1. \( x \) represents a real number. Find any restrictions on \( x \).

\[ x + 8 = 5 \]

2. \( x \) represents a real number. Find any restrictions on \( x \).

\[ \frac{5}{x - 6} \]

3. \( x \) represents a real number. Find any restrictions on \( x \).

\[ \sqrt{x} = 8 \]

4. Solve the equation

\[ 3x + 2 = 20 \]

5. Solve the equation.

\[ 3x + 13 = x + 7 \]

6. Solve the equation.

\[ \frac{x - 4}{3} = 1 \]

7. Solve the equation

\[ \frac{4}{x - 4} = 1 \]
8 Solve the equation.

\[ 6(4x + 2) - 22(x + 2) = -28 \]

9 Solve the equation.

\[ x(x - 4) - 5 = (x - 1)^2 \]

10 Solve the equation.

\[ \frac{3x}{3x + 5} + \frac{2(-6x + 3)}{3x + 5} = \frac{9x^2}{3x + 5} \]

11 Solve the equation.

\[ \frac{15}{y + 4} + \frac{6}{y + 2} = \frac{18}{y + 2} - \frac{3}{y^2 + 6y + 8} \]

12 Solve the equation.

\[ \frac{2x - 2}{x + 3} + \frac{2x - 4}{x - 3} = \frac{2 - 4x}{3 - x} \]

13 Solve the formula for the \( t \).

\[ f = 10t \]

14 Solve the formula for the \( w \).

\[ p = 7m + 8w \]

15 Solve the formula for the \( x \).

\[ f = \frac{m - x}{v} \]
16 Solve the formula for the \( r \).

\[
\frac{1}{r} = \frac{1}{n} + \frac{1}{j}
\]

17 Juan scored 7 points higher on his midterm and 5 points higher on his final than he did on his first exam. If his mean (average) score was 126, what was his score on the first exam?

18 A college student earns $40 per day delivering advertising brochures door-to-door, plus 25 cents for each person he interviews. How many people did he interview on a day when he earned $52?

19 The area of the triangular swimming pool shown in illustration is doubled by adding a rectangular wading pool. Find the width of the pool \( x \).

(The area of a triangle = \( \frac{1}{2} bh \), and the area of a rectangle = \( lw \)).

\[ a = 25 ; \ b = 22 \]
20 The trough in illustration has a cross-sectional area of 108 square inches. Find the depth, \( h \), of the trough.

\[
\text{Area of a trapezoid } \frac{1}{2} h (a + b)
\]

\( a = 18; \ b = 9 \)

21 An executive invests $39000, some at 10\% and some at 7\% annual interest. If he receives an annual return of $3330, how much is invested at each rate?

22 A full-price ticket for a college basketball game costs $4, and a student ticket costs $2.25. If 593 tickets were sold, and the total receipts were $1838.25, how many tickets were student tickets?

23 Of the 649 tickets sold to a movie, 352 were full-price tickets costing $5.00 each. If the gate receipts were $2799.50, what did a student ticket cost?

24 After being discounted 10\%, a radio sells for $127.80. Find the original price.

25 A merchant increases the wholesale cost of a washing machine by 20\% to determine the selling price. If the washer sells for $416.40, find the wholesale cost.

26 A computer store has fixed costs of $8625 per month and a unit cost of $760 for every computer it sells. If the store can sell all the computers it can get for $1335 each, how many must be sold for the store to break even? (The break-even point occurs when costs equal income.)

27 An empty swimming pool can be filled in 10 hours. When full, the pool can be drained in 29 hours. How long will it take to fill the empty pool if the drain is left open?
28 The nurse has 0.65 liters of a solution that is 10% alcohol. How much pure alcohol must she add to bring the solution up to a 70% concentration?

29 A swimming pool contains 38000 gallons of water. How many gallons of chlorine must be added to “shock the pool” and bring the water to a 31/100 % solution?

30 John drove to a distant city in 6 hours. When he returned, there was less traffic, and the trip took only 4 hours. If John averaged 38 mph faster on the return trip, how fast did he drive each way?

31 Two cars leave Pima Community College traveling in opposite directions. One car travels at 88 mph and the other at 63 mph. In how many hours will they be 1057 miles apart?

32 Some bank robbers leave town, speeding at 84 mph. 25 minutes later, the police give chase, traveling at 94 mph. How long (in hours) will it take the police to overtake the robbers?

33 One morning, John drove 10 hours before stopping to eat. After lunch, he increased his speed by 10 mph. If he completed a 680–mile trip in 13 hours of driving time, how fast did he drive in the morning?

34 A plane can fly 410 mph in still air. If it can fly 460 miles downwind in the same amount of time it can fly 360 miles upwind, find the velocity of the wind.
35. 530.14 cubic millimeters of material was removed by drilling the blind hole shown in illustration. Find the depth of the hole.

(The volume of a cylinder is given by $V = \pi r^2 h$)

![Diagram of a cylinder in a block]

$a = 5$

36. The Norman window with dimensions as shown in illustration is a rectangle topped by a semicircle. If the area of the window is 26.28 square feet, find its height $h$.

![Diagram of a Norman window]

$a = 4$
37 Solve the equation

\[ x^2 + 4x - 32 = 0 \]

by factoring. Check all answers.

38 Solve the equation

\[ x^2 + 3x = 0 \]

by factoring. Check all answers.

39 Solve the equation

\[ 4x^2 - 12x = -8 \]

by factoring. Check all answers.

40 Use the square root property to solve the equation

\[ (y + 16)^2 - 25 = 0 \]

You may need to factor an expression.
41 Use the square root property to solve the equation

\[ x^2 - 10x + 25 = 16 \]

You may need to factor an expression.

42 Complete the square to make the binomial a perfect square trinomial.

\[ 36x^2 - 24x \]

43 Solve the equation

\[ x^2 - 2x - 63 = 0 \]

by completing the square.

44 Solve the equation

\[ x^2 + 16x + 28 = 0 \]

by completing the square.

45 Solve the equation by completing the square.

\[ x^2 + 2x = 11 \]
Use the quadratic formula to solve the equation.

\[ x^2 - 8 = 0 \]

Use the quadratic formula to solve the equation.

\[ 2x^2 - 12x - 54 = 0 \]

Use the quadratic formula to solve the equation.

\[ 7x^2 + 63x + 126 = 0 \]

Use the quadratic formula to solve each equation.

\[ 4x(x + 5) = -4 \]

Solve the formula

\[ \frac{x^2}{h^2} + \frac{y^2}{f^2} = 1; \ y \]

for the indicated variable.

Does the equation

\[ 1.929x^2 + 2.367x + 6.822 = 0 \]

have any roots that are real numbers?
52 Change the equation

\[ x + 1 = \frac{30}{x} \]

to quadratic form and solve it by any method.

53 Change the equation

\[ 3x + 10 + \frac{5x + 9}{3x - 10} = \frac{5}{3x - 10} \]

to quadratic form and solve it by any method.

54 A rectangle is 3 feet longer than it is wide. If its area is 54 square feet, find its dimensions.

55 A rectangle is 4 times as long as it is wide. If the area is 64 square feet, find its perimeter.

56 The side of a square is 5 centimeters shorter than the side of a second square. If the sum of their areas is 193 square centimeters, find the length of one side of the larger square.

57 A piece of tin, \( y = 12 \) inches on a side, is to have four equal squares cut from its corners, as in illustration. If the edges are then to be folded up to make a box with a floor area of 16 square inches, find the depth of the box.
58 A piece of sheet metal, 14 inches wide, is bent to form the gutter shown in illustration. If the cross-sectional area is 24 square inches, find the depth of the gutter.

![ILLUSTRATION]

59 A cyclist rides from DeKalb to Rockford, a distance of 200 miles. His return trip takes 1 hours longer, because his speed decreases by 10 miles per hour. How fast does he ride each way?

60 A farmer drives a tractor from one town to another, a distance of 60 kilometers. He drives 10 kilometers per hour faster on the return trip, cutting 1 hour off the time. How fast does he drive each way?

61 If the speed were increased by 60 mph, a 70-mile trip would take 6 hour less time. How long will the trip take at the slower speed?

62 The height of a projectile fired upward with an initial velocity of 80 feet per second is given by the formula

\[ h = -4t^2 + 80t \]

where \( h \) is the height in feet and \( t \) is the time in seconds. Find the time required for the projectile to return to earth.

63 A bus company has 3500 passengers daily, paying a 25 cents fare. For each nickel increase in fare, the company projects that it will lose 60 passengers. What fare increase will produce $1467.00 in daily revenue?

64 A jazz group on tour has been drawing average crowds of 700 persons. It is projected that for every $1 increase in the $18 ticket price, the average attendance will decrease by 50. At what ticket price will nightly receipts be $11550?
A golden rectangle is said to be one of the most visually appealing of all geometric forms. The front of the Parthenon, built in Athens in the 5th century B.C. and shown in illustration, is a golden rectangle. In a golden rectangle, the length \( l \) and the width \( w \) of the rectangle must satisfy the equation

\[
\frac{l}{h} = \frac{h}{l-h}
\]

If a rectangular billboard is to have a height of 18 feet, how long should it be if it is to form a golden rectangle? Round to the nearest tenth of a foot.

[ILLUSTRATION]

Two pipes are used to fill a water storage tank. The first pipe can fill the tank in 3 hours, and the two pipes together can fill the tank in 4 hours less time than the second pipe alone. How long would it take for the second pipe to fill the tank?

A hose can fill a swimming pool in 18 hours. Another hose needs 3 more hours to fill the pool than the two hoses combined. How long would it take the second hose to fill the pool?

Working together, Sarah and Heidi can milk the cows in 4 hours. If they work alone, it takes Heidi 6 hours longer than it takes Sarah. How long would it take Heidi to milk the cows alone?

If two opposite sides of a square are increased by 4 meters and the other sides are decreased by 2 meters, the area of the rectangle that is formed is 7 square meters. Find the area of the original square.

Maude and Matilda each have a bank CD. Maude's is $1500 larger than Matilda's, but the interest rate is 4% less. Last year Maude received interest of $780, and Matilda received $800. Find the rate of interest for each CD.

Some mathematics professors would like to purchase a $200 microwave oven for the department workroom. If 1 of the professors don't contribute, everyone's share will increase by $10. How many professors are in the department?

If a wagon wheel had 30 more spokes, the angle between spokes would decrease by 27°. How many spokes does the wheel have?

Find the dimensions of a rectangle whose area is 459 cm² and whose perimeter is 88 cm.

Find the values of \( x \) and \( y \).

\[ x + 11i = y - yi \]
75 Do the operation and express the answer in $a + bi$ form.

$$(3 - 5i) + (10 + 2i)$$

76 Do the operation and express the answer in $a + bi$ form.

$$\frac{3 + i}{9 - i\sqrt{7}}$$

77 Do the operation and express the answer in $a + bi$ form.

$$(2 - \sqrt{-25}) - (4i - 3)$$

78 Do the operation and express the answer in $a + bi$ form.

$$(52 - \sqrt{-49}) + (5 + \sqrt{-16})$$

79 Do the operation and express the answer in $a + bi$ form.

$$(10 + 4i)^2$$

80 Do the operation and express the answer in $a + bi$ form.

$$(3 + \sqrt{-9})(4 - \sqrt{-4})$$

81 Do the operation and express the answer in $a + bi$ form.

$$\frac{18}{i^7}$$

82 Do the operation and express the answer in $a + bi$ form.

$$\frac{-6}{i^5}$$
83 Do the operation and express the answer in $a + bi$ form.

\[
\frac{-12}{i^{32}}
\]

84 Do the operation and express the answer in $a + bi$ form.

\[
\frac{1}{3 + i}
\]

85 Simplify the expression.

\[i^{25}\]

86 Simplify the expression.

\[i^2\]

87 Simplify the expression.

\[i^{-38}\]

88 Find the absolute value.

\[|15 + 20i|\]

89 Find the absolute value.

\[|9 - 12i|\]

90 Find the absolute value.

\[\left|\frac{9}{8 + i}\right|\]

91 Find the absolute value.

\[\left|\frac{4 + i}{4 - i}\right|\]
Factor the expression over the set of complex numbers.

\[ 9a^2 + 16 \]

In electronics, the formula \( V = IR \) is called Ohm's law. It gives the relationship in a circuit between the voltage \( V \) (in volts), the current \( I \) (in amperes), and the resistance \( R \) (in ohms).

Find \( V \) when \( I = 7 - 9i \) amperes and \( R = 3 + 8i \) ohms.

\[ x^3 - 8x^2 + 7x = 0 \]

\[ x^4 - 100x^2 + 2304 = 0 \]

\[ z^2 - 4z + 1 = 0 \]

\[ 4m^3 - 44m + 72 = 0 \]

\[ 3t^3 - 15t^2 + 18 = 0 \]

\[ 9p - 135p + 504 = 0 \]

Find all real solutions of the equation.

\[ \sqrt{x - 9} = 3 \]

\[ \sqrt{x + 96} = 5 \sqrt{x} \]

\[ \sqrt{9x + 3} = \sqrt{8x + 8} \]
Find all real solutions of the equation.

\[ 3\sqrt{2x + 52} = 4 \]

Find all real solutions of the equation.

\[ 4\sqrt{2t + 6} = 4 \]

Find all real solutions of the equation.

\[ \sqrt{x^2 + 60} = x + 6 \]

Find all real solutions of the equation.

\[ \sqrt{y + 8} = 4 - y \]

Find all real solutions of the equation.

\[ x - \sqrt{13x - 40} = 0 \]

Find all real solutions of the equation.

\[ \sqrt{\frac{x^2 - 17}{x - 4}} = 2\sqrt{2} \]

Find all real solutions of the equation.

\[ \sqrt{\frac{x^2 - 16}{5x - 16}} = \sqrt{2} \]

Find all real solutions of the equation.

\[ 3\sqrt{27x^3 - 945} = 3x - 15 \]

Find all real solutions of the equation.

\[ \sqrt{r} + \sqrt{r + 11} = 11 \]

Find all real solutions of the equation.

\[ \sqrt{x + 16} - \sqrt{x - 35} = \sqrt{3} \]

Solve the inequality and write the answer in interval notation.

\[ 4x - 3 < -7 \]

Solve the inequality and write the answer in interval notation.

\[ 4x - 3 \geq -3 \]
115 Solve the inequality and write the answer in interval notation.

\[-2x - 5 > -3\]

116 Solve the inequality and write the answer in interval notation.

\[\frac{1}{7} x - 5 > -15\]

117 Solve the inequality.

\[\frac{16 (x - 8)}{5} \geq \frac{8 (x + 4)}{4}\]

118 Solve the inequality and write the answer in interval notation.

\[\frac{8}{5} x - \frac{5}{2} x \leq \frac{5}{4} (x + \frac{8}{5}) + \frac{1}{5}\]

119 Solve the inequality and write the answer in interval notation.

\[14 \geq \frac{x - 3}{2} > 5\]

120 Solve the inequality and write the answer in interval notation.

\[5x + 9 \geq 15x + 3 > 3x + 4\]

121 Solve the inequality and write the answer in interval notation.

\[10x^2 + 7x \leq -1\]

122 Solve the inequality and write the answer in interval notation.

\[\frac{x^2 + 2x}{x^2 - 49} \leq 0\]

123 Solve the inequality and write the answer in interval notation.

\[\frac{x^2 - 5x + 6}{x^2 + x - 6} \geq 0\]

124 Solve the inequality and write the answer in interval notation.

\[\frac{10x^2 + 7x + 1}{x^2 + 4x + 4} \geq 0\]
125 Solve the inequality. Write the answer in interval notation.

\[
\frac{10}{x - 6} \leq 2
\]

126 Solve the inequality. Express the answer in interval notation.

\[
\frac{3}{x^2 - 1} \geq 1
\]

127 A student can afford to spend up to $2172. The computer costs $1587 and the CD-ROM costs $24. If she buys the computer, how many CD-ROMs can she buy?

128 The perimeter of the square is to be from 8 meters to 44 meters. Find the range of values for its area \( S \).

129 Express the relationship \( 2 < C < 12 \) in terms of \( F \), where \( F = \frac{7}{2} C + 5 \).

130 Write the expression \(| 10 |\) without using absolute value symbols.

131 Write the expression \(| 4 - 10 |\) without using absolute value symbols.

132 Write the expression without using absolute value symbols.

\[ | 6 | - | - 4 | \]

133 Write the expression without using absolute value symbols.

\[ | x - 5 | \text{ and } x > 5 \]

134 Solve the equation for \( x \).

\[ | 2x + 5 | = 9 \]

135 Solve the equation for \( x \).

\[ \left| \frac{9x - 8}{2} \right| = 13 \]

136 Solve the equation for \( x \).

\[ \left| \frac{8x - 2}{x} \right| = 7 \]

137 Solve the equation for \( x \).

\[ | x + 5 | = | 5 - x | \]

138 Solve the equation for \( x \).

\[ | x - 7 | = | 2x + 7 | \]
Solve the equation for \( x \).

\[
\left| \frac{5x - 1}{4} \right| = \left| \frac{4x + 5}{5} \right|
\]

Solve the inequality. Express the solution set in interval notation.

\[ |x + 5| > 9 \]

Solve the inequality. Express the solution set in interval notation.

\[ |3x - 4| < 7 \]

Solve the inequality. Express the solution set in interval notation.

\[ |2x - 9| - 3 > 10 \]

Solve the inequality. Express the solution set in interval notation.

\[
5 \left| \frac{5x - 1}{6} \right| \geq 1
\]

Solve the inequality. Express the solution set in interval notation.

\[ 0 < |8x + 1| < 9 \]

Solve the inequality. Express the solution set in interval notation.

\[ 3 < \left| \frac{x - 8}{3} \right| < 4 \]

The temperatures on a summer day satisfy the inequality below, where \( t \) is the temperature in degrees Fahrenheit. Express this range without using absolute value symbols.

\[ |t - 79^\circ| \leq 9^\circ \]

A Steinway piano should be placed in an environment where the relative humidity \( h \) is between 35\% and 73\%. Express this range with an inequality containing an absolute value.