Math 135: Intermediate Algebra Homework 11 Solutions

Section 4.2

Solve by substitution:

1.

y = x - 3y = 2x + 1

Answer:

 $\begin{array}{rcrcrcr} x-3 & = & 2x+1 \\ -4 & = & x \\ y & = & -4-3 \\ y & = & -7 \end{array}$

3.

$$y = \frac{1}{2}x + 3$$
$$x = 4y + 6$$

Answer:

 $y = \frac{1}{2}(4y+6) + 3$ y = 2y+6 -6 = y x = 4(-6) + 6x = -18

5.

$$3x + 2y = -8$$
$$y = -4x + 11$$

Answer:

$$3x + 2(-4x + 11) = -8$$

$$-5x + 22 = -8$$

$$x = 6$$

$$y = -4(6) + 11$$

$$y = -13$$

9.

7y = 21 - 14x-5y = 20x

Answer:

$$y = -4x$$

$$7(-4x) = 21 - 14x$$

$$-28x = 21 - 14x$$

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

$$y = -4\left(-\frac{3}{2}\right)$$

$$y = 6$$

11.

$$10a - b = 5$$

$$10a + 3b = -7$$

Answer:

$$b = 10a - 5$$

$$10a + 3(10a - 5) = -7$$

$$40a - 15 = -7$$

$$a = \frac{1}{5}$$

$$b = 10\left(\frac{1}{5}\right) - 5$$

$$b = -3$$

13.

 $\begin{array}{rcl} x-5y &=& -1\\ 7x-y &=& 10 \end{array}$

Answer:

$$x = 5y - 1$$

$$7(5y - 1) - y = 10$$

$$34y - 7 = 10$$

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

$$x = 5\left(\frac{1}{2}\right) - 1$$

$$x = \frac{3}{2}$$

Solve by elimination:

21.

$$\begin{array}{rcl} x+y &=& 3\\ x-y &=& 5 \end{array}$$

Answer:

$$\begin{array}{rcrcr} x+y &=& 3\\ +(x-y) &=& +5 \end{array}$$

37.

2x = 8x = 44 + y = 3y = -1

23.

3x + 2y = -23x - 3y = 1

Answer:

$$\begin{array}{rcl}
-3x + 2y &= -2 \\
+(3x - 3y) &= +1 \\ \hline \\
-y &= -1 \\
y &= 1 \\ -3x + 2(1) &= -2 \\
-3x + 2 &= -2 \\
x &= \frac{4}{3}
\end{array}$$

25.

$$2x - 5y = 7$$

$$6x - 5y = -3$$

Answer:

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$$2x - 5y = 7$$

-(6x - 5y) = -(-3)
$$-4x = 10$$

$$x = -\frac{5}{2}$$

$$2\left(-\frac{5}{2}\right) - 5y = 7$$

$$-5 - 5y = 7$$

$$y = -\frac{12}{5}$$

27.

$$7c + 3d = 0$$

$$7c - 9d = 0$$

Answer:

$$7c + 3d = 0$$

-(7c - 9d) = -0
$$12d = 0$$

$$d = 0$$

$$7c + 3(0) = 0$$

$$7c = 0$$

$$c = 0$$

$$3x + 4y = 1$$
$$2x - 3y = 12$$

Answer:

$$2(3x + 4y) = 2(1)
-3(2x - 3y) = -3(12)$$

$$6x + 8y = 2
-6x + 9y = -36$$

$$17y = -34
y = -2
3x + 4(-2) = 1
3x - 8 = 1
x = 3$$

39.

 $\begin{array}{rcl} 5x+2y&=&11\\ 4x+7y&=&-2 \end{array}$

Answer:

4(5x + 2y) = 4(11)-5(4x + 7y) = -5(-2)20x + 8y = 44-20x - 35y = 10-27y = 54y = -25x + 2(-2) = 115x - 4 = 11x = 3

- **45.** Uptown Towing Company charges \$60 to tow a car plus \$25 per day for vehicle storage. Downtown Towing Company charges \$75 for towing plus \$20 per day for vehicle storage.
 - a. Write an equation that shows how much each company charges in terms of the number of days of storage. Answer:

Let c be the cost and d be the number of days of storage. For Uptown Towing, c = 25d + 60. For Downtown Towing, c = 20d + 75.

b. For how many days of storage will both companies charge the same? Answer:

$$25d + 60 = 20d + 75$$

 $5d = 15$
 $d = 3$

They charge the same for 3 days of storage.

47. A homeowner sections off part of her backyard for a vegetable garden. The width of the garden is 4 ft shorter than the length. The total perimeter of the garden is 52 ft. What are the dimensions of the garden?

Answer:

Let l be the length and w be the width. The perimeter is 2l + 2w (two sides of length l, two of length w), so we know 2l + 2w = 52. Since the width is four feet shorter than the length, we also have w = l - 4. Solving,

$$2l + 2w = 52$$

$$w = l - 4$$

$$2l + 2(l - 4) = 52$$

$$4l - 8 = 52$$

$$l = 15$$

$$w = 15 - 4$$

$$w = 11$$

So the width is 11 ft and the length is 15 ft.

- **49.** On a riverboat trip up the Wailua River in Kauai, a boat traveled against the current at an average speed of 18 mph. On the return trip down the river, the boat traveled with the current at an average speed of 22 mph.
 - **a.** Express this information as a system of equations.

Answer:

Let b be the speed of the boat in still water, and r be the speed of the river. Then on the trip up the river, b - r = 18, and on the trip down the river, b + r = 22.

b. Find the speed of the boat in still water and the speed of the current. Answer:

$$b - r = 18$$

$$b + r = 22$$

$$2b = 40$$

$$b = 20$$

$$20 - r = 18$$

$$r = 2$$

So the speed of the boat in still water is 18 miles per hour, and the speed of the current in the river is 2 miles per hour.

51. A coffee shop sells 12-oz and 20-oz cups of coffee. On a particular day, the shop sold a total of 508 cups of coffee. If the shop sold three times as many 20-oz cups of coffee as 12-oz cups of coffee, how many cups of each size did the coffee shop sell that day?

Answer:

Let s be the number of small (12-oz) cups it sold, and l be the number of large (20-oz) cups it sold. It sold three times as many large cups, so l = 3s, and a total of 508 cups, so l+s = 508. Then we have

> l = 3sl + s = 5083s + s = 508s = 127l = 3(127)l = 381

The store sold 127 12-oz cups and 381 20-oz cups.

53. A public storage facility rents small and large storage lockers. A small storage locker has 200 sq ft of storage space and a large storage locker has 800 sq ft of storage space. The facility has 54 storage lockers and a total of 22,800 sq ft of storage space. How many large storage lockers does the facility have? Answer:

Let s be the number of small (200 sq. ft.) lockers, and l be the number of large (800 sq.ft.) lockers. Making a table

	Number	Locker size	Total size
Small	s	200	200s
Large	l	800	8001

The total number of lockers is 54, so l + s = 54, and the total space available is 22,800 sq. ft. so 200s + 800l = 22,800. Solving,

$$200(s+l) = 200(54)$$

$$200s + 200l = 10,800$$

$$-(200s + 800l) = -22,800$$

$$-600l = -12,000$$

$$l = 30$$

$$s + 30 = 54$$

$$s = 24$$

So the facility has 24 200 sq. ft. lockers and 30 S 800 sq. ft. lockers.

55. Twice the amount of money that was invested in a low-risk fund was invested in a high-risk fund. After one year, the low-risk earned 6% and the high-risk fund lost 9%. The investments had a net loss of \$210. How much was invested in each fund?

Answer:

Let l be the amount invested in the low risk fund and h be the amount invested in the high risk fund. Making a table:

Risk	Amount	Rate	Total return
Low	l	0.06	0.06l
High	h	-0.09	-0.09h

The total return is -\$210, so we have 0.06l - 0.09h = -210. We also know twice as much was invested in the high risk fund as in the low risk fund, so h = 2l. Solving,

$$h = 2l$$

$$0.06l - 0.09h = -210$$

$$0.06l - 0.09(2l) = -210$$

$$-0.12l = -210$$

$$l = 1,750$$

$$h = 2(1,750)$$

$$h = 3,500$$

So \$3,500 was invested in the high risk fund, and \$1,750 in the low risk fund.

Section 7.1 Evaluate, if possible:

1.
$$\sqrt{64} = 8$$

3. $-\sqrt{100} = -10$
7. $2\sqrt{16} = 2(4) = 8$
9. $\sqrt[3]{27} = 3$
11. $5\sqrt[3]{-8} = 5(-2) = -10$
13. $\sqrt[4]{256} = 4$

17.
$$\sqrt{\frac{9}{16}} = \frac{3}{4}$$

19. $\sqrt[3]{-\frac{8}{125}} = -\frac{2}{5}$

21.
$$\sqrt{0.04} = 0.2$$

- 23. Problem requires calculator, not graded.
- 25. Problem requires calculator, not graded.

Simplify:

33.
$$\sqrt{x^6} = x^4$$

35. $\sqrt{16a^6} = 4a^3$
37. $9\sqrt{p^8q^4} = 9p^4q^2$

Rewrite using radical notation. Then simplify, if possible.

49.
$$16^{1/2} = \sqrt{16} = 4$$

51. $-16^{1/2} = -\sqrt{16} = -4$
61. $27^{4/3} = (\sqrt[3]{27})^4 = 3^4 = 81$
63. $-16^{3/2} = -(\sqrt{16})^3 = -4^3 = -64$

Solve:

93. If an object is dropped, the time (in seconds) it takes the object to fall s ft is given by the expression $\frac{1}{4}\sqrt{s}$. Find the time it takes a stone dropped from a height of 100 ft to reach the ground. Answer:

The time required is $\frac{1}{4}\sqrt{100} = \frac{1}{4}10 = 2.5$ seconds.

- **95.** The length of the side of square with area A can be computed using the expression \sqrt{A} . The area of the square picture frame, including the 1-in. wood border, is 25 in².
 - **a.** Find *x*, the length of the side of the picture frame.

Answer: $x = \sqrt{25} = 5$. The length of a side of the picture is 5 in.

b. What size photopraph fits in the frame? Answer:

The border is 1 in, and there are borders on both sides, to the area allowed for the picture is 3 in by 3 in.

- **97.** The manager of an office uses the expression $8000(0.5)^{t/3}$ to calculate the value of a piece of office equipment t years after it was purchased new for \$8000.
 - a. Write this expression in radical form. Answer: $8000(0.5)^{t/3} = 8000\sqrt[3]{0.5}^t$
 - b. Find the value of the equipment 6 yr after it was purchased. Answer: The value is $8000(0.5)^{6/3} = 8000(0.5)^2 =$ 2000. The value is \$2000.