Chapter 1

Section 1.1

1.

$2x+10=40$

$2x+10-10=40-10$

$2x=30$

$\frac{2x}{2}=\frac{30}{2}$

$x=15$

Check:

$2(15)+10-10\stackrel{?}{=}40-10$

$30+0\stackrel{?}{=}30$

$30=30$

2.

$3x+14=35$

$3x+14-14=35-14$

$3x=21$

$\frac{3x}{3}=\frac{21}{3}$

$x=7$

Check:

$3(7)+14\stackrel{?}{=}35$

$21+14\stackrel{?}{=}35$

$35=35$

3.

$-4t+8=-32$

$-4t+8-8=-32-8$

$-4t=-40$

$\frac{-4t}{-4}=\frac{-40}{-4}$

$t=10$

Check:

$-4(10)+8\stackrel{?}{=}-32$

$-40+8\stackrel{?}{=}-32$

$-32=-32$

Check the answers for exercises 4-10 in a similar manner.

4.

$-7m+20=48$

$-7m+20-20=48-20$

$-7m=28$

$\frac{-7m}{-7}=\frac{28}{-7}$

$m=-4$

5.

$2.5x+7.5=32.5$

$2.5x+7.5-7.5=32.5-7.5$

$2.5x=25$

$\frac{2.5x}{2.5}=\frac{25}{2.5}$

$x=10$

6.

$3.4x-8.2=15.6$

$3.4x-8.2+8.2=15.6+8.2$

$3.4x=23.8$

$\frac{3.4x}{3.4}=\frac{23.8}{3.4}$

$x=7$

7.

$20=5.2x-0.8$

$20+0.8=5.2x-0.8+0.8$

$20.8=5.2x$

$\frac{20.8}{5.2}=\frac{5.2x}{5.2}$

$4=x$

$x=4$

8.

$45=-3.6c+189$

$45-189=-3.6c+189-189$

$-144=-3.6c$

$\frac{-144}{-3.6}=\frac{-3.6c}{-3.6}$

$40=c$

$c=40$

9.

$0.05(x-200)=240$
$0.05x-10=240$
$0.05x-10+10=240+10$
$0.05x=250$
$\frac{0.05x}{0.05}=\frac{250}{0.05}$
$x=5000$

10.

$0.03(n-500)=108$
$0.03n-15=108$
$0.03n-15+15=108+15$
$0.03n=123$
$\frac{0.03n}{0.03}=\frac{123}{0.03}$
$n=4100$

11. $C=10h+20$

a.

$C=10(1)+20$
$C=30$

After 1 hour of training, a new employee can produce 30 candies per hour.

b.

$C=10(4)+20$
$C=40+20=60$

After 4 hours of training, a new employee can produce 60 candies per hour.

c.

Let $C=150$
$150=10h+20$
$150-20=10h+20-20$
$130=10h$
$\frac{130}{10}=\frac{10h}{10}$
$13=h$

A new employee can produce 150 candies per hour after 13 hours of training.

12. $E=-17w+600$

a.

$E=-17(0)+600=600$

The total enrollment in math classes at the college was 600 at the beginning of the fall semester.

b.

Let $E=430$
$430=-17w+600$
$430-600=-17w+600-600$
$-170=-17w$
$\frac{-170}{-17}=\frac{-17}{-17}w$
$10=w$

The total enrollment will be 430 ten weeks after the start of the fall semester.

c.

$E=-17w+600$
$E=-17(8)+600$
$E=464$

After 8 weeks, enrollment in math classes at the college will be 464.

13. $P=7.89q+33.73$

a.

$P=7.89(8)+33.73$
$P=63.12+33.73$
$P=96.85$

In March 2017, there were approximately 96.85 million Amazon Prime members in the United States.

b.

$P=7.89q+33.73$
$P=7.89(20)+33.73$
$P=157.8+33.73$
$P=191.53$

In March 2020, there will be approximately 191.53 million Amazon Prime members in the United States. This may be too many to make sense.

c.

Let $P = 133$.

$$133 = 7.89q + 33.73$$
$$133 - 33.73 = 7.89q + 33.73 - 33.73$$
$$99.27 = 7.89q$$
$$\frac{99.27}{7.89} = \frac{7.89q}{7.89}$$
$$12.58 \approx q$$

In about May 2018 (about 12.6 quarters after March 2015) the number of Amazon Prime members will reach about 133 million.

14. $p = 2.399 + 0.03w$

a.

$$p = 2.399 + 0.03(5)$$
$$p = 2.399 + 0.15$$
$$p = 2.549$$

Five weeks after the start of summer, the gas price is \$2.549 per gallon.

b.

Let $p = 2.759$
$$2.759 = 2.399 + 0.03w$$
$$2.759 - 2.399 = 2.399 - 2.399 + 0.03w$$
$$0.360 = 0.03w$$
$$\frac{0.360}{0.03} = \frac{0.03w}{0.03}$$
$$12 = w$$

Twelve weeks after the start of summer, the gas price is \$2.759 per gallon.

15. $P = 1.5t - 300$

a.

$$P = 1.5(100) - 300$$
$$P = 150 - 300$$
$$P = -150$$

If you sell 100 printed T-shirts, you will lose \$150.

b.

$$P = 1.5t - 300$$
$$P = 1.5(400) - 300$$
$$P = 600 - 300$$
$$P = 300$$

If you sell 400 printed T-shirts, you will make \$300 profit.

c.

Let $P = 1000$
$$1000 = 1.5t - 300$$
$$1000 + 300 = 1.5t - 300 + 300$$
$$1300 = 1.5t$$
$$\frac{1300}{1.5} = \frac{1.5t}{1.5}$$
$$866.67 \approx t$$

To make \$1000 profit, you must sell 867 printed T-shirts.

16. $P = 5.5b - 500.50$

a.

$$P = 5.5(75) - 500.50$$
$$P = 412.50 - 500.50$$
$$P = -\$88.00$$

There is a loss of \$88 dollars for selling only 75 books.

b.

$$P = 5.5(b) - 500.50$$
$$P = 5.5(200) - 500.50$$
$$P = 1100 - 500.50$$
$$P = \$599.50$$

There is a \$599.50 profit for selling 200 books.

c.

Let $P = 3600$
$$P = 5.5b - 500.50$$
$$3600 = 5.5b - 500.50$$
$$3600 + 500.50 = 5.5b - 500.50 + 500.50$$
$$4100.5 = 5.5b$$
$$\frac{4100.5}{5.5} = \frac{5.5}{5.5}b$$
$$745.545 = b$$

To make \$3600 in profit, you must sell 746 books.

17. $C = 2.50 + 2.0m$

a.

$C = 2.50 + 2.0(25)$

$C = 2.50 + 50.0$

$C = 52.50$

It costs \$52.50 to take a 25-mile taxi ride in NYC.

b.

$100 = 2.50 + 2.0m$

$100 - 2.50 = 2.50 - 2.50 + 2.0m$

$97.50 = 2.0m$

$\frac{97.50}{2.0} = \frac{2.0m}{2.0}$

$48.75 = m$

For \$100, you can take about a 48-mile taxi ride in NYC.

18.

a.

$P = 35 - 0.07(150)$

$P = 35 - 10.5$

$P = 24.5$

After 150 seconds, the pressure in the vacuum chamber will be 24.5 psi.

b.

$P = 35 - 0.07s$

$1 = 35 - 0.07s$

$1 - 35 = 35 - 35 - 0.07s$

$-34 = -0.07s$

$\frac{-34}{-0.07} = \frac{-0.07s}{-0.07}$

$485.7 \approx s$

The pressure in the vacuum chamber will be 1 psi after about 486 seconds.

19.

a. $P = 3.5$. This too few people. This would mean that only 3500 people live in Kentucky.

b. $P = 4200$. This answer is most reasonable. This would mean that 4,200,000 people live in Kentucky.

c. $P = -210$. This not possible. This would mean that $-210,000$ people live in Kentucky.

20.

a. $R = 20$. A \$20 revenue for a two-day event seems too small.

b. $R = -3000$. Revenue must be ≥ 0 so this is not possible.

c. $R = \$4500$. This answer is most reasonable.

21.

a. $T = -50$. This answer is most reasonable and would mean that the temperature at the South Pole is -50 degrees Fahrenheit.

b. $T = 75$. This temperature is too warm for South Pole temperatures.

c. $T = 82$. This temperature is too warm for South Pole temperatures.

22.

a. $S = 10.50$. This answer is too small to represent a cook's monthly salary.

b. $S = 1600$. This answer is most reasonable for a cook's monthly salary.

c. $S = 28,000$. This answer is too large to represent a cook's monthly salary.

23. $P = 0.08(s - 1000)$

a.

$P = 0.08(2000 - 1000)$

$P = 0.08(1000) = 80$

On sales of \$2000, you will make \$80 in commissions.

b.

$P = 0.08(50,000 - 1000)$

$P = 0.08(49,000)$

$P = 3920$

On sales of \$50,000, you will make \$3920 in commissions.

c.

$$P = 0.08(s - 1000)$$
$$500 = 0.08s - 80$$
$$500 + 80 = 0.08s - 80 + 80$$
$$580 = 0.08s$$
$$\frac{580}{0.08} = \frac{0.08s}{0.08}$$
$$7250 = s$$

To make \$500 per week, you will need \$7250 in sales each week.

24. $P = 0.06(s - 500)$

a.

$$P = 0.06(2000 - 500)$$
$$P = 0.06(1500) = 90$$

On \$2000 in sales, you will make \$90 in commissions.

b.

$$P = 0.06(5000 - 500)$$
$$P = 0.06(4500) = 270$$

On \$5000 in sales, you will make \$270 in commissions.

c.

$$P = 0.06(s - 500)$$
$$450 = 0.06(\mathrm{s} - 500)$$
$$450 = 0.06\mathrm{s} - 30$$
$$450+30 = 0.06\mathrm{s} - 30 + 30$$
$$480 = 0.06s$$
$$\frac{480}{0.06} = \frac{0.06}{0.06}s$$
$$8000 = s$$

If you need at least \$450 per week to pay your bills, you must make \$8000 in sales.

25.

a. $B = 29.95 + 0.55m$

b.

$$B = 29.95 + 0.55(75)$$
$$B = 29.95 + 41.25$$
$$B = 71.20$$

If you drive the 10-foot truck 75 miles, it will cost you \$71.20.

c.

$$B = 29.95 + 0.55m$$
$$100 = 29.95 + 0.55m$$
$$100 - 29.95 = 29.95 - 29.95 + 0.55m$$
$$70.05 = 0.55m$$
$$\frac{70.05}{0.55} = \frac{0.55m}{0.55}$$
$$127.36 \approx m$$

For a total of \$100, you can rent the 10-foot truck from Budget and drive it 127 miles.

26.

a. $C = 59.99 + 29.99m$

b.

Let $m = 24$.

$$C = 59.99 + 29.99(24)$$
$$C = 59.99 + 719.76$$
$$C = 779.75$$

The total cost of this membership for the first 2 years is \$779.75.

c.

Let $C = 1000$.

$$1000 = 59.99 + 29.99m$$
$$1000 - 59.99 = 59.99 + 29.99m - 59.99$$
$$940.01 = 29.99m$$
$$\frac{940.01}{29.99} = \frac{29.99m}{29.99}$$
$$31.34 \approx m$$

\$1000 will purchase 34 months of membership at this club.

27.

a. $P = 250 + 0.07s$

b.

Let $s = 2000$

$$P = 250 + 0.07(2000)$$
$$P = 250 + 140 = 390$$

If you have sales of \$2000 in a week, your pay will be \$390.

c.

$$\text{Let } P = 650$$
$$650 = 250 + 0.07s$$
$$650\text{-}250 = 250 - 250 + 0.07s$$
$$400 = 0.07s$$
$$\frac{400}{0.07} = \frac{0.07s}{0.07}$$
$$5714.29 = s$$

To earn \$650 per week, you must have \$5714.29 in sales each week.

28.

a. $P = 300 + 0.05s$

b.

$$\text{Let } s = 4000$$
$$P = 300 + 0.05(4000)$$
$$P = 300 + 200$$
$$P = \$500$$

Your paycheck will be \$500 if you have \$4000 in sales.

c.

$$\text{Let } P = 750$$
$$750 = 300 + 0.05s$$
$$750 + -300 = 300 + -300 + 0.05s$$
$$450 = 0.05\text{s}$$
$$\frac{450}{0.05} = \frac{0.05}{0.05}s$$
$$\$9000 = s$$

For a paycheck of \$750, the weekly sales would be \$9000.

29. Let C be the total cost (in dollars) of a trip to Las Vegas, and let d be the number of days you stay.

a. $C = 225 + 150d$

b.

$$C = 225 + 150(3)$$
$$C = 225 + 450 = 675$$

A three-day trip to Las Vegas will cost \$675.

c.

$$\frac{\$1200}{2} = \$600$$
$$C = 225 + 150d$$
$$600 = 225 + 150d$$
$$600 - 225 = 225 - 225 + 150d$$
$$375 = 150d$$
$$\frac{375}{150} = \frac{150d}{150}$$
$$2.5 = d$$

If you have \$1200 and gamble half of it, you can stay in Las Vegas for only 2 days.

30. Let C be the total cost (in dollars) for a trip to Orlando, Florida, for a family of four, and let d be the number of days you stay.

a. $C = 1600 + 900d$

b.

$$C = 1600 + 900(5)$$
$$C = 1600 + 4500$$
$$C = 6100$$

A five-day trip to Orlando, Florida, will cost a family of four \$6100.

c.

$$C = 1600 + 900d$$
$$7500 = 1600 + 900d$$
$$7500 - 1600 = 1600 - 1600 + 900d$$
$$5900 = 900d$$
$$\frac{5900}{900} = \frac{900d}{900}$$
$$6.56 \approx d$$

For \$7500 a family of four can take a trip to Orlando, Florida, for six days.

31. Let C be the total cost (in dollars) for shooting a wedding, and let p be the number of proofs edited and printed.

a. $C = 5.29p + 800$

b.

$$C = 5.29(100) + 800$$
$$C = 529 + 800$$
$$C = 1329$$

If the photographer edits and prints 100 proofs, the cost will be \$1329.

c.

Let $C = 1750$.

$$1750 = 5.29p + 800$$
$$1750 - 800 = 5.29p + 800 - 800$$
$$950 = 5.29p$$
$$\frac{950}{5.29} = \frac{5.29p}{5.29}$$
$$179.58 \approx p$$

With a budget of \$1750, the photographer can edit and print 179 proofs.

32. Let R be the total amount a photographer charges her clients for editing and printing p proofs.

a. $R = 7.50p + 600$

b.

$$R = 7.50(100) + 600$$
$$R = 750 + 600$$
$$R = 1350$$

The photographer will charge her client \$1350 to edit and print 100 proofs.

c. Let P be the profit (in dollars) from editing and printing p proofs.

$$P = R - C$$
$$P = (7.50p + 600) - (5.29p + 800)$$
$$P = 7.50p + 600 - 5.29p - 800$$
$$P = 2.21p - 200$$

d.

$$P = 2.21(100) - 200$$
$$P = 221 - 200$$
$$P = 21$$

The photographer makes a \$21 profit from editing and printing 100 proofs from the wedding shoot.

e.

Let $P = 0$.

$$2.21p - 200 = 0$$
$$2.21p = 200$$
$$\frac{2.21p}{2.21} = \frac{200}{2.21}$$
$$p \approx 90.50$$

The photographer must edit and print 91 proofs to break even.

33.

a. Let C be the total cost (in dollars) for selling s snow cones for a month.
Fixed costs are: $2000 + 1150 = 3150$.

$$C = 3150 + 0.36s$$

b.

$$C = 3150 + 0.36(3000)$$
$$C = 4230$$

The monthly cost for selling 3000 snow cones is \$4230.

c.

$$4400 = 3150 + 0.36s$$
$$4400 - 3150 = 3150 - 3150 + 0.36s$$
$$1250 = 0.36s$$
$$\frac{1250}{0.36} = \frac{0.36s}{0.36}$$
$$3472.22 \approx s$$

For a \$4400 budget, the vendor can sell up to 3472 snow cones.

34.

a. Let R be the monthly revenue (in dollars) for selling s snow cones for a month. $R = 2.50s$.

b. $R = 2.50(3000) = 7500$. The total monthly revenue from selling 3000 snow cones is \$7500.

c. Let P be the profit (in dollars) from selling s snow cones.

$$P = R - C$$
$$P = 2.50s - (3150 + 0.36s)$$
$$P = 2.50s - 3150 - 0.36s$$
$$P = 2.14s - 3150$$

d.

$$P = 2.14(4500) - 3150$$
$$P = 9630 - 3150$$
$$P = 6480$$

The vendor makes a \$6480 profit from selling 4500 snow cones.

e.

$$0 = 2.14s - 3150$$
$$3150 = 2.14s - 3150 + 3150$$
$$3150 = 2.14s$$
$$\frac{3150}{2.14} = \frac{2.14s}{2.14}$$
$$1471.96 \approx s$$

The vendor must sell 1472 snow cones to break even.

35.

a. Let C be the total cost (in dollars) for the Squeaky Clean Window Company to clean windows for a day, when w windows are cleaned.

$C = 1.50w + 530$.

b.

$$C = 1.50(60) + 530$$
$$C = 90 + 530$$
$$C = 620$$

If the Squeaky Clean Window Company cleans 60 windows in a day, it will cost the company \$620.

c.

$$800 = 1.50w + 530$$
$$800 - 530 = 1.50w + 530 - 530$$
$$270 = 1.50w$$
$$\frac{270}{1.50} = \frac{1.50w}{1.50}$$
$$180 = w$$

To stay within a budget of \$800, the Squeaky Clean Window Company can clean up to 180 windows.

36. **a.** Let R be the monthly revenue (in dollars) for the Squeaky Clean Window Company to clean windows for a day when w windows are cleaned.

$R = 9w + 50$.

b.

$$R = 9(50) + 50$$
$$R = 450 + 50$$
$$R = 500$$

The Squeaky Clean Window Company will charge a business \$500 to clean 50 windows.

c. Let P be the profit for the Squeaky Clean Window Company to clean windows when w windows are cleaned.

$$P = R - C$$
$$P = (9w + 50) - (1.50w + 530)$$
$$P = 9w + 50 - 1.50w - 530$$
$$P = 7.50w - 480$$

d.

$$P = 7.50(80) - 480$$
$$P = 600 - 480$$
$$P = 120$$

The Squeaky Clean Window Company makes a \$120 profit by washing 80 windows.

e.

$$0 = 7.50w - 480$$
$$0 + 480 = 7.50w - 480 + 480$$
$$480 = 7.50w$$
$$\frac{480}{7.50} = \frac{7.50w}{7.50}$$
$$64 = w$$

They must clean at least 64 windows to break even.

37. Maria's work is correct. Javier needs a decimal to correctly represent 55 cents per bottle in terms of dollars per bottle.

38. Rosemary's work is correct. Will needs to use parentheses so that so that the entire cost is subtracted.

39.

a. Let C be the total cost (in dollars) for pest management from Enviro-Safe Pest Management when m monthly treatments are done.

$C = 150 + 38m$.

b. There are 18 months in 1.5 years.

$$C = 150 + 38(18)$$
$$C = 150 + 684$$
$$C = 834$$

If your house is treated for 1.5 years (18 months) after the initial treatment, it will cost \$834.

40.

a.

$$2013 \to t = 3$$
$$P = 2.76(3) + 309.37$$
$$P = 8.28 + 309.37$$
$$P = 317.65$$

The population of the United States was approximately 317.65 million in 2013.

b.

$$326 = 2.76t + 309.37$$
$$326 - 309.37 = 2.76t + 309.37 - 309.37$$
$$16.63 = 2.76t$$
$$\frac{16.63}{2.76} = \frac{2.76t}{2.76}$$
$$6.03 \approx t$$

In about 2016, the population of the United States was approximately 326 million.

c.

$$375 = 2.76t + 309.37$$
$$375 - 309.37 = 2.76t + 309.37 - 309.37$$
$$65.63 = 2.76t$$
$$\frac{65.63}{2.76} = \frac{2.76t}{2.76}$$
$$23.78 \approx t$$

By late 2033, the population of the United States will have reached 375 million.

41.

a. Let C be the total monthly cost (in dollars) for a manufacturer to produce g sets of golf clubs.

$$C = 23250 + 145g$$

b.

$$C = 23250 + 145(100)$$
$$C = 23250 + 14500$$
$$C = 37750$$

It costs the manufacturer \$37,750 to produce 100 sets of golf clubs.

c.

$$20000 - 23250 = 23250 - 23250 + 145g$$
$$-3250 = 145g$$
$$\frac{-3250}{145} = \frac{145g}{145}$$
$$-22.41 \approx g$$

This is model breakdown. Their costs can never be lower than their fixed costs of \$23,250.

d.

$$\frac{\$37,750}{100 \text{ sets}} = \$377.50 \text{ per set}$$

To break even selling 100 sets of golf clubs per month, the manufacturer must sell each set for \$377.50.

42. **a** $C = 150 + 5t$ for $t \geq 100$.

b.

$$C = 150 + 5(300)$$
$$C = 150 + 1500$$
$$C = 1650$$

It costs \$1650 to make 300 T-shirts.

c.

$$1500 = 150 + 5t$$
$$1500 - 150 = 150 - 150 + 5t$$
$$1350 = 5t$$
$$\frac{1350}{5} = \frac{5t}{5}$$
$$270 = t$$

The camp can have 270 T-shirts made for \$1500.

d.

$$\frac{\$1650}{300 \text{ T-shirts}} = \$5.50 \text{ per T-shirt}$$

To break even selling 300 T-shirts, the camp should sell each for \$5.50.

43.

a $C = 1500 + 1.50n$ for $n \leq 500$.

b.

$$C = 1500 + 1.50(250)$$
$$C = 1500 + 375$$
$$C = 1875$$

It costs Rockon \$1875 to make 250 EPs.

c.

$2000 = 1500 + 1.50n$

$2000 - 1500 = 1500 - 1500 + 1.50n$

$500 = 1.50n$

$\frac{500}{1.50} = \frac{1.50n}{1.50}$

$333.3 \approx n$

With a budget of \$2000, Rockon can order 333 EPs.

d.

$3000 = 1500 + 1.50n$

$3000 - 1500 = 1500 - 1500 + 1.50n$

$1500 = 1.50n$

$\frac{1500}{1.50} = \frac{1.50n}{1.50}$

$1000 = n$

With a budget of \$3000, Rockon can order 1000 EPs. This is model breakdown. They can only order up to 500 EPs.

44. $P = -3t + 50$

a.

Five years in operation: $t = 0$.

One year in operation: $t = -4$.

$P = -3(-4) + 50$

$P = 12 + 50 = 62$

After one year in operation, 62% of companies are still in business.

b.

Five years in operation: $t = 0$.

25 years in operation: $t = 20$.

$P = -3(20) + 50$

$P = -60 + 50 = -10$

After 25 years, –10% of companies are still in business. This is model break down.

c.

$35 = -3t + 50$

$35 - 50 = -3t + 50 - 50$

$-15 = -3t$

$\frac{-15}{-3} = \frac{-3t}{-3}$

$5 = t$

After 10 years, only 35% of companies are still in business.

45.

a. If Budget doubled the cost per mile, it would change the $0.55m$ to $1.10m$, which would make the cost grow faster with every mile driven.

b. 29.95 + 0.55(75) = 71.20, and 29.95 + 1.10(75) = \$112.45.

The cost for 75 miles would not double because the day charge of \$29.95 did not change. The cost for 75 miles would increase from \$71.20 to \$112.45.

46.

a. If the membership plan doubled the cost per month, it would change the $29.99m$ to $59.98m$, which would make the cost grow faster with every month.

b. 2 years = 24 months

59.99 + 29.99(24) = 779.75, and 59.99 + 59.98(24) = 1499.51. Note that 779.75(2) = 1559.50.

The cost for 2 years would not quite double because the initiation fee of \$59.99 did not change. The cost for 2 years would increase from \$779.75 to \$1499.51.

47.

a. If the salesperson got a raise, increasing the guaranteed pay per week \$100, the constant 250 would change to 350. We'd have $P = 350 + 0.07s$.

b. The raise in the commission rate would change the $0.07s$ to $0.08s$. We'd have $P = 250 + 0.08s$.

c. 250 + 0.07(7000) = 740, 350 + 0.07(7000) = 840, and 250 + 0.08(7000) = 810.

If a salesperson makes an average of \$7000 in sales per week, the \$100 increase would be better for the salesperson. The commission-rate change would increase the salary only \$70 per week.

d. 250 + 0.07(4000) = 530, 350 + 0.07(4000) = 630, and 250 + 0.08(4000) = 570.

If the salesperson makes an average of \$4000 in sales per week, the commission-rate increase would be better for the business. The commission-rate increase would cost them on average only \$40 per week.

e.

$$\begin{aligned} 350 + 0.07s &= 250 + 0.08s \\ 100 &= 0.01s \\ \frac{100}{0.01} &= \frac{0.01s}{0.01} \\ 10000 &= s \end{aligned}$$

For the two raises to result in the same weekly pay, the salesperson would have to average $10,000 in sales per week.

48.

a. If the salesperson got a raise, increasing the guaranteed pay per week $150, the constant 300 would change to 450. We'd have $P = 450 + 0.05s$.

b. The raise in the commission rate would change the 0.05s to 0.06s. We'd have $P = 300 + 0.06s$.

c. 300 + 0.05 (20000) = 1300, 450 + 0.05(20000) = 1450, and 300 + 0.06(20000) = 1500.

If a salesperson makes an average of $20,000 in sales per week, the commission-rate increase would be better for the salesperson. The commission-rate increase would increase the salary $200 per week.

d. 300 + 0.05 (11000) = 850, 450 + 0.05(11000) = 1000, and 300 + 0.06(11000) = 960.

If the salesperson makes an average of $11,000 in sales per week, the commission-rate increase would be better for the business. The commission-rate increase would cost them on average only $110 per week.

e.

$$\begin{aligned} 450 + 0.05s &= 300 + 0.06s \\ 150 &= 0.01s \\ \frac{150}{0.01} &= \frac{0.01s}{0.01} \\ 15000 &= s \end{aligned}$$

$15,000 in sales per week would make these raises result in the same weekly pay.

49.

a.

800 + 0.50(800) = 800 + 400 = 1200

If the salaries paid by the photographer increase 50%, the 800 in the cost equation would increase to 1200, and we'd have $C = 5.29p + 1200$.

b.

$$\begin{aligned} P &= R - C \\ P &= (7.50p + 600) - (5.29p + 1200) \\ P &= 7.50p + 600 - 5.29p - 1200 \\ P &= 2.21p - 600 \end{aligned}$$

The new profit minus the old profit is

$$\begin{aligned} &(2.21p - 600) - (2.21p - 200) \\ &= 2.21p - 600 - 2.21p + 200 \\ &= -400. \end{aligned}$$

This increase in salaries would decrease the profit for the photographer by $400.

c.

$$\frac{\$400}{100} = \$4$$

If the photographer wants to cover the increase in salaries, she would have to increase the charge per proof from $5.29 to $9.29.

50.

a. Assuming that both utilities and kiosk-rental costs increase by 20%, the $1150 increases to $1150 + $1150(0.20) = $1380.

$C = 3380 + 0.36s$

b.

$$\begin{aligned} P &= R - C \\ P &= 2.50s - (3380 + 0.36s) \\ P &= 2.50s - 3380 - 0.36s \\ P &= 2.14s - 3380 \end{aligned}$$

The new profit minus the old profit is

$$\begin{aligned} &(2.14s - 3380) - (2.14s - 3150) \\ &= 2.14s - 3380 - 2.14s + 3150 \\ &= -230. \end{aligned}$$

The increase in costs will reduce the snow cone vendor's profits by $230.

c.

$$\frac{\$230}{6000} \approx 0.038$$

To cover the $230 increase in costs, the vendor should increase the charge per snow cone by $0.04, or 4 cents.

51.

Step 1 Reason: Combine the variable terms together on one side of the equation using the subtraction property of equality.

Step 2 Algebraic Step: $-5x+10=-15$

$-10 \quad -10$

Step 3 Reason: Solve for the variable using the division property of equality.

Step 4 Algebraic Step: $x=5$

52.

Step 1 Algebraic Step: $-4x+7=-8x-9$

$+8x \qquad +8x$

Step 2 Reason: Isolate the variable term by using the subtraction property of equality.

Step 3 Algebraic Step: $\frac{4x}{4}=\frac{-16}{4}$

Step 4 Reason: The solution

53.

Step 1 Reason: Simplify the left side of the equation using the distributive property.

Step 2 Algebraic Step: $2x-3=-3x+12$

Step 3 Reason: Combine the variable terms together on one side of the equation using the addition property of equality.

Step 4 Algebraic Step: $5x-3=12$

$+3 \quad +3$

Step 5 Algebraic Step: $\frac{5x}{5}=\frac{15}{5}$

Step 6 Reason: The solution

54.

Step 1 Algebraic Step: $6x+1=-4x-2-3$

Step 2 Reason: Combine like terms on each side of the equation.

Step 3 Algebraic Step: $6x+1=-4x-5$

$+4x \qquad +4x$

Step 4 Reason: Isolate the variable term by using the subtraction property of equality.

Step 5 Algebraic Step: $\frac{10x}{10}=\frac{-6}{10}$

Step 6 Reason: The solution

55.

Algebraic Step to Solve the Equation	Reason for Each Step
$5x+60=2x+90$	This is the given equation.
$5x+60-2x=2x+90-2x$ $3x+60=90$	Combine the variable terms together on one side of the equation using the subtraction property of equality.
$3x+60-60=90-60$ $3x=30$	Isolate the variable term by using the subtraction property of equality.
$\frac{3x}{3}=\frac{30}{3}$	Solve for the variable using the division property of equality.
$x=10$	The solution
$5(10)+60\stackrel{?}{=}2(10)+90$ $50+60\stackrel{?}{=}20+90$ $110=110$	Check the answer.

56.

Algebraic Step to Solve the Equation	Reason for Each Step
$6x+20=9x+5$	This is the given equation.
$6x+20-9x=9x+5-9x$ $-3x+20=5$	Combine the variable terms together on one side of the equation using the subtraction property of equality.
$-3x+20-20=5-20$ $-3x=-15$	Isolate the variable term by using the subtraction property of equality.
$\frac{-3x}{-3}=\frac{-15}{-3}$	Solve for the variable using the division property of equality.
$x=5$	The solution
$6(5)+20\stackrel{?}{=}9(5)+5$ $30+20\stackrel{?}{=}45+5$ $50=50$	Check the answer.

57.

Algebraic Step to Solve the Equation	Reason for Each Step
$\frac{2}{5}d+6=14$	This is the given equation.
$\frac{2}{5}d+6-6=14-6$ $\frac{2}{5}d=8$	Isolate the variable term by using the subtraction property of equality.
$\frac{5}{2}\left(\frac{2}{5}d\right)=\frac{5}{2}(8)$	Solve for the variable using the multiplication property of equality.
$d=20$	The solution
$\frac{2}{5}(20)+6\stackrel{?}{=}14$ $8+6\stackrel{?}{=}14$ $14=14$	Check the answer.

58.

Algebraic Step to Solve the Equation	Reason for Each Step
$\frac{3}{4}x-17=20$	This is the given equation.
$\frac{3}{4}x-17+17=20+17$ $\frac{3}{4}x=37$	Isolate the variable term by using the addition property of equality.
$\frac{4}{3}\left(\frac{3}{4}x\right)=\frac{4}{3}(37)$	Solve for the variable using the multiplication property of equality.
$x=\frac{148}{3}$	The solution
$\frac{3}{4}\left(\frac{148}{3}\right)-17\stackrel{?}{=}20$ $37-17\stackrel{?}{=}20$ $20=20$	Check the answer.

59.

Algebraic Step to Solve the Equation	Reason for Each Step
$\frac{1}{3}m+\frac{4}{3}=4$	This is the given equation.
$3\left(\frac{1}{3}m+\frac{4}{3}\right)=3(4)$ $m+4=12$	Multiply both sides by the LCD, 3, to get eliminate the fraction.
$m+4-4=12-4$	Isolate the variable term by using the subtraction property of equality.
$m=8$	The solution
$\frac{1}{3}(8)+\frac{4}{3}\stackrel{?}{=}4$ $\frac{8}{3}+\frac{4}{3}\stackrel{?}{=}4$ $4=4$	Check the answer.

60.

Algebraic Step to Solve the Equation	Reason for Each Step
$\frac{1}{2}x+\frac{3}{2}=5$	This is the given equation.
$2\left(\frac{1}{2}x+\frac{3}{2}\right)=2(5)$ $x+3=10$	Multiply both sides by the LCD, 2, to get eliminate the fraction.
$x+3-3=10-3$	Isolate the variable term by using the subtraction property of equality.
$x=7$	The solution
$\frac{1}{2}(7)+\frac{3}{2}\stackrel{?}{=}5$ $\frac{7}{2}+\frac{3}{2}\stackrel{?}{=}5$ $5=5$	Check the answer.

61.

Algebraic Step to Solve the Equation	Reason for Each Step
$-3x-6=14+8x$	This is the given equation.
$-3x-6-8x=14+8x-8x$ $-11x-6=14$	Combine the variable terms together on one side of the equation using the subtraction property of equality.
$-11x-6+6=14+6$ $-11x=20$	Isolate the variable term by using the addition property of equality.
$\frac{-11x}{-11}=\frac{20}{-11}$	Solve for the variable using the division property of equality.
$x=-\frac{20}{11}$	The solution
$-3\left(-\frac{20}{11}\right)-6\stackrel{?}{=}14+8\left(-\frac{20}{11}\right)$ $\frac{60}{11}-6\stackrel{?}{=}14-\frac{160}{11}$ $\frac{60}{11}-\frac{66}{11}\stackrel{?}{=}\frac{154}{11}-\frac{160}{11}$ $-\frac{6}{11}=-\frac{6}{11}$	Check the answer.

62.

Algebraic Step to Solve the Equation	Reason for Each Step
$5r-9=18r+2$	This is the given equation.
$5r-9-18r=18r+2-18r$ $-13r-9=2$	Combine the variable terms together on one side of the equation using the subtraction property of equality.
$-13r-9+9=2+9$ $-13r=11$	Isolate the variable term by using the addition property of equality.
$\frac{-13r}{-13}=\frac{11}{-13}$	Solve for the variable using the division property of equality.
$r=-\frac{11}{13}$	The solution
$5\left(-\frac{11}{13}\right)-9\stackrel{?}{=}18\left(-\frac{11}{13}\right)+2$ $-\frac{55}{13}-9\stackrel{?}{=}-\frac{198}{13}+2$ $-\frac{55}{13}-\frac{117}{13}\stackrel{?}{=}-\frac{198}{13}+\frac{26}{13}$ $-\frac{172}{13}=-\frac{172}{13}$	Check the answer.

63.

Algebraic Step to Solve the Equation	Reason for Each Step
$\frac{5}{7}d-\frac{3}{10}=\frac{4}{7}d+4$	This is the given equation.
$70\left(\frac{5}{7}d-\frac{3}{10}\right)=70\left(\frac{4}{7}d+4\right)$ $50d-21=40d+280$	Multiply both sides by the LCD, 70, to get eliminate the fraction.
$50d-21-40d=40d+280-40d$ $10d-21=280$	Combine the variable terms together on one side of the equation using the subtraction property of equality.
$10d-21+21=280+21$ $10d=301$	Isolate the variable term by using the addition property of equality.
$\frac{10d}{10}=\frac{301}{10}$	Solve for the variable using the division property of equality.
$d=\frac{301}{10}$	The solution
$\frac{5}{7}\left(\frac{301}{10}\right)-\frac{3}{10}\stackrel{?}{=}\frac{4}{7}\left(\frac{301}{10}\right)+4$ $\frac{43}{2}-\frac{3}{10}\stackrel{?}{=}\frac{86}{5}+4$ $\frac{215}{10}-\frac{3}{10}\stackrel{?}{=}\frac{86}{5}+\frac{20}{5}$ $\frac{212}{10}\stackrel{?}{=}\frac{106}{5}$ $\frac{106}{5}=\frac{106}{5}$	Check the answer.

64.

Algebraic Step to Solve the Equation	Reason for Each Step
$\frac{3}{8}p-\frac{4}{9}=\frac{5}{8}p+7$	This is the given equation.
$72\left(\frac{3}{8}p-\frac{4}{9}\right)=72\left(\frac{5}{8}p+7\right)$ $27p-32=45p+504$	Multiply both sides by the LCD, 72, to get eliminate the fraction.
$27p-32-45p=45p+504-45p$ $-18p-32=504$	Combine the variable terms together on one side of the equation using the subtraction property of equality.
$-18p-32+32=504+32$ $-18p=536$	Isolate the variable term by using the addition property of equality.
$\frac{-18p}{-18}=\frac{536}{-18}$	Solve for the variable using the division property of equality.
$p=-\frac{268}{9}$	The solution
$\frac{3}{8}\left(-\frac{268}{9}\right)-\frac{4}{9}\stackrel{?}{=}\frac{5}{8}\left(-\frac{268}{9}\right)+7$ $-\frac{67}{6}-\frac{4}{9}\stackrel{?}{=}-\frac{335}{18}+7$ $-\frac{201}{18}-\frac{8}{18}\stackrel{?}{=}-\frac{335}{18}+\frac{126}{18}$ $-\frac{209}{18}=-\frac{209}{18}$	Check the answer.

65.

$1.25d-3.4=-2.3(5d+4)$
$1.25d-3.4=-11.5d-9.2$
$1.25d-3.4+11.5d=-11.5d-9.2+11.5d$
$12.75d-3.4=-9.2$
$12.75d-3.4+3.4=-9.2+3.4$
$12.75d=-5.8$
$\frac{12.75d}{12.75}=\frac{-5.8}{12.75}$
$d\approx -0.45$
Check:
$1.25(-0.45)-3.4\stackrel{?}{=}-2.3(5(-0.45)+4)$
$-0.5625-3.4\stackrel{?}{=}-2.3(-2.25+4)$
$-3.9625\stackrel{?}{=}-2.3(1.75)$
$-3.9625\approx -4.025$

66.

$3.7m-4.6=-1.8(6m+8)$
$3.7m-4.6=-10.8m-14.4$
$3.7m-4.6+10.8m=-10.8m-14.4+10.8m$
$14.5m-4.6=-14.4$
$14.5m-4.6+4.6=-14.4+4.6$
$14.5m=-9.8$
$\frac{14.5m}{14.5}=\frac{-9.8}{14.5}$
$m\approx -0.68$
Check:
$3.7(-0.68)-4.6\stackrel{?}{=}-1.8(6(-0.68)+8)$
$-2.516-4.6\stackrel{?}{=}-1.8(-4.08+8)$
$-7.116\stackrel{?}{=}-1.8(3.92)$
$-7.116\approx -7.056$

67.

$3(c+5)-21=107$
$3c+15-21=107$
$3c-6=107$
$3c-6+6=107+6$
$3c=113$
$\frac{3c}{3}=\frac{113}{3}$
$c=\frac{113}{3}$

Check:

$3\left(\frac{113}{3}+5\right)-21\stackrel{?}{=}107$

$3\left(\frac{113}{3}+\frac{15}{3}\right)-21\stackrel{?}{=}107$

$3\left(\frac{128}{3}\right)-21\stackrel{?}{=}107$

$128-21\stackrel{?}{=}107$

$107=107$

68.

$5k+7=2(6k-14)+56$

$5k+7=12k-28+56$

$5k+7=12k+28$

$5k+7-12k=12k+28-12k$

$-7k+7=28$

$-7k+7-7=28-7$

$-7k=21$

$\frac{-7k}{-7}=\frac{21}{-7}$

$k=-3$

Check:

$5(-3)+7\stackrel{?}{=}2(6(-3)-14)+56$

$-15+7\stackrel{?}{=}2(-18-14)+56$

$-8\stackrel{?}{=}2(-32)+56$

$-8\stackrel{?}{=}-64+56$

$-8=-8$

Check the answers for exercises 69-76 in a similar manner.

69.

$1.7d+5.7=29.7+5d$

$1.7d+5.7-5d=29.7+5d-5d$

$-3.3d+5.7=29.7$

$-3.3d+5.7-5.7=29.7-5.7$

$-3.3d=24$

$\frac{-3.3d}{-3.3}=\frac{24}{-3.3}$

$d\approx-7.27$

70.

$2.1m+3.4=7.2-9.4m$

$2.1m+3.4+9.4m=7.2-9.4m+9.4m$

$11.5m+3.4=7.2$

$11.5m+3.4-3.4=7.2-3.4$

$11.5m=3.8$

$\frac{11.5m}{11.5}=\frac{3.8}{11.5}$

$m\approx0.33$

71.

$\frac{3}{7}(2z-5)=\frac{4}{7}(-3z+9)$

$\frac{6}{7}z-\frac{15}{7}=-\frac{12}{7}z+\frac{36}{7}$

$7\left(\frac{6}{7}z-\frac{15}{7}\right)=7\left(-\frac{12}{7}z+\frac{36}{7}\right)$

$6z-15=-12z+36$

$6z-15+12z=-12z+36+12z$

$18z-15=36$

$18z-15+15=36+15$

$18z=51$

$\frac{18z}{18}=\frac{51}{18}$

$z=\frac{51}{18}$

$z=\frac{17}{6}$

72.

$\frac{2}{5}(3r-8)=\frac{3}{5}(-4r+6)$

$\frac{6}{5}r-\frac{16}{5}=-\frac{12}{5}r+\frac{18}{5}$

$5\left(\frac{6}{5}r-\frac{16}{5}\right)=5\left(-\frac{12}{5}r+\frac{18}{5}\right)$

$6r-16=-12r+18$

$6r-16+12r=-12r+18+12r$

$18r-16=18$

$18r-16+16=18+16$

$18r=34$

$\frac{18r}{18}=\frac{34}{18}$

$r=\frac{34}{18}$

$r=\frac{17}{9}$

73.

$$-3(2v+9)-3(3v-7)=4v+6(2v-8)$$
$$-6v-27-9v+21=4v+12v-48$$
$$-15v-6=16v-48$$
$$-15v-6-16v=16v-48-16v$$
$$-31v-6=-48$$
$$-31v-6+6=-48+6$$
$$-31v=-42$$
$$\frac{-31v}{-31}=\frac{-42}{-31}$$
$$v=\frac{42}{31}$$

74.

$$4(2x+7)-6(4x-8)=12x+3(4x-9)$$
$$8x+28-24x+48=12x+12x-27$$
$$-16x+76=24x-27$$
$$-16x+76-24x=24x-27-24x$$
$$-40x+76=-27$$
$$-40x+76-76=-27-76$$
$$-40x=-103$$
$$\frac{-40x}{-40}=\frac{-103}{-40}$$
$$x=\frac{103}{40}$$

75.

$$-\frac{8}{9}(3t+5)=\frac{2}{3}t-12$$
$$-\frac{24}{9}t-\frac{40}{9}=\frac{2}{3}t-12$$
$$9\left(-\frac{24}{9}t-\frac{40}{9}\right)=9\left(\frac{2}{3}t-12\right)$$
$$-24t-40=6t-108$$
$$-24t-40-6t=6t-108-6t$$
$$-30t-40=-108$$
$$-30t-40+40=-108+40$$
$$-30t=-68$$
$$\frac{-30t}{-30}=\frac{-68}{-30}$$
$$t=\frac{68}{30}$$
$$t=\frac{34}{15}$$

76.

$$-\frac{2}{7}(4x+2)=\frac{3}{28}x-15$$
$$-\frac{8}{7}x-\frac{4}{7}=\frac{3}{28}x-15$$
$$28\left(-\frac{8}{7}x-\frac{4}{7}\right)=28\left(\frac{3}{28}x-15\right)$$
$$-32x-16=3x-420$$
$$-32x-16-3x=3x-420-3x$$
$$-35x-16=-420$$
$$-35x-16+16=-420+16$$
$$-35x=-404$$
$$\frac{-35x}{-35}=\frac{-404}{-35}$$
$$x=\frac{404}{35}$$

77.

$$F=ma$$
$$\frac{F}{m}=\frac{ma}{m}$$
$$a=\frac{F}{m}$$

78.

$$W=mg$$
$$\frac{W}{g}=\frac{mg}{g}$$
$$m=\frac{W}{g}$$

79.

$$J=Ft$$
$$\frac{J}{t}=\frac{Ft}{t}$$
$$F=\frac{J}{t}$$

80.

$$P=10h$$
$$\frac{P}{10}=\frac{10h}{10}$$
$$h=\frac{P}{10}$$

81.

$$\omega = \omega_0 + \alpha t$$
$$\omega - \omega_0 = \omega_0 + \alpha t - \omega_0$$
$$\omega - \omega_0 = \alpha t$$
$$\frac{\omega - \omega_0}{t} = \frac{\alpha t}{t}$$
$$\alpha = \frac{\omega - \omega_0}{t}$$

82.

$$y = mx + b$$
$$y - mx = mx + b - mx$$
$$y - mx = b$$
$$b = y - mx$$

83.

$$K = \frac{1}{2} I\omega^2$$
$$2(K) = 2\left(\frac{1}{2} I\omega^2\right)$$
$$2K = I\omega^2$$
$$\frac{2K}{\omega^2} = \frac{I\omega^2}{\omega^2}$$
$$I = \frac{2k}{\omega^2}$$

84.

$$U = \frac{1}{2} kx^2$$
$$2(U) = 2\left(\frac{1}{2} kx^2\right)$$
$$2U = kx^2$$
$$\frac{2U}{x^2} = \frac{kx^2}{x^2}$$
$$k = \frac{2U}{x^2}$$

85.

$$K = \frac{1}{2} mv^2$$
$$2(K) = 2\left(\frac{1}{2} mv^2\right)$$
$$2K = mv^2$$
$$\frac{2K}{v^2} = \frac{mv^2}{v^2}$$
$$m = \frac{2K}{v^2}$$

86.

$$y = \frac{1}{2} xz^2$$
$$2(y) = 2\left(\frac{1}{2} xz^2\right)$$
$$2y = xz^2$$
$$\frac{2y}{z^2} = \frac{xz^2}{z^2}$$
$$x = \frac{2y}{z^2}$$

87.

$$ax + by = c$$
$$ax + by - ax = c - ax$$
$$by = c - ax$$
$$\frac{by}{b} = \frac{c - ax}{b}$$
$$y = \frac{c - ax}{b}$$

88.

$$2x - y = z$$
$$2x - y + y = z + y$$
$$2x = y + z$$
$$\frac{2x}{2} = \frac{y + z}{2}$$
$$x = \frac{y + z}{2}$$

89.

$$ax + 5 = y$$
$$ax + 5 - 5 = y - 5$$
$$ax = y - 5$$
$$\frac{ax}{a} = \frac{y - 5}{a}$$
$$x = \frac{y - 5}{a}$$

90.

$$4m + n = p$$
$$4m + n - n = p - n$$
$$4m = p - n$$
$$\frac{4m}{4} = \frac{p - n}{4}$$
$$m = \frac{p - n}{4}$$

91.

$$b = 2c + 3d$$
$$b - 3d = 2c + 3d - 3d$$
$$b - 3d = 2c$$
$$\frac{b-3d}{2} = \frac{2c}{2}$$
$$c = \frac{b-3d}{2}$$

92.

$$x = 3y + 5z$$
$$x - 5z = 3y + 5z - 5z$$
$$x - 5z = 3y$$
$$\frac{x-5z}{3} = \frac{3y}{3}$$
$$y = \frac{x-5z}{3}$$

93.

$$5x^2 + 3y = z$$
$$5x^2 + 3y - 5x^2 = z - 5x^2$$
$$3y = z - 5x^2$$
$$\frac{3y}{3} = \frac{z-5x^2}{3}$$
$$y = \frac{z-5x^2}{3}$$

94.

$$4a - 5b^2 = c$$
$$4a - 5b^2 + 5b^2 = c + 5b^2$$
$$4a = c + 5b^2$$
$$\frac{4a}{4} = \frac{c+5b^2}{4}$$
$$a = \frac{c+5b^2}{4}$$

95. Yes, rounding the outside temperature to 73 degrees Fahrenheit is appropriate because a difference of 0.4-degree Fahrenheit would not be noticed.

96. No, a body temperature of 100.3 degrees Fahrenheit would not be rounded to the nearest whole degree. A 0.3-degree Fahrenheit difference in body temperature could be critical.

97. A result of $236.5725 would be rounded to $236.57 because our monetary units extend to hundredth place value.

98. The correct rounding of 2200.8 pens would be 2200 pens. If the budget is limited to $500, rounding up would result in going over budget.

99. The number of cars that the company would need to wash should be rounded to 313 (312.25 rounded up). To make the profit of $400, the company needs to wash just slightly more than 312 cars. Therefore, the next possible whole number greater than that is 313. Anything less would result in a profit of less than $400.

100. Your example. Refer to problems 98 and 99.