x}=12$

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

17. $|9-2x|=7$

18. $\sqrt{|2x+6|}=4$

19. $\frac{3}{x}-\frac{2}{x+1}=\frac{1}{x^2+x}$

20. $\frac{1}{2}x-\frac{x+4}{3}=1$

21. $\sqrt{|3x-6|}=3$

22. $\frac{3}{2x+1}=\frac{4}{5x}$