

**Workbook
Teacher's Edition**

Financial Algebra

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1-1 Business Organization

Exercises

1. Avril invested \$60,000 in a partnership with Lane, Jules, Ray, Ravi, and Petra. The total investment of all partners was \$320,000. What percent of the business does Avril own?
18.75%
2. The Metropolitan Corporation has issued a total of 2,400,000 shares. The North Side Investment Group owns 7.5% of those shares. How many shares does North Side own?
180,000
3. Enid, Eve, and Tammy have formed a partnership. The total investment was \$400,000. Enid owns 35.4% and Eve owns 28.8% of the partnership. How much did Tammy invest?
\$143,200
4. Three partners are investing a total of \$1,200,000 in a new restaurant. Their investments are in the ratio of 6:8:11. How much did each invest?
\$288,000; \$384,000; and \$528,000
5. Alli, Beth, Catie, Dave, Eddie, Franny, and George invested \$4,914,000 in a business venture in the ratio of 1:2:3:4:5:6:7 respectively. How much did Alli and George each invest?
Alli; \$175,500 and George; \$1,228,500
6. Dennis owns 24% of a partnership. Bob owns 48% of the partnership. If Rich is the third partner, what percent of the partnership does he own? Write a simplified ratio to represent their investments in the partnership.
28%; 6:12:7
7. Angel owns $\frac{5}{8}$ of a partnership in a bakery.
 - a. What percent of the bakery does Angel own?
62.5%
 - b. Angel's partner, Lisa, owns the remaining portion of the bakery. Write a simplified ratio to represent Angel's ownership to Lisa's ownership in the bakery.
5:3
8. Austen owns seven-sixteenths of a jewelry store. The total investment for the store was \$832,000. What is the value of Austen's share of the business?
\$364,000
9. Penny owns five-ninths of a movie theater. Penny's investment is worth \$450,000. What is the total investment that was made for the movie theater?
\$810,000
10. The Barnaby Corporation issued 2,700,000 shares of stock at its beginning to shareholders. How many shares must a shareowner own to have a majority of the shares?
1,350,001
11. Ella owns 15% of Fitz Incorporated. The rest of the shares are owned equally by the remaining 5 shareholders. What percent of the corporation does each of the other shareholders own?
17%

12. Clinton and Barbara are the partners in a local music shop. They needed \$448,500 to start the business. They invested in the ratio of 11:12.
- How much money did each invest?
Clinton: \$214,500 and Barbara: \$234,000
 - What percent of the business is owned by Clinton? Round to the nearest tenth of a percent.
47.8%
13. Andrea, Dina, and Lindsay invested in a partnership in the ratio of 7:9:14, respectively. Ten years later, their partnership was worth \$1,800,000. Dina decided to move to Europe and sold her part of the partnership to Andrea.
- How much did Andrea pay Dina for her share of the partnership? Round to the nearest dollar.
\$540,000
 - What percent of the business did Andrea own after she bought out Dina? Round to the nearest tenth of a percent.
53.3%
 - What was the new ratio of ownership once the business was owned by only Andrea and Lindsay?
8:7
14. Mike, Rob, Jon, and Kristy own shares in the Arlington Partnership in the ratio of $a:b:c:d$ respectively. Arlington is now worth E dollars.
- Write an algebraic expression for the percent of the partnership that represents Mike's investment.
$$\frac{100a}{a + b + c + d}$$
 - Jon decides to sell his portion of the partnership to Kristy. Write the new ratio of ownership for Mike, Rob, and Kristy.
 $a:b:c + d$
 - Write an algebraic expression for the new percent representing Kristy's ownership.
$$\frac{100(c + d)}{a + b + c + d}$$
15. Fifty-five and one-half percent of the shareholders in a fast food chain are under the age of 40. If the corporation is owned by 86,000 investors, how many of the shareholders are 40 and over?
38,270
16. The North Salem Stock Club owns x percent of the shares of a certain corporation. Each of the 10 club members owns y shares of that stock. The corporation's ownership is represented by a total of S shares of stock. Express the number of shares of the corporation owned by each club member.
$$y = \frac{xS}{1,000}$$
17. A partnership owned by 25 partners is worth 5.4 million dollars. The partnership loses a lawsuit worth 6.2 million dollars. How much of the settlement is each partner liable for after the partnership is sold? Explain.
Partners are personally liable, so \$800,000 needs to be paid in the lawsuit. Each partner must pay \$32,000.

1-2 Stock Market Data

Exercises

1. Use the trading data for Friday, October 20 and Friday, October 27 to answer the questions.

Discovery Inc.	
October 20	
Last	\$38.50
Trade Time	4:00 P.M. ET
Chg	\$1.56
Open	\$37.22
52-week High	\$76.19
52-week Low	\$22.78
Sales in 100s	19,700
High	\$40.10
Low	\$36.77

Discovery Inc.	
October 27	
Last	\$42.00
Trade Time	4:00 P.M. ET
Chg	\$1.50
Open	\$42.50
52-week High	\$76.19
52-week Low	\$22.78
Sales in 100s	23,600
High	\$42.50
Low	\$42.00

- What was the difference between the high and the low prices on October 20?
\$3.33
- On October 27, what was the actual volume of Discovery Inc. shares posted?
Write the volume in numerals.
2,360,000
- At what price did Discovery Inc. close on October 19?
\$35.66
- Use the October 19 closing price from above and the October 20 opening price to find the difference in prices as a percent increase. Round to the nearest hundredth percent.
4.37%
- On October 21, Discovery Inc. announced that they would close one of their manufacturing plants. This resulted in a drop in their stock price. It closed at \$32. Express the net change from October 20 to October 21 as a percent, rounded to the nearest tenth of a percent.
-16.9%
- On October 28, Discovery Inc. announced that they would not be closing the plant. This news caused the price of their stock to rise. It closed at \$48.20. Express the net change from October 27 to October 28 as a percent, rounded to the nearest tenth of a percent.
14.8%
- Explain why the 52-week high and 52-week low numbers are the same in both charts.
Over the course of the week, no prices were high enough to become a new 52-week high, nor low enough to become a new 52-week low.
- Examine the closing price of Discovery Inc. on October 27. One year earlier, one share closed at 30% higher than that amount. What was the closing price one year earlier?
\$54.60

2. Write each of the following volumes using complete numerals.

a. Sales in 100s: 82567
8,256,700

b. Sales in 100s: 321.78
32,178

c. Sales in 1000s: 12856
12,856,000

d. Sales in 1000s: 6478.98
6,478,980

e. Sales in 100,000s: 35495.235
3,549,523,500

f. Sales in 100,000: 3.2
320,000

Use the spreadsheet to answer the Exercises 3 – 7. Use the left side of the equation to indicate in which cell to store the formula.

	A	B	C	D	E	F	G	H
1	Symbol	Stock	Aug. 21 Last	Change	% Change from Aug. 20	Aug. 20 Close	Volume in 100s	Volume in 1000s
2	ABC	American Bicycle Corp.	34.89	3.02		31.87	12345	
3	DEF	Detroit Energy Fund	8.56	0.35	4.3		121	
4	GHI	General Hospital Incorporated	14.7	-0.28		14.98	8123	
5	JKL	Juniper Kansas Luxuries	121.45	-2.95			763542	
6	MNO	Middle Network Offices	75		-0.6	75.45	2637	
7	PQR	Prince Queen Resalers	11.29	0.88				239.478
8	STU	Southern Texas Underwriters	54.92	-3.37				23754.2
9	VWX	Valley Windmill Xperience, Inc.			-1.83	64.88		493004

3. Write a formula that will convert the volume given in 100s into a volume given in 1000s.

a. Juniper Kansas
H5 = G5/10

b. Detroit Energy
H3 = G3/10

4. Write a formula that will store the exact volume for each stock in column I.

a. Valley Windmill
I9 = H9*1000

b. Middle Network
I6 = H6*1000 or I6 = G6*100

5. Write a formula to determine the close on August 20 for each of the following.

a. Southern Texas
F8 = C8-D8

b. Prince Queen Resalers
F7 = C7-D7

6. Write a formula to determine the percent change for each of the following.

a. ABC
E2 = 100*D2/F2

b. GHI
E4 = 100*D4/F4

7. Calculate each net change.

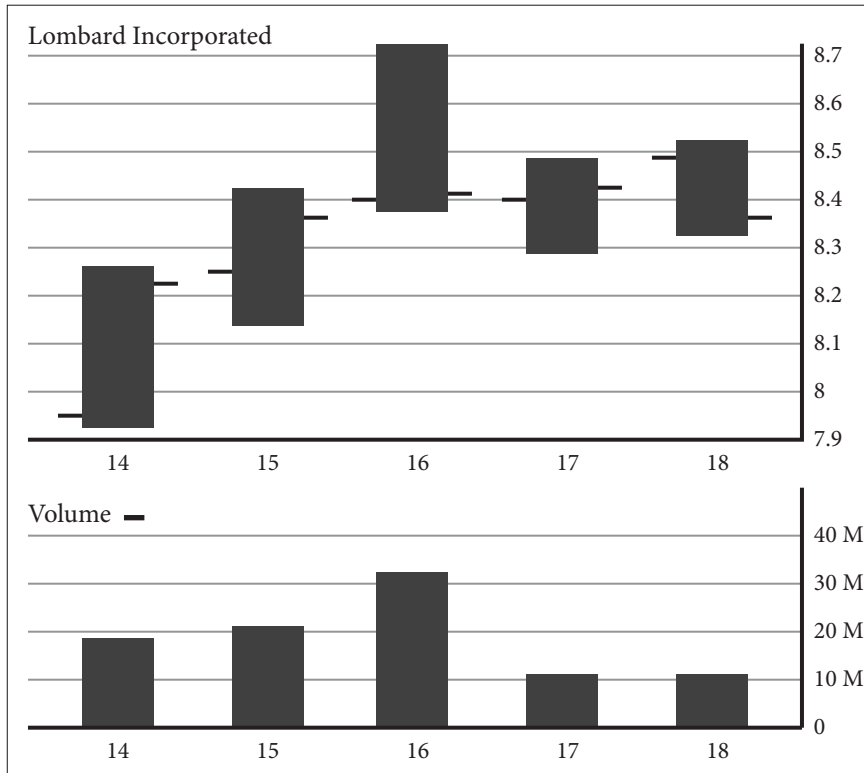
a. MNO
approximately -\$0.45

b. VWX
approximately -\$1.19

1-3 Stock Market Data Charts

Exercises

Use the stock chart to answer the exercises below.



- Which day had the greatest high price? Which day had the least low price?
Dec. 16; Dec. 14
- Approximately how many shares of Lombard Incorporated were traded over the five days?
94 million
- On what date did the stock close at a price lower than it opened?
Dec. 18
- Find each price.

a. opening on December 16 approximately \$8.40	b. high on December 18 approximately \$8.52
c. low on December 14 approximately \$7.93	d. closing on December 15 approximately \$8.37
- Express each net change as a monetary amount and as a percent to the nearest tenth.

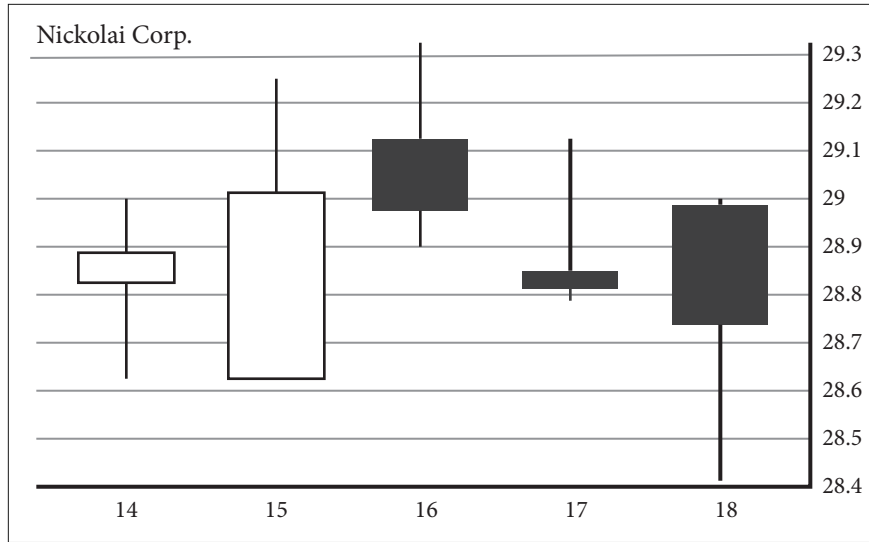
a. from December 14 to December 15 $8.37 - 8.22 = 0.15$; 1.8%	b. from December 17 to December 18 $8.37 - 8.42 = -0.05$; -0.5%
--	--
- Approximately how many fewer shares were traded on December 18 than on December 16?
approximately 21,000,000 shares

Use the candlestick chart to answer the exercises below.

7. On which days were opening prices higher than the closing prices?
Dec. 16, 17, and 18

8. On which days were the closing prices higher than the opening prices?
Dec. 14 and 15

9. On 12/16, what was the approximate closing price?
 approximate low price?
\$28.98; \$28.90

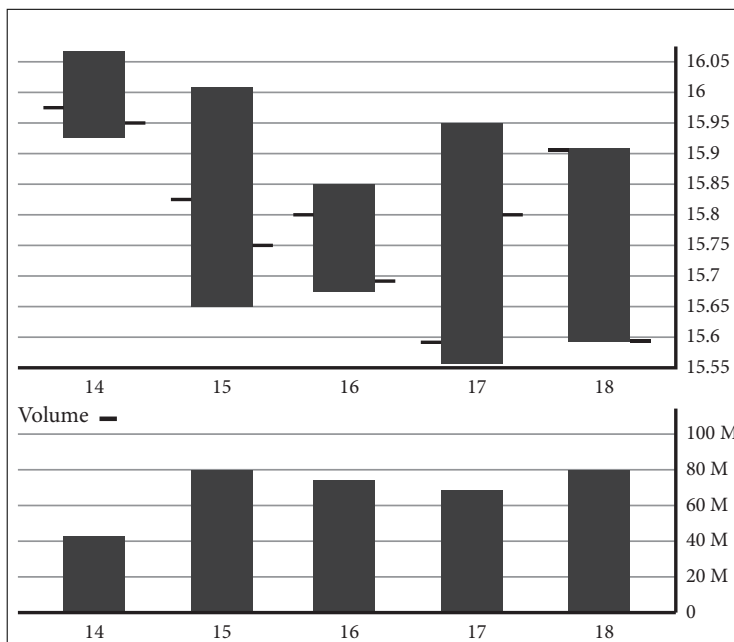


10. What was the difference between the lowest and highest prices recorded for this period?
\$29.32 – \$28.41 = \$0.91

11. What does the absence of a line at the bottom of the December 15 bar indicate?
The opening price was the low price for the day.

12. Construct a bar chart for the following 5-day period December 14 – December 18.

Day	Open	Close	High	Low	Volume
14	15.98	15.95	16.07	15.93	41,000,000
15	15.83	15.75	16.01	15.65	80,000,000
16	15.80	15.69	15.85	15.67	75,000,000
17	15.59	15.80	15.95	15.56	70,000,000
18	15.91	15.59	15.91	15.59	80,000,000



1-4 Simple Moving Averages

Exercises

- Determine the 3-day simple moving averages for the ten consecutive day closing prices.
7.78, 7.90, 8.00, 7.97, 7.86, 7.67, 7.60, 7.65, 7.65, 7.70
7.89; 7.96; 7.94; 7.83; 7.71; 7.64; 7.63; 7.67
- Determine the 5-day simple moving averages for the ten consecutive day closing prices.
121.56, 121.60, 121.65, 121.65, 121.60, 121.52, 120, 120.67, 121.50, 121.45
121.61; 121.60; 121.28; 121.09; 121.06; 121.03
- Determine the 6-day simple moving averages for the ten consecutive day closing prices.
97.70, 97.70, 98, 98.45, 99, 99.68, 101, 101.50, 100, 100.56
98.42; 98.97; 99.61; 99.94; 100.29
- Determine the 7-day simple moving averages for the fourteen consecutive day closing prices for Exxon Mobil listed.
43.23, 43.23, 43.21, 43, 43.50, 43.55, 43.45, 43.56, 43.76, 44, 44.03, 44.09, 44, 44.02
43.31; 43.36; 43.43; 43.55; 43.69; 43.78; 43.84; 43.92

Determine the simple moving averages (SMA) by subtraction and addition for each set of ten consecutive days closing prices.

- 3-day SMA
\$11.97, \$11.85, \$11.52, \$13.17, \$14.24
\$15.02, \$15.26, \$14.96, \$13.56, \$13.38
**11.78; 12.18; 12.98; 14.14; 14.84; 15.08;
14.59; 13.97**
- 4-day SMA
\$26.31, \$25.94, \$27.65, \$27.13, \$26.81
\$26.65, \$26.55, \$25.89, \$25.82, \$25.87
**26.76; 26.88; 27.06; 26.79;
26.48; 26.23; 26.03**
- 5-day SMA
\$221.49, \$222.15, \$221.70, \$223.81, \$223.00
\$223.03, \$222.99, \$224.04, \$224.12, \$224.16
**222.43; 222.74; 222.91; 223.37; 223.44;
223.67**
- 6-day SMA
\$0.65, \$0.53, \$0.60, \$0.63, \$0.50,
\$0.55, \$0.56, \$0.58, \$0.59, \$0.67
0.58; 0.56; 0.57; 0.57; 0.58
- Use a spreadsheet to determine the 10-day simple moving averages for General Electric.

17-Sep	16.97	24-Sep	17.06	1-Oct	16.31	8-Oct	16.46	15-Oct	16.79
18-Sep	16.88	25-Sep	16.35	2-Oct	15.45	9-Oct	16.20	16-Oct	16.35
21-Sep	16.43	28-Sep	16.47	5-Oct	15.59	12-Oct	16.36	19-Oct	16.05
22-Sep	17.06	29-Sep	16.91	6-Oct	16.14	13-Oct	16.32	20-Oct	15.80
23-Sep	17.17	30-Sep	16.83	7-Oct	16.03	14-Oct	16.77	21-Oct	15.51

**The SMAs begin at Day 10; 16.81; 16.75; 16.60; 16.52; 16.43; 16.31; 16.25;
16.24; 16.23; 16.17; 16.16; 16.21; 16.30; 16.35; 16.31; 16.26**

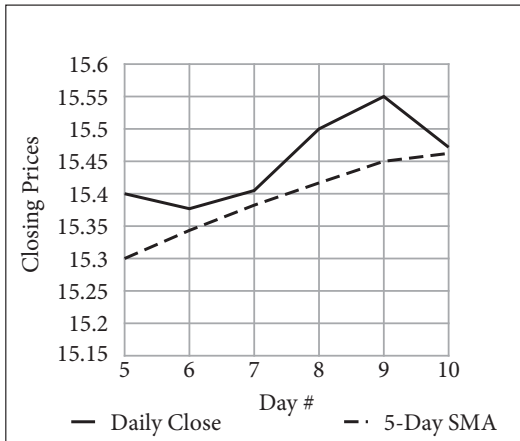
- Use a spreadsheet to determine the 12-day simple moving averages for Motorola.

4-Aug	7.24	10-Aug	7.17	14-Aug	7.26	20-Aug	7.37	26-Aug	7.48
5-Aug	7.13	11-Aug	7.03	17-Aug	7.06	21-Aug	7.58	27-Aug	7.34
6-Aug	7.11	12-Aug	7.07	18-Aug	7.21	24-Aug	7.48	28-Aug	7.21
7-Aug	7.13	13-Aug	7.28	19-Aug	7.29	25-Aug	7.53	31-Aug	7.18

The SMAs begin at Day 12; 7.17; 7.18; 7.21; 7.24; 7.28; 7.30; 7.33; 7.34; 7.33

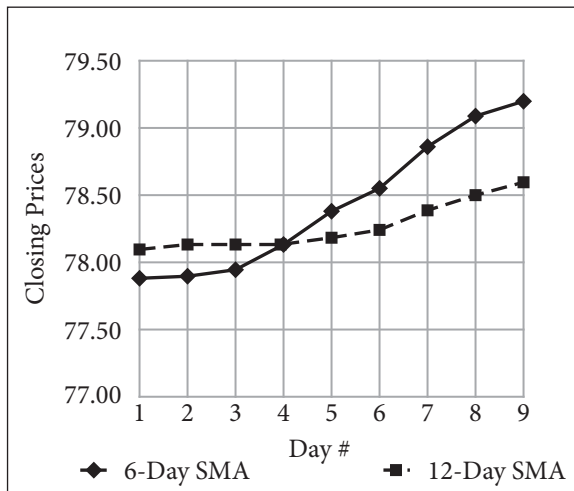
11. The closing prices for 10 consecutive trading days for a particular stock are given here. Calculate the 5-day simple moving averages and plot both the closing prices and the averages on a graph.

15.19, 15.21, 15.32, 15.40, 15.40, 15.38, 15.41, 15.50, 15.55, 15.47



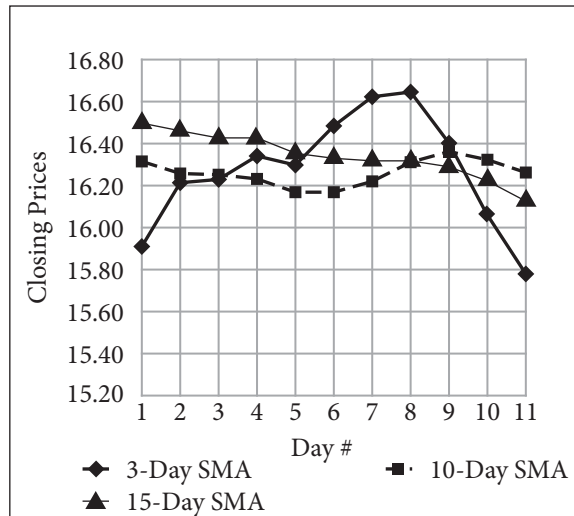
12. Discuss the implication of the crossover on the 4th day in the graph.

The fast moving average graph overtakes the slow moving average graph on Day 4. The investor might consider buying.



13. Examine the following SMA graph to determine an implication for each crossover.

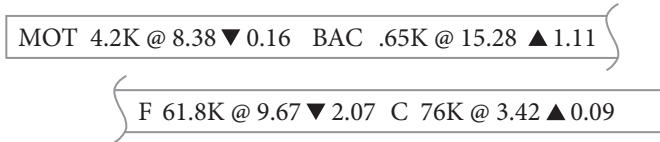
- a. on Day 3
buy
- b. on Day 5
buy
- c. on Day 9
sell



1-5 Stock Market Ticker

Exercises

Use the following ticker to answer Exercises 1 - 6. The stock symbols represent the corporations: C, CitiGroup Inc; BAC, Bank of America; F, Ford Motor Corp; and MOT, Motorola.



1. Millie is following the trades of Motorola. The result of the latest trade is posted on the ticker.
 - a. How many shares of MOT were traded and at what price per share?
4,200; \$8.38
 - b. What was the value of the MOT trade?
\$35,196
 - c. Suppose the next MOT trade represents a sale of 1,200 shares at a price that is \$0.23 lower than the last transaction. What will Millie see scrolling on the ticker for this transaction?
MOT 1.2K@8.15 ▼0.39

2. Susan sold her Bank of America shares as indicated on the ticker above.
 - a. How many shares did she sell?
650
 - b. For how much did each share sell?
\$15.28
 - c. What was the total value of all the shares Susan sold?
\$9,932
 - d. Suppose that the next BAC trade that comes across the ticker represents a sale of 34,000 shares at a price that is \$2.31 higher than the last transaction. What will Susan see scrolling across her screen for this transaction of BAC?
BAC 34K@17.59 ▲3.42

3. How many shares of Ford are indicated on the ticker?
61,800

4. What is the total value of all of the CitiGroup shares traded?
\$259,920

5. Interpret each of the following.

a. @3.42 Each share was traded at \$3.42.	b. MOT 4.2K 4,200 shares of Motorola were traded.	c. ▲1.11 The trading price was \$1.11 higher than the previous day's closing price.
---	---	---

6. What was the previous day's closing price for each stock?
MOT \$8.54; BAC \$14.17; F \$11.74; C \$3.33

7. Ron knows that JP Morgan Chase & Co has the ticker symbol JPM. What can Ron learn from the following line of symbols: JPM 0.26K @ 43.43 ▼0.98?
260 shares of JPM were traded at \$43.43 per share which is a price that is \$0.98 lower than the previous day's closing price.
8. For their 16th birthday, Liz gave her twin daughters Adiana and Marina 3,500 shares of IBM to be split evenly between them. Ten years later, on September 13, the twins sold all of the shares at a price of \$127.91. The closing price of IBM on September 12 was \$126.13. How did this trade appear on the stock ticker?
IBM 3.5K@127.91▲1.78
9. Jenna contacted her broker and asked him to sell all 4,000 of her Pepsico (PEP) shares on Friday as soon as the trading price hit \$59.48 per share. Jenna knew that PEP closed at \$58 on Thursday. How will her trade appear on the ticker?
PEP 4K@59.48▲1.48

Use the following ticker information to answer Exercises 10 - 14. The stock symbols represent the corporations: **BMY, Bristol-Myers Squibb; AA, Alcoa; INTC, Intel Corp; and MSFT, Microsoft.**

BMY 0.88K @ 25.87 ▼0.93	AA 78K @ 15.73 ▲1.12
INTC 17.9K @ 20.09 ▼1.06	MSFT 0.81K @ 30.52 ▼2.23

10. Lucinda put in an order for some shares of Bristol-Myers Squibb.
- As shown on the ticker, how many shares did Lucinda buy and for what price per share?
880; \$25.87
 - What was the value of Lucinda's trade?
\$22,765.60
11. Jared has sold his shares of Intel, as indicated on the above ticker.
- How many shares did he sell and for what price per share?
17,900; \$20.09
 - What was the total value of all the shares Jared sold?
\$359,611
12. How many shares of Alcoa are indicated on the ticker?
78,000
13. What is the total value of all of the Microsoft shares traded?
\$24,721.20
14. Interpret each of the following.
- | | | |
|---|--|---|
| a. AA 1.1K
1,100 shares of Alcoa were traded. | b. ▼1.06
The price was \$1.06 lower than the previous close. | c. @15.73
Each share was traded at \$15.73. |
|---|--|---|
15. Write the ticker symbols for each situation.
- 1,500 shares of RJS at a price of \$13.19 which is \$0.92 lower than the previous day's close
RJS 1.5K@13.19 ▼0.92
 - 38,700 shares of EPZ at \$39.22 which is \$1.83 higher than the previous day's close
EPZ 38.7K@39.22 ▲1.83

1-6 Stock Transactions

Exercises

- Five years ago, Julianne purchased stock for \$9,433. Yesterday, she sold the stock for \$10,219. What was her gross capital gain?
\$786
- A few years ago, Melky bought 100 shares of a cologne company's stock for \$16.77 per share. Last month she sold all of the shares for \$11.88 per share. What was her loss?
\$489
- In March of 2009, Jennifer bought shares of stock in the Pepsi-Cola Company for \$47 per share. In December 2009, she sold them for \$60 per share. Express the increase in price as a percent of the purchase price. Round to the nearest tenth of a percent.
27.7%
- Mike bought shares of a brand new corporation that manufactures dish antennas. He bought the stock years ago for \$4,100. He recently sold this stock for \$7,100. Express his capital gain as a percent of the original purchase price. Round to the nearest tenth of a percent.
73.2%
- Fran bought shares in a supermarket chain in early 2008 for \$21.11 per share. She sold them later in that same year for \$20 per share. Express her loss as a percent of the purchase price. Round to the nearest percent.
5%
- Andy bought 300 shares of a corporation that manufactures kitchen cabinets. He bought the stock years ago for x dollars. He recently sold this stock for y dollars. Express his capital gain as a percent of the original purchase price algebraically.
$$\frac{(300y - 300x)100}{300x}$$
- Ashley bought \$1,200 worth of stock in a home improvement store. She does not know what she will sell it for, so let x represent the selling price of all the shares. Express the percent value of Ashley's capital gain algebraically.
$$\frac{(x - 1,200)100}{1,200}$$
- Jake bought 540 shares of Sound Foundations stock years ago for \$44.50 per share. He sold them yesterday for \$49.54 per share.
 - What was the percent increase in the price per share, rounded to the nearest percent?
11%
 - What was the percent capital gain for the 540 shares, rounded to the nearest percent?
11%
- Lisa bought h shares of Home Depot stock for x dollars per share. She sold all of the shares years later for y dollars per share. Express her capital gain algebraically.
 $hx - hy$
- Jack bought w shares of Xerox stock for a total of t dollars. Write an expression for the price he paid per share.
$$\frac{t}{w}$$

11. Bill purchased shares of Apple for a dollars per share. He plans to sell them as soon as the price rises 20%. Express the price he will sell his shares at algebraically.

1.2a

12. Maria purchased 1,000 shares of stock for \$65.50 per share in 2003. She sold them in 2010 for \$55.10 per share. Express her loss as a percent of the purchase price, rounded to the nearest tenth of a percent.

15.9%

13. Allen purchased shares of stock for x dollars in 2010. He sold them weeks later for y dollars per share. Express his capital gain as a percent of the purchase price.

$\frac{(y - x)100}{x}$

14. Anna bought 350 shares of stock for p dollars per share. She sold them last week for s dollars per share. Express her capital gain algebraically in terms of p and s .

$350s - 350p$

15. Max bought x shares of stock for y dollars per share. His broker told him to sell them when they earn a p percent capital gain. Express the total selling price of the shares algebraically.

$xy + \frac{pxy}{100}$

16. Donnie bought x shares of stock for y dollars per share years ago. His stock rose in price, and eventually hit a price that would earn him a 137% capital gain. He decided to sell 75% of his x shares.

- a. Represent 75% of the x shares algebraically.

$0.75x$

- b. Represent the capital gain earned on each of the shares that were sold algebraically.

$1.37y$

- c. Represent the capital gain earned on all of the shares that were sold algebraically.

$(1.37y)(0.75x) = 1.0275xy$

- d. Represent the total value of the shares that were sold algebraically.

$2.0275xy$

- e. Years later, the company stock falls to its lowest price of \$3 per share. Donnie sells the rest of his shares. Write an expression for the total selling price of all the shares sold at \$3.

$3(0.25x) = 0.75x$

17. Fill in the missing purchase prices and selling prices for stock trades in the table.

Number of Shares	Purchase Price per Share	Selling Price per Share	Capital Gain or Loss	Percent Gain or Loss (nearest tenth of a percent)
500	\$54	\$62	a. \$4,000	b. 14.8%
100	c. \$19	\$12	\$700	d. 36.8%
650	\$31	f. \$35.65	g. \$3,022.50	15%
1,300	h. \$29	\$23	-\$7,800	j. -20.7%

1-7 Stock Transaction Fees

Exercises

- Juaquin made three trades through his online discount broker, Electro-Trade. Electro-Trade charges a fee of x dollars per trade. Juaquin's first purchase was for \$2,456, his second purchase was for \$3,000, and his third purchase was for \$2,119. If the total of the purchases was \$7,623 including broker fees, what does Electro-Trade charge per trade?
\$16
- Ted made x transactions last month using Trades-Are-Us online brokers, which charges y dollars per trade. Each transaction was a sale of stock. The total value of all the shares Ted sold was t dollars. The brokers sold the stock, took out their fees, and sent Ted a check for the rest of the money he was owed. Express the value of the check Ted received from the broker algebraically.
 $t - xy$

- The fee schedule for the Glen Head Brokerage Firm is shown in the table below.

Fee Schedule for Glen Head Brokerage Firm	Online Trades	Telephone Trades (automated)	Trades Using a Broker
Portfolio Value less than \$100,000	x dollars per trade	online fee plus r dollars	c percent commission plus online fee
Portfolio Value greater than \$100,000	y dollars per trade	online fee plus q dollars	p percent of commission plus online fee

- Joy purchased s dollars worth of stock using a broker from Glen Head Brokerage Firm. The current value of her portfolio is \$21,771. Express algebraically the broker fee she must pay for this transaction.
 $x + \frac{c}{100}s$
 - Jonathan has a portfolio worth 1.1 million dollars. He made x automated telephone trades during the past year, buying and selling \$90,000 worth of stock. Express his total broker fee algebraically.
 $x(y + q)$
- Meghan purchases \$41,655 worth of stock on her broker's advice and pays her broker a 1.5% broker fee. She sells it when it increases to \$47,300, months later, and uses a discount broker who charges \$19 per trade. Compute her net proceeds after the broker fees are taken out. Round to the nearest cent.
\$5,001.17
 - Fred is a broker who charges 1% per stock transaction. A competing online broker charges \$26 per trade. If someone is planning to purchase stock, at what purchase price would Fred's commission be the same as the online broker fee?
\$2,600
 - Barbara purchased stock last year for \$8,500 and paid a 1.25% broker fee. She sold it for \$7,324 and had to pay a 0.5% broker fee. Compute her net proceeds.
-1,318.87; the net proceeds were negative.

7. Adam purchased stock several years ago for x dollars and had to pay a 1.5% broker fee. He sold that stock last month for y dollars and paid a discount broker \$15 for the sale. Express his net proceeds algebraically.
 $y - 15 - 1.015x$
8. Steven purchases x dollars worth of stock on his broker's advice and pays his broker a flat \$12 broker fee. The value of the shares falls to f dollars months later, and Steven uses a broker who charges 1% commission to make the sale. Express his net proceeds algebraically.
 $0.99f - (x + 12)$
9. Rich bought 20,000 dollars worth of stock and paid a y percent commission. Dan purchased 17,000 dollars worth of stock and paid a q percent commission. Find values of y and q , where y and q are each less than 3, such that Rich's commission is less than Dan's.

Answers vary.

10. If you bought 600 shares of stock for \$41 per share, paid a 1% commission, and then sold them six months later for \$41.75 per share, with a \$30 flat fee, are your net proceeds positive or negative? Explain.
Positive; the cost of the stock was \$24,600 + \$246 fee. The stock sold for \$25,050. The amount earned covers the \$30 fee. Net proceeds = \$174
11. Mr. Wankel bought x shares of stock for y dollars per share last month. He paid his broker a flat fee of \$14. He sold the stock this month for p dollars per share, and paid his broker a 2% commission. Express his net proceeds algebraically.
 $(xp - 0.02xp) - (xy + 14)$
12. Michelle Miranda Investing charges their customers a 1% commission. The Halloran Group, a discount broker, charges \$13.75 per trade. For what amount of stock would Miranda charge double the commission of Halloran?
\$2,750
13. CoronaCorp, a discount broker, charges their customers x dollars per trade. The Sclair Bear & Bull House charges a 1.5% commission. For what value of stock would both brokers charge the same commission? Express your answer algebraically.
 $\frac{x}{0.015}$
14. Mrs. Cowley purchases \$32,000 worth of stock on her broker's advice and pays her broker a 0.75% broker fee. She is forced to sell it when it falls to \$25,100 two years later, and uses a discount broker who charges \$17 per trade. Compute her net loss after the broker fees are taken out.
-\$7,157
15. Sal bought x shares of a stock that sold for \$31.50 per share. He paid a 1% commission on the sale. The total cost of his investment, including the broker fee, was \$5,726.70. How many shares did he purchase?
180
16. Mrs. Didamo purchased stock years ago for d dollars and had to pay a flat \$20 broker fee. The price dropped but she needed money for college so she sold it at a loss, for x dollars, plus a 1% broker fee. Express her net loss algebraically.
 $0.99x - (d + 20)$

1-8 Stock Splits

Exercises

- Yesterday the Rockville Corporation instituted a 2-for-1 stock split. Before the split, the market share price was \$63.44 per share and the corporation had 2.3 billion shares outstanding.
 - What was the pre-split market cap for Rockville?
\$145.912 billion
 - What was the post-split number of shares outstanding for Rockville?
4.6 billion
 - What was the post-split market price per share for Rockville?
\$31.72
- Suppose that a corporation has a market capitalization of \$97,000,000,000 with 450M outstanding shares. Calculate the price per share to the nearest cent.
\$215.56
- Tele-Mart instituted a 5-for-1 split in April. After the split, Roberta owned 1,860 shares. How many shares had she owned before the split?
372
- In May, the Black Oyster Corporation instituted a 3-for-1 split. After the split, the price of one share was x dollars. What was the pre-split price per share, expressed algebraically?
 $3x$ dollars
- Patterson's Appliances was considering a 2-for-3 reverse split. If the pre-split market cap was \$634,000,000, what would the post split market cap be?
\$634 million – there is no change in the market cap.
- Faye owned 1,300 shares of Wonderband Corp. Last week, a 2-for-1 split was executed. The pre-split price per share was w dollars.
 - Determine the number of shares Faye owned after the split.
2,600
 - Write an algebraic expression for the price per share after the split.
 $\frac{w}{2}$
 - Express the total value of the Wonderband stock Faye owned algebraically after the split.
 $\frac{2,600w}{2} = 1,300w$
- Suppose that before a stock split, a share was selling for x dollars. After the stock split, the price was $\frac{2x}{3}$ dollars per share. What was the stock split ratio?
3 for 2
- On December 14, XTO Energy Inc executed a 5-for-4 split. At that time, Ed owned 553 shares of that stock. The price per share was \$55.60 before the split. After the split, he received a check for a fractional part of a share. What was the amount of that check?
\$11.12

9. Yesterday, Tenser Inc. executed a 2-for-1 split. Jamie was holding 500 shares of the stock before the split and each was worth \$34.12.
- What was the total value of her shares before the split?
\$17,060
 - How many shares did she hold after the split?
1,000
 - What was the post-split price per share?
\$17.06
 - What was the total value of Jamie's shares after the split?
\$17,060
10. On May 30, Universe Inc. announced a 5-for-2 stock split. Before the split, the corporation had 340 million shares outstanding with a market value of \$73.25 per share.
- How many shares were outstanding after the split?
850,000,000
 - What was the post-split price per share?
\$29.30
 - Show that this split was a "monetary non-event" for the corporation.
pre-split market cap = 340,000,000(73.25) = \$24,905,000,000;
post-split market cap = 850,000,000(29.30) = \$24,905,000,000
11. Two days ago, Lisa owned y shares of Postaero. Yesterday, the corporation instituted a 3-for-2 stock split. Before the split, each share was worth x dollars.
- How many shares did she hold after the split? Express your answer algebraically.
 $\frac{3y}{2}$
 - What was the price per share after the split? Express your answer algebraically.
 $\frac{2x}{3}$
 - Show that the split was a "monetary non-event" for Lisa.
pre-split value = xy ; post-split value = $\left(\frac{3y}{2}\right)\left(\frac{2x}{3}\right) = xy$
12. Last week, Donna owned x shares of Spoonaire stock. Yesterday, the company instituted a 2-for-5 reverse split. The pre-split price per share was \$3.40. The number of shares outstanding before the split was y .
- How many shares did Donna hold after the split? What was the post-split price per share?
 $\frac{2x}{5}$; **\$8.50**
 - What was the post-split number of outstanding shares? What was the post-split market cap?
 $\frac{2y}{5}$; **$8.50\left(\frac{2y}{5}\right) = 3.40$**
13. After a 5-for-2 stock split, Laura owned x shares of Skroyco stock. Each share was worth \$16 after the split. What was the value of one share before the split?
\$40

1-9 Dividend Income

Exercises

- Jared is purchasing a stock that pays an annual dividend of \$3.42 per share.
 - If he purchases 400 shares for \$53.18 per share, what would his annual income be from dividends?
\$1,368
 - What is the yield, to the nearest tenth of a percent?
6.4%
- Marianne purchased s shares of a corporation that pays a d dollars quarterly dividend. What is her annual dividend income, expressed algebraically?
 $4ds$
- Adrianna owns 1,000 shares of a corporation that pays an annual dividend of \$2.17 per share. How much should she expect to receive on a quarterly dividend check?
\$542.50
- Mr. Fierro owns x shares of stock. The annual dividend per share is q dollars. Express Mr. Fierro's quarterly dividend amount algebraically.
 $\frac{xq}{4}$
- The annual dividend per share of a certain stock is d dollars. The current price of the stock is x dollars per share. What is the percent yield of the stock, expressed algebraically?
 $\frac{100d}{x}$
- You bought x shares of a stock for y dollars per share. The annual dividend per share is d . Express the percent yield algebraically.
 $\frac{100d}{y}$
- Stock in the Sister Golden Hair Shampoo Company was selling for \$44.64 per share, and it was paying a \$2.08 annual dividend. It underwent a 2-for-1 split.
 - What was the new price of one share after the split?
\$22.32
 - If you owned 300 shares before the split, how many shares did you own after the split?
600
 - What was the annual dividend per share after the split?
\$1.04
 - What was the yield, to the nearest tenth of a percent, before the split?
4.7%
 - What was the yield, to the nearest tenth of a percent, after the split?
4.7%
- One share of West World stock pays an annual dividend of \$1.50. Today West World closed at \$26.50 with a net change of -3.50 . What was the stock's yield at yesterday's closing price?
5%

9. The stock in a real estate corporation was selling for \$6 per share, with an annual dividend of \$0.12. It underwent a 2-for-5 reverse split.
- What was the value of the stock after the reverse split?
\$15
 - What was the annual dividend after the reverse split?
\$0.30
 - What was the yield after the reverse split?
2%
10. One share of Liam Corp. stock pays an annual dividend of d dollars. Today Liam closed at c dollars with a net change of $+h$. Write an expression for the stock's yield at yesterday's close.
 $\frac{100d}{c - h}$
11. In early 2010, Xerox was paying a \$0.17 annual dividend. What would you receive on a quarterly dividend check if you had x shares of Xerox at that time? Express your answer algebraically.
 $\frac{0.17x}{4}$
12. A corporation was paying a \$4.20 annual dividend. The stock underwent a 3-for-2 split. What is the new annual dividend per share?
\$2.80
13. If you received a dividend check for d dollars and your stock had a quarterly dividend of p dollars, express the number of shares you owned algebraically.
 $\frac{d}{p}$
14. Complete the missing entries in the table below. Round all dollar amounts to the nearest cent, and round all percents to the nearest tenth of a percent.

Price per Share at Wednesday's Close	Dividend	Wednesday's Net Change	Tuesday's Closing Price	Tuesday's Yield	Wednesday's Yield
\$23	\$0.96	+1	a. \$22	b. 4.4%	c. 4.2%
\$54.10	\$2	d. -0.78	\$54.88	e. 3.6%	f. 3.7%
W	D	C	g. $W + C$	h. $\frac{100D}{W + C}\%$	i. $\frac{100D}{W}\%$

15. Pat owned 2,500 shares of Speed King Corporation, and received a quarterly dividend check for \$925. What was the annual dividend for one share of Speed King?
\$1.48
16. Janet owned 114 shares of a corporation, and received a quarterly dividend check for y dollars. Express the annual dividend for one share algebraically.
 $\frac{4y}{114} = \frac{2y}{57}$
17. A stock's dividend is not changing, yet its yield has fallen over the past five consecutive days. What has happened to the price of the stock over those last five days?
It has risen.
18. A stock's dividend was decreased Tuesday. Does that mean its yield is lower on Tuesday than it was on Monday? Explain.
Not necessarily; It is possible that the yield actually increased even though the dollar amount of the dividend decreased.

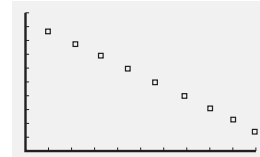
2-1 Interpret Scatterplots

Exercises

1. Mike is comparing ten students' GPAs when they were freshmen with their grades as graduating seniors. Do you think the grades are correlated positively, negatively, or not at all? Explain your answer.

Answers vary, but it would be reasonable to expect that, generally speaking, the top freshman students would be good students as seniors.

2. Determine if the scatterplot at the right depicts a positive correlation or a negative correlation.
negative



3. Lori created a scatterplot where the explanatory variable was the side of a square, and the response variable was the perimeter of the square. Is the data positively or negatively correlated? Explain.
It is positively correlated. As the side length increases, the perimeter increases. The scatterplot is linear.
4. Tom is creating a scatterplot that depicts the perimeter and area of a square. (If s is the length of a side of a square, the perimeter is $4s$ and the area is s^2). He sets up these coordinates in which the explanatory variable is the perimeter and the response variable is the area.

$(10, u)$ $(12, v)$ $(20, w)$ $(24, x)$ $(36, y)$ $(z, 49)$

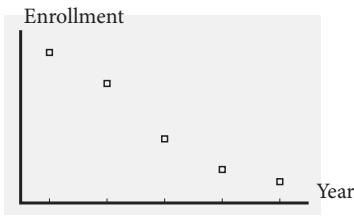
- a. Find the values of $u, v, w, x, y,$ and z .
 $u = 6.25; v = 9; w = 25; x = 36; y = 81; z = 28$
- b. If the points are put on a scatterplot, do they depict a positive or negative correlation?
positive
5. In each situation of bivariate data there is causation, so the variables can be named explanatory and response variables. Identify each explanatory variable and response variable.
- | | |
|---|---|
| a. number of days worked,
amount earned
number of days-explanatory;
amount earned-response | b. amount earned in the year,
income taxes paid
amount earned-explanatory;
income tax-response |
| c. temperature,
number of swimmers at the beach
temperature-explanatory; number
of swimmers-response | d. price of a dress,
number of dresses sold
price-explanatory; number of
dresses sold-response |
6. Let r represent the radius of a circle and let d represent the diameter. The circumference of a circle is given by the formula $C = \pi d$. The area of a circle is given by the formula $A = \pi r^2$.
- a. Find the areas and circumferences of circles with radii 4, 5, 6, and 8 using $\pi = 3.14$. Round to the nearest hundredth.
When $r = 4$, $A = 50.24$ and $C = 25.12$; when $r = 5$, $A = 78.50$ and $C = 31.40$; when $r = 6$, $A = 113.04$ and $C = 37.68$; when $r = 8$, $A = 200.96$ and $C = 50.24$.
- b. Let the areas be the explanatory variables and the circumferences be the response variables. Draw a scatterplot and determine if there is a positive or negative correlation.
positive



7. Some data about Cold Spring Hills High School is given in the table.

Year	Enrollment	Number of Students in Recycling
2006	1,233	8
2007	1,144	13
2008	8,988	17
2009	9,902	27
2010	870	33

a. Let x represent the year and y represent the enrollment. Draw a scatterplot to depict the data.



b. Are the years and the enrollments negatively or positively correlated?
negatively

c. Let x represent the year and let y represent the number of students in the recycling club. Would a scatterplot of x and y show a negative or positive correlation?
positive

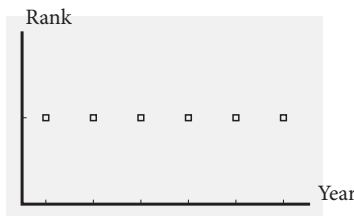
8. The following table gives the year and payroll of the New York Yankees baseball team. It also gives the rank of the payroll when compared to all other Major League Baseball teams.

Year	Payroll in Million of Dollars	Rank in Payroll
2001	193	1
2002	113	1
2003	126	1
2004	153	1
2005	185	1
2006	209	1

a. Describe the correlation between year and payroll.
It is positive.

b. Describe the correlation between year and rank of payroll.
There is no correlation.

c. Draw a scatterplot that shows the relationship between year and rank.



2-2 Linear Regression

Exercises

1. The table gives the number of CDs sold at certain prices for a given online music store during December.

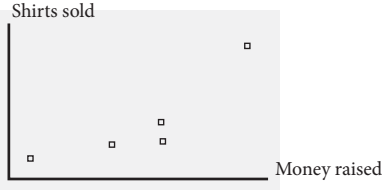
Price (x)	\$8.99	\$10.99	\$11.99	\$12.99	\$13.99	\$14.99
Number of CDs Sold	6,456	6,009	5,345	4,560	4,100	3,231

- a. Find the correlation coefficient for the data. Round to the nearest hundredth. Interpret the correlation coefficient.
-0.98; it shows a strong, positive relationship between price and CDs sold. The scatterplot shows it is linear.
- b. Find the equation of the regression line. Round to the nearest thousandth.
 $y = -549.614x + 11,723.247$
- c. What is the slope of the regression line, rounded to the nearest thousandth?
-549.614
- d. What are the units of the slope?
CDs per dollar
- e. If the price of CDs was raised to \$17.99, predict the number of CDs that would be sold. Round to the nearest hundred.
1,800
2. Over the past twenty years, Elisa has noticed that as the price of gasoline increased, her medical bills also increased. She found that the correlation coefficient was $r = 0.89$. Do you think this high correlation is due to causation? Explain.
Answers vary, but should include that it is probably not causation; it might be because inflation has raised the prices of everything.
3. Find the linear regression line for a scatterplot formed by the points (10, 261), (21, 252), (42, 209), (33, 163), and (52, 98). Round to the nearest tenth.
 $y = -3.5x + 308.3$
4. On a sheet of graph paper, draw a coordinate plane that shows mainly Quadrant I. Graph the points (1, 2), (4, 6), (5, 9), (6, 14), (8, 18), and (9, 19).
- a. Sketch, by eye only, your best approximation for the linear regression line. Approximate the y -intercept of your line. Approximate the slope of your line.
Answers vary, but the slope should be close to 2 and the y -intercept should be close to -1.5.
- b. Use your calculator to plot the regression line. Find the equation of the regression line. Round to the nearest hundredth. Compare the actual regression line to the line you drew in part a.
 $y = 2.31x - 1.39$; Comparisons vary.
- c. Describe the correlation shown in the scatterplot. Find the correlation coefficient r for the data. Round to the nearest hundredth.
strong, positive; 0.98

5. The table gives the amount raised by Key Club members and the number of Key Club t-shirts sold at Meadow East High School for given years.

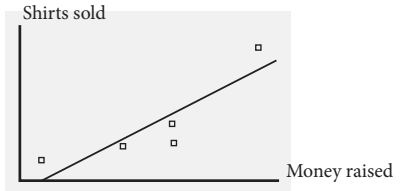
Year	2006	2007	2008	2009	2010
Money Raised	\$7,456	\$7,988	\$8,322	\$8,344	\$8,901
Shirts Sold	34	40	50	41	82

a. Draw a scatterplot on your calculator comparing money raised and shirts sold.



b. Find the regression line equation correct to seven decimal places, and plot it on your scatterplot.

$y = 0.0312460x - 206.8855907$



c. Find the average amount raised over the five years shown. Assign the value to r . Find the average number of shirts sold over the five years shown. Assign the value to s .

$r = \$8,202.20$; $s = 49.4$

d. Substitute the point (r, s) into the regression equation from part b to show that this point satisfies the equation.

When $x = r = 8,202.2$ and $y = s = 49.4$, both sides of the equation equal 49.4.

e. Add the point (r, s) to the list of the five points you originally entered on your calculator. Compute a new regression line based on the six points you have plotted. Compare it to the original regression line you found in part b. How do they differ?

They are the same. The average of the x-values and y-values when plotted as a point, lie on the regression line.

f. Describe the correlation between the amount of money raised and the number of shirts sold. Find the correlation coefficient r for the data.

strong, positive; 0.87

6. Describe each of the following correlation coefficients using the terms strong, moderate, weak, positive, and negative.

- a. $r = 0.91$
strong, positive
- b. $r = -0.57$
moderate, negative
- c. $r = -0.9$
strong, negative
- d. $r = -0.25$
weak, negative
- e. $r = 0.099999$
weak, positive
- f. $r = -0.198$
weak, negative

7. Kaitlyn has sold Girl Scout cookies for the past four years. She kept data on her sales, as shown in the table. She is planning to sell again this year and plans on visiting 200 homes. Predict the number of boxes she would sell if she visited 200 homes. Round to the nearest ten boxes. Explain your work.

Number of Houses Visited	78	90	50	80
Number of Boxes Sold	122	135	70	119

320; find the regression equation, $y = 1.65x - 11.60$ and substitute 200 for x .

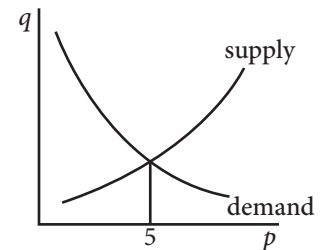
2-3 Supply and Demand

Exercises

- Wayne's Widget World sells widgets to stores for \$9.20 each. A local store marks them up \$8.79. What is the retail price at this store?
\$17.99
- The wholesale price of an item is w dollars. The retail price is p percent higher. Express the retail price algebraically.
 $w + \frac{wp}{100}$
- The Knockey Corporation sells hockey sticks at a wholesale price of \$103. If a store marks this up 106%, what is the retail price?
\$212.18
- A tire company sells bicycle tires to retailers for t dollars. The Mineola Bike Shop marks them up 80%. Express the retail price at the Mineola Bike Shop algebraically.
 $1.8t$

- The following graph shows the supply and demand curves for a widget.

- Explain what will happen if the price is set at \$9.
Supply will exceed demand. There will be too much inventory. The price will be lowered to clear the inventory.
- Use the graph above to explain what will happen if the price is set at \$2.75.
Demand will exceed supply. There will not be enough inventory and the insufficient supply will drive up the price.

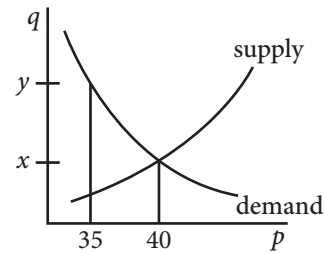


- An automobile DVD system sells to stores at a wholesale price of \$497. A popular national chain store sells them for \$879.99. What is the markup?
\$382.99
- A guitar sells for a retail price of g dollars. The wholesale price of the guitar is w . Write an expression for the markup and an expression for the percent of the markup.
 $g - w; \frac{100(g - w)}{w}$
- An automobile ski rack is sold to stores at a wholesale price of \$38. If a store has a \$23 markup, what is the retail price of the ski rack? Find the percent of the markup, to the nearest percent.
\$61; 61%
- A manufacturer takes a poll of several retailers to determine how many widgets they would buy at different wholesale prices. The results are shown. What is the equation of the demand function? Round values to the nearest hundredth. How many widgets, to the nearest hundred, would retailers buy at a price of \$20?

Wholesale Price	23	26	28	30	33	35	37	40
Quantities Retailers Will Purchase (1,000s)	4,000	3,450	3,100	2,550	2,000	1,900	1,750	1,400

$$q = -155.88p + 7,428.85; 4,300$$

10. The graph shows supply and demand curves for the AquaPod, a digital music player for scuba divers.



- What is the equilibrium price?
\$40
 - What will happen if the price is set at \$35?
Demand will exceed supply and the price will be driven up.
 - How many AquaPods are demanded at a price of \$35?
y
 - How many AquaPods are supplied at a price of \$40?
x
 - What will happen if the price is set at \$45?
Supply will exceed demand and suppliers will have to lower the price to sell off excess supply.
11. The Coletti Company produces paper cups. They have developed a new type of insulated cup that is biodegradable and doesn't allow the cup to get too hot to hold. They want to use the demand function to help them set a price. They survey dozens of retailers to get an approximation of how many cups would be demanded at each price.

Wholesale Price, p (pack of 50)	\$5	\$5.50	\$6	\$6.50	\$7	\$7.50	\$8	\$8.50	\$9	\$9.50
Quantity, q (1,000s)	5,100	4,900	4,600	4,200	3,700	2,400	2,100	1,600	700	200

- Find the equation of the linear regression line. Round to the nearest thousandth.
 $q = -1,164.848p + 11,395.152$
- Give the slope of the regression line and give an interpretation of its units.
The slope is $-1,164.848$. Its units are packages of cups per dollar. For each dollar increase in price, about 1,165 less packages of cups are demanded.
- Find the correlation coefficient and interpret the value. Round to the nearest thousandth.
 -0.987 ; strong, negative correlation; As the price goes up, demand goes down.
- Based on the regression line, how many packages of cups would be demanded at a wholesale price of \$4? Round to the nearest hundred.
6,700
- Was your answer to part d an example of extrapolation or interpolation? Explain.
Extrapolation, because 4 is not between 5 and 9.50
- Based on the table, if the company sold 5,100,000 packages of cups at a price of \$5 each, how much money would they take in?
\$25,500,000
- If the company sold 200,000 packages of cups at a price of \$9.50 each, how much money would they take in?
\$1,900,000
- Compare your answers to parts f and g. Why is it not correct to conclude that more profit is made by selling for \$5 than for \$9.50? **At \$5, more cups need to be manufactured. Profit depends on the cost of producing the cups, not just the revenue.**

2-4 Fixed and Variable Expenses

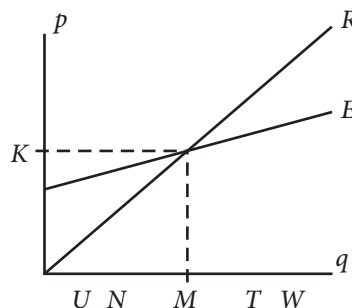
Exercises

- The fixed expenses for producing widgets are \$947,900. The labor and materials required for each widget produced costs \$16.44. Represent the total expenses as a function of the quantity produced.
 $E = 16.44q + 947,900$
- A widget manufacturer's expense equation is $E = 14q + 29,000$. What are the variable costs to produce one widget?
\$14
- The Catania Cat Corporation manufactures litter boxes for cats. Their expense function is $E = 4.18q + 82,000$. Find the average cost of producing 10,000 litter boxes.
\$12.38
- The expense function for a certain item is $E = 2.95q + 712,000$. Express the average cost of producing q items algebraically.
 $\frac{2.95q + 712,000}{q}$
- The Mizzi Corporation has created a demand function for one of its wrench sets. It expresses the quantity demanded in terms of the wholesale price p , and was found by surveying retailers and using linear regression. The demand function is $q = -98p + 5,788$. Their expense function is $E = 23q + 68,000$. Express the expense function as a function in terms of p .
 $E = -2,254p + 201,124$
- A corporation's expense function is $E = 7.50q + 34,000$. The demand function was determined to be $q = -5.5p + 6,000$. Express the expense function in terms of the price.
 $E = -41.25p + 79,000$
- Wexler's manufactures widgets. They create a monthly expense equation of all expenses in one month of manufacturing. The expense equation is $E = 2.10q + 7,600$. They plan to sell the widgets to retailers at a wholesale price of \$3.50 each.
 - How many widgets must be sold so that the income from the widgets is equal to the expenses of producing them? Round to the nearest widget.
5,429
 - If the company sells 2,900 widgets, how much money will they lose?
\$3,540
- Find the break-even point for the expense equation $E = 6.25q + 259,325$ and the revenue function $R = 12q$.
(45,100; 541,200)
- The NFW Corporation produces a product with fixed expenses of f dollars and variable expenses of v dollars per item. If q represents quantity produced, write the expense function.
 $E = vq + f$
- The Burden Corporation manufactures racquets. The racquets have the expense equation $E = rq + f$. What is the average cost of producing x racquets?
 $\frac{rx + f}{x}$

11. The DiMonte Corporation invented a new type of sunglass lens. Their variable expenses are \$12.66 per unit, and their fixed expenses are \$111,200.
- How much does it cost them to produce one lens? 15,000 lenses?
\$111,212.66; \$301,100
 - Express the expense function algebraically. What is the slope of the expense function?
 $E = 12.66q + 111,200$; 12.66
 - If the slope is interpreted as a rate, give the units to use.
dollar cost per lens
 - What is the average cost, to the nearest cent, of producing 15,000 lenses?
\$20.07
 - What is the average cost, to the nearest cent, of producing 17,000 lenses?
\$19.20
 - As the number of widgets increased from 15,000 to 17,000, did the average expense per lens increase or decrease?
decrease

12. The expense equation for a new business venture is $E = 4.55q + 28,500$. If the owners have \$100,000 to start up this operation, what quantity can they produce initially if they spend all of this money on production? Round to the nearest hundred units.
15,700

13. The graph shows Expense (E) and Revenue (R) functions and several different levels of quantity produced.

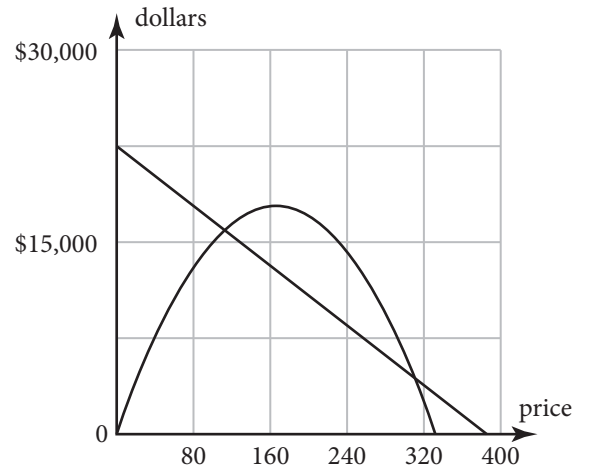


- What are the coordinates of the break-even point?
 (M, K)
 - If U units are produced, will there be a profit or a loss?
loss
 - Compare the profit made if W units are produced to the profit made if T units are produced. Which level of production yields a greater profit? How can you tell?
The profit is higher at quantity W because the difference between the revenue and expense graphs is greater than it is at quantity T .
14. The fixed costs of producing a Winner Widget are f dollars. The variable costs are v dollars per widget. If the average cost of producing q Winner Widgets is a , express the fixed cost f in terms of a , v , and q .
 $f = q(a - v)$
15. Explain why the y -intercept of the expense function is never 0, while the y -intercept of the revenue function is always 0.
The expense function has fixed costs as its y -intercept; if no units are produced, the fixed costs are still an expense. For the revenue function, if no units are sold then there is no revenue, so its y -intercept is 0.

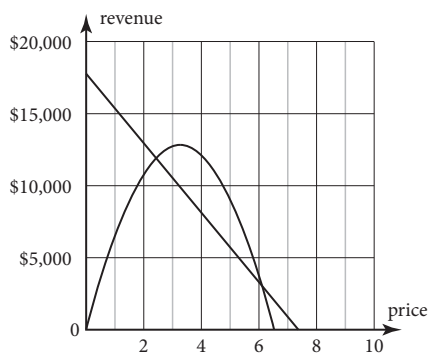
2-5 Graphs of Expense and Revenue Functions

Exercises

- Examine the graphs of an expense function and a revenue function.
 - What is the price at which the maximum revenue is attained?
approximately \$160
 - Estimate the maximum revenue.
approximately \$18,000
 - Estimate the leftmost breakeven point.
(110, 16,000)
 - Estimate the rightmost breakeven point.
(300, 6,000)



- Identify the maximum point by using the axis of symmetry.
 - $R = -2,000p^2 + 44,000p$
(11, 242,000)
 - $R = -125p^2 + 3,200p$
(12.8, 20,480)
- Geoff's company manufactures customized T-shirts. Each shirt costs \$2.00 to manufacture and print. The fixed costs for this product line are \$2,000. The demand function is $q = -1,200p + 7,800$, where p is the price for each shirt.
 - Write the expense equation in terms of the demand q .
 $E = 2.00q + 2,000$
 - Express the expense equation from part a in terms of the price p .
 $E = -2,400p + 17,600$
 - Write the revenue function in terms of the price.
 $R = -1,200p^2 + 7,800p$
 - Graph the functions in an appropriate viewing window. What price yields the maximum revenue? What is the revenue at that price? Identify the price at the breakeven points. Round answers to the nearest cent.
\$3.25; \$12,675; (2.41, 11,822.67) and (6.09, 2,977.33)



4. Mobile Tech manufactures cellular phone accessories. A particular item in their product line costs \$40 each to manufacture. The fixed costs are \$120,000. The demand function is $q = -120p + 8,000$ where q is the quantity the public will buy given the price p .

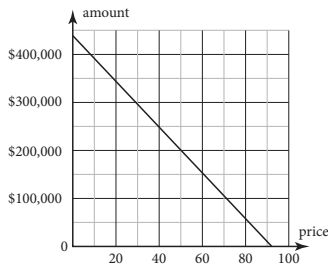
a. Write the expense function in terms of p .

$E = -4,800p + 440,000$

b. Identify an appropriate viewing window for the domain of the expense function.

Xmin = 0, Xmax = 100, Xscale = 10

c. Construct the graph of the expense function from part a.



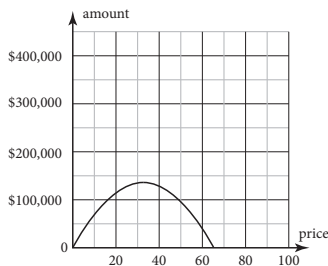
d. What is the revenue equation for this Mobile Tech product? Write the revenue equation in terms of the price.

$R = p(-120p + 8,000) = -120p^2 + 8,000p$

e. Use the revenue equation from part d. What would the revenue be if the price of the item was set at \$60?

\$48,000

f. Graph the revenue function found in part d.

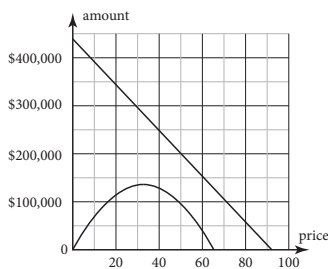


g. Which price would yield the higher revenue, \$20 or \$40?

\$40

h. Graph the expense and revenue functions found above. Interpret the graph.

Expenses will always be greater than revenue in this situation. It is not a profitable venture.



2-6 Breakeven Analysis

Exercises

1. AVS Industries has determined that the combined fixed and variable expenses for the production and sale of 800,000 items are \$24,000,000. What is the price at the breakeven point for this item?

\$30

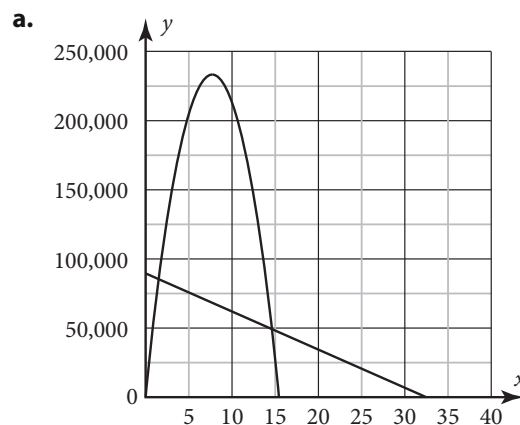
2. The expense equation for the production of a certain MP3 player is $E = 1,250q + 700,000$ where q is the quantity demanded. At a particular price, the breakeven revenue is \$3,800,000. What is the quantity demanded at the breakeven point?

2,480 MP3 players

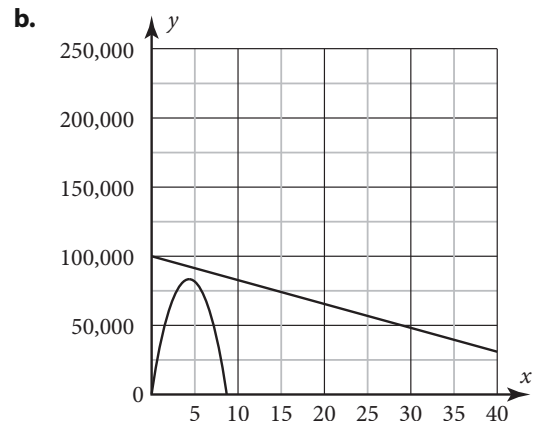
3. A manufacturer determines that a product will reach the breakeven point if sold at either \$30 or \$120. At \$80, the expense and revenue values are both \$120,000. At \$120, the expense and revenue values are both \$400,000. Graph possible revenue and expense functions that would depict this situation. Label the maximum and minimum values for each of the axes. Circle the breakeven points.

Answers vary.

4. Estimate the breakeven points of the expense and revenue functions in each graph.



(2, 80,000) and (14, 50,000)

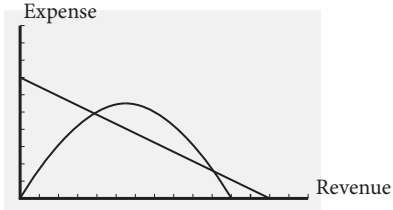


**There are no breakeven points.
Expenses are greater than revenues.**

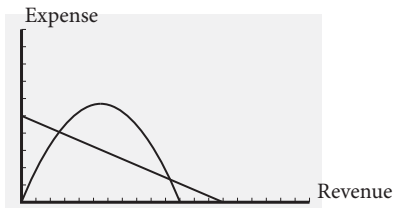
5. Sound Foundations Inc. is a firm that manufactures concrete building supplies. Their research department has invented a new product which they want to sell to builders. After extensive analysis, they have found that their breakeven point will occur only once when the price of the item is \$1,200. At this price, the expense and revenue will be \$3,500,000. Graph possible revenue and expense functions that would depict this situation. Label the maximum and minimum values for each of the axes. Circle the breakeven point and interpret the graph.

Answers vary.

6. Sunset Park Equipment produces camping gear. They are considering manufacturing a new energy-efficient lantern. The expense function is $E = -54,000p + 7,000,000$ and the revenue function is $R = -1,800p^2 + 200,000p$.
- a. Sketch the graphs of the expense and revenue functions. Label the maximum and minimum values for each axis. Circle the breakeven points.

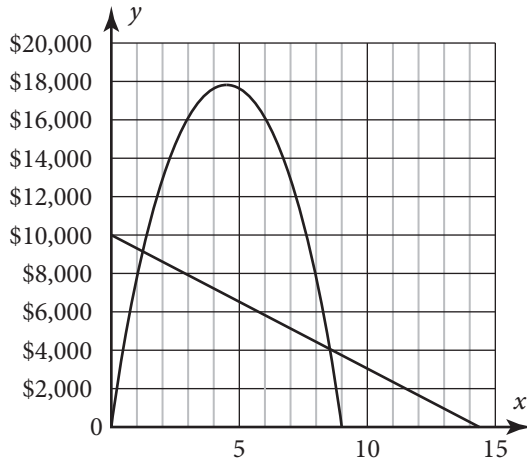


- b. Determine the prices at the breakeven points. Round to the nearest cent.
\$37.55 and \$103.56
- c. Use your answers from part b to determine the revenue and expense amounts for each of the breakeven points. Round to the nearest cent.
When $p = 37.55$, $E = 4,972,300$ and $R = 4,971,995.50$. When $p = 103.56$, $E = 1,407,760$ and $R = 1,407,587.52$.
7. Baby-B-Good manufactures affordable plastic baby rattles. The expense equation is $E = -3,400p + 50,000$, and the revenue equation is $R = -1,800p^2 + 20,000p$.
- a. Sketch the graph of the expense and revenue functions. Circle the breakeven points.



- b. Determine the prices at the breakeven points. Round to the nearest cent.
\$2.70 and \$10.30
- c. Use your answers from part b to determine the revenue and expense amounts for each of the breakeven points. Round to the nearest cent.
When $p = 2.70$, $E = 40,820$ and $R = 40,878$. When $p = 10.30$, $E = 14,980$ and $R = 15,038$.
8. Determine both the expense and revenue functions shown in the graph in terms of price x .

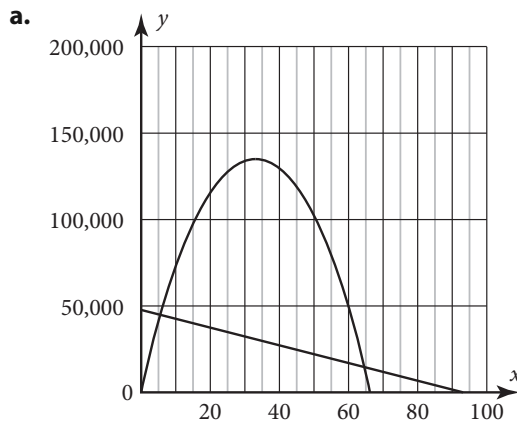
Answers vary but should be close to
 $E = -700x + 10,000$ and
 $R = -900x^2 + 8,000x$.



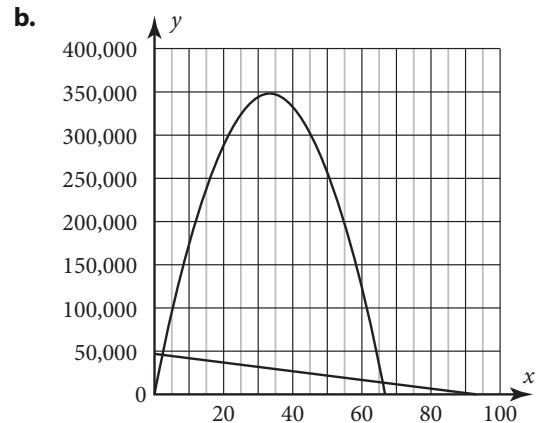
2-7 The Profit Equation

Exercises

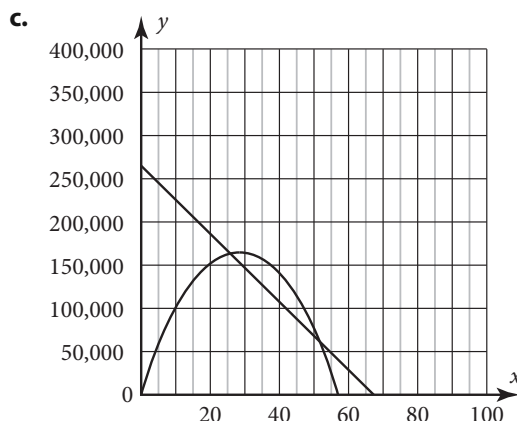
1. Maximum profit can be found on the graph where the difference between the revenue and expense functions is the greatest. Examine each of the following graphs and estimate the maximum profit price and the maximum profit at that price.



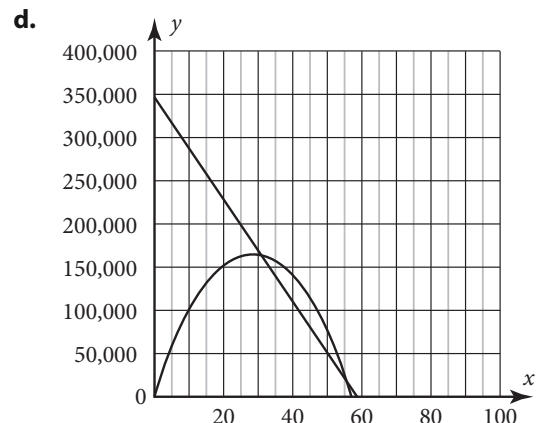
approximately (35, 135,000)



approximately (35, 350,000)



approximately (40, 140,000)



approximately (42, 125,000)

Determine the profit equation.

2. $E = -14,000p + 80,000$ $R = -32,200p^2 + 106,000p$
 $P = -32,200p^2 + 120,000p - 80,000$

3. $E = -2,100p + 100,000$ $R = -900p^2 + 20,000p$
 $P = -900p^2 + 22,100p - 100,000$

4. $E = -1,100p + 40,000$ $R = -150p^2 + 3,800p$
 $P = -150p^2 + 4,900p - 40,000$

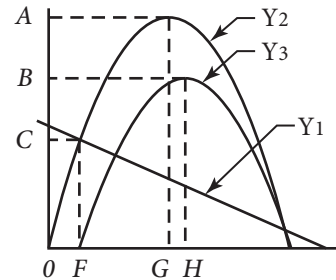
5. The expense and revenue function can yield a profit function. That equation can represent no profit made for any price.
- Use your graphing calculator and the revenue equation from Exercise 2 to determine an expense equation which would yield a situation where no profit can be made.
Answers vary. The expense equation must be entirely above the revenue equation.
 - Use your graphing calculator and the expense equation from Exercise 3 to determine a revenue equation which would yield a situation where no profit can be made.
Answers vary. The revenue equation must be entirely below the expense equation.
6. Determine the maximum profit and the price that would yield the maximum profit for each equation.
- $P = -500p^2 + 67,600p - 20,000$
At \$67.60, the maximum profit is \$2,264,880.
 - $P = -370p^2 + 8,800p - 25,000$
At \$11.89, the maximum profit is \$27,324.32.
 - $P = -31p^2 + 4,540p - 9,251$
At \$73.23, the maximum profit is \$156,971.58.
7. Listen Up sells external computer speakers. Their new product has the following expense and revenue functions: $E = -828p + 400,000$ and $R = -38p^2 + 8,000p$.
- Determine the profit function.
 $P = -38p^2 + 8,828p - 400,000$
 - Determine the price, to the nearest cent, which yields the maximum profit.
\$116.16
 - Determine the maximum profit to the nearest cent.
\$112,720.95
8. FunFleece Incorporated manufactures fleece hats. It is considering making a new type of weatherproof fleece hat. The expense and revenue functions are $E = -300p + 150,000$ and $R = -300p^2 + 29,000p$.
- Determine the profit function.
 $P = -300p^2 + 29,300p - 150,000$
 - Determine the price, to the nearest cent, which yields the maximum profit.
\$48.83
 - Determine the maximum profit to the nearest cent.
\$565,408.33
9. Determine the expense equation given the profit and revenue equations.
- $$P = -468p^2 + 45,599p - 299,000 \quad R = -468p^2 + 45,000p$$
- $$E = -599p + 299,000$$
10. Determine the revenue equation given the profit and expense equations.
- $$P = -525p^2 + 65,326p - 185,000 \quad E = -326p + 185,000$$
- $$R = -525p^2 + 65,000p$$

2-8 Mathematically Modeling a Business

Exercises

Use the graph of the expense function (Y_1), the revenue function (Y_2), and the profit function (Y_3) to answer Exercises 1 – 3.

- Name the coordinates of the maximum revenue point.
(G, A)
- Name the coordinates of the maximum profit point.
(H, B)
- What is the significance of the point (F, C)?
It is a breakeven point.



You are the CEO of Widget World Corporation. Researchers have developed a new electronic widget. The fixed costs to make the widget will be \$30,000, and the variable cost will be \$150 per widget. Exercises 4 – 13 are about the Widget World Corporation.

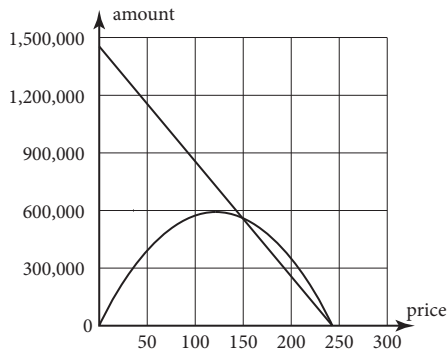
- Write the expense function for the electronic widget in terms of q where q is the quantity that will be produced.
 $E = 150q + 30,000$
- The market research department conducted consumer surveys and reported the following results. In these ordered pairs, the first number represents the **possible price** and the second number represents the **quantity demanded**. The points are listed as (p, q) .
(75, 6,500), (100, 5,900), (125, 4,500), (150, 3,900), (175, 2,800), (200, 1,500), (225, 900)

You now need to set up a demand function using the ordered pairs from the market research department. Enter these ordered pairs into graphing calculator lists. Write the linear regression equation that models this set of ordered pairs. Round each coefficient to the nearest integer.

$$y = -39x + 9,564$$

- The equations used are in terms of q and p . Replace y with q and replace x with p . Write the new equation for q in terms of p .
 $q = -39p + 9,564$
- Recall that the revenue equation is $R = pq$. Substitute the quantity (demand) equation from Exercise 6 into the revenue equation and simplify.
 $R = -39p^2 + 9,564p$
- Use the equation for the demand from Exercise 6. Substitute this into your expense equation from Exercise 4 to write an expense equation in terms of p rather than q .
 $E = 150(-39p + 9,564) + 30,000 = -5,850p + 1,434,600$
- Enter the equation for R as Y_1 and the equation for E as Y_2 in your graphing calculator. What viewing window will you use to graph Y_1 and Y_2 in the same window?
 $Y_1 = -39x^2 + 9,564x$ and $Y_2 = -5,850x + 1,434,600$; Answers vary, but should be close to $X_{\min} = 0$, $X_{\max} = 300$, $Y_{\min} = 0$, $Y_{\max} = 1,500,000$

10. Make a sketch of the graphs. Describe your graph.



The downward parabola is the graph of the revenue function and the line is the graph of the profit function.

11. Find the coordinates of the breakeven points in your graph in Exercise 10. Round the coordinates to the nearest whole number.

(150, 557,100) and (245, 0)

12. Write the profit equation in terms of x (the price variable) by subtracting the expense equation from the revenue equation. Let Y_3 represent the profit. What will you enter in your calculator?

$$Y_3 = -39x^2 + 9,564x - (-5,850x + 1,434,600) = -39x^2 + 15,414x - 1,434,600$$

13. Enter the profit equation into your graphing calculator and determine the maximum profit price and amount to the nearest integer.

a. The x -value represents the price at which each widget should be set in order to get maximum profit. What is that price?

\$198

b. The y -value represents the maximum profit. What is that profit?

\$88,422

3-1 Checking Accounts

Exercises

- Mitchell has a balance of \$1,200 in his First State Bank checking account. He deposits a \$387.89 paycheck, a \$437.12 dividend check, and a personal check for \$250 into his account. He wants to receive \$400 in cash. How much will he have in his account after the transaction?
\$1,875.01
- Meg has a total of d dollars in her checking account. She makes a cash deposit of c dollars and a deposit of three checks each worth s dollars. She would like e dollars in cash from this transaction. She has enough money in her account to cover the cash received. Express her new checking account balance after the transaction as an algebraic expression.
 $d + c + 3s - e$
- Neal deposited a \$489.50 paycheck, an x dollar stock dividend check, a y dollar rebate check, and \$85 cash into his checking account. His original account balance was w dollars. Assume each check clears. Write an expression for the balance in his account after the deposits?
 $w + 574.50 + x + y$
- Elaine has m dollars in her checking account. On December 8, she deposited \$1,200, r dollars, and \$568.90. She also cashed a check for t dollars and one for \$73.70. Write an algebraic expression that represents the amount of money in her account after the transactions.
 $m + 1,695.20 + r - t$
- Del and Jen have a joint checking account. Their balance at the beginning of October was \$6,238.67. During the month they made deposits totaling d dollars, wrote checks totaling \$1,459.98, paid a maintenance fee of z dollars, and earned b dollars in interest on the account. Write an algebraic expression that represents the balance at the end of the month?
 $4,778.69 + d - z + b$
- New Merrick Bank charges a \$21-per-check overdraft protection fee. On June 5, Lewis had \$989.00 in his account. Over the next few days, the following checks were submitted for payment at his bank: June 6, \$875.15, \$340.50, and \$450.63; June 7, \$330; and June 8, \$560.00.
 - How much will he pay in overdraft protection fees?
\$84
 - How much will he owe the bank after June 8?
\$1,651.13
- Dean has a checking account at City Center Bank. During the month of April, he made deposits totaling \$2,458.52 and wrote checks totaling \$789.23. He paid a maintenance fee of \$25 and earned \$3.24 in interest. His balance at the end of the month was \$4,492.76. What was the balance at the beginning of April?
\$2,845.23
- Bellrose Bank charges a monthly maintenance fee of \$17 and a check writing fee of \$0.05 per check. Last year, Patricia wrote 445 checks from her account at Bellrose. What was the total of all fees she paid on that account last year?
\$226.25

9. Create a check register for the transactions listed.
 - a. Your balance on 1/5 is \$822.67.
 - b. You write check 1076 on January 6 for \$600.00 to Excel Health Club.
 - c. You deposit a paycheck for \$227.45 on 1/11.
 - d. You deposit a \$50 rebate check on 1/15.
 - e. On 1/16, you begin writing a donation check to Clothes for Kids but make an error and have to void the check. You write the very next check for \$100 to this organization.
 - f. On 1/20, you withdraw \$200 from the ATM at the mall. The company owning the ATM charges you \$3.50 and your bank charges you \$2.50 for the ATM transaction.
 - g. On 1/21, you made a debit card purchase at Stacy's Store for \$134.87.
 - h. Your friend gave you the \$1,300 he owed you and you deposit it on 1/22.
 - i. You write the next check on 1/23 to iBiz for \$744.24 for a new computer.
 - j. You deposit your paycheck for \$227.45 on 1/23.
 - k. On 1/24, you withdraw \$50 from the ATM affiliated with your bank. There are no fees.
 - l. On 1/24, you write the next check for \$75.00 to iTel Wireless.
 - m. On 1/25, you write a check for \$120 concert tickets to Ticket King.

NUMBER OR CODE	DATE	TRANSACTION DESCRIPTION	PAYMENT AMOUNT	✓	FEE	DEPOSIT AMOUNT	\$ BAL
							822.67
1076	1/6	Excel Health Club	\$ 600 00				- 600.00
							222.67
	1/11	Deposit (Paycheck)				227 45	+ 227.45
							450.12
	1/15	Deposit (Rebate Check)				50 00	+ 50.00
							500.12
1077	1/16	VOID					
1078	1/16	Clothes for Kids	100 00				- 100.00
							400.12
	1/20	ATM Withdraw	200 00				- 200.00
							200.12
	1/20	ATM Charge	3 50		FEE		- 3.50
							196.62
	1/20	ATM Bank Charge	2 50		FEE		- 2.50
							194.12
	1/21	Debit Card - Stacy's	134 87				- 134.87
							59.25
	1/22	Deposit				1,300 00	+ 1,300.00
							1,359.25
1079	1/23	iBiz	744 24				- 744.24
							615.01
	1/23	Deposit (Paycheck)				227 45	+ 227.45
							842.46
	1/24	ATM Withdraw	50 00				- 50.00
							792.46
1080	1/24	iTel Wireless	75 00				- 75.00
							717.46
1081	1/25	Ticket King	120 00				- 120.00
							597.46

- 10.** Create a check register for the transactions listed.
- a.** Your balance on 2/25 is \$769.22.
 - b.** On 2/25, you write check 747 for \$18 to Steve Smith.
 - c.** On 2/27, you deposit your paycheck in the amount of \$450.80.
 - d.** Your grandparents send you a check for \$50 which you deposit into your account on 2/28.
 - e.** On 3/2 you write a check to North State College for \$300.00 and another check to Middle Island Auto Parts for \$120.65.
 - f.** Later in the day on 3/2 you write two more checks: Metro Transit for \$85.00 and Bling's Department Store for \$58.76.
 - g.** On 3/3, at Border Barns Books, as you write the next check for \$105.85, you make a mistake and void that check. You pay with the next available check in your checkbook.
 - h.** On 3/5, you deposit a rebate check for \$425 into your checking account.
 - i.** On 3/8, you pay your car insurance with an e-check to AllFarm Insurance for \$521.30.
 - j.** On 3/10, you withdraw \$300 from the ATM. There is a \$4.50 charge for using the ATM.
 - k.** On 3/11, you deposit your paycheck in the amount of \$450.80.
 - l.** On 3/12, you use your debit card to make three purchases at Sports Master: \$88.91, \$23.50, and \$100.70.
 - m.** On 3/13, you transfer \$1,000 from your savings account into your checking account.
 - n.** On 3/13, you write a check to Empire Properties for your first month's rent in your new apartment in the amount of \$820.00.
 - o.** On 3/15, you use your debit card to purchase a \$150.00 microwave at Kitchen Supply.
- (Check register is on the next page.)

(Transactions are listed on the previous page.)

NUMBER OR CODE	DATE	TRANSACTION DESCRIPTION	PAYMENT AMOUNT	✓	FEE	DEPOSIT AMOUNT	\$ BAL.
							769.22
747	2/25	Steve Smith	\$ 18 00				- 18.00
							751.22
	2/27	Deposit				450 80	+ 450.80
							1,202.02
	2/28	Deposit (Birthday Check)				50 00	+ 50.00
							1,252.02
748	3/2	North State College	300 00				- 300.00
							952.02
749	3/2	Middle Island Auto Parts	120 65				- 120.65
							831.37
750	3/2	Metro Transit	85 00				- 85.00
							746.37
751	3/2	Bling's	58 76				- 58.76
							687.61
752	3/3	VOID					
753	3/3	Border Barns Books	105 85				- 105.85
							581.76
	3/5	Deposit (Rebate Check)				425 00	+ 425.00
							1,006.76
EFT	3/8	e-check AllFarm Insurance	521 30				- 521.30
							485.46
	3/10	ATM Withdraw	300 00				- 300.00
							185.46
	3/10	ATM Charge	4 50		FEE		- 4.50
							180.96
	3/11	Deposit (Paycheck)				450 00	+ 450.00
							630.96
	3/12	Debit Card (Sports Master)	88 91				- 88.91
							542.05
	3/12	Debit Card (Sports Master)	23 50				- 23.50
							518.55
	3/12	Debit Card (Sports Master)	100 70				- 100.70
							417.85
	3/13	Transfer from Savings				1000 00	+ 1,000.00
							1,417.85
754	3/13	Empire Properties	820 00				- 820.00
							597.85
	3/15	Debit Card (Kitchen Supply)	150 00				- 150.00
							447.85

3-2 Reconcile a Bank Statement

Exercises

1. On the back of Elise's monthly statement, she listed the following outstanding withdrawals: #123, \$76.09; #117, \$400; #130, \$560.25; debit card, \$340.50; and #138, \$83.71. She also determined that a deposit for \$500 and the other for \$328.90 are outstanding. Using these outstanding transactions, what adjustment will have to be made to her statement balance?
-\$631.65

2. Pina filled out the following information on the back of her monthly statement:

Ending balance from statement	\$1,139.78
Deposits outstanding	+ \$280.67
Total of checks outstanding	- \$656.91
Revised statement balance	\$_____
Balance from checkbook	\$763.54

Find Pina's revised statement balance. Does her account reconcile?

\$763.54; yes

3. Tasha filled out the following information on the back of her bank statement:

Ending balance from statement	\$764.22
Deposits outstanding	+ \$387.11
Total of checks outstanding	- \$455.32
Revised statement balance	\$_____
Balance from checkbook	\$669.01

Find Tasha's revised statement balance. Does her account reconcile?

\$696.01; no

4. Lenny opened a checking account last month. Today he received his first statement. The statement listed five deposits and 24 checks that cleared. Lenny's check register shows nine outstanding checks. How many checks has Lenny written since the last statement?
33

5. Arden's checking account charges a \$21 monthly maintenance fee with no per check fee. He wants to switch to a different account with a fee of 18 cents per check and a \$15 monthly maintenance fee. The following information is about his last five monthly statements.

Month	Number of Checks on Statement	Month	Number of Checks on Statement	Month	Number of Checks on Statement
Feb	24	Mar	37	Apr	35
May	33	June	41		

- a. What is the mean number of checks Arden wrote per month during the last five months?
34
- b. About how much should Arden expect to pay per month for the new checking account?
\$21.12
- c. What advice would you give Arden?
Arden should keep his current checking account.

6. Below you will find Mitch West's monthly statement and his check register. Use them to complete parts a – e in his checking account summary. Does his account reconcile?

Checking Account Summary

Ending balance from statement	\$764.22
Ending Balance from Statement	a. \$2,368.29
Deposits Outstanding	+ b. \$300.00
Total of Checks Outstanding	- c. \$119.00
Revised statement balance	d. \$2,549.29
Balance from Checkbook	e. \$2,549.29

Mitch West 23 Sycamore Lane Benridge, NY 10506	ACCOUNT NUMBER: 456213-A232 STATEMENT PERIOD: 5/15 - 6/15			
STARTING BALANCE → \$ 2,312.70				
DATE	DESCRIPTION	CHECK NUMBER	TRANSACTION AMOUNT	BALANCE
8/16	W/D	1056	\$ 256.00	
8/20	DEPOSIT		\$ 1,200.80	
8/22	W/D	Debit card	\$ 234.81	
8/22	W/D	1058	\$ 334.90	
8/23	W/D	Debit Card	\$ 34.72	
8/25	W/D	1060	\$ 145.78	
8/26	W/D	1059	\$ 56.00	
8/27	DEPOSIT		\$ 150.00	
9/1	W/D	1061	\$ 230.00	
ENDING BALANCE →				\$2,368.29

NUMBER OR CODE	DATE	TRANSACTION DESCRIPTION	PAYMENT AMOUNT	✓	FEE	DEPOSIT AMOUNT	BALANCE
							\$ <u>2,312.70</u>
1056	8/15	Best Offer Inc.	256 00				- 256.00 <u>2,053.70</u>
1057	8/16	Dept. of Motor Vehicles	86 50				- 86.50 <u>1,967.20</u>
1058	8/16	AutoWorld	334 90				- 334.90 <u>1,632.30</u>
	8/18	Car Nation	234 81				- 234.81 <u>1,397.49</u>
	8/20	Deposit				1,200 80	+ 1,200.80 <u>2,598.29</u>
1059	8/21	Print Makers	56 00				- 56.00 <u>2,542.29</u>
1060	8/22	Book Bonanza	145 78				- 145.78 <u>2,396.51</u>
	8/23	Fast Freddy's Fast Food	34 72				- 34.72 <u>2,361.79</u>
	8/27	Deposit				150 00	+ 150.00 <u>2,511.79</u>
1061	8/30	Lincoln Savings Bank	230 00				- 230.00 <u>2,281.79</u>
1062	9/1	VOID					<u>2,281.79</u>
1063	9/1	Pasta Pete's	32 50				- 32.50 <u>2,249.29</u>
	9/2	Deposit				300 00	+ 300.00 <u>2,549.29</u>

3-3 Savings Accounts

Exercises

- Gary deposits \$3,700 in an account that pays 2.15% simple interest. He keeps the money in the account for three years, but doesn't make any deposits or withdrawals. How much interest will he receive after the three years?
\$238.65
- How much simple interest is earned on \$6,000 at an interest rate of 4.25% in $4\frac{1}{2}$ years?
\$1,147.50
- How much principal would you have to deposit to earn \$700 simple interest in $1\frac{1}{2}$ years at a rate of 4%?
\$11,666.67
- Jesse estimates that it will cost \$300,000 to send his newborn son to a private college in 18 years. He currently has \$65,000 to deposit in an account. What simple interest rate would he need so that \$65,000 grows into \$300,000 in 18 years? Round to the nearest percent.
20%
- Dillon has a bank account that pays 3.2% simple interest. His balance is \$1,766. How long will it take for the amount in the account to grow to \$2,000? Round to the nearest year.
4 years
- How long will it take \$5,000 to double in an account that pays 5.6% simple interest? Round to the nearest year.
18 years
- How much simple interest would \$1,500 earn in 11 months at an interest rate of 3.75%?
\$51.56
- How much simple interest would \$1,000 earn in 275 days at an interest rate of 4.21%? (There are 365 days in a year.)
\$31.72
- Colin deposited \$1,230 in an account that pays 3.19% simple interest for three years.
 - What will the interest be for the three years?
\$117.71
 - What will be the new balance after three years?
\$1,347.71
 - How much interest did the account earn the first year, to the nearest cent?
\$39.24
 - How much interest did the account earn the second year, to the nearest cent?
\$39.24
 - How much interest did the account earn the third year, to the nearest cent?
\$39.24

10. Gerry deposited \$1,230 in an account that pays 3.19% simple interest for one year.
- How much interest will he earn in one year?
\$39.24
 - What will his balance be after one year?
\$1,269.24
 - Gerry withdraws all of the principal and interest after the first year and deposits it into another one-year account at the same rate. What will his interest be for the second year?
\$40.49
 - What will his balance be after two years?
\$1,309.73
 - Compare the accounts of Gerry and Colin from Exercise 9. Who earned more interest the second year, Gerry or Colin? Explain.
Gerry; he added the interest from the first year to the principal and reinvested it.
11. Use the simple interest formula to find the missing entries in the following table. Round monetary amounts to the nearest cent, percents to the nearest hundredth of a percent, and time to the nearest month. Use 365 days = 1 year.

Interest	Principal	Rate	Time
a. \$25.48	\$980	2.6%	1 yr
b. \$110.56	\$2,900	3.05%	15 mo
\$400	\$3,500	4.5%	c. 30 mo
\$400	d. \$2,222.22	4.5%	4 yr
\$400	\$3,000	e. 4.44%	3 yr
f. \$10,890.41	\$750,000	5.3%	100 days
y dollars	p	2.11%	g. $\frac{y}{0.0211p}$

12. How much simple interest would x dollars earn in 13 months at a rate of r percent?
 $\frac{13xr}{12}$ dollars
13. How long would \$100,000 take to double at a simple interest rate of 8%?
12.5 years
14. How long would \$450 take to double at a simple interest rate of 100%?
1 year
15. What simple interest rate, to the nearest tenth, is needed for \$15,000 to double in 8 years?
12.5%
16. Arrange these fractions of a year in ascending order: 190 days, 5 months, 160 days, 7 months, 200 days.
5 months, 160 days, 190 days, 200 days, 7 months

3-4 Explore Compound Interest

Exercises

Round to the nearest cent where necessary.

- How much interest would \$2,000 earn in one year at the rate of 4.2%?
\$84
- How much interest would \$2,000 earn, compounded annually, in two years at the rate of 4.2%?
\$171.53
- How much interest would \$2,000 earn, with simple interest, in two years at the rate of 4.2%?
\$168.00
- Compare your answers to Exercises 2 and 3. Explain why they differ.
The compound interest is greater because the interest from the first year is added to the principal before computing the interest for year two.
- How much would d dollars earn in one year at the rate of p percent compounded annually?
$$\frac{dp}{100}$$
- Margaret deposits \$1,000 in a savings account that pays 5.4% interest compounded semi-annually. What is her balance after one year?
\$1,054.73
- How much interest does \$5,300 earn at a rate of 2.8% interest compounded quarterly, in three months?
\$37.10
- Mr. Guny deposits \$4,900 in a savings account that pays $3\frac{1}{2}\%$ interest compounded quarterly.
 - Find the first quarter's interest.
\$42.88
 - Find the first quarter's balance.
\$4,942.88
 - Find the second quarter's interest.
\$43.25
 - Find the second quarter's balance.
\$4,986.13
 - Find the third quarter's interest.
\$43.63
 - Find the third quarter's balance.
\$5,029.76
 - Find the fourth quarter's interest.
\$44.01
 - Find the fourth quarter's balance.
\$5,073.77
 - How much interest does the account earn in the first year?
\$173.77
- Jonathan deposits \$6,000 in a savings account that pays 3.2% interest compounded quarterly. What is his balance after one year?
\$6,194.32
- How much interest would \$1,000,000 earn at 5% compounded daily, in one day?
\$136.99

11. How much interest would y dollars earn in one day at a rate of 3.75% compounded daily?

$$\frac{0.0375y}{365}$$

12. Mrs. Huber opened a savings account on June 26 with a \$1,300 deposit. The account pays 3.6% interest compounded daily. On June 27, she deposited \$450 and on June 28 she withdrew \$110. Complete the table based on Mrs. Huber's banking activity.

	June 26	June 27	June 28
Opening balance	a. \$0	f. \$1,300.13	k. \$1,750.30
Deposit	b. \$1,300.00	g. \$450.00	---
Withdrawal	---	---	l. \$110.00
Principal used to Compute Interest	c. \$1,300.00	h. \$1,750.13	m. \$1,640.30
Interest	d. \$0.13	i. \$0.17	n. \$0.16
Ending Balance	e. \$1,300.13	j. \$1,750.30	p. \$1,640.46

13. Mr. Nolan has a bank account that compounds interest daily at a rate of 3.7%. On the morning of December 7, the principal is \$2,644.08. That day he withdraws \$550 to pay for a snow blower. Later that day he receives a \$934 paycheck from his employer, and he deposits that in the bank. On December 8, he withdraws \$300 to go holiday shopping. What is his balance at the end of the day on December 8?
\$2,728.67

14. Mrs. Platt has an account that pays p percent interest compounded daily. On April 27, she had an opening balance of b dollars. Also on April 27, she made a w dollars withdrawal and a d dollars deposit. Express her interest for April 27 algebraically.

$$\frac{p}{100}(b - w + d)$$

15. This morning, Mrs. Rullan had a balance of b dollars in an account that pays 3.05% interest compounded weekly. This afternoon she makes a withdrawal in the amount of w dollars. Express her interest for the day algebraically.

$$\frac{0.0305(b - w)}{365}$$

16. Kristin deposited \$9,000 in an account that has an annual interest rate of 4.1% compounded monthly. How much interest will she earn at the end of one month?
\$30.75

17. How much would \$25,000 earn in one hour at the rate of 5%, compounded hourly?
\$0.14

18. The Jules Server Scholarship Fund gives a graduation award of \$250 to a graduating senior at North End High School. Currently the fund has a balance of \$8,300 in an account that pays 5.2% interest compounded annually. Will the amount earned in annual interest be enough to pay for the award?
yes

19. Kelly has d dollars in an account that pays 3.4% interest compounded weekly. Express her balance after one week algebraically.

$$d + \frac{0.034d}{52}$$

3-5**Compound Interest Formula****Exercises**

Round to the nearest cent wherever necessary.

- Mr. Mady opens a savings account with principal P dollars that pays 4.11% interest compounded quarterly. Express his ending balance after one year algebraically.
$$P\left(1 + \frac{0.0411}{4}\right)^4$$
- Jeff deposits \$2,300 at 3.13% interest compounded weekly. What will be his ending balance after one year?
\$2,373.11
- Nancy has \$4,111 in an account that pays 3.07% interest compounded monthly. What is her ending balance after two years?
\$4,370.98
- Mr. Weinstein has a savings account with a balance of \$19,211.34. It pays 4% interest compounded daily. What is his ending balance after three years, if no other deposits or withdrawals are made? How much interest does he earn over the three years?
\$21,660.58; \$2,449.24
- If you invested \$10,000 at 3.8% compounded hourly for five years, what would be your ending balance?
\$12,092.49
- Danielle has a CD at Crossland Bank. She invests \$22,350 for four years at 4.55% interest, compounded monthly. What is her ending balance? How much interest did she make?
\$26,802.15; \$4,452.15
- Ms. Santoro is opening a one-year CD for \$16,000. The interest is compounded daily. She is told by the bank representative that the annual percentage rate (APR) is 4.8%. What is the annual percentage yield (APY) for this account?
4.92%
- Knob Hill Savings Bank offers a one-year CD at 3.88% interest compounded daily. What is the APY for this account? Round to the nearest hundredth of a percent.
3.96%
- Kings Park Bank is advertising a special 5.08% APR for CDs. Kevin takes out a one-year CD for \$24,000. The interest is compounded daily. Find the APY for Kevin's account.
5.21%
- Imagine that you invest \$100,000 in an account that pays 5.9% annual interest compounded monthly. What will your balance be at the end of 18 years?
\$288,463.33
- Yurik invests \$88,000 in a CD that is locked into a 4.75% interest rate compounded monthly, for seven years. How much will Yurik have in the account when the CD matures?
\$122,631.08

12. Stephanie has created a study tool to help her study compound interest. She writes the compound interest formula with letters different than the traditional representations.

$$X = M\left(1 + \frac{Q}{K}\right)^{KB}$$

- a. If Q is increased, does the new balance increase or decrease? Explain your answer.
increase; interest rate increases
- b. If K is decreased, does the new balance increase or decrease? Explain.
decrease; less frequent compounding
- c. If B is increased, does the new balance increase or decrease? Explain.
increase; compounding for more years
- d. Is it possible that $M > X$? Explain.
No; the new balance is always greater (or the same) as the principal after interest is added.
- e. Using Stephanie's variable representation, express the amount of interest earned on the account.

$$X = M\left(1 + \frac{Q}{K}\right)^{KB} - M$$

13. Compare the simple interest for one year on a principal of 1 million dollars at an interest rate of 6.3% to compounding every second for the same principal and interest rate.

- a. How many seconds are in an hour?
3,600
- b. How many seconds are in a day?
86,400
- c. How many seconds are in a year?
31,536,000
- d. How much interest does \$1,000,000 earn in one year at 6.3% interest, compounded every second?
\$65,026.27
- e. How much does the same \$1,000,000 earn at 6.3% in one year, under simple interest?
\$63,000
- f. How much more interest did the compounded account earn when compared to the simple-interest account?
\$2,026.27

14. Britney invested \$4,000 in a CD at TTYL Bank that pays 3.4% interest compounded monthly.

- a. How much will Britney have in her account at the end of one year?
\$4,138.14
- b. What is the APY for this account? Round to the nearest hundredth of a percent.
3.45%

15. How much more would \$5,000 earn in ten years, compounded daily at 6%, when compared to the interest on \$5,000 over ten years, at 6% compounded semiannually?

\$79.58

3-6 Continuous Compounding

Exercises

Round to the nearest cent wherever necessary.

- Given the function $f(x) = \frac{1,234,999}{x}$, as the values of x increase towards infinity, what happens to the values of $f(x)$?
The values approach 0.
- As the values of x increase towards infinity, what happens to the values of $g(x) = 3x - 19$?
The values increase without bound.
- Given the function $h(x) = \frac{8x-3}{4x+5}$, as the values of x increase towards infinity, use a table to find out what happens to the values of $h(x)$.
The values approach 2.
- If $f(x) = \frac{10}{x^2}$, use a table and your calculator to find $\lim_{x \rightarrow \infty} f(x)$.
0
- Given the function $f(x) = 2^x$, find $\lim_{x \rightarrow \infty} f(x)$.
no limit
- Given the function $f(x) = \left(\frac{1}{2}\right)^x$, use a table to compute $\lim_{x \rightarrow \infty} f(x)$.
0
- If you deposit \$1,000 at 100% simple interest, what will your ending balance be after one year?
\$2,000

Compare simple interest with daily compounding and continuous compounding.

- If you deposit \$10,000 at 3.85% simple interest, what would your ending balance be after three years?
\$11,155
- If you deposit \$10,000 at 3.85% interest, compounded daily, what would your ending balance be after three years?
\$11,224.28
- If you deposit \$10,000 at 3.85% interest, compounded continuously, what would your ending balance be after three years?
\$11,224.35
- How much more did the account that was compounded continuously earn compared to the account compounded daily?
\$0.07
- How much more did the account that was compounded daily earn compared to the simple-interest account?
\$69.28

13. Eric deposits \$4,700 at 5.03% interest, compounded continuously for five years.

a. What is his ending balance?

\$6,043.98

b. How much interest did the account earn?

\$1,343.98

14. Write the verbal sentence that is the translation of $\lim_{x \rightarrow \infty} f(x) = 3.66$.

The limit of $f(x)$, as x approaches infinity, is 3.66.

15. Write the verbal sentence given below symbolically using limit notation.

The limit of $g(x)$, as x approaches zero, is fifteen.

$\lim_{x \rightarrow 0} g(x) = 15$

16. Given the function $f(x) = \frac{2x-17}{x}$, use a table to find $\lim_{x \rightarrow \infty} f(x)$.

2

17. Find the interest for each compounding period on \$50,000 for $2\frac{1}{2}$ years at a rate of 4.3%.

a. annually

\$5,549.58

b. semiannually

\$5,611.15

c. quarterly

\$5,642.61

d. monthly

\$5,663.85

e. daily

\$5,674.19

f. hourly

\$5,674.53

g. continuously

\$5,674.54

18. A private university has an endowment fund that currently has 49 million dollars in it. If it is invested in a one-year CD that pays 5.12% interest compounded continuously, how much interest will it earn?

\$2,574,135.57

19. Use a table of increasing values of x to find each of the following limits.

a. $\lim_{x \rightarrow \infty} f(x)$ if $f(x) = \frac{5x-2}{x+3}$

5

b. $\lim_{x \rightarrow \infty} g(x)$ if $g(x) = \frac{12x+5}{4x+3}$

3

c. $\lim_{x \rightarrow \infty} f(x)$ if $f(x) = \frac{5x^3-100}{x^2}$

∞

d. $\lim_{x \rightarrow \infty} f(x)$ if $f(x) = \frac{7x^2-1}{x^3+2}$

0

20. Find the interest earned on a \$14,000 balance for nine months at $3\frac{3}{4}$ % interest compounded continuously.

\$399.34

21. Assume you had P dollars to invest in an account that paid 5% interest compounded continuously. How long would it take your money to double? (Hint: Try substituting different numbers of years into the continuous compounding formula). Round to the nearest year.

14 years

3-7 Future Value of Investments

Exercises

1. Vincent made a \$2,000 deposit into an account on August 1 that yields 2% interest compounded annually. How much money will be in that account at the end of 5 years?
\$2,208.16

2. On December 31, Juan Carlos made a \$7,000 deposit in an account that pays 2.975% interest compounded semi-annually. How much will be in that account at the end of two years.
\$7,425.89

3. Liam was born on October 1, 2009. His grandparents put \$20,000 into an account that yielded 3% interest compounded quarterly. When Liam turns 18, his grandparents will give him the money for a college education. How much will Liam get on his 18th birthday?
\$34,251.05

4. Colleen is 15 years from retiring. She opens an account at the Savings Bank. She plans to deposit \$10,000 each year into the account, which pays 2.7% interest, compounded annually.

- a. How much will be in the account in 15 years?
\$181,952.33

- b. How much interest would be earned?
\$31,952.33

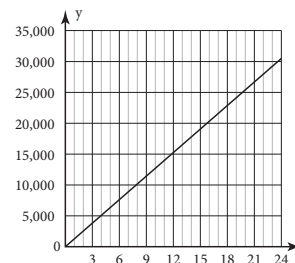
5. Anton opened an account at Bradley Bank by depositing \$1,250. The account pays 2.325% interest compounded monthly. He deposits \$1,250 every month for the next two years.

- a. How much will he have in the account at the end of the two-year period?
\$30,678.03

- b. Write the future value function. Let x represent each of the monthly interest periods.

$$B = \frac{1,250 \left(1 + \left(\frac{0.02325}{12} \right)^x - 1 \right)}{\frac{0.02325}{12}}$$

- c. Graph the future value function.



- d. Using your graph, what will the approximate balance be after one year?
about \$15,000

6. Sylvia wants to go on a cruise around the world in 5 years. If she puts \$50 into an account each week that pays 2.25% interest compounded weekly, how much will she have at the end of the five-year period?
\$13,756.31

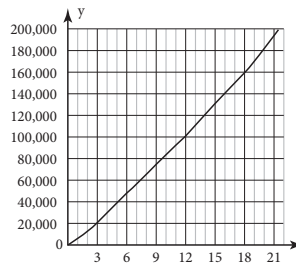
7. Fatima opened a savings account with \$7,500. She decided to deposit that same amount semiannually. This account earns 3.975% interest compounded semiannually.

a. What is the future value of the account after 10 years?
\$182,003.62

b. Write the future value function. Let x represent the number of semiannual interest periods.

$$B = \frac{7,500 \left(1 + \left(\frac{0.03975}{2} \right)^x - 1 \right)}{\frac{0.03975}{2}}$$

c. Graph the future value function.



d. Using your graph, what is the approximate amount in her account after 18 months?
about \$160,000

8. Marina invests \$200 every quarter into an account that pays 1.5% annual interest rate compounded quarterly. Adriana invests \$180 in an account that pays 3% annual interest rate compounded quarterly.

a. Determine the amount in Marina's account after 10 years.
\$8,613.78

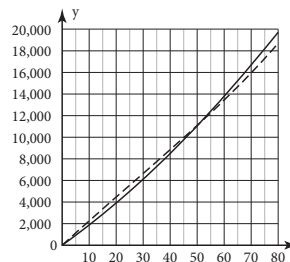
b. Determine the amount in Adriana's account after 10 years.
\$8,360.37

c. Who had more money in the account after 10 years?
Marina

d. Write the future value function for Marina's account. $B = \frac{200 \left(1 + \left(\frac{0.015}{4} \right)^x - 1 \right)}{\frac{0.015}{4}}$

e. Write the future value function for Adriana's account. $B = \frac{180 \left(1 + \left(\frac{0.03}{4} \right)^x - 1 \right)}{\frac{0.03}{4}}$

f. Graph Marina and Adriana's future value function on the same axes.



g. The future value function for a periodic investment x every quarter for 10 years at an interest rate of 2% is $B = \frac{x \left(\left(1 + \frac{0.02}{4} \right)^{40} - 1 \right)}{\frac{0.02}{4}}$. Use a graphing calculator to determine the amount of a periodic investment that would yield close to \$10,000 in the account at the end of 10 years.
approximately \$226

3-8 Present Value of Investments

Exercises

1. Complete the table to find the single deposit investment amounts.

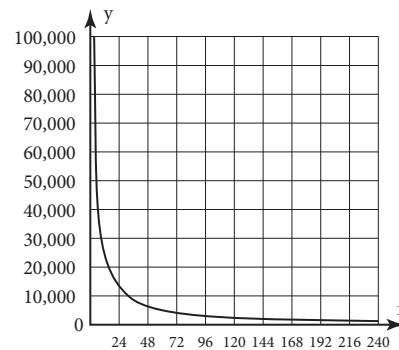
Future Value	Rate	Interest Periods	Deposit (to nearest cent)
\$200	2% compounded annually	2 yr	a. \$192.23
\$400	1.5% compounded semiannually	4 yr	b. \$376.79
\$5,000	3.5% compounded quarterly	8 yr	c. \$3,783.52
\$25,000	4.1% compounded monthly	64 mo	d. \$20,097.23

2. Complete the table to find the periodic deposit investment amounts.

Future Value	Rate	Interest Periods	Deposit (to nearest cent)
\$7,000	1.25% compounded annually	5 yr	a. \$1,365.43
\$9,500	2.6% compounded semiannually	8 yr	b. \$537.98
\$500,000	1.625% compounded quarterly	15 yr	c. \$7,375.76
\$1,000,000	2% compounded monthly	246 mo	d. \$3,291.83

3. When his daughter Alisa was born, Mike began saving for her wedding. He wanted to have saved about \$30,000 by the end of 20 years. How much should Mike deposit into an account that yields 3% interest compounded annually in order to have that amount? Round your answer to the nearest thousand dollars.
\$16,610.27
4. How long will it take for \$5,000 to grow to \$10,000 in an account that yields 5% interest compounded annually. Experiment with the formula in your calculator using different years.
approximately 14 yrs
5. Martina will be attending 4 years of undergraduate school and four more years of graduate school. She wants to have \$200,000 in her savings account when she graduates in 8 years. How much must she deposit in an account now at a 2.6% interest rate that compounds monthly to meet her goal? Round your answer to the nearest dollar.
\$162,478
6. Kate wants to install an inground pool in five years. She estimates the cost will be \$50,000. How much should she deposit monthly into an account that pays 3% interest compounded monthly in order to have enough money to pay for the pool in 5 years?
\$773.43

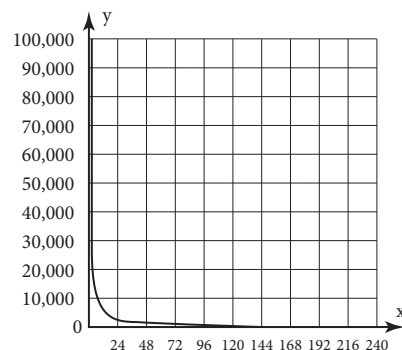
7. Amber wants to have saved \$300,000 by some point in the future. She set up a direct deposit account with a 1.75% APR compounded monthly, but she is unsure of how much to periodically deposit for varying lengths of time. Set up a present value function and graph that function to depict the present values for this situation from 12 months to 240 months.



8. Geri wants \$30,000 at the end of five years in order to pay for new siding on her house. If her bank pays 2.2% interest compounded annually, how much does she have to deposit each year in order to have that amount?
\$5,741.74
9. Uncle Al wants to open an account for his nieces and nephews that he hopes will have \$100,000 in it after 25 years. How much should he deposit now into an account that yields 1.75% interest compounded monthly so he can be assured of meeting that goal amount?
\$64,585.43
10. Althea will need \$30,000 for her nursing school tuition in 18 months. She has a bank account that pays 2.45% interest compounded monthly. How much does she have to put in each month to have enough money for the tuition?
\$1,637.93
11. Art opened an account online that pays 2.8% interest compounded monthly. He has a goal of saving \$20,000 by the end of four years. How much will he need to deposit each month?
\$394.25
12. Anthony wants to repay the loan his parents gave him in three years. How much does he need to deposit into an account semi-annually that pays 3.25% interest twice a year in order to have \$35,000 to repay the loan?
\$5,600.81
13. Lorna needs \$40,000 for a down payment when she buys her boat in 4 years. How much does she need to deposit into an account that pays 4.15% interest compounded quarterly in order to meet her goal?
\$33,910.84

Graph the present value amounts for each situation.

14. How much should Sandy deposit each month into a 2.85% account, which compounds interest monthly, if she wants to save \$85,000? Use a span from year 0 to year 10 in months.



4-1**Introduction to Consumer Credit****Exercises**

1. Monique purchases a \$5,100 dining room set. She can't afford to pay cash, so she uses the installment plan, which requires an 18% down payment. How much is the down payment?
\$918
2. Joe wants to purchase an electric keyboard. The price of the keyboard at Macelli's, with tax, is \$2,344. He can save \$150 per month. How long will it take him to save for the keyboard?
about 16 months
3. Lisa purchases a professional racing bicycle that sells for \$3,000, including tax. It requires a \$200 down payment. The remainder, plus a finance charge, is paid back monthly over the next $2\frac{1}{2}$ years. The monthly payment is \$111.75. What is the finance charge?
\$552.50
4. The price of a stove is s dollars. Pedro makes a 10% down payment for a two-year installment purchase. The monthly payment is m dollars. Express the finance charge algebraically.
 $-0.9s + 24m$
5. Depot Headquarters has a new promotional payment plan. All purchases can be paid off on the installment plan with no interest, as long as the total is paid in full within twelve months. There is a \$25 minimum monthly payment required. If the Koslow family buys a hot tub for \$4,355, and they make only the minimum payment for 11 months, how much will they have to pay in the 12th month?
\$4,080
6. The White family purchases a new pool table on a no-interest-for-one-year plan. The cost is \$2,665. There is a d dollars down payment. If they make a minimum monthly payment of m dollars until the last month, express their last month's payment algebraically.
 $2,665 - d - 11m$
7. Snow-House sells a \$1,980 snow thrower on the installment plan. The installment agreement includes a 20% down payment and 12 monthly payments of \$161 each.
 - a. How much is the down payment?
\$396
 - b. What is the total amount of the monthly payments?
\$1,932
 - c. What is the total cost of the snow thrower on the installment plan?
\$2,328
 - d. What is the finance charge?
\$348
8. Carey bought a \$2,100 computer system on the installment plan. He made a \$400 down payment, and he has to make monthly payments of \$79.50 for the next two years. How much interest will he pay?
\$208

9. Mike bought a set of golf clubs that cost k dollars. He signed an installment agreement requiring a 5% down payment and monthly payments of g dollars for $1\frac{1}{2}$ years.
- Express his down payment algebraically.
 $0.05k$
 - How many monthly payments must Mike make?
18
 - Write expressions for the total amount of the monthly payments and the finance charge.
 $18g$; $18g - 0.95k$
10. Mrs. Grudman bought a dishwasher at a special sale. The dishwasher regularly sold for \$912. No down payment was required. Mrs. Grudman has to pay \$160 for the next six months. What is the average amount she pays in interest each month?
\$8
11. The Hut sells a \$2,445 entertainment system credenza on a six-month layaway plan.
- If the monthly payment is \$440, what is the sum of the monthly payments?
\$2,640
 - What is the fee charged for the layaway plan?
\$195
 - Where is the credenza kept during the six months of the layaway plan?
The Hut
12. Jessica has \$70,000 in the bank and is earning 5% compounded monthly. She plans to purchase a used car, for which the down payment is \$500 and the monthly payments are \$280.
- Will her monthly interest cover the cost of the down payment? Explain.
No. Her monthly interest is only \$291.69.
 - Will her monthly interest cover the cost of the monthly payment?
yes
13. Joseph purchased a widget that regularly sold for w dollars but was on sale at 10% off. He had to pay t dollars for sales tax. He bought it on the installment plan and had to pay 15% of the total cost with tax as a down payment. His monthly payments were m dollars per month for 3 years.
- Write expressions for the amount of the discount and the sale price.
 $0.1w$; $0.9w$
 - Write expressions for the total cost of the widget, with tax, and the down payment.
 $0.9w + t$
 - What was the total of all of the monthly payments? What was the total he paid for the widget on the installment plan?
 $36m$; $0.15(0.9w + t) + 36m$
 - What was the finance charge?
 $0.15(0.9w + t) + 36m - 0.9w$, or $-0.765w + 0.15t + 36m$

4-2 Loans

Exercises

Round to the nearest cent wherever necessary.

1. Refer to the table to find the monthly payments necessary to complete parts a - e.

a. What is the monthly payment for a \$3,200 five-year loan with an APR of 9%?
\$66.43

b. Mia borrows \$66,000 for four years at an APR of 7.25%. What is the monthly payment?
\$1,587.96

c. What is the total amount of the monthly payments for a \$6,100, two-year loan with an APR of 8.75%? Round to the nearest dollar.
\$6,671

d. The total of monthly payments for a 3-year loan is \$19,668.60. The APR is 7.75%. How much money was originally borrowed?
\$17,500

e. What is the finance charge for a \$7,000, two-year loan with a 6.75% APR?
\$502.88

2. Ray borrows b dollars over a $2\frac{1}{2}$ -year period. The monthly payment is m dollars. Express his finance charge algebraically.
 $30m - b$

3. Cecilia bought a new car. The total amount she needs to borrow is \$29,541. She plans to take out a 4-year loan at an APR of 6.3%. What is the monthly payment?
\$697.84

4. Claire needs to borrow \$12,000 from a local bank. She compares the monthly payments for an 8.1% loan for three different periods of time. What is the monthly payment for a one-year loan? a two-year loan? a five-year loan?
\$1,044.42; \$543.27; \$243.89

5. The Star Pawnshop will lend up to 45% of the value of a borrower's collateral. Ryan wants to use \$4,000 worth of jewelry as collateral for a loan. What is the maximum amount that he could borrow from Star?
\$1,800

6. Solomon is taking out a loan of x dollars for y years, that has a monthly payment of m dollars. Express the finance charge for this loan algebraically.
 $12my - x$

Table of Monthly Payments per \$1,000 of Principal

Rate	1 yr	2 yr	3 yr	4 yr	5 yr	10 yr
6.50%	86.30	44.55	30.65	23.71	19.57	11.35
6.75%	86.41	44.66	30.76	23.83	19.68	11.48
7.00%	86.53	44.77	30.88	23.95	19.80	11.61
7.25%	86.64	44.89	30.99	24.06	19.92	11.74
7.50%	86.76	45.00	31.11	24.18	20.04	11.87
7.75%	86.87	45.11	31.22	24.30	20.16	12.00
8.00%	86.99	45.23	31.34	24.41	20.28	12.13
8.25%	87.10	45.34	31.45	24.53	20.40	12.27
8.50%	87.22	45.46	31.57	24.65	20.52	12.40
8.75%	87.34	45.57	31.68	24.77	20.64	12.53
9.00%	87.45	45.68	31.80	24.89	20.76	12.67

7. Jeanne has a \$14,800, $3\frac{1}{2}$ -year loan with an APR of 8.56%.
- What is the monthly payment for this loan?
\$409.05
 - If she changes the loan to a 3-year loan, what is the monthly payment?
\$467.61
 - What is the difference in the monthly payments for the two loans?
\$58.56
 - Which loan has the higher finance charge? What is the difference in the finance charge for these two loans?
 $3\frac{1}{2}$ -year loan; \$346.14
 - Do you feel that it is worth paying the higher monthly payment to have the loan finish six months earlier?
Answers vary.
8. Liz found an error in the monthly payment her bank charged her for a four-year, \$19,500 loan. She took the loan out at an APR of 9%. Her bank was charging her \$495.26 per month.
- What is the correct monthly payment?
\$485.26
 - Liz noticed the error just before making the last payment. The bank told her that they would credit all of the overpayments and adjust her last month's payment accordingly. What should her last month's payment be after the adjustment? Explain.
\$15.26; Liz paid \$10 extra per month for 47 months, for a total of \$470. The correct monthly payment for the last month should have been \$485.26.
9. The Bartolotti family took out a loan to have a garage built next to their house. The ten-year, 10.4% loan was for \$56,188. The monthly payment was \$475, but the promissory note stated that there was a balloon payment at the end.
- How many monthly payments do the Bartolotti's have to make?
120
 - What is the sum of all but the last monthly payment?
\$56,525
 - If the finance charge is \$34,415.60, what must the total of all of the monthly payments be?
\$90,603.60
 - What is the amount of the balloon payment for the final month of this loan?
\$34,078.60
10. Christina is a police officer, so she can use the Police and Fire Credit Union. The credit union will lend her \$11,000 for three years at 8.05% APR. The same loan at her savings bank has an APR of 10.1%.
- How much would Christina save on the monthly payment if she takes the loan from the credit union?
\$10.51
 - How much would she save in finance charges by taking the loan from the credit union?
\$378.36

4-3 Loan Calculations and Regression

Exercises

- What is the monthly payment for a 10-year, \$20,000 loan at 4.625% APR? What is the total interest paid on this loan?
\$208.48; \$5,017.60
- Max is taking out a 5.1% loan in order to purchase a \$17,000 car. The length of the loan is five years. How much will he pay in interest?
\$2,295.40
- Merissa wants to borrow \$12,000 to purchase a used boat. After looking at her monthly budget, she realizes that all she can afford to pay per month is \$250. The bank is offering a 6.1% loan. What should the length of her loan be so that she can keep within her budget? Round to the nearest year.
5 years
- What is the total interest on a 15-year, 4.98% loan with a principal of \$40,000?
\$16,862
- Ansel wants to borrow \$10,000 from the Hampton County Bank. They offered him a 6-year loan with an APR of 6.35%. How much will he pay in interest over the life of the loan?
\$2,052.08
- Tom and Kathy want to borrow \$35,000 in order to build an addition to their home. Their bank will lend them the money for 12 years at an interest rate of $5\frac{3}{8}\%$. How much will they pay in interest to the bank over the life of the loan?
\$12,568.96

Use the Yearly Payment Schedule to answer Exercises 7 – 10.

Year	Principal Paid	Interest Paid	Loan Balance	Year	Principal Paid	Interest Paid	Loan Balance
							\$76,000.00
2011	\$3,702.31	\$3,158.45	\$72,297.69	2019	\$5,198.46	\$1,662.30	\$36,279.09
2012	\$3,862.78	\$2,997.98	\$68,434.91	2020	\$5,423.74	\$1,437.02	\$30,855.35
2013	\$4,030.18	\$2,830.58	\$64,404.73	2021	\$5,658.80	\$1,201.96	\$25,196.55
2014	\$4,204.85	\$2,655.91	\$60,199.88	2022	\$5,904.04	\$956.72	\$19,292.51
2015	\$4,387.07	\$2,473.69	\$55,812.81	2023	\$6,159.90	\$700.86	\$13,132.61
2016	\$4,577.18	\$2,283.58	\$51,235.63	2024	\$6,426.88	\$433.88	\$6,705.73
2017	\$4,775.56	\$2,085.20	\$46,460.07	2025	\$6,705.73	\$157.40	\$0.00
2018	\$4,982.52	\$1,878.24	\$41,477.55				

- What is the loan amount?
\$76,000
- What is the length of the loan?
15 years
- What is the monthly payment?
\$571.73
- What is the total interest over the loan's life?
\$26,911.40

11. Neville is considering taking out a \$9,000 loan. He went to two lending institutions. Sunset Park Company offered him a 10-year loan with an interest rate of 5.2%. Carroll Gardens Bank offered him an 8-year loan with an interest rate of 6.6%. Which loan will have the lowest interest over its lifetime?

the loan from Sunset Park Company

12. JFK Federal Bank offers a \$50,000 loan at an interest rate of 4.875% that can be paid back over 3 to 15 years.
- a. Write the monthly payment formula for this loan situation. Let t represent the number of years from 3 to 15 inclusive.

$$M = \frac{50,000 \left(\frac{0.04875}{12} \right) \left(1 + \frac{0.04875}{12} \right)^{12t}}{\left(1 + \frac{0.04875}{12} \right)^{12t} - 1}$$

- b. Write the total interest formula for this loan situation. Let t represent the number of years from 3 to 15 inclusive.

$$M = 12t \cdot \frac{50,000 \left(\frac{0.04875}{12} \right) \left(1 + \frac{0.04875}{12} \right)^{12t}}{\left(1 + \frac{0.04875}{12} \right)^{12t} - 1} - 50,000$$

Use the table of decreasing loan balances for a \$230,000 loan at 5.5% for 20 years.

13. Write a linear regression equation that models the data with numbers rounded to the nearest tenth.

$$y = -11,308.1x + 247,673.7$$

14. Write a quadratic regression equation that models the data with numbers rounded to the nearest tenth.

$$y = -307.3x^2 - 5,161.2x + 228,208.5$$

15. Write a cubic regression equation that models the data with numbers rounded to the nearest tenth.

$$y = -5.6x^3 - 139.6x^2 - 6,470.9x + 230,121.1$$

	Loan Balance
0	\$230,000.00
1	\$223,502.14
2	\$216,637.75
3	\$209,386.16
4	\$201,725.52
5	\$193,632.76
6	\$185,083.51
7	\$176,052.02
8	\$166,511.07
9	\$156,431.94
10	\$145,784.26
11	\$134,535.97
12	\$122,653.20
13	\$110,100.15
14	\$96,839.02
15	\$82,829.83
16	\$68,030.43
17	\$52,396.21
18	\$35,880.12
19	\$18,432.38
20	\$0.00

4-4 Credit Cards

Exercises

Round to the nearest cent wherever necessary.

- If the APR on a credit card is 22.2%, what is the monthly interest rate?
1.85%
- If the monthly interest rate on a credit card is p percent, express the APR algebraically.
 $12p$
- The average daily balance for Dave's last credit card statement was \$1,213.44, and he had to pay a finance charge. The APR is 20.4%. What is the monthly interest rate? What is the finance charge for the month?
1.7%; \$20.63
- Mr. Reis had these daily balances on his credit card for his last billing period. He did not pay the card in full the previous month, so he will have to pay a finance charge. The APR is 19.8%.

six days @ \$341.22	ten days @ \$987.45
three days @ \$2,122.33	eleven days @ \$2,310.10

 - What is the average daily balance?
\$1,456.66
 - What is the finance charge?
\$24.03
- Mrs. Fagin's daily balances for the past billing period are given below.

For five days she owed \$233.49.	For three days she owed \$651.11.
For nine days she owed \$991.08.	For seven days she owed \$770.00.
For seven days she owed \$778.25.	

 Find Mrs. Fagin's average daily balance.
\$738.01
- Mike Bauer had a daily balance of x dollars for d days, y dollars for 9 days, r dollars for 4 days, and m dollars for 5 days. Express his average daily balance algebraically.
 $\frac{dx + 9y + 4r + 5m}{18 + d}$
- Mrs. Cykman's credit card was stolen, and she did not realize it for several days. The thief charged a \$440 watch while using it. According to the Truth-in-Lending Act, at most how much of this is Mrs. Cykman responsible for paying?
\$50
- Mr. Kramden's credit card was lost on a vacation. He immediately reported it missing. The person who found it days later used it and charged c dollars worth of merchandise on the card, where $c > 50$. How much of the c dollars is Mr. Kramden responsible for paying?
\$0
- The average daily balance for Pete's credit card last month was a dollars. The finance charge was f dollars. Express the APR algebraically.
 $\frac{12f}{a}$

10. Brett and Andy applied for the same credit card from the same bank. The bank checked both of their FICO scores. Brett had an excellent credit rating, and Andy had a poor credit rating.
- Brett was given a card with an APR of 12.6%. What was his monthly percentage rate?
1.05%
 - Andy was given a card with an APR of 16.2%. What was his monthly percentage rate?
1.35%
 - If each of them had an average daily balance of \$7,980, and had to pay a finance charge, how much more would Andy pay than Brett?
\$23.94
11. A set of daily balances are expressed algebraically below.
 w days @ r dollars 5 days @ x dollars n days @ q dollars p days @ \$765
 If the APR is 21.6%, express the finance charge algebraically.

$$\frac{rw + 5x + nq + 765p}{5 + w + n + p} \text{ (0.018)}$$
12. Mrs. Imperiale's credit card has an APR of 13.2%. She does not ever pay her balance off in full, so she always pays a finance charge. Her next billing cycle starts today. The billing period is 31 days long. She is planning to purchase \$7,400 worth of new kitchen cabinets this month. She will use her tax refund to pay off her entire bill next month. If she purchases the kitchen cabinets on the last day of the billing cycle instead of the first day, how much would she save in finance charges? Round to the nearest ten dollars.
\$80
13. Pat's ending balance on his debit card last month was \$233.55. This month he had \$542 worth of purchases and \$710 worth of deposits. What is his ending balance for this month?
\$401.55
14. Tomika's credit rating was lowered, and the credit card company raised her APR from 18% to 25.2%.
- If her average daily balance this month is \$8,237, what is the increase in this month's finance charge due to the higher APR?
\$49.42
 - If this amount is typical of Tomika's average daily balance all year, how much would the rise in interest rate cost her in a typical year? Round to the nearest ten dollars.
\$590
15. Linda and Rob charged a \$67.44 restaurant bill on their credit card. They gave the card to the waitress, who accidentally transposed two digits and charged them \$76.44. They did not notice this until they received their statement later that month. Their card has an 18% APR.
- How much were Linda and Rob overcharged?
\$9
 - They plan to pay their monthly statement amount in full, but they need to deduct the amount they were overcharged, plus the finance charge that was based on the incorrect amount. If the overcharged amount was on their statement for 18 of the 31-day billing cycle, how much should they deduct from this monthly statement, including the amount they were overcharged?
\$9.08

4-5 Credit Card Statement

Exercises

1. The summary portion of Manny Ramira's credit card statement is shown. Determine the New Balance amount.

SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	1,237.56	\$1,200.00	\$2,560.67	\$0.00	\$9.56		

\$2,607.79

2. Lizzy has a credit line of \$9,000 on her credit card. Her summary is shown. What is her available credit balance?

SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	\$6,500.56	\$5,200.00	\$978.45	\$20.00	\$12.88		

\$6,688.11

3. Rich had a previous balance of x dollars and made an on-time credit card payment of y dollars where $y < x$. He has a credit line of 10,000 dollars and pays an APR of 15.4%. Rich made purchases totaling \$1,300.30. Write an algebraic expression that represents his current available credit.

$10,000 - (x - y + 0.0128x + 1,300.30)$

4. Determine the error that was made using the following summary statement.

SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	\$350.90	\$200.00	\$200.00	\$0.00	\$8.68	\$759.58	

The payment was added rather than subtracted.

5. Marianne has a credit card with a line of credit at \$15,000. She made the following purchases: \$1,374.90, \$266.21, 39.46, and \$903.01. What is Marianne's available credit?

\$12,416.42

6. Luke has a credit line of \$8,500 on his credit card. He had a previous balance of \$4,236.87 and made a \$3,200.00 payment. The total of his purchases is \$989.42. What is Luke's available credit?

\$6,473.71

7. The APR on Ramona's credit card is currently 24.6%. What is the monthly periodic rate?

2.05%

8. Sheila's monthly periodic rate is 2.41%. What is her APR?

28.92%

9. Examine the summary section of a monthly credit card statement. Calculate the new balance.

SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	\$876.34	\$800.00	\$1,009.56	\$30.00	\$29.67		\$18.00

\$1,145.57

10. Jack set up a spreadsheet to model his credit card statement. The summary statement portion of the spreadsheet is shown. Write the formula for available credit that would be entered in cell J32.

	D	E	F	G	H	I	J
31	Previous Balance	Payments	New Purchases	Late Charge	Finance Charges	Credit Line	Available Credit
32							

I32 – (D32 – E32 + F32 + G32 + H32)

11. Use the credit card statement to answer the questions below.

Liam DeWitt				6915 Maple Creek Dr. West Chester, OH			
ACCOUNT INFORMATION							
Account Number		4-10700000		Billing Date		13 Sept	
				Payment Due		30 Sept	
TRANSACTIONS						DEBITS / CREDITS (-)	
22 Aug	Propane Home Heat					\$250.50	
23 Aug	TJ Marsha's Department Store					\$87.60	
25 Aug	Brighton University					\$1,300.00	
1 Sept	Middle Island Auto Parts					\$470.63	
2 Sept	Payment					-\$2,000.00	
3 Sept	Al's Mobal Gas Station					\$34.76	
5 Sept	Stop, Shop and Go					\$102.71	
10 Sept	Federal Express					\$45.90	
12 Sept	Computer Depot					\$848.60	
SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	\$3,240.50			\$0.00			\$30.00
Total Credit Line				Average Daily Balance	# Days in Billing Cycle	APR	Monthly Periodic Rate
Total Available Credit					30	19.8%	
Credit Line for Cash							
Available Credit for Cash							

- How many purchases (debits) were made during the billing cycle?
8
- What is the sum of all purchases (debits) made during the billing cycle?
\$3,140.70
- When is the payment for this statement due?
September 30
- What is the minimum amount that can be paid?
\$30.00
- How many days are in the billing cycle?
30
- What is the previous balance?
\$3,240.50

4-6 Average Daily Balance

Exercises

Use Liam DeWitt's FlashCard statement and the blank credit calendar for Exercises 1 – 4.

Liam DeWitt				6915 Maple Creek Dr. West Chester, OH			
ACCOUNT INFORMATION							
Account Number	4-10700000			Billing Date	13 Sept	Payment Due	30 Sept
TRANSACTIONS						DEBITS / CREDITS (-)	
22 Aug	Propane Home Heat					\$250.50	
23 Aug	TJ Marsha's Department Store					\$87.60	
25 Aug	Brighton University					\$1,300.00	
1 Sept	Middle Island Auto Parts					\$470.63	
2 Sept	Payment					- \$2,000.00	
3 Sept	Al's Mobal Gas Station					\$34.76	
5 Sept	Stop, Shop and Go					\$102.71	
10 Sept	Federal Express					\$45.90	
12 Sept	Computer Depot					\$848.60	
SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	\$3,240.50			\$0.00			\$30.00
Total Credit Line				\$ 5,000.00	Average Daily Balance	# Days in Billing Cycle	APR
Total Available Credit				\$ 5,000.00		30	19.8%
Credit Line for Cash				\$ 4,000.00			Monthly Periodic Rate
Available Credit for Cash				\$ 4,000.00			

\$3,240.50	\$3,240.50	\$3,240.50	\$3,240.50	\$3,240.50	\$3,240.50	\$3,240.50
(15)	(16)	(17)	(18)	(19)	(20)	(21)
+250.50	+87.60		+1,300.00			
\$3,491.00	\$3,578.60	\$3,578.60	\$4,878.60	\$4,878.60	\$4,878.60	\$4,878.60
(22)	(23)	(24)	(25)	(26)	(27)	(28)
\$4,878.60	\$4,878.60	\$4,878.60	+470.63	-2,000.00	+34.76	
(29)	(30)	(31)	\$5,349.23	\$3,349.23	\$3,383.99	\$3,383.99
(1)	(2)	(3)	(4)	(5)	(6)	(7)
+102.71					+45.90	
\$3,486.70	\$3,486.70	\$3,486.70	\$3,486.70	\$3,486.70	\$3,532.60	\$3,532.60
(8)	(9)	(10)	(11)	(12)	(13)	(14)
+848.60						
\$4,381.20	\$4,381.20					

- What is Liam's average daily balance?
\$3,873.65
- What is Liam's monthly periodic rate?
1.65%
- What is Liam's finance charge?
\$63.92
- What is Liam's new balance?
\$4,445.12
- What is Liam's available credit?
\$554.88

Use Shannon Houston's credit card statement and the blank calendar for Exercises 6 – 11.

Shannon Houston				720 Timber Trail Dr Indianapolis, IN			
ACCOUNT INFORMATION							
Account Number		16677289-02		Billing Date		6 Apr	
				Payment Due		30 Apr	
TRANSACTIONS						DEBITS / CREDITS (-)	
9 Mar	Gingham Pastry Shop			\$27.68			
11 Mar	Corner Clothes			\$127.35			
16 Mar	Le Petite Menu			\$87.40			
22 Mar	Payment			- \$190.60			
26 Mar	Dutchess Pharmacy			57.30			
28 Mar	Sparrow Jewelers			\$325.90			
4 Apr	Elder's Antiques			\$870.21			
SUMMARY	Previous Balance	Payments / Credits	Transactions	Late Charge	Finance Charge	New Balance	Minimum Payment
	\$560.30			\$0.00			\$25.00
Total Credit Line			\$ 5,000.00	Average Daily Balance	# Days in Billing Cycle	APR	Monthly Periodic Rate
Total Available Credit							
Credit Line for Cash			\$ 4,000.00		30	15.6%	
Available Credit for Cash			\$ 4,000.00				

\$560.30	$\frac{+27.68}{\$587.98}$	\$587.98	$\frac{+127.35}{\$715.33}$	\$715.33	\$715.33	\$715.33
8	9	10	11	12	13	14
\$715.33	$\frac{+87.40}{\$802.73}$	\$802.73	\$802.73	\$802.73	\$802.73	\$802.73
15	16	17	18	19	20	21
$\frac{-190.60}{\$612.13}$	\$612.13	\$612.13	\$612.13	$\frac{+57.30}{\$669.43}$	\$669.43	$\frac{+325.90}{\$995.33}$
22	23	24	25	26	27	28
\$995.33	\$995.33	\$995.33	\$995.33	\$995.33	\$995.33	$\frac{+870.21}{\$1,865.54}$
29	30	31	1	2	3	4
\$1,865.54	\$1,865.54					
5	6					

6. What amount should be in the box for Payment/Credits?
\$190.60
7. What amount should be in the box for Transactions?
\$1,495.84
8. What is Shannon's average daily balance?
\$882.69
9. What is Shannon's finance charge?
\$11.47
10. What is Shannon's new balance?
\$1,877.01
11. What is Shannon's available credit?
\$3,122.99

5-1 Classified Ads

Exercises

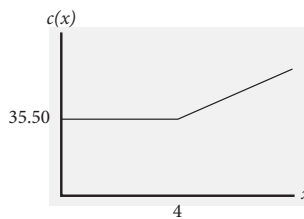
1. Enrique plans to sell his car and places a 6-line ad. His paper charges \$42 for the first two lines and \$6.75 per extra line, to run the ad for one week. What will Enrique's ad cost to run for three weeks?

\$207

2. The following piecewise function gives the cost, $c(x)$, of a classified ad in a car magazine.

$$c(x) = \begin{cases} 35.50 & \text{when } x \leq 4 \\ 35.50 + 5.25(x - 4) & \text{when } x > 4 \end{cases}$$

- a. Graph the function.



- b. If x is the number of lines in the ad, what is the cost of each extra line?

\$5.25

- c. Is the cost of one line the same as the cost of four lines?

yes

3. Griffith purchased a used car for \$9,400. He paid $6\frac{1}{2}\%$ sales tax. How much tax did he pay?

\$611

4. Ms. Boyrer is writing a program to compute ad costs. She needs to enter an algebraic representation of the costs of a local paper's ad. The charge is \$32.25 for up to three lines for a classified ad. Each additional line costs \$6. Express the cost of an ad $f(x)$ with x lines as a function of x algebraically.

$$f(x) = \begin{cases} 32.50 & \text{when } x \leq 3 \\ 32.50 + 6(x - 3) & \text{when } x > 3 \end{cases}$$

5. The Fort Salonga News charges \$29.50 for a classified ad that is four or fewer lines long. Each line above four lines costs an additional \$5.25. Express the cost of an ad algebraically as a piecewise function.

$$c(x) = \begin{cases} 29.50 & \text{when } x \leq 4 \\ 29.50 + 5.25(x - 4) & \text{when } x > 4 \end{cases}$$

6. Roxanne set up the following split function which represents the cost of an auto classified ad from her hometown newspaper.

$$f(x) = \begin{cases} 31.50 & \text{when } x \leq 5 \\ 31.50 + 5.50(x - 5) & \text{when } x > 5 \end{cases}$$

If x is the number of lines in the ad, express the price $c(x)$ of a classified ad from this paper in words.

The cost is \$31.50 for five or fewer lines, and \$5.50 for each additional line.

7. Dr. Mandel purchased a used car for \$11,325. Her state charges 8% tax for the car, \$53 for license plates, and \$40 for a state safety and emissions inspection. How much does she need to pay for these extra charges, not including the price of the car?

\$999

8. LEEANNE plans to sell her car and places an x -line ad. The newspaper charges p dollars for the first k lines and e dollars per extra line, to run the ad for a week.

a. When $x > k$, write an algebraic expression for the cost of running the ad for a week.
 $p + e(x - k)$

b. When $x < k$, write an algebraic expression for the cost of running the ad for two weeks.
 $2p$ dollars

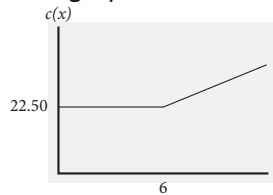
9. A local *Pennysaver* paper charges f dollars for a five-line classified ad. Each additional line costs a dollars. Express the cost of an eight-line ad algebraically.

$f + 3a$

10. Graph the piecewise function: $f(x) = \begin{cases} 22.50 & \text{when } x \leq 6 \\ 22.50 + 5.75(x - 6) & \text{when } x > 6 \end{cases}$

What are the coordinates of the cusp? What is the slope of the graph where $x > 6$? What is the slope of the graph where $x < 6$?

**$(6, 22.50)$; when $x > 6$, slope = 5.75;
 when $x < 6$, slope = 0**



11. Mr. Ciangiola placed this ad in the *Collector Car Digest*:

2007 Chevrolet HHR SUV. Orange, 4 cyl.
 automatic, leather, chrome wheels, wood
 trim, running boards, PS, PB, AM/FM/CD.
 Mint! \$18,500. 555-7331.

a. If the newspaper charges \$45 for the first four lines and \$7 for each extra line, how much will this ad cost?
\$45

b. Sue buys the car for 5% less than the advertised price. How much does she pay?
\$17,575

c. Sue must pay her state 4% sales tax on the sale. How much must she pay in sales tax?
\$703

12. Express the classified ad rate, \$36 for the first four lines and \$4.25 for each additional line, as a piecewise function. Use a "Let" statement to identify what x and y represent.

Let x = number of lines in the ad; let $c(x)$ = cost of the ad

$c(x) = \begin{cases} 36 & \text{when } x \leq 4 \\ 36 + 4.25(x - 4) & \text{when } x > 4 \end{cases}$

13. The following piecewise function represents the cost of an x -line classified ad from the *Rhinebeck Register*.

$$f(x) = \begin{cases} D & \text{when } x \leq w \\ D + K(x - w) & \text{when } x > w \end{cases}$$

a. What is the cost of a p -line ad, if $p < w$?
 D dollars

b. What is the cost of a b -line ad, if $b > w$?
 $D + K(b - w)$

c. Find the total cost, with 6% sales tax, of a w -line ad.
 $1.06D$

5-2 Buy or Sell a Car

Exercises

- Find the mean, median, mode, and range for each data set given.
 - 5, 4, 6, 7, 6, 7, 8, 7
**mean = 6.25; median = 6.5;
 mode = 7; range = 3**
 - 112, 122, 132, 142, 152
**mean = 132; median = 132;
 mode = none; range = 40**
 - 34, 56, 44, 200
**mean = 83.5; median = 50;
 mode = none; range = 166**
 - 88, 76, 99, 71, 80
**mean = 82.8; median = 80;
 mode = none; range = 28**
- Billy is looking to sell his Camaro. He compiles these prices from the newspaper for cars just like his: \$2,000; \$19,900; \$18,100; \$17,500; and \$20,000.
 - Why is it more reasonable for Billy to use the median, rather than the mean, to get a reasonable estimated price for his car?
There is an extremely low price, and the median is resistant to extreme scores.
 - What is the difference between the mean and the median?
The mean is \$15,500 and the median is \$18,100, so the difference is \$2,600.
- The following automobile prices are listed in descending order: $a, b, c, d, x, y,$ and w . Express the difference between the median and the mean of these prices algebraically.

$$d - \frac{a + b + c + d + x + y + w}{7}$$
- A local charity wants to purchase a classic 1956 Thunderbird for use as a prize in a fundraiser. They find the following eight prices in the paper.

\$48,000	\$57,000	\$31,000	\$58,999
\$61,200	\$59,000	\$97,500	\$42,500

 - What is the best measure of central tendency to use to get a reasonable estimate for the cost of the car? Explain.
The median because there is an extremely high price.
 - What is the range?
\$66,500
- Carol has taken three tests this quarter in her Financial Algebra class. Her grades for the three tests were 91, 81, and 78. What grade does she need on the fourth test to have an 85 test average?
90
- Find the value of x that will make the mean of the following data set equal to 80.
 78, 90, 88, 70, x
74
- Create an original set of five numbers with mean 20.
Answers vary.
- Create an original set of five numbers such that the lowest number is 10, the highest is 50, and the mean is 20.
Answers vary.

9. Given is the list of prices for a set of used original hubcaps for a 1957 Chevrolet. They vary depending on the condition. Find the following statistics for the hubcap prices.

\$120 \$50 \$320 \$220 \$310 \$100 \$260 \$300 \$155 \$125
 \$600 \$250 \$200 \$200 \$125

- | | |
|--|--|
| a. mean, to the nearest dollar
\$222 | b. median
\$200 |
| c. mode
\$125 and \$200 | d. four quartiles
\$125, \$200, \$300, \$600 |
| e. range
\$550 | f. interquartile range
\$175 |
| g. boundary for the lower outliers; any lower outliers
\$137.5; none | |
| h. boundary for the upper outliers; any upper outliers
\$562.5; yes, \$600 | |

10. The data below gives the MPG ratings for cars owned by 15 Placid High School seniors. Find the following statistics about the MPG ratings.

15.9, 17.8, 21.6, 25.2, 31.1, 29, 28.6, 32, 34, 14, 19.8, 19.5, 20.1, 27.7, 25.5

- | | |
|--|---|
| a. mean
24.12 | b. median
25.2 |
| c. median of the lowest seven scores
19.5 | d. lower quartile, Q_1
19.5 |
| e. median of the highest seven scores
29 | f. upper quartile, Q_3
29 |
| g. interquartile range
9.5 | h. range
20 |
| i. boundary for the upper outliers
43.25 | j. boundary for the lower outliers
5.25 |
| k. How many outliers are in this data set?
0 | |

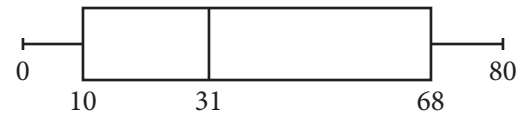
11. The following scores are written in ascending order: $a, b, c, d, e, f, g, h,$ and i .

- a. What measure of central tendency does score e represent?
median
- b. What measure of central tendency is represented by $\frac{a+b+c+d+e+f+g+h+i}{9}$?
mean
- c. Which quartile is represented by $\frac{b+c}{2}$?
 Q_1

5-3 Graph Frequency Distributions

Exercises

1. The boxplot summarizes information about the numbers of hours worked in December for 220 seniors at Tomah High School.



- a. What is the range? What is the interquartile range?
80; 58
- b. What percent of the students worked 68 or more hours?
25%
- c. How many students worked 31 hours or less?
110
- d. Does the boxplot give the median of the distribution? What is the median?
yes; 31

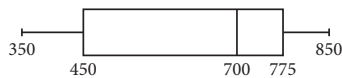
2. Jerry is looking to purchase a set of used chrome wheels for his SUV. He found 23 ads for the wheels he wants online and in the classified ads of his local newspaper and arranged the prices in ascending order, which is given below.

\$350 \$350 \$350 \$420 \$450 \$450 \$500 \$500 \$500 \$500
 \$600 \$700 \$725 \$725 \$725 \$725 \$725 \$775 \$775 \$800
 \$825 \$825 \$850

- a. Make a frequency table to display the data.

Prices	\$350	\$420	\$450	\$500	\$600	\$700	\$725	\$775	\$800	\$825	\$850
Frequency	3	1	2	4	1	1	5	2	1	2	1

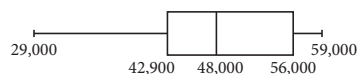
- b. Find the mean.
615
- c. Draw a box-and-whisker plot for the data.



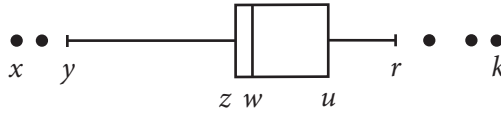
3. Collector Car Magazine has a listing for many Chevrolet Nomads.

- a. Find the total frequency.
18
- b. Find the range.
\$30,000
- c. Find the mean to the nearest cent.
\$47,494.44
- d. Draw a box-and-whisker plot for the data.

Price	Frequency
\$29,000	2
\$34,000	1
\$35,000	1
\$42,900	1
\$48,000	5
\$51,000	3
\$56,000	1
\$59,000	4

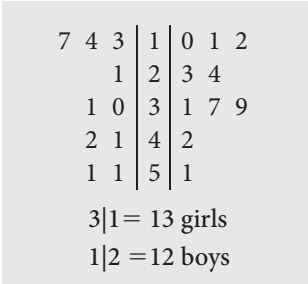


4. Used the modified boxplot to determine if Statements a - g are True or False. When the statement is false, explain.



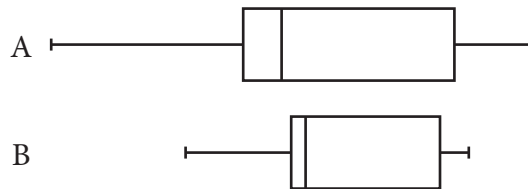
- a. The range is $r - y$.
False; range is $k - x$.
- b. 25% of the scores are at or below y .
False; Q_1 is z .
- c. The interquartile range is $u - z$.
true
- d. The median is w .
true
- e. The boundary for upper outliers is r .
False; r is the highest score that is not an outlier.
- f. The boundary for lower outliers is y .
False; y is the lowest score that is not an outlier.

5. The back-to-back stem-and-leaf plot gives data about girls on the left and boys on the right. It shows the number of girls and boys at each high school in Greene County who purchased their own cars with money they earned working.



- a. How many high schools are in Greene County?
10
- b. What is the mean number of girls who bought their own cars?
31.1
- c. What is the mean number of boys who bought their own cars?
28
- d. Find the median of the distribution of girls.
30.5
- e. Find the range of the distribution of boys.
41

6. The side-by-side boxplots for distributions A and B were drawn on the same axes.



- a. Which distribution has the greater range?
A
- b. Which distribution has the lower first quartile?
A
- c. Which distribution has the smallest interquartile range?
B
- d. What percent of the scores in distribution A is above distribution B's maximum score?
25%
- e. Which distribution has scores that are the most varied?
A
- f. What percent of scores in distribution A are less than distribution B's first quartile?
50%

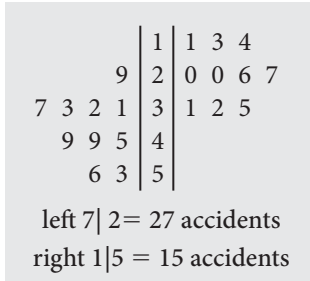
5-4 Automobile Insurance

Exercises

- Mr. Cousins has 100/300 bodily injury insurance. He was in an auto accident caused by his negligence. Five people were injured in the accident. They sued in court and were awarded money. One person was awarded \$150,000, and each of the other two was awarded \$95,000. How much will the insurance company pay for these lawsuits?
\$290,000
- Ronaldo has 50/250 BI liability insurance. He loses control of his car and injures 18 children in a Little League game, and each child is awarded \$20,000 as a result of a lawsuit. How much will the insurance company pay in total for this lawsuit? How much will Ronaldo be personally responsible for?
\$250,000
- Cai's annual premium is p dollars. If she pays her premium semiannually, there is a 1% surcharge on each payment. Write an expression for the amount of her semiannual payment.
$$\frac{1.01p}{2}$$
- Jake has \$25,000 worth of property damage insurance and \$1,000-deductible collision insurance. He caused an accident that damaged a \$2,000 sign, and he also did \$2,400 worth of damage to another car. His car had \$2,980 worth of damage done.
 - How much will the insurance company pay under Jake's property damage insurance?
\$4,400
 - How much will the insurance company pay under Jake's collision insurance?
\$1,980
 - How much of the damage must Jake pay for?
\$1,000
- Allen Siegell has a personal injury protection policy that covers each person in, on, around, or under his car for medical expenses up to \$50,000. He is involved in an accident and five people in his car are hurt. One person has \$3,000 of medical expenses, three people each have \$500 worth of medical expenses, and Allen himself has medical expenses totaling \$62,000. How much money must the insurance company pay out for these five people?
\$54,400
- The Chow family just bought a second car. The annual premium would have been a dollars to insure the car, but they are entitled to a 12% discount since they have another car insured by the company.
 - Express their annual premium after the discount algebraically.
 $a - 0.12a = 0.88a$
 - If they pay their premium semiannually, and have to pay a b dollars surcharge for this arrangement, express their quarterly payment algebraically.
$$\frac{0.88a}{2} + b$$

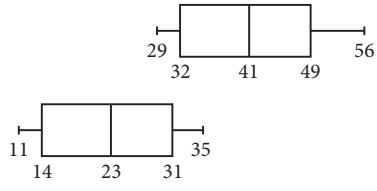
7. Mrs. Lennon has 100/275/50 liability insurance and \$50,000 PIP insurance. During an ice storm, she hits a fence and bounces into a store front with 11 people inside. Some are hurt and sue her. A passenger in Mrs. Lennon’s car is also hurt.
- The store front will cost \$24,000 to replace. There was \$1,450 worth of damage to the fence. What insurance will cover this, and how much will the company pay?
Property damage; \$25,450
 - A professional soccer player was in the store, and due to the injuries, he can never play soccer again. He sues for \$3,000,000 and is awarded that money in court. What type of insurance covers this, and how much will the insurance company pay?
\$100,000 under BI
 - The passenger in the car had medical bills totaling \$20,000. What type of insurance covers this, and how much will the insurance company pay?
\$20,000 under PIP
 - The 11 people in the store are hurt and each requires \$12,000 or less for medical attention. Will the company pay for all of these injuries?
Yes, under PIP

8. In 2000, Roslyn High School instituted a safe driver course for all students who have licenses. They want to statistically analyze if the course is working. The back-to-back stem-and-leaf plot gives the annual number of car accidents involving Roslyn students. The numbers on the extreme left show the units digit for the years 1990-1999. The numbers on the right show the units digit for the years 2000-2009.



- What is the mean number of annual accidents for the years 1990-1999? the years 2000-2009?
41.4; 22.9
- What is the range of the annual accident figures for the years 1990-1999? the years 2000-2009?
27; 24

e. Draw side-by-side box-and-whisker plots based on the stem-and-leaf plot. Copy the boxplots under each other, to scale, so they are lined up.



f. What do the side-by-side boxplots tell about the safe driver program that Roslyn high School instituted? Explain.

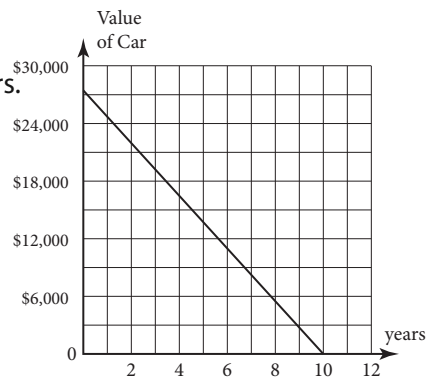
The program was a success because the number of accidents decreased.

9. Manuel has x dollar-deductible collision insurance. His car is involved in an accident, and has w dollars worth of damage to it, where $x > w$. How much must the insurance company pay him for the damages?
\$0

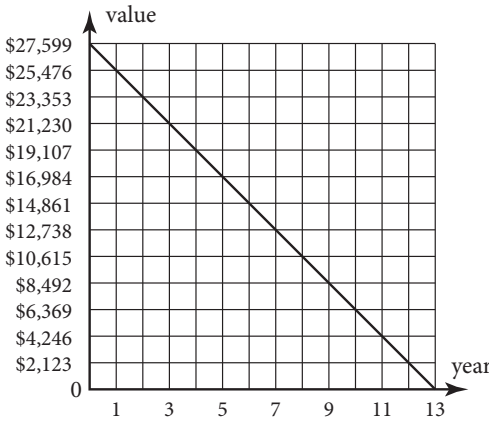
5-5 Linear Automobile Depreciation

Exercises

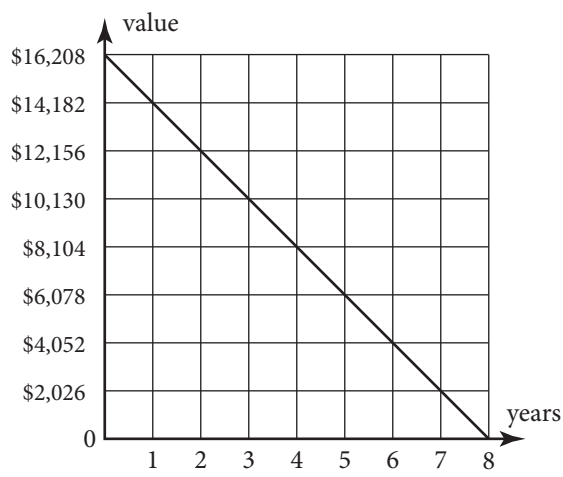
- Jason purchased a car for \$22,995. According to his research, this make and model of car loses all of its marketable value after 9 years. If this car depreciates in a straight line form, what are the intercepts of the depreciation equation?
(0, 22,995) and (9, 0)
- Suppose that Phyllis knows that her car straight line depreciates at a rate of \$1,997 per year over an 11-year period. What was the original price of her car?
\$21,967
- Ina's car straight line depreciates at a rate of D dollars per year. Her car originally cost C dollars. What are the intercepts of the straight line depreciation equation?
(0, C) and ($\frac{C}{D}$, 0)
- A new car sells for \$29,250. It straight line depreciates in 13 years. What is the slope of the straight line depreciation equation?
-2,250
- A new car straight line depreciates according to the equation $y = -1,875x + 20,625$.
 - What is the original price of the car?
\$20,625
 - How many years will it take for this car to fully straight line depreciate?
11
- Write and graph a straight line depreciation equation for a car that was purchased at \$27,450 and completely depreciates after 10 years.
 $y = -2,745x + 27,450$
- Caroline purchased a car four years ago at a price of \$28,400. According to research on this make and model, similar cars have straight line depreciated to zero value after 8 years. How much will this car be worth after 51 months?
\$13,312.50
- The straight line depreciation equation for a luxury car is $y = -4,150x + 49,800$. In approximately how many years will the car's value drop by 30%?
3.6



9. Katie purchased a new car for \$27,599. This make and model straight line depreciates for 13 years.
- Identify the coordinates of the x- and y-intercepts for the depreciation equation.
(0, 27,599) and (13, 0)
 - Determine the slope of the depreciation equation.
-2,123
 - Write the straight line depreciation equation that models this situation.
 $y = -2,123x + 27,599$
 - Draw the graph of the straight line depreciation equation.

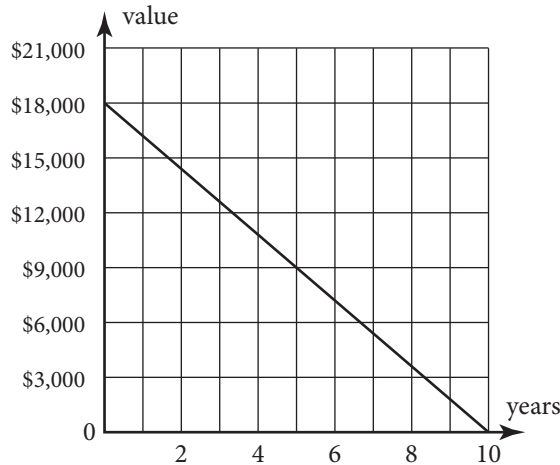


10. Geoff purchased a used car for \$16,208. This make and model used car straight line depreciates after 8 years.
- Identify the coordinates of the x- and y-intercepts for the depreciation equation.
(0, 16,208) and (8, 0)
 - Determine the slope of the depreciation equation.
-2,026
 - Write the straight line depreciation equation that models this situation.
 $y = -2,026x + 16,208$
 - Draw the graph of the straight line depreciation equation.



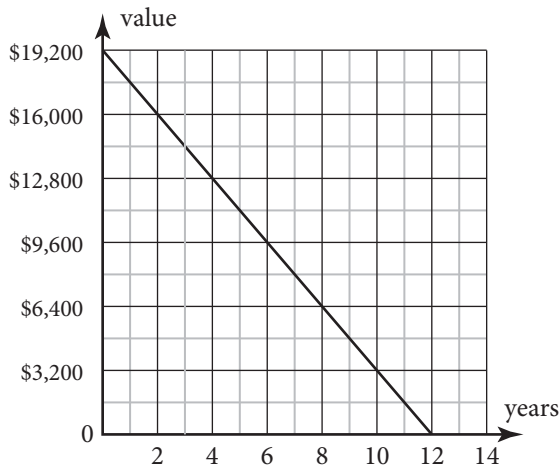
11. The straight line depreciation equation for a truck is $y = -4,265x + 59,710$.
- What is the original price of the car?
\$59,710
 - How much value does the car lose per year?
\$4,265
 - How many years will it take for the car to totally depreciate?
14

12. Examine the straight line depreciation graph for a car.



- At what price was the car purchased?
\$18,000
 - After how many years does the car totally depreciate?
10
 - Write the equation of the straight line depreciation graph shown.
 $y = -1,800x + 18,000$
13. The straight line depreciation equation for a car is $y = -2,682x + 32,814$.
- What is the car worth after 6 years?
\$16,092
 - What is the car worth after 12 years?
\$0
 - Suppose that T represents a length of time in years when the car still has value. Write an algebraic expression to represent the value of the car after T years.
 $-2,682x + 32,814$
 - Suppose that after a years, the car depreciates to b dollars. Write an algebraic expression for a .
 $\frac{b - 32,814}{-2,682}$

14. The graph of a straight line depreciation equation is shown.



- a. Use the graph to approximate the value of the car after 4 years.
\$12,800
- b. Use the graph to approximate the value of the car after 5 years.
\$11,200
- c. Use the graph to approximate when the car will be worth half its original value.
6 years

15. Tom purchased a new car for \$36,000. He has determined that it straight line depreciates over 12 years. When he purchased the car, he made a \$6,000 down payment and financed the rest with a five-year loan where he pays \$610 per month.

- a. Create an expense and depreciation function where x represents the number of months.
Depreciation: $y = -250x + 36,000$; Expense: $y = 610x + 6,000$
- b. After how many months will the amount invested in the car be equal to the value of the car? Round your answer to the nearest month.
35 months

5-6 Historical and Exponential Depreciation

Exercises

1. Tanya's new car sold for \$23,856. Her online research indicates that the car will depreciate exponentially at a rate of $6\frac{3}{8}\%$ per year. Write the exponential depreciation formula for Tanya's car.

$$y = 23,856(1 - 0.06375)^x$$

2. The screen to the right is from a graphing calculator after running an exponential regression analysis of a set of automobile data. X represents years and y represents car value. Using the numbers on the screen, write the exponential regression equation.

$$y = 43,754.00257(0.8223288103)^x$$

```
ExpReg
y=a*b^x
a=43754.00259
b=.8223288103
r^2=.8405850061
r=-.9168342304
```

3. The screen to the right is from a graphing calculator after running an exponential regression analysis of a set of automobile data. The variable x represents years and y represents car value. What is the annual depreciation percentage for this car? Round your answer to the nearest tenth of a percent.

11.4%

```
ExpReg
y=a*b^x
a=26092.73333
b=.8865688485
r^2=.9616674348
r=-.9806464372
```

4. Sharon purchased a used car for \$24,600. The car depreciates exponentially by 8% per year. How much will the car be worth after 5 years? Round your answer to the nearest penny.

\$16,213.41

5. Brad purchased a five-year old car for \$14,200. When the car was new, it sold for \$24,000. Find the depreciation rate to the nearest hundredth of a percent.

9.96%

6. Lyle's new car cost him \$28,000. He was told that this make and model depreciates exponentially at a rate of 11.5% per year. How much will his car be worth after 57 months?

\$15,672.51

7. Gina bought a used car for A dollars. B years ago, when the car was new, it sold for C dollars. Express the depreciation rate in terms of A , B , and C .

$$1 - \left(\frac{A}{C}\right)^{\frac{1}{B}}$$

8. A car exponentially depreciates at a rate of 8.5% per year. Mia purchased a 4-year-old car for \$17,500. What was the original price of the car when it was new? Round your answer to the nearest thousand dollars.

\$25,000

9. Nancy and Bob bought a used car for \$22,800. When this car was new, it sold for \$30,000. If the car depreciates exponentially at a rate of 9.2% per year, approximately how old is the car? Round your answer to the nearest hundredth of a year.

2.84 years

10. A car originally sold for \$21,000. It depreciates exponentially at a rate of 6.2% per year. When purchasing the car, Jon put \$5,000 down and pays \$3,000 per year to pay off the balance.

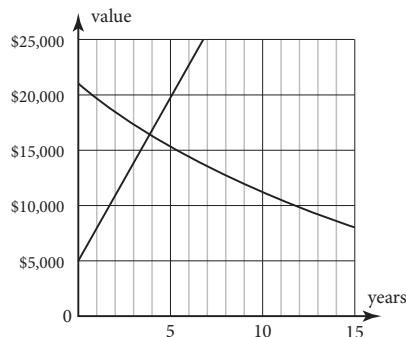
a. Write the exponential depreciation equation. Write the expense equation.

$y = 21,000(1 - 0.062)^x$; $y = 3,000x + 5000$

b. Graph these two equations on the same axes.

c. After how many years will his car value equal the amount he paid to date for the car? Round your answer to the nearest year.

4 years



d. What is the approximate value of the car at this point?

\$16,500

11. The historical prices of a car are recorded for 12 years as shown.

Age	Value	Age	Value	Age	Value
0	\$21,000	4	\$12,500	8	\$4,300
1	\$19,225	5	\$10,200	9	\$3,000
2	\$17,700	6	\$8,700	10	\$2,100
3	\$15,000	7	\$6,200	11	\$1,000

a. Determine the exponential depreciation equation that models this data. Round to the nearest hundredth.

$y = 30,153.99(0.77)^x$

b. Determine the depreciation rate.

approximately 22.89%

12. The car that Dana bought is 5 years old. She paid \$11,100. This make and model depreciates exponentially at a rate of 10.25% per year. What was the original price of the car when it was new?

\$19,061

13. Arnold bought a three-year old car. He paid A dollars for it. This make and model depreciates at a rate of D percent per year. Write an expression for the original selling price of the car when it was new.

$\frac{A}{(1 - \frac{D}{100})^3}$

14. A new car sells for \$31,400. It exponentially depreciates at a rate of 4.95% to \$26,500. How long did it take for the car to depreciate to this amount? Round your answer to the nearest tenth of a year.

3.3 years

5-7 Driving Data

Exercises

1. A car travels at an average rate of speed of 60 miles per hour for $7\frac{1}{2}$ hours. How many miles does this car travel?

450

2. A car travels m miles in t hours. Express its average speed algebraically.

$$\frac{m}{t}$$

3. Juanita has a hybrid car that averages 44 miles per gallon. Her car has a 12-gallon tank. How far can she travel on one full tank of gas?

about 528 miles

4. Ruth is planning a 1,543-mile trip to a math teachers' conference in San Diego. She plans to average 50 miles per hour on the trip. At that speed, for how many hours will she be driving? Express your answer to the nearest hour.

31

5. Lisa is a trucker and needs to keep track of her mileage for business purposes. She begins a trip with an odometer reading of x miles and ends the trip with an odometer reading of y miles.

- a. Express the total number of miles covered algebraically.

$$y - x$$

- b. If the trip takes h hours of driving, express the average speed algebraically.

$$\frac{y - x}{h}$$

- c. If the truck used g gallons of gas during the trip, express the mpg the truck averaged during the trip algebraically.

$$\frac{y - x}{g}$$

- d. If gas costs c dollars per gallon, write an algebraic expression that represents the fuel expense for the trip.

$$cg$$

6. Abby's car gets approximately 24 miles per gallon. She is planning a 1,200-mile trip.

- a. About how many gallons of gas should she plan to buy?

50

- b. At an average price of \$4.20 per gallon, how much should she expect to spend for gas?

\$210

7. Sarah drives at an average speed of s miles per hour for h hours. Express algebraically the number of miles she covers.

$$sh$$

8. Raquel is driving from New York City to Daytona, Florida, a distance of 1,034 miles. How much time is saved by doing the trip at an average speed of 60 mph as compared with 55 mph? Round to the nearest half-hour.

1.5 hours

9. Complete the table. Round entries to the nearest hundredth.

Distance (mi)	Rate (mph)	Time (hours)	MPG	Gallons Used	Price per gallon (\$)	Cost for Fuel (\$)
200	40	a. 5	b. 16.67	12	4.33	c. 51.96
d. 330	55	6	20	e. 16.5	G	f. 16.5G
1,000	60	g. 16.67	h. 22.03	45.4	i. $\frac{T}{45.4}$	T
1,000	r	j. $\frac{1,000}{r}$	x	k. $\frac{1,000}{x}$	G	l. $\frac{1,000G}{x}$

10. Monique is away at college, and needs something from home, 625 miles away. She arranges to meet her father at a location in between home and college, so he can drop off the item.

a. Monique averages 55 mph, and her part of the trip takes h hours. Represent the miles she covered algebraically.

$55h$

b. Her father takes 2 more hours than Monique to make his part of the trip, and his average speed is 50 mph. Represent the distance he covered algebraically.

$50(h + 2)$

c. What is the sum of the distances they covered, expressed algebraically, using your answers from parts a and b?

$105h + 100$

d. What is the sum of the distances they covered?

625 miles

e. Write an equation that can be used to find the number of hours they traveled.

$105h + 100 = 625$

f. How many hours did it take Monique to do her part of the trip?

5

g. How many miles did Monique drive?

275

h. How many hours did it take her father to do his part of the trip? How many miles did her father drive?

7; 350

11. Francois' car gets about 12.5 kilometers per liter. He is planning a 1,600-kilometer trip.

a. About how many liters of gas should Francois plan to buy? Round your answer to the nearest liter.

128

b. At an average price of \$1.18 per liter, how much should Francois expect to spend for gas?

\$151.04

12. Ace Car Rental charges customers \$0.18 per mile driven. You picked up a car and the odometer read x miles and brought it back with the odometer reading y miles. Write an algebraic expression for the total cost Ace would charge you for mileage use on a rented car.

$\$0.18(y - x)$

5-8 Driving Safety Data

Exercises

Answer each hour and minute question to the nearest unit. Answer each second question to the nearest tenth.

5,280 feet = 1 mile; 1,000 meters = 1 kilometer

1. How many miles does a car traveling at 57 mph cover in one hour?
57
2. How many feet does a car traveling at 57 mph cover in one hour? in one minute? in one second?
300,960; 5,016; 83.6
3. How many miles does a car traveling at 70 mph cover in one hour?
70
4. How many feet does a car traveling at 70 mph cover in one hour? in one minute? in one second?
369,600; 6,160; 102.7
5. How many miles does a car traveling at a mph cover in one hour?
 a
6. How many feet does a car traveling at a mph cover in one hour? in one minute? in one second?
 $5,280a$; $\frac{5,280a}{60}$; $\frac{5,280a}{60}$
7. How many kilometers does a car traveling at 50 kph cover in one hour?
50
8. How many meters does a car traveling at 50 kph cover in one hour? in one minute? in one second?
50,000; 833; 13.9
9. How many kilometers does a car traveling at a kph cover in one hour?
 a
10. How many meters does a car traveling at a kph cover in one hour? in one minute? in one second?
 $1,000a$; $\frac{1,000a}{60}$; $\frac{1,000a}{60}$
11. Complete the chart:

Speed	Reaction Distance	Braking Distance
75 mph	a. 75 feet	f. 281.25 feet
65 mph	b. 65 feet	g. 211.25 feet
55 mph	c. 55 feet	h. 151.25 feet
45 mph	d. 45 feet	i. 101.25 feet
5 mph	e. 5 feet	j. 1.25 feet

12. Jerry is driving 35 miles per hour as he approaches a park. A dog darts out into the street between two parked cars, and Jerry reacts in about three-quarters of a second. What is his approximate reaction distance?

38 feet

13. Manuel is driving 60 miles per hour on a state road with a 65 mph speed limit. He sees a fallen tree up ahead and must come to a quick, complete stop.

- a. What is his approximate reaction distance?

60 feet

- b. What is his approximate braking distance?

180 feet

- c. About how many feet does the car travel from the time he switches pedals until the car has completely stopped?

240 feet

14. Anita is driving on the highway at the legal speed limit of 63 mph. She sees a police road block about 300 feet ahead and must come to a complete stop. Her reaction time is approximately $\frac{3}{4}$ of a second. Is she far enough away to safely bring the car to a complete stop? Explain your answer.

Anita's total stopping distance is 261.45 feet. She has enough roadway ahead of her to bring the car to a safe stop before the road block.

15. Rob is driving on a Canadian highway near Montreal at 63 kph. He sees an accident about 30 meters ahead and needs to bring the car to a complete stop. His reaction time is approximately $\frac{3}{4}$ of a second. Is he far enough away from the accident to safely bring the car to a complete stop?

Rob's total stopping distance is 35.9 meters which is greater than the distance to the accident.

16. Model the total stopping distance by the equation $y = \frac{x^2}{20} + x$ where x represents the speed in mph, and y represents the total stopping distance in feet.

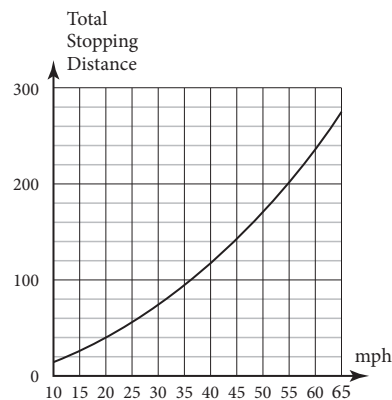
- a. Graph this equation for the values of x where $x \geq 10$ and $x \leq 65$.

- b. Use the graph to approximate the stopping distance for a car traveling at 30 mph.

about 75 feet

- c. Use the graph to approximate the speed for a car that completely stops after 240 feet.

about 60 mph



17. A spreadsheet user inputs a speed in kph into cell A1.

- a. Write a formula that would enter the approximate equivalent of that speed in mph in cell A2.

=A1*0.621371

- b. Write a spreadsheet formula that would enter the approximate total stopping distance in meters in cell A3.

=A1^2/170 + A1/5

5-9 Accident Investigation Data

Exercises

- A car is traveling on an cement road with a drag factor of 1.1. The speed limit on this portion of the road is 45 mph. It was determined that the brakes were operating at 85% efficiency. The driver notices that the draw bridge is up ahead and that traffic is stopped. The driver immediately applies the brakes and the tires leave four distinct skid marks each 50 feet in length.

 - What is the minimum speed the car was traveling when it entered the skid? Round your answer to the nearest tenth.
37.4 mph
 - Did the driver exceed the speed limit when entering the skid?
no
- Highway 21 has a surface drag factor of 0.72. A car with a b percent braking efficiency is approaching an accident causing the driver to apply the brakes for an immediate stop. The tires leave four distinct skid marks of c feet each. Write an expression for determining the minimum speed of the car when entering into the skid.

$$\sqrt{30c \cdot 0.72 \cdot \frac{b}{100}}$$
- Mark was traveling at 40 mph on a road with a drag factor of 0.85. His brakes were working at 80% efficiency. To the nearest tenth of a foot, what would you expect the average length of the skid marks to be if he applied his brakes in order to come to an immediate stop?
78.4 feet
- Davia is traveling on an asphalt road at 50 miles per hour when she immediately applies the brakes in order to avoid hitting a deer. The road has a drag factor of A , and her brakes are operating at 90% efficiency. Her car leaves three skid marks each of length r . Write an algebraic expression that represents the skid distance.
 $\frac{2,500}{27A}$
- Determine the radius of the yaw mark made when brakes are immediately applied to avoid a collision based upon a yaw mark chord measuring 59.5 feet and a middle ordinate measuring 6 feet. Round your answer to the nearest tenth.
76.8
- Arami's car left three skid marks on the road after she slammed her foot on the brake pedal to make an emergency stop. The police measured them to be 45 feet, 40 feet, and 44 feet. What skid distance will be used when calculating the skid speed formula?
43 feet
- Grace's car left four skid marks on the road surface during a highway accident. Two of the skid marks were each 52 feet, and two of the skid marks were each 56 feet. What skid distance will be used when calculating the skid speed formula?
54 feet
- Sam's car left three skid marks. Two of the marks were each A feet long, and one skid mark was B feet long. Write the algebraic expression that represents the skid distance that will be used in the skid speed formula.
 $\frac{2A + B}{3}$

9. Russell was driving on a gravel road that had a 20 mph speed limit posted. A car ahead of him pulled out from a parking lot causing Russell to immediately apply the brakes. His tires left two skid marks of lengths 60 feet and 62 feet. The road had a drag factor of 0.47. His brakes were operating at 95% efficiency. The police gave Russell a ticket for speeding. Russell insisted that he was driving under the limit. Who is correct (the police or Russell)? Explain.

The police were correct. According to the formula, Russell's minimum skid speed was approximately 28.6 miles per hour.

10. Delia was driving on an asphalt road with a drag factor of 0.80. Her brakes were working at 78% efficiency. She hit the brakes in order to avoid a cat that ran out in front of her car. Three of her tires made skid marks of 38 feet, 42 feet, and 45 feet respectively. What was the minimum speed Delia was going at the time she went into the skid?

27.9 mph

11. A car is traveling at 52 mph before it enters into a skid. The drag factor of the road surface is 0.86, and the braking efficiency is 88%. How long might the average skid mark be to the nearest tenth of a foot?

119.1 feet

12. Bill is driving his car at 41 mph when he makes an emergency stop. His wheels lock and leave four skid marks of equal length. The drag factor for the road surface was 0.94, and his brakes were operating at 95% efficiency. How long might the skid marks be to the nearest foot?

63 feet

13. Andrea was traveling down a road at 45 mph when she was forced to immediately apply her brakes in order to come to a complete stop. Her car left two skid marks that averaged 60 feet in length with a difference of 6 feet between them. Her brakes were operating at 90% efficiency at the time of the incident. What was the possible drag factor of this road surface? What were the lengths of each skid mark?

1.25; 57 feet and 63 feet

14. An accident reconstructionist takes measurements of the yaw marks at the scene of an accident. What is the radius of the curve if the middle ordinate measures 5.3 feet when using a chord with a length of 39 feet? Round your answer to the nearest tenth of a foot.

38.5 feet

15. The measure of the middle ordinate of a yaw mark is 7 feet. The radius of the arc is determined to be 64 feet. What was the length of the chord used in this situation? Round your answer to the nearest tenth of a foot.

58.2 feet

16. The following measurements from yaw marks left at the scene of an accident were taken by police. Using a 40-foot length chord, the middle ordinate measured approximately 4 feet. The drag factor for the road surface was determined to be 0.95.

- a. Determine the radius of the curved yaw mark to the nearest tenth of a foot.

52 feet

- b. Determine the minimum speed that the car was going when the skid occurred to the nearest tenth.

27.2 mph

6-1 Look for Employment

Exercises

1. Mitchell found a job listed in the classified ads that pays a yearly salary of \$57.3K. What is the weekly salary based on this annual salary?
\$1,101.92

2. Clarissa is considering two job offers. One has an annual salary of \$61.1K and the other has an annual salary of \$63.4K. What is the difference in the weekly pay for these two jobs, rounded to the nearest dollar?
\$44

3. Mr. Leonard took a job through an employment agency. The job pays \$88K per year. He must pay a fee to the employment agency. The fee is 22% of his first four weeks' pay. How much money must Mr. Leonard pay the agency, to the nearest cent?
\$1,489.23

4. The Ludwig Employment Agency posted a job in the advertising field. The fee is 18% of three weeks' pay. The job pays d dollars annually. Express the agency fee algebraically.
 $0.18\left(\frac{3d}{52}\right)$

5. Arielle owns Levitt Construction Corporation. She needs a welder and is placing a seven-line classified ad. The cost of an ad that is x lines long is given by the following piecewise function. Find the cost of a seven-line ad.

$$c(x) = \begin{cases} 33 & \text{when } x \leq 4 \\ 33 + 5(x - 4) & \text{when } x > 4 \end{cases}$$

\$48

6. The *Carpenter's Chronicle* charges \$12 for each of the first three lines of a classified ad and \$7.25 for each additional line. Express the cost of an x -line ad, $c(x)$, algebraically as a piecewise function.

$$c(x) = \begin{cases} 12x & \text{when } x \leq 3 \\ 36 + 7.25(x - 3) & \text{when } x > 3 \end{cases}$$

7. Job-Finder charges employers d dollars to post a job on their website. They offer a 12% discount if 10 or more jobs are posted. If 24 jobs are posted by a specific employer, write an algebraic expression for the cost of the 24 ads with the discount.

$21.12d$

8. Art's Printing Service charges \$27.50 to print 100 high-quality copies of a one-page resume. Each additional set of 100 copies costs \$14.99. Express the cost, $c(r)$, of printing r sets of 100 resumes, as a piecewise function.

$$c(r) = \begin{cases} 27.50 & \text{when } r = 1 \\ 27.50 + 14.99(r - 1) & \text{when } r > 1 \end{cases}$$

9. Yoko needs 300 copies of her resume printed. Dakota Printing charges \$19.50 for the first 200 copies and \$9 for every 100 additional copies.

- a. How much will 300 copies cost, including a sales tax of $4\frac{1}{2}\%$? Round to the nearest cent.
\$29.78

- b. If the number of sets of 100 resumes is represented by r , express the cost of the resumes, $c(r)$, algebraically as a piecewise function.

$$c(r) = \begin{cases} 19.50 & \text{when } r \leq 2 \\ 19.50 + 9(r - 2) & \text{when } r > 2 \end{cases}$$

10. Kim answered a help-wanted ad. The ad states that the job pays d dollars semiannually. Express Kim's monthly salary algebraically.

$$\frac{d}{6}$$

11. Rudy's job pays him \$1,550 per week. Express his annual salary using the 'K' notation.

\$80.6K

12. Teach-Tech is an online job listing site for prospective teachers. The charge to teachers looking for jobs is \$19 per week, for the first 4 weeks, to post their resumes. After four weeks, the cost is \$7 per week.

- a. If w represents the number of weeks, represent the cost $c(w)$ as a piecewise function.

$$c(w) = \begin{cases} 19w & \text{when } w \leq 4 \\ 76 + 7(w - 4) & \text{when } w > 4 \end{cases}$$

- b. Find the cost of listing a resume for 8 weeks.

\$104

13. Charleen earns m dollars per month as a police officer. Express algebraically her annual salary using the K abbreviation found in classified ads.

$$\frac{12m}{1,000} \text{K}$$

14. Marty is a dentist. He is placing an eight-line classified ad for a hygienist. The following piecewise function gives the price of an x -line ad.

$$c(x) = \begin{cases} 31 & \text{when } x \leq 5 \\ 20 + 6(x - 5) & \text{when } x > 5 \end{cases}$$

- a. What is the cost of the first five lines if Marty purchases five lines?

\$31

- b. What is the cost of the first five lines if Marty purchases more than five lines?

\$20

- c. How much less is a six-line ad compared to a five-line ad?

\$5

15. Kevin is looking for a job as a piano technician. One classified ad lists a job that pays 64.6K. Another job he found has a weekly salary of \$1,120. What is the difference in the weekly salaries of these two jobs? Round to the nearest dollar.

\$122

16. Michelle got a new job through the McCartney Employment Agency. The job pays \$49,400 per year, and the agency fee is equal to 35% of one month's pay. How much must Michelle pay the agency? Round to the nearest cent.

\$1,440.83

17. Todd is looking for a job as a chemistry teacher. He plans to send resumes to 145 schools in his city. His local printer charges \$34 per 100 copies and sells them only in sets of 100.

- a. How many copies must Todd purchase if he is to have enough resumes?

200

- b. How much will the copies cost Todd, including 5% sales tax?

\$71.40

6-2 Pay Periods and Hourly Rates

Exercises

- Mr. Varello is paid semimonthly. His annual salary is \$64,333. What is his semimonthly salary, rounded to the nearest cent?
\$2,680.54
- Mr. Whittaker earns b dollars biweekly. His employer is changing the pay procedure to monthly, but no annual salaries are changing. Express his monthly salary algebraically.
 $\frac{13b}{6}$
- Mrs. Frederick is paid semimonthly. Her semimonthly salary is \$1,641.55. What is her annual salary?
\$39,397.20
- Ms. Saevitz is paid semimonthly. Her annual salary is a dollars. Her office is considering going to a biweekly pay schedule. Express the difference between her biweekly salary and her semimonthly salary algebraically.
 $\frac{a}{24} - \frac{a}{26}$
- Julianne works at a local Emerald Monday restaurant. Her regular hourly wage is \$9.50.
 - She regularly works 40 hours per week. What is her regular weekly pay?
\$380
 - If she works 50 weeks each year at this rate, what is her annual salary?
\$19,000
- Mr. Lewis regularly works h hours per week at a rate of y dollars per hour. Express his annual salary algebraically.
 $52hy$
- Mrs. Roper works 40 hours per week regularly, at a rate of \$12.20 per hour. When she works overtime, her rate is time and a half of her regular hourly rate. What is Mrs. Roper's hourly overtime rate?
\$18.30
- If you earned d dollars per hour regularly, express your hourly overtime rate algebraically if you are paid time-and-a-half for overtime.
 $1.5d$
- Mr. Ed earns \$14.50 per hour. His regular hours are 40 hours per week, and he receives time-and-a-half overtime. Find his total pay for a week in which he works 45 hours.
\$688.75
- Mrs. Trobiano regularly works 40 hours per week, at a rate of d dollars per hour. Last week she worked h overtime hours at double time. Express her total weekly salary algebraically.
 $40d + 2hd$
- Krissy worked her 40 regular hours last week, plus 8 overtime hours at the time-and-a-half rate. Her gross pay was \$572. What was her hourly rate?
\$11

12. Mrs. Frasier worked her 40 regular hours last week, plus four overtime hours at the double-time rate. Her gross pay was \$576. What was her hourly rate?
\$12
13. Last year Andrea's annual salary was a dollars. This year she received a raise of r dollars per year. She is now paid semimonthly.
- Express her biweekly salary last year algebraically.
 $\frac{a}{26}$
 - Express her semimonthly salary this year algebraically.
 $\frac{a+r}{24}$
 - How many more checks did Andrea receive each year when she was paid biweekly, as compared to the new semimonthly arrangement?
2
14. This week, Sean worked h regular hours and t overtime hours at the time-and-a-half rate. He earned \$950. If r represents his hourly rate, express r algebraically in terms of h and t .
 $\frac{950}{h + 1.5t}$
15. Mr. Harrison earns \$32 per hour. He regularly works 40 hours per week. If he works 26 overtime hours (at time-and-a-half), would his overtime pay exceed his regular gross pay? Explain.
No; his overtime pay would equal 39 hours at regular pay.
16. In 2003, Carlos Zambrano earned \$340,000 pitching for the Chicago Cubs. In 2009, his salary was \$18,750,000.
- Zambrano pitched in 32 games in 2003. What was his salary per game in 2003?
\$10,625
 - He pitched in 28 games in 2009. What was his salary per game in 2009? Round to the nearest cent.
\$669,642.86
 - Did he earn more per game in 2009 than he did for the entire 2003 season?
yes
17. Last year, Mrs. Sclair's annual salary was \$88,441. This year she received a raise and now earns \$96,402 annually. She is paid weekly.
- What was her weekly salary last year? Round to the nearest cent.
\$1,700.29
 - What is Mrs. Sclair's weekly salary this year? Round to the nearest cent.
\$1,853.88
 - On a weekly basis, how much more does Mrs. Sclair earn as a result of her raise?
\$153.09
18. Leah is paid semimonthly. How many fewer paychecks does she receive in two years compared to someone who is paid weekly?
56

6-3 Commissions, Royalties, and Piecework Pay

Exercises

- Enid wrote a textbook for high school students. She receives a 5% royalty based on the total sales of the book. The book sells for \$51.95, and 12,341 copies were sold last year. How much did Enid receive in royalty payments for last year, to the nearest cent?
\$32,055.75
- Rich wrote a novel that sells for n dollars each. He received a bonus of \$50,000 to sign the contract to write the book, and he receives 9% commission on each book sale. Express the total amount of income he earns from selling b books algebraically.
 $0.09bn + 50,000$
- Dafna makes sport jackets. She is paid d dollars per hour, plus a piece rate of p dollars for each jacket. Last week she made j jackets in h hours. Write an expression for her total earnings.
 $jp + dh$
- Rock singer and writer Beep Blair is paid 11.5% on her CD sales and music downloads. Last year, she sold 1.22 million CDs and 2.1 million music downloads. The CDs were sold to music stores for \$5 each, and the music downloads were \$1 each.
 - What was the total amount of CD sales?
\$6,100,000
 - What was the total amount of downloads?
\$2,100,000
 - How much did Beep Blair receive in royalties last year?
\$943,000
- Mr. Corona sells magazines part-time. He is paid a monthly commission. He receives 21% of his first \$1,500 in sales and 14% of the balance of his sales. Last month he sold \$2,233 worth of magazine subscriptions. How much commission did he earn last month?
\$417.62
- Carter Cadillac pays commission to its car sales staff. They are paid a percent of the profit the dealership makes on the car, not on the selling price of the car. If the profit is under \$500, the commission rate is 18%. If the profit is at least \$500 and less than or equal to \$2,000, the commission rate is 24% of the profit. If the profit is above \$2,000, the rate is 27% of the profit. If p represents the profit, express the commission $c(p)$ algebraically as a split function.
$$c(p) = \begin{cases} 0.18p & \text{when } p < 500 \\ 0.24p & \text{when } 500 \leq p < 2,000 \\ 0.27p & \text{when } p > 2,000 \end{cases}$$
- Mrs. Lohrius sells electronics on commission. She receives 10% of her first x dollars in sales and 12% of the balance of her sales. Last month, she sold y dollars worth of electronics. Express the commission she earned last month algebraically.
 $0.1x + 0.12(y - x)$

8. Abbey Road Motors pays a percent commission to its sales people. They are paid a percent of the profit the dealership makes on a car. If the profit is under \$1,000, the commission rate is 20%. If the profit is at least \$1,000 and less than or equal to \$2,000, the commission rate is 20% of the first \$1,000 and 24% of the remainder of the profit. If the profit is above \$2,000, the rate is 20% of the first \$1,000 of profit, 24% of the next \$1,000 of profit, and 29% of the amount of profit over \$2,000. If p represents the profit, express the commission $c(p)$ algebraically as a split function.

$$c(p) = \begin{cases} 0.2p & \text{when } p < 1,000 \\ 200 + 0.24(p - 1,000) & \text{when } 1,000 \leq p < 2,000 \\ 440 + 0.29(p - 2,000) & \text{when } p > 2,000 \end{cases}$$

9. Casey is a real estate agent. She earns 8.15% commission on each sale she makes. After working with a potential buyer for $3\frac{1}{2}$ months, she finally sold a house for \$877,000.
- What did Casey earn in commissions for this sale?
\$71,475.50
 - This was her only sale for the entire $3\frac{1}{2}$ -month period. What was her average salary per month for this period, to the nearest cent?
\$20,421.57
 - For the next four months, Casey is not able to sell a house due to a faltering economy. What is her average monthly salary for the past $7\frac{1}{2}$ months, to the nearest cent?
\$9,530.07
10. Barry works at Larry's Computer Outlet. He receives a weekly salary of \$310 plus 3.05% commission based on his sales. Last year, he sold \$1,015,092 worth of computer equipment. How much money did Barry earn last year, to the nearest cent?
\$47,080.31
11. Jill picks corn and gets paid at a piecework rate of 55 cents per container for the first 300 containers picked. She receives 60 cents per container for every container over 300 that she picks. Last week, Jill picked 370 containers. How much did she earn?
\$207
12. Vicki works at Apple Appliances. She earns d dollars per hour, but is also paid $p\%$ commission on all sales. Last week she sold w dollars worth of appliances in the h hours she worked. Write an expression that represents her salary for the week.
 $dh + \frac{pw}{100}$
13. Ms. Halloran works in a factory. She receives a salary of \$9.10 per hour and piecework pay of 15 cents per unit produced. Last week she worked 40 hours and produced 988 units.
- What was her piecework pay? What was her total hourly pay for the week? What was her total pay for the week?
\$148.20; \$364.00; \$512.20
 - If her boss offered to pay her a straight \$13 per hour and no piecework pay for the week, would she earn more or less than under the piecework pay system?
yes, \$7.80 more
 - What would her total weekly salary have been if she produced 0 units?
\$364

6-4 Employee Benefits

Exercises

1. Ali has worked at a fashion magazine for the last 5 years. Her current annual salary is \$64,000. When she was hired, she was told that she had four days of paid vacation time. For each year that she worked at the magazine, she would gain another three days of paid vacation time to a maximum of 26 days. How many paid vacation days does she now get at the end of five years of employment?

16

2. Ina's employer offers a sliding paid vacation. When she started work, she was given two paid days of vacation. For each four-month period she stays at the job, her vacation is increased by one day.

- a. Let x represent the number of 4-month periods worked and y represent the total number of vacation days. Write an equation that models the relationship between these variables.
 $y = 2 + x$

- b. How much vacation time will she have after working for this employer for 6.5 years?
21.5 days

3. When Tyler started at his current job, his employer gave him five days of paid vacation time with a promise of five additional paid vacation days for each two-year period he remains with the company to a maximum of five work weeks of paid vacation time.

- a. Let x represent the number of years he has worked for this employer and y represent the number of paid vacation days he has earned. Write an equation that models the relationship of these variables.

$$y = 5 + \frac{5x}{2}$$

- b. It has been eight years since Tyler began working for this employer. How many paid vacation days has he earned?

25

- c. When will Tyler reach the maximum number of paid vacation days allowable?
after 8 years

4. When Alton started his current job, his employer told him that he had one day of paid vacation until he reaches his first year with the company. Then, at the end of the first year, he would receive three vacation days. After each year, his number of vacation days would triple up to 27 days of paid vacation.

- a. Let x represent the number of years worked and y represent the number of paid vacation days. Write an equation that models the relationship between these variables.

$$y = 3^x$$

- b. How many vacation days will he have earned after two years?

9

- c. In what year will he have maxed out his vacation days?

year 3

5. Martha's employee benefits include family health care coverage. She contributes 18% of the cost. Martha gets paid biweekly and \$108.00 is taken out of each paycheck for family health care coverage. How much does her employer contribute annually for the family coverage?
\$12,792
6. Rachel contributes 20% of the cost of her individual health care. This is a \$38 deduction from each of her weekly paychecks. What is the total value of her individual coverage for the year?
\$9,880
7. At Chocolatier Incorporated, there are two factors that determine the cost of health care. If an employee makes less than \$65,000 per year, he pays \$52 per month for individual coverage and \$98 per month for family coverage. If an employee makes at least \$65,000 per year, individual coverage is \$67 per month and family coverage is \$122 per month.
- a. Graham makes \$62,800 per year. He has individual health care. His yearly contribution is 10% of the total cost. How much does his employer contribute?
\$5,616
- b. Claudia 's annual salary is \$75,400. She has family health care. Her employer contributes \$1,052 per month towards her total coverage cost. What percent does Claudia contribute toward the total coverage? Round to the nearest tenth of a percent.
10.4%
8. Dan's employee benefits include health care coverage. His employer covers 78% of the cost, which is a contribution of \$1,599.78 towards the total coverage amount. How much does Dan pay for his coverage?
\$451.22
9. Liz works at Food For Thought magazine. Her employer offers her a pension. Liz's employer uses a formula to calculate the pension. Retiring employees receive 2.1% of their average salary over the last four years of employment for every year worked. Liz is planning on retiring at the end of this year after, 20 years of employment. Her salaries for the last four years are \$66,000; \$66,000; \$73,000; and \$75,000. Calculate Liz's annual pension.
\$29,400
10. As part of their employee benefits, all workers at Light and Power Electric Company receive a pension that is calculated by multiplying the number of years worked times 1.875% of the average of their three highest years' salaries. Mia has worked for LPEC for 30 years and is retiring. Her highest salaries were \$92,000, \$94,800, and \$96,250. Calculate Mia's pension.
\$53,071.88
11. In Ben's state, the weekly unemployment compensation is 55% of the 26-week average for the two highest-salaried quarters. A quarter is three consecutive months. For July, August, and September, Ben earned a total of \$22,400. In October, November, and December, he earned a total of \$22,800. Determine Ben's weekly unemployment compensation.
\$956.15
12. Carol's weekly unemployment compensation is W percent of the 26-week average for the two highest salaried quarters. For January, February, and March, Carol earned X dollars. In April, May, and June, she earned Y dollars. Write an algebraic expression that represents Carol's weekly unemployment compensation.

$$\left(\frac{X + Y}{26}\right)\left(\frac{W}{100}\right)$$

6-5 Social Security and Medicare

Exercises

- Dr. Grumman got his first job in 1990. In that year, the government took out 7.45% of each income for Social Security and Medicare, until a person made \$51,300. If Dr. Grumman earned \$31,340 in 1990, how much did he pay to Social Security and Medicare?
\$2,334.83
- Lauren earned a total of d dollars last year. The government took out 6.2% for Social Security and 1.45% for Medicare. Write an algebraic expression that represents what she paid to Social Security and Medicare combined.
 $0.0765d$
- In 1978, the Social Security and Medicare rate combined was 6.05%, up to \$17,700 earned.
 - Express the Social Security tax $s(x)$ for 1978 as a piecewise function.
$$s(x) = \begin{cases} 0.0605x & \text{when } x \leq 17,700 \\ 1,070.85 & \text{when } x > 17,700 \end{cases}$$
 - Ten years later, the percent had increased to 7.51% and the maximum taxable income had increased to \$45,000. Express the Social Security tax $s(x)$ for 1988 as a piecewise function.
$$s(x) = \begin{cases} 1.0751x & \text{when } x \leq 45,000 \\ 3,379.50 & \text{when } x > 45,000 \end{cases}$$
 - If a person earned \$50,000 in 1978, and \$50,000 in 1988, what was the difference in the Social Security and Medicare taxes paid?
\$2,308.65
- In 2010, the government took out 6.2% of earnings for Social Security to a maximum taxable income of \$106,800. For Medicare, 1.45% of earnings was paid. How much money would someone have to have earned in 2010 so that their payments into Medicare were equal to their payments into Social Security? Round to the nearest dollar.
\$456,662
- In 1998, Lisa earned \$149,461.20. The Social Security maximum taxable income was \$68,400, and the Social Security percent was 6.2%.
 - What was her monthly gross pay?
\$12,455.10
 - In what month did Lisa hit the maximum taxable Social Security income?
June
 - How much Social Security tax did Lisa pay in May, to the nearest cent?
\$772.22
 - How much Social Security tax did Lisa pay in July, to the nearest cent?
\$0
 - How much Social Security tax did Lisa pay in June, to the nearest cent?
\$379.72

The following table gives a historical look at Social Security and Medicare taxes from 2000 – 2010. Use the table for Exercises 6 – 10.

Year	Social Security Percent	Social Security Maximum Taxable Income	Medicare Percent	Income Subject to Medicare Tax
2000	6.2%	76,200	1.45%	All income
2001	6.2%	80,400	1.45%	All income
2002	6.2%	84,900	1.45%	All income
2003	6.2%	87,900	1.45%	All income
2004	6.2%	87,900	1.45%	All income
2005	6.2%	90,000	1.45%	All income
2006	6.2%	94,200	1.45%	All income
2007	6.2%	97,500	1.45%	All income
2008	6.2%	102,000	1.45%	All income
2009	6.2%	106,800	1.45%	All income
2010	6.2%	106,800	1.45%	All income

6. In 2010, for the first time since 2004 the maximum taxable income was not raised. Find the maximum a person could pay into Social Security for 2010.

\$6,621.60

7. Let $t(x)$ represent the total combined Social Security and Medicare taxes for the year 2007. If x represents the income, express this total as a piecewise function.

$$t(x) = \begin{cases} 0.0765x & \text{when } x \leq 97,500 \\ 6,045 + 0.0145x & \text{when } x > 97,500 \end{cases}$$

8. Mr. Jackson had two jobs in 2005. The first job, in which he earned \$74,007, was from January to August, and the second job, in which he earned \$35,311, was from August to the end of the year. At the first job, he earned \$74,007. As a result, he paid too much Social Security tax. How much should he be refunded?

\$1,197.72

9. In 2009, Dr. Kirmser's gross pay was \$381,318.60.

- a. What was her monthly gross pay?

\$31,776.55

- b. In what month did she hit the maximum taxable Social Security income?

April

- c. How much Social Security tax did she pay in February? Round to the nearest cent.

\$1,970.15

- d. How much Social Security tax did she pay in September? Round to the nearest cent.

\$0

- e. How much Social Security tax did Dr. Kirmser pay in April? Round to the nearest dollar.

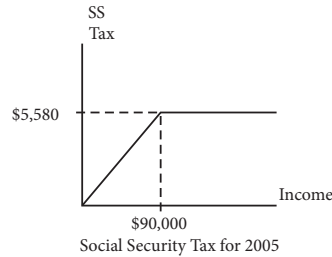
\$711

10. Use the information from the table to examine Social Security and Medicare taxes for 2005.

- a. If x represents income, express the Social Security function $s(x)$ for 2005 as a piecewise function.

$$s(x) = \begin{cases} 0.062x & \text{when } x \leq 90,000 \\ 5,580 & \text{when } x > 90,000 \end{cases}$$

- b. Graph the Social Security function for 2005.



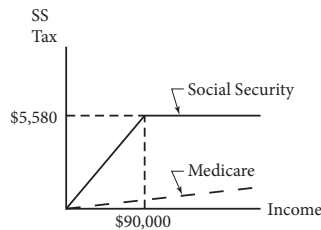
- c. Find the coordinates of the cusp.

$$(90,000, 5,580)$$

- d. If x represents income, what is the Medicare function $m(x)$ for 2005?

$$m(x) = 0.0145x$$

- e. Graph the Medicare function for 2005 on the same axes as the Social Security function in part b.



- f. Elena worked three jobs in 2005. The total of her three incomes was less than \$90,000. At Hamburger Coach, she made h dollars. At the Binghamton Book Exchange, she made b dollars. At Ruby's Restaurant, she made r dollars. Express the combined total of her social security and Medicare taxes as an algebraic expression.

$$0.0765(h + b + r)$$

- g. In 2005, how much money would someone have to have earned so that their payments into Medicare were equal to their payments into Social Security? Round to the nearest dollar.

$$\$384,828$$

7-1

Tax Tables, Worksheets,
and Schedules

Exercises

Use the portion of the tax table shown here to answer Exercises 1 – 7.

If line 43 (taxable income) is —		And you are —			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
Your tax is —		Your tax is —			
77,000					
77,000	77,050	15,600	11,944	15,939	14,319
77,050	77,100	15,613	11,956	15,953	14,331
77,100	77,150	15,625	11,969	15,967	14,344
77,150	77,200	15,638	11,981	15,981	14,356
77,200	77,250	15,650	11,994	15,995	14,369
77,250	77,300	15,663	12,006	16,009	14,381
77,300	77,350	15,675	12,019	16,023	14,394
77,350	77,400	15,688	12,031	16,037	14,406
77,400	77,450	15,700	12,044	16,051	14,419
77,450	77,500	15,713	12,056	16,065	14,431
77,500	77,550	15,725	12,069	16,079	14,444
77,550	77,600	15,738	12,081	16,093	14,456
77,600	77,650	15,750	12,094	16,107	14,469
77,650	77,700	15,763	12,106	16,121	14,481
77,700	77,750	15,775	12,119	16,135	14,494
77,750	77,800	15,788	12,131	16,149	14,506
77,800	77,850	15,800	12,144	16,163	14,519
77,850	77,900	15,813	12,156	16,177	14,531
77,900	77,950	15,825	12,169	16,191	14,544
77,950	78,000	15,838	12,181	16,205	14,556
80,000					
80,000	80,050	16,385	12,694	16,779	15,069
80,050	80,100	16,399	12,706	16,793	15,081
80,100	80,150	16,413	12,719	16,807	15,094
80,150	80,200	16,427	12,731	16,821	15,106
80,200	80,250	16,441	12,744	16,835	15,119
80,250	80,300	16,455	12,756	16,849	15,131
80,300	80,350	16,469	12,769	16,863	15,144
80,350	80,400	16,483	12,781	16,877	15,156
80,400	80,450	16,497	12,794	16,891	15,169
80,450	80,500	16,511	12,806	16,905	15,181
80,500	80,550	16,525	12,819	16,919	15,194
80,550	80,600	16,539	12,831	16,933	15,206
80,600	80,650	16,553	12,844	16,947	15,219
80,650	80,700	16,567	12,856	16,961	15,231
80,700	80,750	16,581	12,869	16,975	15,244
80,750	80,800	16,595	12,881	16,989	15,256
80,800	80,850	16,609	12,894	17,003	15,269
80,850	80,900	16,623	12,906	17,017	15,281
80,900	80,950	16,637	12,919	17,031	15,294
80,950	81,000	16,651	12,931	17,045	15,306
83,000					
83,000	83,050	17,225	13,444	17,619	15,819
83,050	83,100	17,239	13,456	17,633	15,831
83,100	83,150	17,253	13,469	17,647	15,844
83,150	83,200	17,267	13,481	17,661	15,856
83,200	83,250	17,281	13,494	17,675	15,869
83,250	83,300	17,295	13,506	17,689	15,881
83,300	83,350	17,309	13,519	17,703	15,894
83,350	83,400	17,323	13,531	17,717	15,906
83,400	83,450	17,337	13,544	17,731	15,919
83,450	83,500	17,351	13,556	17,745	15,931
83,500	83,550	17,365	13,569	17,759	15,944
83,550	83,600	17,379	13,581	17,773	15,956
83,600	83,650	17,393	13,594	17,787	15,969
83,650	83,700	17,407	13,606	17,801	15,981
83,700	83,750	17,421	13,619	17,815	15,994
83,750	83,800	17,435	13,631	17,829	16,006
83,800	83,850	17,449	13,644	17,843	16,019
83,850	83,900	17,463	13,656	17,857	16,031
83,900	83,950	17,477	13,669	17,871	16,044
83,950	84,000	17,491	13,681	17,885	16,056

- Abe is single. His taxable income is \$83,492. How much does Abe owe in taxes?
\$17,351
- Roberta is married and filing a joint return with her husband Steve. Their combined taxable income is \$80,997. How much do they owe in taxes?
\$12,931
- Quinn files as Head of Household. His tax is \$14,406. What is his range of income according to the tax table?
\$77,350 – \$77,400
- Determine the tax for each filing status and taxable income amount listed.

<p>a. single \$80,602 \$16,553</p> <p>c. married filing jointly \$77,777 \$12,131</p>	<p>b. head of household \$83,572 \$15,956</p> <p>d. married filing separately \$83,050 \$17,633</p>
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- Given a taxable income amount, express the tax table line that would be used in compound inequality notation.

<p>a. $i = \\$80,154$ $i \geq \\$80,150$ and $i < \\$80,200$</p>	<p>b. $i = \\$83,221$ $i \geq \\$83,200$ and $i < \\$83,250$</p>
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6. Given the taxable income amount, express the tax table line that would be used in interval notation.
- a. $i = \$80,101$
 $\$80,100 \leq i < \$80,150$
- b. $i = 77,686$
 $\$77,650 \leq i < \$77,700$
7. Given the filing status and the tax, identify the taxable income interval that was used to determine that tax.
- a. head of household \$14,544
 $\$77,900 \leq i < \$77,950$
- b. single \$15,675
 $\$77,300 \leq i < \$77,350$
- c. married filing jointly \$13,456
 $\$80,050 \leq i < \$80,100$
- d. married filing separately \$16,835
 $\$80,200 \leq i < \$80,250$

Use the Tax Schedule for Head of Household to answer Exercises 8 – 12.

Schedule X— If your filing status is **Single**

If your taxable income is:		The tax is:	
Over—	But not over—		of the amount over—
\$0	\$8,025	..... 10%	\$0
8,025	32,550	\$802.50 + 15%	8,025
32,550	78,850	4,481.25 + 25%	32,550
78,850	164,550	16,056.25 + 28%	78,850
164,550	357,700	40,052.25 + 33%	164,550
357,700	.....	103,791.75 + 35%	357,700

8. Calculate the tax for each of the taxable incomes of a head of household taxpayer.
- a. \$200,000
 $\$51,750.75$
- b. \$23,872
 $\$3,179.55$
- c. \$121,890
 $\$28,107.45$
- d. \$82,251
 $\$17,008.53$

9. For what taxable income would a taxpayer have to pay \$6,231.25 in taxes?
\$39,550
10. According to the tax schedule, Ann has to pay about \$40,000 in taxes. What is Ann's taxable income interval?
over \$78,850 but not over \$164,550
11. Sam's taxable income is \$92,300. What percent of his taxable income is his tax? Round to the nearest percent.
21%
12. Manny's taxable income, t , is between \$32,550 and \$78,850. Write an algebraic expression that represents the amount of his tax.
 $4,481.25 + 0.25(t - 32,550)$

Use the tax computation worksheet for a single taxpayer to answer Exercises 13 – 15.

Section A — Use if your filing status is **Single**. Complete the row below that applies to you.

Taxable income If line 43 is —	(a) Enter the amount from line 43	(b) Multiplication amount	(c) Multiply (a) by (b)	(d) Subtraction amount	Tax Subtract (d) from (c). Enter the result here and on Form 1040, line 44
At least \$100,000 but not over \$164,550	\$	× 28% (.28)	\$	\$ 6,021.75	\$
Over \$164,550 but not over \$357,700	\$	× 33% (.33)	\$	\$ 14,249.25	\$
Over \$357,700	\$	× 35% (.35)	\$	\$ 21,403.25	\$

13. Calculate the tax for each of the taxable incomes using the tax computation worksheet above.
 - a. \$189,000
\$48,120.75
 - b. \$115,221
\$26,240.13
 - c. \$372,951
\$109,129.60
14. Let x represent a single taxpayer's taxable income that is over \$164,550 but not over \$357,700. Write an expression for this taxpayer's tax in terms of x .
 $0.33x - 14,249.25$
15. Let w represent the tax for any taxable income t on the interval $t > 357,700$. Round amounts to nearest dollar.
 - a. Calculate the lowest tax on this interval.
\$103,792
 - b. Calculate the highest tax on this interval.
There is no maximum.
 - c. Express the tax for this row of the worksheet in interval notation in terms of w .
 $w \geq \$103,792$

7-2 Modeling Tax Schedules

Exercises

Use the tax schedule for a taxpayer filing as head of household to answer Exercises 1 and 2.

Schedule Y-1— If your filing status is **Married filing jointly** or **Qualifying widow(er)**

If your taxable income is:		The tax is:	
Over—	But not over—		of the amount over—
\$0	\$16,050	..... 10%	\$0
16,050	65,100	\$1,605.00 + 15%	16,050
65,100	131,450	8,962.50 + 25%	65,100
131,450	200,300	25,550.00 + 28%	131,450
200,300	357,700	44,828.00 + 33%	200,300
357,700	.....	96,770.00 + 35%	357,700

1. There are 6 taxable income intervals in this chart. Let x represent any taxable income. Express those intervals in tax schedule notation, interval notation, and compound inequality.

Tax Schedule Notation	Interval Notation	Compound Inequality Notation
Over \$0 but not over \$16,050	$0 < x \leq 16,050$	$x > 0$ and $x \leq 16,050$
Over \$16,050 but not over \$65,100	$16,050 < x \leq 65,100$	$x > 16,050$ and $x \leq 65,100$
Over \$65,100 but not over \$131,450	$65,100 < x \leq 131,450$	$x > 65,100$ and $x \leq 131,450$
Over \$131,450 but not over \$200,300	$131,450 < x \leq 200,300$	$x > 131,450$ and $x \leq 200,300$
Over \$200,300 but not over \$357,700	$200,300 < x \leq 357,700$	$x > 200,300$ and $x \leq 357,700$
Over \$357,700	$x > 357,700$	$x > 357,700$

2. Let y represent the tax and x represent the taxable income of a head of household taxpayer. Use the tax worksheet below to write four equations in $y = mx + b$ form for values of x that are greater than or equal to \$100,000.

Section D — Use if your filing status is **Head of household**. Complete the row below that applies to you.

Taxable income. If line 43 is—	(a) Enter the amount from line 43	(b) Multiplication amount	(c) Multiply (a) by (b)	(d) Subtraction amount	Tax Subtract (d) from (c). Enter the result here and on Form 1040, line 44
At least \$100,000 but not over \$112,650	\$	$\times 25\%$ (.25)	\$	\$ 4,937.50	\$
Over \$112,650 but not over \$182,400	\$	$\times 28\%$ (.28)	\$	\$ 8,317.00	\$
Over \$182,400 but not over \$357,700	\$	$\times 33\%$ (.33)	\$	\$ 17,437.00	\$
Over \$357,700	\$	$\times 35\%$ (.35)	\$	\$ 24,591.00	\$

$y = 0.25x - 4,937.5$; $y = 0.28x - 8,317$; $y = 0.33x - 17,437$; $y = 0.35x - 24,591$

3. Write a piecewise function to represent the tax $f(x)$ for the first three taxable income intervals in the schedule below for a single taxpayer.

Schedule X— If your filing status is **Single**

If your taxable income is:		The tax is:	
Over—	But not over—		of the amount over—
\$0	\$8,025	----- 10%	\$0
8,025	32,550	\$802.50 + 15%	8,025
32,550	78,850	4,481.25 + 25%	32,550
78,850	164,550	16,056.25 + 28%	78,850
164,550	357,700	40,052.25 + 33%	164,550
357,700	-----	103,791.75 + 35%	357,700

$$f(x) = \begin{cases} 0.10x & 0 < x \leq 8,025 \\ 802.5 + 0.15(x - 8,025) & 8,025 < x \leq 32,550 \\ 4,481.25 + 0.25(x - 32,550) & 32,550 < x \leq 78,850 \end{cases}$$

4. Examine the tax schedule for the years 1914 and 2009. The schedule in 1914 applied to all taxpayers. The schedule for 2009 is for a single taxpayer. **Marginal Tax Rate** is the rate of tax a taxpayer pays at his/her income level.

1914		
Marginal Tax Rate	Tax Brackets	
	Over	But not over
1.0%	\$0	\$20,000
2.0%	\$20,000	\$50,000
3.0%	\$50,000	\$75,000
4.0%	\$75,000	\$100,000
5.0%	\$100,000	\$250,000
6.0%	\$250,000	\$500,000
7.0%	\$500,000	

2009		
Marginal Tax Rate	Tax Brackets	
	Over	But not over
10.0%	\$0	\$8,375
15.0%	\$8,375	\$34,000
25.0%	\$34,000	\$82,400
28.0%	\$82,400	\$171,850
33.0%	\$171,850	\$373,650
35.0%	\$373,650	

- a. What was the marginal tax rate for a taxpayer with a taxable income of \$40,000 in 1914?
2.0%
- b. What was the marginal tax rate for a taxpayer with a taxable income of \$40,000 in 2009?
25.0%
- c. Based on the marginal tax rate, find the difference in tax between a single taxpayer in 1914 making \$90,000 and a single taxpayer in 2009 making the same amount.
\$21,600
5. Examine the following piecewise function that models the tax computation worksheet for a single taxpayer in 2005. Write the tax equations in $y = mx + b$ form.

$$c(x) = \begin{cases} 14,652.50 + 0.28(x - 71,950) & 100,000 < x \leq 150,150 \\ 36,548.50 + 0.33(x - 150,150) & 150,150 < x \leq 326,450 \\ 94,727.50 + 0.35(x - 326,450) & x > 326,450 \end{cases}$$

$y = 0.28x - 5,493.5$; $y = 0.33x - 13,001$; $y = 0.38x - 19,530$

7-3 Income Statements

Exercises

- Jack's employer just switched to a new payroll system. He wants to make sure that his net pay has been computed correctly. His gross pay per pay period is \$587.34. He has the following deductions: Social Security tax (6.2%), Medicare tax (1.45%), federal withholding tax \$164.45, state withholding tax \$76.34, retirement insurance contribution \$50.00, disability insurance fee \$8.00, medical insurance fee \$23.00, and dental insurance fee \$8.00. What should his net pay be for this pay period?
\$212.62
- Tony makes an hourly salary of \$11.50 for 40 regular hours of work. For any time worked beyond 40 hours, he is paid at a rate of time-and-a-half per hour. Last week, Tony worked 46 hours. Find each of the following for this period.
 - Tony's gross pay
\$563.50
 - Social Security tax
\$34.94
 - Medicare tax
\$8.17
- Elizabeth works for Picasso Paint Supplies. Her annual salary is \$72,580.
 - What is Elizabeth's annual Social Security deduction?
\$4,499.96
 - What is Elizabeth's annual Medicare deduction?
\$1,052.41
 - Elizabeth is paid every other week. What is her biweekly gross pay?
\$2,791.54
 - Each pay period, Elizabeth's employer deducts 21% for federal withholding tax. What is the total amount withheld for federal tax from Elizabeth's annual salary?
\$15,241.80
 - If Elizabeth is taxed at an annual rate of 2.875% for city tax, how much is deducted from her salary per paycheck to withhold that tax?
\$80.26
 - As of January 1, Elizabeth will receive a 9.1% raise. What will Elizabeth's annual salary be?
\$79,184.78
- A taxpayer's annual Social Security tax is \$6,107. What is the taxpayer's gross annual salary?
\$98,500
- A taxpayer's annual Medicare tax is \$841. What is the taxpayer's gross annual salary?
\$58,000

6. Let x represent the paycheck number for a weekly pay period. Let y represent the number of the week in the year.
- Write an expression to represent the calendar year-to-date amount.
 xy
 - Write an expression for the Social Security tax for this pay period.
 $0.062y$
 - Write an expression for the year-to-date Social Security tax.
 $0.062xy$
 - Write an expression for the Medicare tax for this pay period.
 $0.0145x$
 - Write an expression for the year-to-date Medicare tax.
 $0.0145xy$
 - If C percent of the gross pay is withheld for federal taxes, write an expression for the weekly amount withheld for those taxes.
 $\frac{Cx}{100}$
 - Write an expression for the total annual federal tax withheld.
 $\frac{Cxy}{100}$


7. Use the partial information given in this electronic W-2 form to calculate the amount in Box 3.
\$102,600

1 Wages, tips, other compensation		2 Federal income tax withheld	
3 Social security wages		4 Social security tax withheld \$6,361.20	
5 Medicare wages and tips		6 Medicare tax withheld	
7 Social security tips		8 Allocated tips	
9 Advance EIC payment		10 Dependent care benefits	
11 Nonqualified plans		12a See instructions for box 12 E \$2,400.00	
13 Statutory employee <input type="checkbox"/> Retirement plan <input checked="" type="checkbox"/> Third-party sick pay <input type="checkbox"/>		12b	
14 Other caf125 \$5,600.00		12c	

8. Melanie is taxed at a 19% tax rate for her Federal taxes. Last year, she reduced her taxable income by contributing X dollars per biweekly paycheck to her tax deferred retirement account and Y dollars per biweekly paycheck to her FSA. Write an expression for the amount she reduced her taxes by if her gross biweekly pay is Z dollars.
 $4.94Z - 4.94(X + Y)$

9. Examine Alfredo Plata's incomplete W-2 form. Based on the information in Box 2, determine the amounts in each of the following boxes.

- Box 1
\$86,250.34
- Box 3
\$92,830.34
- Box 4
\$5,755.48
- Box 5
\$92,830.34

a Employee's social security number 000-00-0000		Safe, accurate, FAST! Use  Visit the IRS website at www.irs.gov/efile.	
b Employer identification number (EIN) 00-0000000		1 Wages, tips, other compensation	2 Federal income tax withheld \$14,662.50
c Employer's name, address, and ZIP code Blake Industries 234 Washington Blvd Seven Bridges, NY 10515		3 Social security wages	4 Social security tax withheld
d Control number		5 Medicare wages and tips	6 Medicare tax withheld \$1,346.04
e Employee's first name and initial Last name Suff. Alfredo Plata		7 Social security tips	8 Allocated tips
f Employee's address and ZIP code 137 Michigan Rd. Seven Bridges, NY 10515		9 Advance EIC payment	10 Dependent care benefits
15 State Employer's state ID number 00-0000000		11 Nonqualified plans	12a See instructions for box 12 E \$2,300.00
16 State wages, tips, etc.		13 Statutory employee <input type="checkbox"/> Retirement plan <input checked="" type="checkbox"/> Third-party sick pay <input type="checkbox"/>	12b
17 State income tax		14 Other caf125 \$4,280.00	12c
18 Local wages, tips, etc.		15 Local income tax	12d
19 Local income tax		20 Locality name	

7-4 Forms 1040EZ and 1040A

Exercises

- Arthur's employer withheld \$15,987.76 in federal income tax. After completing his return, Arthur has determined that his tax is \$18,945.22. Will Art get a refund, or does he owe the IRS and how much?
Arthur owes the IRS \$2,957.46.
- Latoya is an accountant who also works as a part-time museum tour guide. Information from her tax worksheet is wages from accounting job, \$85,290.45; wages from museum job, \$12,670.34; interest, \$563.99; and dividends, \$234.67. What is Latoya's total income?
\$98,759.45
- Drew is single with a taxable income for last year of \$83,472. His employer withheld \$16,998 in federal taxes.
 - Use the tax tables from Lesson 7-1 in this workbook to determine Drew's tax.
\$17,351
 - Does Drew get a refund?
no
 - Find the difference between Drew's tax and the amount withheld by his employer.
\$353
- Davia and Bill are married and file their taxes jointly. Davia's taxable income was \$50,675 and Bill's was \$32,802. Davia's employer withheld \$11,654 in federal taxes. Bill's employer withheld \$7,345 in federal taxes.
 - What is their combined taxable income?
\$83,477
 - Use the tax tables from Lesson 7-1 in this workbook to determine their tax.
\$13,556
 - Do they get a refund?
yes
 - Find the difference between their tax and the amount withheld by their employers.
\$5,443
- Parker is single and paying off his graduate student loan. The monthly payment is \$679.34. He is hoping to receive an income tax refund that is large enough to make at least one monthly payment. His taxable income is \$77,911 and his employer withheld \$19,458 in federal taxes.
 - How much of a refund will Tony receive?
\$3,633
 - How many loan payments will Parker be able to make with this refund?
5

6. Eileen is a married taxpayer who files jointly with her husband. Their combined taxable income is X dollars and their tax is Y dollars. Eileen's employer withheld A dollars from her salary and her husband's withheld B dollars from his salary during the year.

a. Write an algebraic expression for the amount they would receive should they get a refund.

$A + B - Y$

b. Write an algebraic expression for the amount they would owe in taxes if the combined amount withheld was not enough to cover the tax they owe.

$Y - (A + B)$

Use the current applicable 1040EZ or 1040A tax form and the IRS information booklet that goes with each to complete a tax return. Tax forms are available at www.irs.gov.

7. Gil Anderson is single and works as a manager of a local print shop. Use his W-2 form below to complete a 1040EZ form.

a Employee's social security number 000-00-0000		Safe, accurate, FAST! Use		Visit the IRS website at www.irs.gov/efile	
b Employer identification number (EIN) 00-0000000		1 Wages, tips, other compensation \$76,854.00	2 Federal income tax withheld \$18,449.00		
c Employer's name, address, and ZIP code River Road Printing 79 River Road Cliff, Idaho 83319		3 Social security wages \$76,854.00	4 Social security tax withheld \$4,766.19		
		5 Medicare wages and tips \$76,854.00	6 Medicare tax withheld \$1,114.67		
		7 Social security tips	8 Allocated tips		
d Control number		9 Advance EIC payment	10 Dependent care benefits		
e Employee's first name and initial Last name Suffix Gilbert R. Anderson		11 Nonqualified plans	12a See instructions for box 12		
246 Edwards Street Cliff, Idaho 83319		13 Statutory retirement Third-party <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	12b		
		14 Other	12c		
			12d		
f Employee's address and ZIP code		15 State Employer's state ID number 00-0000000	16 State wages, tips, etc. \$76,854.00	17 State income tax \$8,456.14	18 Local wages, tips, etc.
				19 Local income tax	20 Locality name

Answers vary depending on the year.

8. Pat and Rosa Invidia are married with three children. Rosa is a seamstress and Pat is a salesman. Complete a 1040A form using the information on their W-2 forms below. Pat and Rosa received \$987.21 in interest on bank deposits and \$230 in stock dividends.

a Employee's social security number 000-00-0000		Safe, accurate, FAST! Use		Visit the IRS website at www.irs.gov/efile	
b Employer identification number (EIN) 00-0000000		1 Wages, tips, other compensation \$48,031.00	2 Federal income tax withheld \$10,566.82		
c Employer's name, address, and ZIP code Brooklyn Clothiers 8 Bushwick Street Brooklyn, NY 11202		3 Social security wages \$48,031.00	4 Social security tax withheld \$2,977.92		
		5 Medicare wages and tips \$48,031.00	6 Medicare tax withheld \$696.45		
		7 Social security tips	8 Allocated tips		
d Control number		9 Advance EIC payment	10 Dependent care benefits		
e Employee's first name and initial Last name Suffix Patrick A. Invidia		11 Nonqualified plans	12a See instructions for box 12		
10 Presidential Street Brooklyn, NY 11201		13 Statutory retirement Third-party <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	12b		
		14 Other	12c		
			12d		
f Employee's address and ZIP code		15 State Employer's state ID number 00-0000000	16 State wages, tips, etc. \$48,031.00	17 State income tax \$5,283.41	18 Local wages, tips, etc. \$48,031.00
				19 Local income tax \$3,362.17	20 Locality name

Answers vary depending on the year.

a Employee's social security number 000-00-0000		Safe, accurate, FAST! Use		Visit the IRS website at www.irs.gov/efile	
b Employer identification number (EIN) 00-0000000		1 Wages, tips, other compensation \$48,121.00	2 Federal income tax withheld \$9,143.00		
c Employer's name, address, and ZIP code Fresh Fashions 221 Memorial Drive New York, NY 10025		3 Social security wages \$48,121.00	4 Social security tax withheld \$2,983.50		
		5 Medicare wages and tips \$48,121.00	6 Medicare tax withheld \$697.75		
		7 Social security tips	8 Allocated tips		
d Control number		9 Advance EIC payment	10 Dependent care benefits		
e Employee's first name and initial Last name Suffix Rosa S. Invidia		11 Nonqualified plans	12a See instructions for box 12		
10 Presidential Street Brooklyn, NY 11201		13 Statutory retirement Third-party <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	12b		
		14 Other	12c		
			12d		
f Employee's address and ZIP code		15 State Employer's state ID number 00-0000000	16 State wages, tips, etc. \$48,121.00	17 State income tax \$5,293.31	18 Local wages, tips, etc. \$48,121.00
				19 Local income tax \$3,368.47	20 Locality name

7-5 Form 1040 and Schedules A and B

Exercises

1. Mike and Lisa Lerner had combined wages of \$91,301 last year. They also had a bank interest of \$792 and \$667. They received stock dividends of \$287 and \$530. During the year, Lisa won a \$1,000 prize. Find the total income from wages, bank interest, dividends, and the prize.
\$94,577
2. Paul and Mary had \$78,111.19 in income from their jobs and their bank interest. They also had \$2,139 worth of moving expenses, and Paul paid \$6,000 in alimony. These two expenses are deductions from income. Find their adjusted gross income.
\$69,972.19
3. The Starkey family had total income of i dollars. They also had a dollars in adjustments to income. Express their adjusted gross income algebraically.
 $i - a$
4. The Kivetsky family had an adjusted gross income of \$119,245.61. They included medical deductions on Schedule A. They had \$14,191 in medical expenses. Medical insurance covered 80% of these expenses. The IRS allows medical and dental expenses deductions for the amount that exceeds 7.5% of a taxpayer's adjusted gross income. How much can they claim as a medical deduction?
\$0
5. Anita's adjusted gross income was a dollars last year. If she had m dollars of medical expenses last year, and 80% of these expenses were covered by her insurance, express her medical expense deduction algebraically.
 $0.20m - 0.075a$ or **\$0, whichever is greater**
6. The Mazzeo family donated c dollars in cash to charity last tax year. They also donated b bags of used clothing valued at \$50 each. They donated two used computers valued at x dollars each to the local food pantry. Express their total charitable contributions algebraically.
 $c + 50b + 2x$
7. The Holfester family took $5\frac{1}{2}$ hours to gather information for their Schedule A. The itemized deductions saved them \$4,095 in taxes. What was the mean savings per hour to fill out Schedule A? Round to the nearest dollar.
\$745
8. The Lowatsky family had \$9,441 worth of hurricane damage that was not covered by insurance. They need to follow IRS procedures to take a casualty deduction on Schedule A.
 - a. The IRS requires that \$100 be deducted from each casualty. What is the total casualty loss after the \$100 is deducted?
\$9,341
 - b. Their adjusted gross income is \$67,481. Find 10% of their adjusted gross income.
\$6,748.10
 - c. Their Schedule A casualty deduction can be found by subtracting 10% of the adjusted gross income from the answer to part a. What is their casualty loss deduction?
\$2,592.90

9. Maria's adjusted gross income was a dollars. She had three different casualties last year that were not covered by insurance. A laptop computer valued at x dollars was taken from her gym locker, and her car was stolen, and she did not have comprehensive insurance, so she lost y dollars. An ice storm caused z dollars worth of damage that was not covered by insurance. Express her casualty loss algebraically.

$x + y + z - 300 - 0.10a$

10. The Filipowicz family consists of two parents, four children, and one grandparent that lives with them. If the deduction per exemption is e dollars, express their total deduction for exemptions algebraically.

$7e$

11. Jenny and Larry Strawberry are married with two children. Their W-2 forms for the last completed tax year are shown below. They also had the following tax-related information.

Bank interest	\$636	Dividends	\$129
Real estate taxes	\$7,444	Mortgage interest paid	\$6,211
Casualty and theft loss	\$14,200	Job expenses	\$815
Charity contributions	cash, \$570; used clothing, \$330		
Medical expenses (not reimbursed by insurance)	\$288; \$3,240; \$976; \$399		

a Employee's social security number 000-00-0000		Safe, accurate, FAST! Use Visit the IRS website at www.irs.gov/efile.	
b Employer identification number (EIN) 00-0000000		1 Wages, tips, other compensation \$60,799.00	2 Federal income tax withheld \$11,760.00
c Employer's name, address, and ZIP code Lincoln High School 1219 Wisconsin Avenue Madison, WI 53701		3 Social security wages \$60,799.00	4 Social security tax withheld
		5 Medicare wages and tips \$60,799.00	6 Medicare tax withheld
		7 Social security tips	8 Allocated tips
d Control number		9 Advance EIC payment	10 Dependent care benefits
e Employee's first name and initial Last name Suff. Jenny Strawberry		11 Nonqualified plans	12a See instructions for box 12
f Employee's address and ZIP code 450 Glen Cove Avenue Madison, WI 53701		13 Statutory employee Retirement plan Third-party sick pay <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	12b
		14 Other	12c
			12d
15 State Employer's state ID number 00-0000000	16 State wages, tips, etc. \$60,799.00	17 State income tax \$2,111.00	18 Local wages, tips, etc.
			19 Local income tax
			20 Locality name

a Employee's social security number 000-00-0000		Safe, accurate, FAST! Use Visit the IRS website at www.irs.gov/efile.	
b Employer identification number (EIN) 00-0000000		1 Wages, tips, other compensation \$77,455.00	2 Federal income tax withheld \$14,915.00
c Employer's name, address, and ZIP code Cousin's Construction Company 112 Franklin Avenue Madison, WI 53701		3 Social security wages \$77,455.00	4 Social security tax withheld
		5 Medicare wages and tips \$77,455.00	6 Medicare tax withheld
		7 Social security tips	8 Allocated tips
d Control number		9 Advance EIC payment	10 Dependent care benefits
e Employee's first name and initial Last name Suff. Larry Strawberry		11 Nonqualified plans	12a See instructions for box 12
f Employee's address and ZIP code 450 Glen Cove Avenue Madison, WI 53701		13 Statutory employee Retirement plan Third-party sick pay <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	12b
		14 Other	12c
			12d
15 State Employer's state ID number 00-0000000	16 State wages, tips, etc. \$77,455.00	17 State income tax \$2,007.00	18 Local wages, tips, etc.
			19 Local income tax
			20 Locality name

a. Complete a Form 1040, including Schedules A and B. Round all entries to the nearest dollar.

Answers vary depending on the year.

b. Find in the missing Social Security and Medicare taxes from their W-2.

Answers vary depending on the year.

8-1 Find a Place to Live

Exercises

- Use the interval 25% – 30% to find the monetary range that is recommended for the monthly housing budget in each situation. Round to the nearest dollar.
 - Enrique makes \$109,992 per year.
\$2,292 – \$2,750
 - Barbara makes \$5,000 per month.
\$1,250 – \$1,500
- Hannah's financial advisor believes that she should spend no more than 26% of her gross monthly income for housing. She has determined that amount is \$1,794 per month. Based on this amount and her advisor's recommendation, what is Hannah's annual salary?
\$82,800
- Adina makes \$53,112 per year and is looking to find a new apartment rental in her city. She searched online and found an apartment for \$1,500 per month. The recommendation is to budget between 25% and 30% of your monthly income for rent. Can Adina afford this apartment based upon the recommended interval? Explain.
No; the interval is \$1,106.50 – \$1,327.80. The apartment is above the price range recommended.
- Rex makes \$12.50 per hour. He works 35 hours a week. He pays 24% of his gross earnings in federal and state taxes and saves 10% of his monthly gross income. He is considering renting an apartment that will cost \$1,600 per month.
 - Is this monthly rental fee within the recommended 25% – 30% housing expense range?
no
 - Based upon his expenses, can he make the monthly payments?
no
- Brian's monthly gross income is \$2,950. He pays 22% of his monthly gross earnings in federal and state taxes and spends 10% of that monthly income to pay off his credit card debt. Brian is also paying off a loan his parents gave him for a new car by sending them 8% of his income per month. Brian found an apartment near his work that rents for \$1,300 per month. Will he be able to make the payments without changing the amounts he pays towards his loan and credit card debt?
Yes, but it will leave him with only \$470 for the month.
- Larry is renting an apartment that will cost r dollars per month. He must pay a D dollars application fee and C dollars for a credit application. His security deposit is two month's rent and he must also pay the last month's rent upon signing the lease. His broker charges 7% of the total year's rent as the fee for finding the apartment. Write an algebraic expression that represents the total cost of signing the lease.
 $3.84r + D + C$
- The square footage and monthly rental of 10 similar one-bedroom apartments yield the linear regression $y = 0.775x + 950.25$ where x represents the square footage of the apartment and y represents the monthly rental price. Grace can afford \$1,500 per month rent. Using the equation, what size apartment should she expect to be able to rent for that price?
about 709 square feet

8. Carla wants to rent a new apartment. She made a table listing the square footage of the apartments and their rents as shown. Use linear regression analysis to determine if there is a correlation between the square footage and the amount charged for the monthly rent.

Square feet	600	790	800	850	925	980	1,050	1,400
Monthly Rent (\$)	795	1,523	1,600	1,800	2,000	2,100	2,300	3,000

- a. What is the linear regression equation? Round the numbers to the nearest hundredth.
 $y = 2.67x - 575.6$

- b. Interpret the correlation coefficient.
0.98; It is a strong positive correlation.

9. The square footage and monthly rental of 15 similar one-bedroom apartments yield the linear regression formula $y = 1.3485x + 840.51$, where x represents the square footage and y represents the monthly rental price. Round answers to the nearest whole number.

- a. Determine the monthly rent for an apartment with 1,200 square feet.
\$2,459

- b. Determine the square footage of an apartment with a monthly rent of \$1,900.
786 sq. ft

10. Conan is moving into a two-bedroom apartment in Valley Oaks. The monthly rent is \$2,000. His up-front fees are shown. How much can he expect to pay up front for this apartment?
\$7,440

Application fee: 3% of one month's rent
Credit application fee: \$20
Security deposit: 1 month's rent and last month's rent
Broker's fee: 14% of year's rent

11. Debbie wants to rent a one-bedroom apartment in April Acres. The apartment has a monthly rent of D dollars. The fees are shown below. Write an algebraic expression that represents the amount she is expected to pay before renting the apartment.

Application fee: 2% of one month's rent Security deposit: $\frac{1}{2}$ month's rent
 Last month's rent paid up front Broker's fee: 4% of one year's rent

2D

12. NuHome Movers charges \$95 per hour for loading/unloading services and \$80 per hour for packing/unpacking services. Their charge is \$2.50 per mile for truck rental. Jay is moving a distance of 200 miles and needs 9 hours of loading/unloading and 7 hours of packing/unpacking. What will his moving cost be if the service also charges 7.25% tax on the total?
\$2,053.84

14. iVan charges an hourly rate for a moving team to load and unload a truck. The charge is a different hourly rate for a team to pack and unpack boxes. Use the quotes to determine the iVan hourly rates.

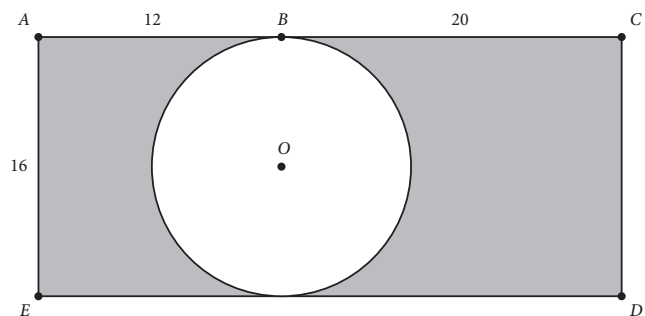
Weekday Move	Weekend Move
8 hours of loading/unloading	5 hours of loading/unloading
<u>6 hours of packing/unpacking</u>	<u>3 hours of packing/unpacking</u>
\$890 total cost	\$515 total cost

\$70 per hour loading/unloading
\$55 per hour packing/unpacking

8-2 Read a Floor Plan

Exercises

- The length of a room is $19\frac{1}{2}$ feet. When using $\frac{1}{4}$ inch = 1 foot scale, what would be the length of the wall on a floor plan?
 $4\frac{7}{8}$ in.
- Kim is building a large gazebo for her backyard. It is in the shape of a regular hexagon. Each side of the gazebo is 12 feet long. The apothem is 10.4 feet. She needs to purchase stones for the floor. It costs \$9.50 per square foot for a special type of interlocking stone. Find the cost of the gazebo's floor. Round to the nearest ten dollars.
\$3,560
- Find the volume of a rectangular room that measures 13 feet by 15.5 feet, with an 8-foot ceiling.
 $1,612 \text{ ft}^3$
- A rectangular room has length L and width W . Its volume is 2,455 cubic feet. Express the height of the ceiling algebraically in terms of x .
 $\frac{2,455}{LW}$
- A regular heptagon (7 sides) has perimeter 126 and area A . Express the apothem a of the heptagon algebraically in terms of the area A .
 $\frac{A}{63}$
- An irregular plane figure drawn on graph paper is framed inside of a 15 by 40 rectangle. To find its area, 10,000 random points are generated, and 5,710 of them land inside the irregular region. What is the area of the irregular region, to the nearest integer?
343 sq. units
- The main meeting room of the Glen Oaks Community Center measures 46 feet by 34 feet and has a 12-foot ceiling. It is well-insulated and faces the east side of his house. The manager wants to purchase an air conditioner. How large of an air conditioner should he purchase? Round up to the next thousand BTUs.
54,000 BTUs
- Circle O is situated in rectangle $ACDE$ as shown.
 - Find the area of the rectangle.
512 sq. units
 - Find the radius of the circle.
8 units
 - Find the area of the circle to the nearest integer.
201 sq. units
 - Find the area of the shaded region.
311 sq. units



9. Kyoko plans to put a new wood floor in her den, which is shown in the floor plan.

a. What is the area of the floor?

246.5 sq. ft

b. At a cost of \$11 per foot, how much will it cost to put down the new floor?

\$2,711.50

c. Kyoko plans to put an *area rug* in the room.

The rug will be large enough so that only a 2-foot wide section of the wood floor will be exposed. Find the dimensions of the area rug.

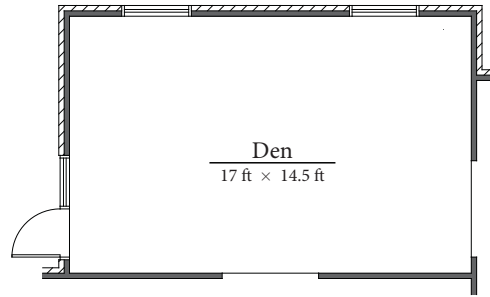
13 ft × 10.5 ft

d. What is the area of the area rug?

136.5 sq. ft

e. Find the area of the wood floor that will be exposed once the area rug is laid down.

110 sq. ft



10. A rectangular room has length L , width W , and height H , where L , W , and H are measured in feet.

a. Express the volume in cubic feet algebraically.

LWH

b. If carpeting costs \$72 per square yard, write an expression for the cost of carpeting the floor of this room.

$8LW$ dollars

11. A rectangular room measures 16 feet by 18 feet. The ceiling is 9 feet high.

a. Find the total area of the four walls in the room.

612 sq. ft

b. If a gallon of paint costs \$37.99 and it covers 400 square feet on average, what is the cost of painting the room, including the ceiling, with two coats of paint? Explain your answer.

\$189.95; to paint the room twice, you will need to cover 1,800 sq. ft. You need more than 4 gal of paint, so you have to buy 5 gal.

c. This room is well-insulated and is on the north side of the house. How large of an air conditioner would this room require? Round to the next highest thousand BTUs.

7,000 BTUs

d. A scale drawing is made of this room using the scale $1 \text{ sq ft} = \frac{1}{4} \text{ sq in.}$ What are the dimensions of this room on the drawing?

4 in. × 4.5 in. × 2.25 in.

12. A rectangular room measures L feet by W feet. The ceiling is 8 feet high. The walls and the ceiling will be painted the same color. Express the total area of the walls and ceiling algebraically.

$16L + 16W + LW$

8-3 Mortgage Application Process

Exercises

- The Jacobs family is planning to buy a home. They have some money for a down payment already. They see a home they like and compute that they would need to borrow \$213,000 from a bank over a 30-year period. The APR is 6.75%.
 - What is the monthly payment, to the nearest cent?
\$1,381.51
 - What is the total of all of the monthly payments over the 30 years?
\$497,343.60
 - What is her total interest for the 30 years?
\$284,343.60
- Pam and Chris found a home for which they would have to borrow H dollars. If they take out a 25-year loan with monthly payment M , express the interest I in terms of H and M .
 $I = 300M - H$
- The bank requires that the Dotkoms pay their homeowner's insurance, property taxes, and mortgage in one monthly payment to the bank. If their monthly mortgage payment is \$1,711.22, their semi-annual property tax bill is \$3,239, and their annual homeowner's insurance bill is \$980, how much do they pay the bank each month?
\$2,332.72
- If you borrow \$200,000 at an APR of 8% for 25 years, you will pay more per month than if you borrow the money for 30 years at 8%.
 - What is the monthly payment on the 25-year mortgage, to the nearest cent?
\$1,543.63
 - What is the total interest paid on the 25-year mortgage?
\$263,089
 - What is the monthly payment on the 30-year mortgage?
\$1,467.53
 - What is the total interest paid on the 30-year mortgage?
\$328,310.80
 - How much more interest is paid on the 30-year loan? Round to the nearest dollar.
\$65,222
 - What is the difference between the monthly payments of the two different loans? Round to the nearest dollar.
\$76.10
- The assessed value of the Kreiner family's house is \$457,000. The annual property tax rate is 2.66% of assessed value. What is the annual property tax on the Kreiner's home?
\$12,156.20

6. Tom and Gwen have an adjusted gross income of \$144,112. Their monthly mortgage payment for the house they want would be \$1,483. Their annual property taxes would be \$9,330, and the homeowner's insurance premium would cost them \$1,099 per year. They have a monthly \$444 car payment, and their credit card monthly payment averages \$4,021.
- Based on the front-end ratio, would the bank lend them \$220,000 to purchase the house they want? Explain your answer.
Yes; their front-end ratio is about 19.6%, which is less than 28%.
 - Based on the back-end ratio, would the bank lend them \$220,000 to purchase the house they want? Explain your answer.
No; their back-end ratio is about 56.8%, which is much greater than the 36% benchmark.
7. The market value of Jennifer and Neil's home is \$319,000. The assessed value is \$280,000. The annual property tax rate is \$19.70 per \$1,000 of assessed value.
- What is the property tax on their home?
\$5,516
 - How much do they pay monthly toward property taxes? Round to the nearest cent.
\$459.67
8. Rowena has an adjusted gross income of k dollars. She is looking at a new house. Her monthly mortgage payment would be m . The annual property taxes would be p , and the annual homeowner's premium would be h . Express her front-end ratio algebraically.
$$\left(m + \frac{p}{12} + \frac{h}{12}\right) \div \frac{k}{12}$$
9. Britney and Jakob have an adjusted gross income of x dollars. Their monthly mortgage payment is m . Their annual property taxes is p , and their annual homeowner's premium is h . They have a monthly credit card bill of c and a monthly car loan of l . They also have an annual college tuition bill represented by t . Write an expression for each ratio.
- front-end ratio
$$\left(m + \frac{p}{12} + \frac{h}{12}\right) \div \frac{x}{12}$$
 - back-end ratio
$$\left(m + \frac{p}{12} + \frac{h}{12} + l + c + \frac{t}{12}\right) \div \frac{x}{12}$$
10. Find the monthly payment (before the balloon payment) for a 25-year, interest-only balloon mortgage for \$300,000 at an APR of 7%. Round to the nearest ten dollars.
\$1,120
11. An interest-only balloon mortgage of a principal p for 20 years has total interest of i dollars. Write an expression for the amount of each monthly payment before the balloon payment.
$$\frac{i}{239}$$
12. Ted has an adjusted gross income of \$120,006. He wants a house with a monthly mortgage payment of \$1,921 and annual property taxes of \$7,112. His semiannual homeowner's premium would be \$897. Ted has a credit card bill that averages \$300 per month.
- What is the back-end ratio to the nearest percent? the front-end ratio?
27%; 30%
 - Assume that his credit rating is good. Based on the back-end ratio, would the bank offer him a loan? Explain.
Yes, since the back-end ratio is less than 36%.
 - Based on the front-end ratio, would the bank offer him a loan? Explain.
Yes, since the front-end ratio is less than 28%.

8-4 Purchase a Home

Exercises

- Let L represent a loan amount, P represent the percent of the APR on that loan, D represent the daily interest that would be charged on the loan at that rate, M represent the number of days in a month, and C represent the closing date on a loan.
 - If I represents the interest on the loan for one year, write an algebraic expression for the interest I .
$$\frac{LP}{100}$$
 - Write an algebraic expression for the daily interest in terms of I .
$$\frac{I}{365}$$
 - Let Z represent the interest due on a loan from the closing date to the end of the month. Write an algebraic expression for Z .
$$(M - C)D$$
- Liz and Nick are buying a \$725,000 home. They have been approved for a 5.25% APR, 30-year mortgage. They made a 20% down payment and will be closing on March 11.
 - What is their interest on the loan for one year?
\$30,450
 - What is the daily interest?
\$83.42
 - How much should they expect to pay in prepaid interest at the closing?
\$1,668.40
- How much will be charged in prepaid interest on a \$500,000 loan with an APR of 4.725% that was closed on August 26?
\$323.65
- Lars has been approved for a \$420,000, 20-year mortgage with an APR of 5.125%.
 - What is his monthly payment?
\$2,800.90
 - How much interest would he expect to pay on the loan in one month?
\$1,793.75
 - How much of the monthly payment will go toward the principal?
\$1,007.15
- The bank approved Sylvie for a \$250,000, 15-year mortgage with an APR of 4.95%.
 - What is her monthly payment?
\$1,970.48
 - How much interest would she expect to pay on the loan in one month?
\$1,031.25
 - How much of the monthly payment will go toward the principal?
\$939.23

6. Hillary was told that based on the price of her home, her approximated closing costs would range from \$11,600 to \$40,600. How much was the price of her home?

\$580,000

7. Laura and Rich have been approved for a \$325,000, 15-year mortgage with an APR of 5.3%. Using the mortgage and interest formulas, complete the two-month amortization table.

Payment Number	Beginning Balance	Monthly Payment	Toward Interest	Toward Principal	Ending Balance
1	325,000.00	2,621.15	1,435.42	1,185.74	328,814.26
2	323,814.26	2,621.15	1,430.18	1,190.98	322,623.29

8. Examine the following loan amortization table for the first 5 months of a \$475,000, 25-year mortgage with an APR of 5.45%. Complete the table.

Payment Number	Beginning Balance	Monthly Payment	Toward Interest	Toward Principal	Ending Balance
1	475,000.00	2,902.75	2,157.29	745.46	474,254.54
2	474,254.54	2,902.75	2,153.91	748.84	473,505.70
3	473,505.70	2,902.75	2,150.51	752.24	472,753.45
4	472,753.45	2,902.75	2,147.09	755.66	471,997.79
5	471,997.79	2,902.75	2,143.66	759.09	471,238.70
6	471,238.70	2,902.75	2,140.21	762.54	470,476.16

9. Examine the loan amortization table for the last 6 months of a \$200,000, 8-year mortgage with an APR of 5.025%. Determine the amounts missing in the table.

Payment Number	Beginning Balance	Monthly Payment	Toward Interest	Toward Principal	Ending Balance
92	12,514.18	2,534.37	52.40	2,481.96	10,032.22
93	10,032.22	2,534.37	42.01	2,492.36	7,539.86
94	7,539.86	2,534.37	31.57	2,502.79	5,037.07
95	5,037.07	2,534.37	21.09	2,513.27	2,523.80
96	2,523.80	2,534.37	10.57	2,523.80	0.00

10. Shay took out a \$560,000, 10-year mortgage with an APR of 6%. The first month she made an extra payment of \$1,200. What was the ending balance at the end of her first month?

\$555,382.85

11. Randy took out an adjustable rate mortgage for \$375,000 over 20 years. It had an introductory rate of 3.25% for the first year, and then it rose to 4.5%. Complete the chart for the 13th payment.

Payment Number	Beginning Balance	Monthly Payment	Toward Interest	Toward Principal	Ending Balance
12	362,608.15	2,126.98	982.06	1,144.92	361,463.23
13	361,463.23	2,361.33	1,355.49	1,005.84	360,457.39

8-5**Rentals, Condominiums,
and Cooperatives****Exercises**

- On March 1, Anton purchased a new condominium. He pays a monthly maintenance fee of \$1,030. His monthly property taxes equal 13.5% of the monthly fee. How much will Anton pay in property taxes for this calendar year?
\$1,668.60
- Sarah purchased a condominium at Tulip Meadows. She pays \$3,196.80 in property taxes each year. These taxes are taken out of her monthly maintenance fee of \$1,480. What percentage of this monthly fee goes to property taxes?
18%
- Last year, one-fifth of the Fitzgerald's \$800 dollar co-op maintenance fee went toward property taxes. How much property tax did the Fitzgerald's pay last year?
\$160
- Luella's monthly maintenance fee is \$720, of which p percent is tax deductible for property tax purposes. Express the annual property tax deduction algebraically.
 $86.40p$
- The Sea Cottage Cooperative is owned by the shareholders. The co-op has a total of 32,000 shares. Linda has an apartment at Sea Cottage and owns 480 shares of the cooperative. What percentage of Sea Cottage does Linda own?
1.5%
- Last year, p percent of Shannon's x -dollar co-op monthly maintenance fee went toward property taxes. Write an algebraic expression for Shannon's annual property taxes.
 $0.12xp$
- Petra has a co-op in Sunset Village. The cooperative consists of a total of 28,000 shares. If Petra owns s shares, what percentage of the cooperative corporation does she own?
 $\frac{s}{280}$
- The South Hills Apartment Complex has just announced rate increases. All rents will increase by 3.2%, and the security deposit, which was formerly 50% of one month's rent, must now equal 60% of the new rent. Eddie rented an apartment for \$1,600. In what amount should he write a check to cover the new rent and the extra security deposit?
\$1,841.92
- Joey rented an apartment from a landlord in his hometown. His rent was R dollars per month until he moved out last week. The new tenants pay N dollars per month. Write an algebraic expression to represent the percent increase.
 $\frac{(N - R)100}{R}$
- In 1998, Ben bought a co-op for \$120,000. He borrowed \$90,000 from the bank to make the purchase. Now he wants to sell the co-op, but the market value has decreased to \$80,000. His equity in the co-op is \$46,800. If he sells the co-op, he will have to pay off the mortgage. How much will he make after he pays off the mortgage?
\$36,800

11. Nick moved into an apartment in the city. He pays \$3,200 rent per month. The landlord told him the rent has increased 3% per year on average.
- Express the rent y as an exponential function of the number of years x .
 $y = 3,200(1.03)^x$
 - Suppose the rent has increased \$100 each year. Express the rent y as a function of the number of years x .
 $y = 100x + 3,200$
 - Determine the predicted rent after 5 years using each of the two equations.
Exponential: \$3,709.68; linear = \$3,700

12. The monthly rents for Jillian's one-bedroom apartment, at the North Haven Towers, for a 10-year period, are given in the table.

Year	Monthly Rent (\$)
1	1,680
2	1,700
3	1,750
4	1,790
5	1,825
6	1,855
7	1,885
8	1,920
9	1,965
10	2,000

- Write the exponential regression equation that models these rents. Round the numbers to the nearest hundredth.
 $y = 1,647.55(1.02)^x$
- According to your equation, what is the approximate yearly rent increase percentage?
2%
- Using your equation, what will the rent be in 15 years?
\$2,217.39

13. Beth moved into an apartment close to her new job. She will be paying \$2,000 per month in rent and expects a 2.5% rent increase each year.

- Express the rent y as an exponential function of the number of years rented, x .
 $y = 2,000(1.025)^x$
- What can she expect the rent to be in the 10th year?
\$2,560.17

14. Monthly rent at The Breakers Co-ops has increased annually, modeled by the exponential equation $y = 2,700(1.045)^x$. What was the percent increase per year?
4.5%

15. Margot bought a condominium at a time when prices were at their highest. She paid \$185,000. Since then, she has watched the market value decrease by 5% per year.

- Write an exponential depreciation equation to model this situation.
 $y = 185,000(0.95)^x$
- Based on your equation, approximately when will her condominium be worth less than \$145,000?
after 5 years

9-1**Retirement Income from Savings****Exercises**

1. Ethan is 48 years old. He is planning on retiring when he turns 62. He has opened an IRA with an APR of 2.95% compounded monthly. If he makes monthly deposits of \$850 to the account, how much will he have in the account when he is ready to retire?
\$176,539.27
2. Conor is 21 years old and just started working after college. He has opened a retirement account that pays 2.5% interest compounded monthly. He plans on making monthly deposits of \$200. How much will he have in the account when he reaches $59\frac{1}{2}$ years of age?
\$155,098.92
3. Carla opened a retirement account that pays P percent interest compounded monthly. If she has direct deposits of X dollars per month taken out of her paycheck, write an expression that represents her balance after Y years.
$$\frac{X\left(1 + \frac{P}{1,200}\right)^{12Y} - 1}{\frac{P}{1,200}}$$
4. Gillian started a retirement account with \$10,000 when she turned 35. The account compounds interest quarterly at a rate of 3.625%. She made no further deposits into the account. After 20 years, she decided to withdraw 40% of what had accumulated in the account so that she could make her home handicap accessible. She had to pay a 10% penalty on the early withdrawal. What was her penalty?
\$823.20
5. Tanya is 42 years old. She would like to open a retirement account so that she will have one half million dollars in the account when she retires at the age of 65. How much must she deposit each month into an account with an APR of 2.75% in order to reach her goal?
\$1,300.68
6. John is $59\frac{1}{2}$ years old. He plans to retire in 3 years. He now has \$600,000 in a savings account that yields 3.4% interest compounded continuously. He has calculated that his final working year's salary will be \$115,000. He has been told by his financial advisor that he should have 60% to 70% of his final year annual income available for use each year when he is retired.
 - a. What is the range of income that his financial advisor feels he must have per year after he retires?
\$69,000 – \$80,500
 - b. Use the continuous compounding formula to determine how much he will have in his account at the beginning of retirement.
\$664,430
 - c. If he uses 60% of his final annual salary, not accounting for any interest accrued in the account, how many years will he be able to tap into this account in his retirement?
between 9 and 10 years

7. Melanie has been contributing to a retirement account that pays 3.875% interest with pre-tax dollars. This account compounds interest monthly. She has put \$300 per month into the account. At the end of 8 years, she needed money for a down payment on a new home. She withdrew 25% of the money that was in the account.

a. Rounded to the nearest dollar, how much did she withdraw?

\$8,425

b. Since she is in the 21% tax bracket, what was her tax liability on the amount of the withdrawal (rounded to the nearest dollar)?

\$1,769

c. She had to pay a 10% early withdrawal penalty. How much was she required to pay (rounded to the nearest dollar)?

\$843

d. How much did this withdrawal “cost” her?

\$2,612

8. Van is an office supervisor who has been contributing to his retirement account for the last Y years with pre-tax dollars. The account compounds interest quarterly at a rate of P percent. He contributes D dollars into the account after each 3-month period and this has not changed over the life of the account.

a. Write an expression to represent the balance in the account after Y years of saving.

$$\frac{D\left(1 + \frac{P}{400}\right)^{2Y} - 1}{\frac{P}{400}}$$

b. After $(Y + 2)$ years of contributions, he needed to withdraw W percent of the money in his account. Write an expression for the withdrawal amount.

$$\left(\frac{W}{100}\right)\left(\frac{D\left(1 + \frac{P}{400}\right)^{2Y} - 1}{\frac{P}{400}}\right)$$

c. Van pays T percent of his income in taxes. Write an algebraic expression for the combined total of his tax liability and the 10% early withdrawal penalty.

$$\left(\frac{T}{100} + 0.01\right)\left(\frac{W}{100}\right)\left(\frac{D\left(1 + \frac{P}{400}\right)^{2Y} - 1}{\frac{P}{400}}\right)$$

9. Meryl contributed 500 pre-tax dollars per month into her retirement account last tax year. Her taxable income for the year was \$77,480. She files taxes as a married filing separately taxpayer.
- What would her taxable income have been had she contributed to the account in after-tax dollars?
\$83,480
 - Use the tax table below to calculate her tax liability in both the pre-tax and after-tax contribution situations.
pre tax: \$16,065; after tax: \$17,745
 - How much did Meryl save in taxes during that year?
\$1,680

If line 43 (taxable income) is —		And you are —			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
Your tax is —					
77,000					
77,000	77,050	15,600	11,944	15,939	14,319
77,050	77,100	15,613	11,956	15,953	14,331
77,100	77,150	15,625	11,969	15,967	14,344
77,150	77,200	15,638	11,981	15,981	14,356
77,200	77,250	15,650	11,994	15,995	14,369
77,250	77,300	15,663	12,006	16,009	14,381
77,300	77,350	15,675	12,019	16,023	14,394
77,350	77,400	15,688	12,031	16,037	14,406
77,400	77,450	15,700	12,044	16,051	14,419
77,450	77,500	15,713	12,056	16,065	14,431
77,500	77,550	15,725	12,069	16,079	14,444
77,550	77,600	15,738	12,081	16,093	14,456
77,600	77,650	15,750	12,094	16,107	14,469
77,650	77,700	15,763	12,106	16,121	14,481
77,700	77,750	15,775	12,119	16,135	14,494
77,750	77,800	15,788	12,131	16,149	14,506
77,800	77,850	15,800	12,144	16,163	14,519
77,850	77,900	15,813	12,156	16,177	14,531
77,900	77,950	15,825	12,169	16,191	14,544
77,950	78,000	15,838	12,181	16,205	14,556

If line 43 (taxable income) is —		And you are —			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
Your tax is —					
80,000					
80,000	80,050	16,385	12,694	16,779	15,069
80,050	80,100	16,399	12,706	16,793	15,081
80,100	80,150	16,413	12,719	16,807	15,094
80,150	80,200	16,427	12,731	16,821	15,106
80,200	80,250	16,441	12,744	16,835	15,119
80,250	80,300	16,455	12,756	16,849	15,131
80,300	80,350	16,469	12,769	16,863	15,144
80,350	80,400	16,483	12,781	16,877	15,156
80,400	80,450	16,497	12,794	16,891	15,169
80,450	80,500	16,511	12,806	16,905	15,181
80,500	80,550	16,525	12,819	16,919	15,194
80,550	80,600	16,539	12,831	16,933	15,206
80,600	80,650	16,553	12,844	16,947	15,219
80,650	80,700	16,567	12,856	16,961	15,231
80,700	80,750	16,581	12,869	16,975	15,244
80,750	80,800	16,595	12,881	16,989	15,256
80,800	80,850	16,609	12,894	17,003	15,269
80,850	80,900	16,623	12,906	17,017	15,281
80,900	80,950	16,637	12,919	17,031	15,294
80,950	81,000	16,651	12,931	17,045	15,306

If line 43 (taxable income) is —		And you are —			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
Your tax is —					
83,000					
83,000	83,050	17,225	13,444	17,619	15,819
83,050	83,100	17,239	13,456	17,633	15,831
83,100	83,150	17,253	13,469	17,647	15,844
83,150	83,200	17,267	13,481	17,661	15,856
83,200	83,250	17,281	13,494	17,675	15,869
83,250	83,300	17,295	13,506	17,689	15,881
83,300	83,350	17,309	13,519	17,703	15,894
83,350	83,400	17,323	13,531	17,717	15,906
83,400	83,450	17,337	13,544	17,731	15,919
83,450	83,500	17,351	13,556	17,745	15,931
83,500	83,550	17,365	13,569	17,759	15,944
83,550	83,600	17,379	13,581	17,773	15,956
83,600	83,650	17,393	13,594	17,787	15,969
83,650	83,700	17,407	13,606	17,801	15,981
83,700	83,750	17,421	13,619	17,815	15,994
83,750	83,800	17,435	13,631	17,829	16,006
83,800	83,850	17,449	13,644	17,843	16,019
83,850	83,900	17,463	13,656	17,857	16,031
83,900	83,950	17,477	13,669	17,871	16,044
83,950	84,000	17,491	13,681	17,885	16,056

10. Pei is a 26-year-old television executive. She files taxes as a single taxpayer. She needed to withdraw \$30,000 from her tax-deferred retirement account to assist her parents with some financial problems. Pei’s gross taxable income for the year in question was \$162,983.
- a. Use the tax schedule shown below to calculate Pei’s tax liability had she not made the early withdrawal.
\$39,613.49

Schedule X— If your filing status is **Single**

If your taxable income is:		The tax is:	
Over—	But not over—		of the amount over—
\$0	\$8,025	----- 10%	\$0
8,025	32,550	\$802.50 + 15%	8,025
32,550	78,850	4,481.25 + 25%	32,550
78,850	164,550	16,056.25 + 28%	78,850
164,550	357,700	40,052.25 + 33%	164,550
357,700	-----	103,791.75 + 35%	357,700

- b. Use the same worksheet to calculate her liability with an increase in her taxable income of \$30,000.
\$49,435.14
- c. How much more in taxes did she pay because of the early withdrawal?
\$9,821.65
- d. What was her early withdrawal penalty?
\$3,000
11. Annette makes \$96,000 per year working for an online e-magazine. Her company offers a 401K retirement plan in which they will match 45% of her contributions to the 401K up to 9% of her salary. The company will only allow employees to make contributions to the 401K to a maximum of 25% of their salary. For the year in question, the maximum allowable contribution to any 401K is \$22,000 since she is over the age of 55.
- a. What is the maximum Annette’s employer will allow for her contribution?
\$24,000
- b. What is the maximum contribution she could make?
\$22,000
- c. What is her employer’s maximum contribution amount?
\$8,640
- d. Annette only wants to contribute an amount up to her employer’s maximum contribution level. What should that monthly amount be?
\$1,600



9-2 Social Security Benefits

Exercises

- In 2009, the maximum taxable income for Social Security was \$106,800 with a 6.2% tax rate.
 - What is the maximum anyone could have paid into Social Security tax in the year 2009?
\$6,621.60
 - Ravi had two jobs in 2009. One employer paid him \$59,810 and the other paid him \$61,200. Each employer took out 6.2% for Social Security. How much did Ravi overpay in Social Security for 2009?
\$881.02
- In 2009, Giselle had two jobs. She earned \$73,440 working the first 8 months of the year at a nursing home. She switched jobs in September and began to work in a hospital, where she earned \$32,211. In 2009, the maximum taxable income for Social Security was \$106,800. The Social Security tax rate was 6.2%. How much OASDI tax did Giselle overpay?
\$0
- Alexandra had two employers last year. Both of her employers took out OASDI tax. The OASDI percent was p and the maximum taxable OASDI income was m dollars. She earned x dollars at one job and y dollars at her second job, and $x + y > m$. Express her OASDI refund algebraically.
$$\frac{p}{100}(x + y - m)$$

For Exercises 4 – 6 use the Social Security worksheet below.

Social Security Benefits Worksheet—Lines 20a and 20b

- Enter the total amount from box 5 of all your Forms SSA-1099 and Forms RRB-1099. Also, enter this amount on Form 1040, line 20a 1. _____
- Enter one-half of line 1 2. _____
- Enter the total of the amounts from Form 1040, lines 7, 8a, 9a, 10 through 14, 15b, 16b, 17 through 19, and 21 3. _____
- Enter the amount, if any, from Form 1040, line 8b 4. _____
- Add lines 2, 3, and 4 5. _____
- Enter the total of the amounts from Form 1040, lines 23 through 32, plus any write-in adjustments you entered on the dotted line next to line 36. 6. _____
- Is the amount on line 6 less than the amount on line 5?
 - No.  None of your social security benefits are taxable. Enter -0- on Form 1040, line 20b.
 - Yes. Subtract line 6 from line 5 7. _____
- If you are:
 - Married filing jointly, enter \$32,000
 - Single, head of household, qualifying widow(er), or married filing separately and you lived apart from your spouse for all of 2008, enter \$25,000
 - Married filing separately and you lived with your spouse at any time in 2008, skip lines 8 through 15; multiply line 7 by 85% (.85) and enter the result on line 16. Then go to line 17
 } 8. _____
- Is the amount on line 8 less than the amount on line 7?
 - No.  None of your social security benefits are taxable. Enter -0- on Form 1040, line 20b. If you are married filing separately and you lived apart from your spouse for all of 2008, be sure you entered "D" to the right of the word "benefits" on line 20a.
 - Yes. Subtract line 8 from line 7 9. _____
- Enter: \$12,000 if married filing jointly; \$9,000 if single, head of household, qualifying widow(er), or married filing separately and you lived apart from your spouse for all of 2008 .. 10. _____
- Subtract line 10 from line 9. If zero or less, enter -0- 11. _____
- Enter the smaller of line 9 or line 10 12. _____
- Enter one-half of line 12 13. _____
- Enter the smaller of line 2 or line 13 14. _____
- Multiply line 11 by 85% (.85). If line 11 is zero, enter -0- 15. _____
- Add lines 14 and 15. 16. _____
- Multiply line 1 by 85% (.85) 17. _____
- Taxable social security benefits. Enter the smaller of line 16 or line 17. Also enter this amount on Form 1040, line 20b 18. _____

4. Andrew and Julianne Coletti are married and filing a joint Form 1040. Andrew is collecting Social Security, but Julianne is not. They are filling out the Social Security worksheet on page 123 so they can determine the amount of Andrew's Social Security benefits that they will pay Federal income tax on. Number a blank sheet of paper 1 – 18. Fill in the following lines which were taken from their tax information:

Line 1—Andrew received \$31,555 in Social Security benefits.

Line 3—the total of their other sources of income is \$143,677.

Line 4—the amount from line 8b is \$502.

Line 6—the total to enter is \$6,075.

- a. Fill in the correct entries for the rest of the lines on their Social Security worksheet.
2. \$15,777.50; 5. \$159,956.50; 7. \$153,881.50; 8. \$32,000; 9. \$121,881.50; 10. \$12,000; 11. \$109,881.50; 12. \$12,000; 13. \$6,000; 14. \$6,000; 15. \$99,399.28; 16. \$99,399.28; 17. \$26,821.75; 18. \$26,821.75
- b. How much of Andrew's Social Security benefit must they pay Federal income tax on?
\$26,821.75
- c. How much of Andrew's Social Security benefit is not taxed?
\$4,733.25

5. Sabrina is single. She is filling out the Social Security worksheet on page 123 so she can determine the amount of her Social Security benefits that she will pay Federal income tax on. Number a blank sheet of paper 1 – 18. Fill in the following lines which were taken from Sabrina's tax information.

- Line 1—she received \$29,612 in Social Security benefits.
- Line 3—the total of her other sources of income is \$67,891.
- Line 4—the amount from line 8b is \$440.
- Line 6—the total to enter is \$3,921.

How much of Sabrina's Social Security benefits does she have to pay tax on?

\$25,170.20

6. Mr. Stevens filled out a Social Security benefits worksheet. He received x dollars in Social Security benefits but had to pay taxes on t dollars of it.

- a. Express the fraction of his Social Security income that he had to pay tax on as a percent.

$$\frac{100t}{x}$$
- b. Express algebraically the amount of his Social Security benefits that were not taxed.
 $x - t$

7. Emanuel requests his annual Social Security Statement from the IRS each year. He wants to check how many Social Security credits he received for 2009. He worked all year and earned \$2,962 per month. How many credits did he earn in 2009?

4

8. This year Phil pays m dollars for Medicare Part B coverage. He reads that this cost will go up 11.5% next year. Express the difference between this year's and next year's cost algebraically.

$0.115m$

9-3 Pensions

Exercises

- Dyana worked at Litton Light Manufacturing for 25 years. Her employer offers a pension benefit package with a flat benefit formula using the flat amount of \$60 for each year of service to calculate her monthly pension. How much will Dyana's monthly pension benefit be?
\$1,500
- Frank worked for Morton Industries for 18 years. His company offered him a flat amount of \$48 for each year of service as his monthly pension package. After one year, he was notified of a 1.625% cost of living adjustment to his monthly pension benefit. Determine Frank's current monthly pension benefit.
\$878.04
- Aileen worked for PenUltimate Inc. for Y years. Her company offered her a flat monthly pension benefit of D dollars for each year of service. After one year in retirement, she was notified of a P percent cost of living adjustment. Write an algebraic expression that represents her current monthly pension benefit.
 $DY\left(1 + \frac{P}{100}\right)$
- George is retiring after 30 years at Peabody Motors. The company offers him a flat yearly retirement benefit of \$870 for each year of service. What will be his monthly pension?
\$2,175
- Mary is retiring after working for Fashionista Limited for 21 years. The company offered her a flat retirement benefit of \$50 per month for each year of the first 15 years of service and \$65 per month for each year of service thereafter.
 - What was her monthly income in the first year after retirement?
\$1,140
 - What was her annual income for the first year of retirement?
\$13,680
 - After one year of retirement, she received a 0.9% cost of living adjustment to her monthly pension benefit. What was her new monthly benefit?
\$1,150.26
- Statton Realty offers their employees a flat pension plan in which a predetermined dollar amount (multiplier) is multiplied by the number of years of service to determine the monthly pension benefit using the following schedule.

YEARS EMPLOYED	MULTIPLIER
15 – 19	\$62.50
20 – 25	\$75.80
26 +	\$83.25

After working at Statton for 25 years, Gina has decided to open her own business. What would be the difference in her monthly pension benefit if she stays for an extra year?
\$269.50 per month

7. Risa’s employer offers an annual pension benefit calculated by multiplying 1.875% of the career average salary times the number of years employed. Here are Risa’s annual salaries over the last 15 years of employment.

56,000	56,000	57,100	57,100	58,900	58,900	58,900	62,000
65,000	65,000	66,400	66,800	66,800	68,000	68,600	

- a. What is Risa’s career average salary?
\$62,100
 - b. What is Risa’s annual pension under this plan?
\$17,465.63
 - c. What percentage of her final annual salary will her annual retirement salary be? Round your answer to the nearest percent.
28%
 - d. What is Risa’s monthly pension benefit? Round your answer to the nearest cent.
\$1,455.47
8. Kevin is planning on retiring after 25 years of employment. For the last three years he has made \$132,000; \$135,000; and \$138,000. His employer offers a defined benefit plan in which the annual pension is calculated as the product of the final three-year average salary, the number of years of service, and a 2.25% multiplier. What will Kevin’s annual pension be?
\$75,937.50
9. Depot City uses a final average formula to calculate an employee’s pension benefits. The amount used in the calculations is the salary average of the final five years of employment. The retiree will receive an annual benefit that is equivalent to 1.2% of the final average for each year of employment. Vilma is retiring at the end of this year, after 23 years of employment at Depot City. Calculate her annual retirement pension given that her final five years of salaries are \$63,000; 63,700; 64,000; 64,000; and 64,800.
\$17,636.40
10. Singh’s employer offers a defined contribution pension plan that uses a graded 6-year vesting formula as shown here.

Years Employed	Vesting Percentage
1 – 2	0%
3 – 10	25%
10 – 15	45%
15 – 20	70%
20 – 35	85%
30+	100%

- His employer matches \$0.75 on the dollar for all of his contributions. After 16 years, Singh decides to move to a different state. His personal contributions (adjusted for losses or gains in the investment) amount to \$25,000. How much of his pension will he be able to take with him?
\$38,125

11. Alternate Universe Inc. offers their employees P percent of the average of their last three years of annual salaries for each year of service to the company. Helen began working at Alternate Universe Y years ago and is now planning to retire. Her final three years of salaries are A , B , and C dollars. Write an algebraic expression that will represent her annual retirement benefit.

$$Y * \frac{P}{100} * \frac{A + B + C}{3}$$

12. Richie has contributed Y dollars per month to his pension plan for each of the last R years. His employer has matched P percent of each contribution. His employer uses a graded vesting formula according to the schedule below.

Years Employed	Vesting Percentage
0	0%
1	0%
2 – 8	$B\%$
9 – 15	$C\%$
16 – 30	$D\%$
30+	100%

Richie has decided to change jobs after R years of service where $16 \leq R \leq 30$.

- a. Write an algebraic expression that represents how much he has contributed to his retirement account.

$$12RY$$

- b. How much of his contributions can he take with him?

$$100\%$$

- c. Write an algebraic expression that represents how much his employer has contributed to his retirement account.

$$\frac{3RYP}{25}$$

- d. Write an algebraic expression that represents how much of the employer contributions Richie can take with him.

$$\frac{3RYPD}{2,500}$$

13. Logan has worked for the Pendleton University for the last 20 years. The university calculates their employee's pension according to the following formula.

Determine the average of the highest 5 years of annual earnings.

Determine the monthly average using the above amount.

Subtract \$1,000 from that amount.

Multiply the result by 45%.

Add \$500 to that result.

For each year of employment over 15 years, add 0.5% of the average monthly salary.

The final result is the monthly pension benefit.

Logan's five highest annual salaries are \$73,000; \$73,900; \$73,900; \$74,000; and \$75,000.

Calculate Logan's monthly pension benefit if he retires after 20 years of employment. Round any calculations to the nearest cent.

$$\$2,977.58$$

9-4 Life Insurance

Exercises

1. Mr. Kurris is 50 years old. In four years, his house will be paid off and his daughter will be finished with college. He wants to take out a five-year level-term life insurance policy with a face value \$750,000. The monthly premium is \$61.
 - a. What will be his total cost for this policy over the 5-year period?
\$3,660
 - b. If he dies after paying for the policy for 16 months, how much will the insurance company pay his beneficiaries?
\$750,000
 - c. If he does not die during the five years, how much does the insurance company make on this policy?
\$3,660
 - d. If he dies after paying for the policy for 13 months, how much will the insurance company lose on this policy?
\$749,207

2. The Apple Insurance Company offers five-year term \$100,000 policies to a 46-year-old female for \$516 per year. The mortality rates are shown below. Fill in the missing entries a – g in the table.

Age at Death	46	47	48	49	50	Age ≥ 51
Mortality Rate	0.0016	0.0019	0.0022	0.0027	0.0032	a. 0.9984
Insurance Company Profit at End of Each Year	b. -\$99,484	c. -\$98,968	d. -\$98,452	e. -\$97,936	f. -\$97,420	g. \$2,580

- h. What is the expected profit for one of these policies? Round to the nearest cent.
\$1,435.89
 - i. If the company sold 5,000 of the same policies to 46-year-old females, what would their expected profit be for the 5,000 policies? Round to the nearest thousand dollars.
\$7,179,000

3. Julio has a universal life insurance policy with a face value of \$200,000. The current cash value of the policy is \$11,560. If the premium is \$102 per month, for how many months can the cash value be used to pay the premium?
113

4. An insurance company sells a \$500,000 five-year term policy to a female. The monthly policy is m dollars. If the person dies 20 months after taking out the policy, express the insurance company's profit algebraically.
 $20m - 500,000$

5. Mr. DiPasquale’s whole life premium increased from \$115 to \$149 per month when he increased his face value. Find the percent increase to the nearest percent.
30%

6. Use the mortality table below to answer parts a – f.

Exact Age	Mortality Table for Males		Mortality Table for Females	
	Death Probability	Life Expectancy	Death Probability	Life Expectancy
56	0.008467	23.52	0.005148	26.94
57	0.009121	22.71	0.005627	26.07
58	0.009912	21.92	0.006166	25.22
59	0.010827	21.13	0.006765	24.37
60	0.011858	20.36	0.007445	23.53
65	0.017976	16.67	0.011511	19.50
66	0.019564	15.96	0.012572	18.72
67	0.021291	15.27	0.013772	17.95
68	0.023162	14.59	0.015130	17.19
69	0.025217	13.93	0.016651	16.45

a. What is the life expectancy for a 69-year-old female? Round to the nearest year.
16 yrs

b. Until what age is a 65-year-old male expected to live? Round to the nearest year.
82

c. If the company insures 10,000 58-year-old males, how many are expected to die before their 59th birthday? Round to the nearest integer.
99

d. Based on the table, what is the probability that a 68-year-old male will live to his 69th birthday?
0.976838

7. The mortality rate for a certain female elderly age category is 0.0059. A company insures 10,000 people in this category. About how many of them will die before their next birthday?
59

8. Express the expected profit algebraically for the following mortality table.

Profit	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
Probability	0.01	0.02	0.9	0.01

$0.01a + 0.02b + 0.9c + 0.01d$

9. Mr. Norton has a universal life insurance policy, and the current cash value of the policy is *c*. The premium is *m* dollars per month. He is going to use the cash value to pay for premiums as long as it can. In those months, the cash value will earn *i* interest. Write an algebraic expression for the number of months the cash value can be used to pay the premium.
 $\left[\frac{c + i}{m} \right]$

10. Use the definition of the greatest integer function to evaluate the following.
- a. $[109.999]$ **109**
 - b. $[87.007]$ **87**
 - c. $[-50.95]$ **-51**
 - d. $[34\frac{12}{13}]$ **34**
11. The Wonderland Miracle Carnival Company manages a game at a state fair. They charge \$3 per game. Winners receive a \$10 prize. The probability of winning the game is 0.15.
- a. What is the probability of losing the game?
0.85
 - b. What profit does the company earn if a person wins the game?
-\$7
 - c. What profit does the company earn if the person loses the game?
\$3
 - d. Set up a table indicating the profit and the probability of winning and losing.

Profit	-\$7	\$3
Probability	0.15	0.85

- e. What is the expected profit per game?
\$1.50
 - f. If 800 people play this game during the week-long state fair, what is the company's profit for the week?
\$1,200
12. Mr. Kite took out a 10-year term policy with a face-value of f dollars. Over the lifetime of the policy, he pays monthly payments of m dollars. He dies after 12 years.
- a. Express the total he paid for the policy algebraically.
 $120m$
 - b. How much will his family receive from the insurance company?
\$0
13. Mr. Henderson takes out a term life insurance policy with a renewable annual premium. The first year premium is \$350. Premiums increase by 7% each year.
- a. What will the premiums be in the second year?
\$374.50
 - b. What will the premiums be in the third year? Round to the nearest cent.
\$400.72
 - c. What will the premiums be in the n th year?
 $350(1.07)^n$

10-1 Utility Expenses

Exercises

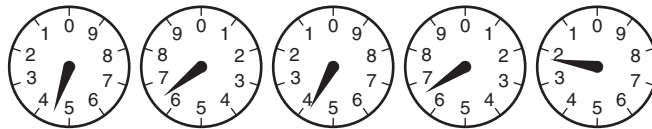
- Craig's June water bill listed two meter readings. The previous reading was 6,372 ccf and the present reading is 6,501 ccf. How much water did Craig's household use during the billing period?

129 ccf

- The Ricardo household used w cubic feet of water during a summer month. Express the number of ccf of water they used algebraically.

$\frac{w}{100}$

- Mrs. Zorn works for a utility company and is reading the electric meter for a local pizza place, which is shown below.



How many kWh of electricity are indicated by the dials?

46,462

- A certain guitar amplifier requires 200 watts when it is being used. How much would it cost to run for 55 minutes, at a cost of \$0.11 per kWh? Round to the nearest cent.

\$0.02

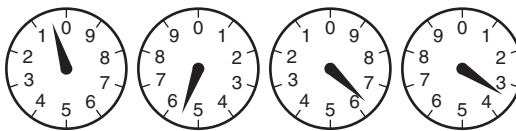
- The dials shown below are from a natural gas meter and display the number of ccf used. How many ccf are indicated by the dials?

53,607



- The Simpsons' previous water bill showed a meter reading of 433 ccf. Below is their meter's current reading. At a cost of \$0.91 per ccf, what should their next water bill be?

\$118.30



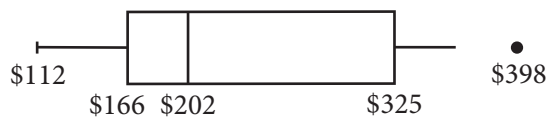
- The Robinsons' old dryer cost them \$455 per year to run. The new one they purchased for \$940 will save them 18% annually in energy costs to run it. In how many years will it pay for itself?

12 years

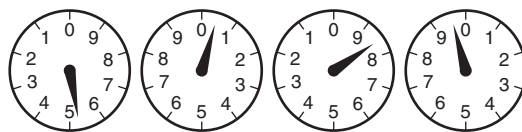
8. An appliance uses w watts to run. If you run it for h hours, and the cost per kilowatt hour is c , express the cost of running the appliance algebraically.
$$\frac{whc}{1,000}$$
9. The Nesmiths' old clothes washer costs c dollars to run for a year. They replace it with a new energy-efficient washer that costs w dollars, but saves p percent per year in energy usage. How many years will it take for the washer to pay for itself? Express your answer algebraically using the greatest integer function.
$$\left\lfloor \frac{w}{pc} \div 100 \right\rfloor + 1$$
10. Two years ago the Lange family used \$3,250 worth of electricity. Last year they switched to balanced billing.
- a. What was their monthly payment last year under balanced billing? Round to the nearest cent.
\$270.83
- b. During last year, they actually used \$3,766 of electricity and their balanced billing payments were not enough to pay for their electrical usage. They had to pay the difference at the end of the year. How much did they owe the utility company?
\$516.04
11. Last winter, the Kranepool family used 431 gallons of heating oil at a price of \$4.12 per gallon. If the price increases 8.25% next year, what will their approximate heating expense be for the year? Round to the nearest ten dollars.
\$1,920
12. A typical light bulb requires 60 watts to run when it is turned on. If a light fixture requires three of these bulbs, and the light is left on unnecessarily for four hours per day, how many kWh of electricity are wasted each year?
262.8
13. Mr. Denton's last water bill was for \$109.56. The previous reading was 1,209 ccf and the present reading was 1,417 ccf. What does his water company charge for 100 cubic feet of water? Round to the nearest cent.
\$0.53
14. The Manilow family paid their electric bill using balanced billing all last year. The monthly payment was m dollars. At the end of the year, the electric company told them they used more electricity than they were billed for, and they owed d dollars. Express the value of the electricity used by the Manilows last year algebraically.
 $12m + d$
15. A water bill listed a previous reading of 4,501 ccf and a present reading of 4,971 ccf. The water company charges \$0.86 per ccf of water. What should have been charged on this water bill?
\$404.20

16. One watt hour is equivalent to 3.413 BTUs per hour.
- If an air conditioner is rated at 10,000 BTU, how many watts does it require per hour? Round to the nearest hundred watts.
2,900
 - Express your answer to part a in kWh.
2.9
 - If you run an air conditioner for 15 hours per day, and electricity costs \$0.12 per kWh, estimate the cost of running the air conditioner for 15 hours on 60 summer days. Round to the nearest dollar.
\$313

17. The following box-and-whisker plot gives the monthly costs of electricity for the Sharkey household for the year.



- How many months was the bill \$202 or less?
6
 - How many months had bills greater than or equal to \$166?
9
 - If they have gas heat, and they live in Virginia, which month do you think had the \$398 bill? Explain your reasoning.
July or August; the bill was more due to the air conditioning expenses.
 - If they have electric heat, and they live in Minnesota, which month do you think had the \$398 bill? Explain.
January or February; the bill was more due to the heating expenses.
18. The Lennon family used x dollars worth of electricity two years ago and then switched to balanced billing.
- Express the amount of their monthly balanced billing payment algebraically.
 $\frac{x}{12}$
 - Last year, they underpaid their bill and were charged c dollars at the end of the year to make up for the underpaid charges. Express the amount of this year's balanced billing monthly payment algebraically, if it was based on last year's usage.
 $\frac{x + c}{12}$
19. How many cubic feet are represented by the following water meter?
508,900



10-2 Electronic Utilities

Exercises

1. A pay phone at an airport charges \$0.85 for the first four minutes (or part of) and \$0.34 for each extra minute (or part of). Express the cost $c(m)$ of an m -minute phone call as a split function using the greatest integer function.

$$c(m) = \begin{cases} 0.85 & \text{when } m \leq 4 \\ 0.85 + 0.34(m - 4) & \text{when } m > 5 \text{ and } m \text{ is an integer} \\ 0.85 + 0.34([m - 4] + 1) & \text{when } m > 5 \text{ and } m \text{ is not an integer} \end{cases}$$

2. A wireless phone company's *Call-All* plan has a basic charge per month, which includes a certain amount of free minutes. There is a charge for each additional minute. The split function below gives the price $c(m)$ of an m -minute phone call. Fractions of a minute are charged as if they were a full minute.

$$c(m) = \begin{cases} 29.99 & \text{when } m \leq 700 \\ 29.99 + 0.22(m - 700) & \text{when } m > 700 \text{ and } m \text{ is an integer} \\ 29.99 + 0.22([m - 700] + 1) & \text{when } m > 700 \text{ and } m \text{ is not an integer} \end{cases}$$

- a. Describe the cost of the *Call-All* plan by interpreting the split function.
The basic charge of \$29.99/mo includes 700 minutes. Each extra minute is \$0.22. Parts of a minute are rounded up to the next whole minute.
- b. Find the monthly cost of the *Call-All* plan for someone that used 980 minutes.
\$91.59
3. The Tech-N-Text phone company charges \$48 for unlimited texting per month, or \$0.16 per text message sent or received. For what amount of text messages would the unlimited plan cost the same as the per-text plan?
300
4. Next-Text charges \$19 for a texting plan with 250 text messages included. If the customer goes over the 250 messages, the cost is \$0.12 per text message. They have an unlimited plan which costs \$45 per month.

- a. If t represents the number of text messages, and $c(t)$ represents the cost of the messages, express $c(t)$ as a split function in terms of t .

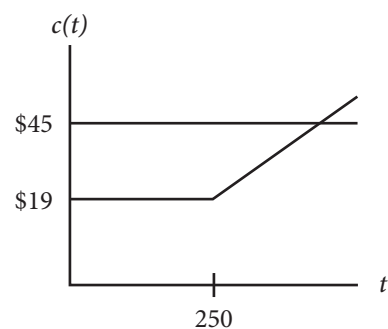
$$c(t) = \begin{cases} 19 & \text{when } t \leq 250 \\ 19 + 0.12(t - 250) & \text{when } t > 250 \end{cases}$$

- b. Graph the function from part a. What are the coordinates of the cusp?
(250, 19)

- c. On the same axes, graph the function $c(t) = 45$, which represents the cost under the unlimited plan.
Parts b and c are shown in the graph.

- d. Find the coordinates of the point of intersection of the two graphs. Round to the nearest hundredth.
(466.67, 45)

- e. For what number of text messages are the costs of the two different plans the same? Round to the nearest integer.
467



5. A cable TV provider charges Nina \$99 per month for three services—Internet, phone, and cable television. In addition, Nina’s monthly bill for cell phone calls and text messages averages \$59.70 per month. What is her average cost per day for these four services?
\$5.29

6. The split function below gives the cost $c(x)$ of x text messages from WestQuest Cellular. Find the coordinates of the cusp without graphing the function. Explain your answer.

$$c(x) = \begin{cases} 43.50 & \text{when } x \leq 500 \\ 43.50 + 0.1(x - 500) & \text{when } x > 500 \end{cases}$$

(500, 43.50); the cusp has y-coordinate equal to the flat rate for the first 500 minutes.

7. Examine the following split function which gives the cost $c(t)$ of t text messages per month.

$$c(t) = \begin{cases} w & \text{when } t \leq r \\ w + k(t - r) & \text{when } t > r \end{cases}$$

- a. If Sophie had r text messages, what is the cost for the month?

w

- b. Is the cost of $2r$ text messages double the cost of r text messages? Explain.

No; the flat fee w is paid regardless. The cost of the first r text messages is w . The cost of the additional r text messages is kr .

8. Eleni gets charged for an average of 1,340 text messages per month, at a rate of \$0.13 per message. She is thinking of paying a flat fee of \$70 for unlimited text messaging. How much would she save each year by using the unlimited plan instead of the pay-per-message plan?
\$1,250.40

9. The Super Vision cable TV/Internet/phone provider advertises a flat \$100 monthly fee for all three services for a new customer. The rate is guaranteed for five years. Cable Zone normally charges \$46 for monthly home phone service, \$36 for monthly Internet service, and \$56 for monthly cable television.

- a. How much could a customer save during the first year by switching from Cable Zone to Super Vision?

\$456

- b. Super Vision raises the rates 23% after a new customer’s first year, how much will a customer who switched from Super Vision save in the second year?

\$180

- c. If Super Vision raises the rates 18% for the third year compared to the second year, which company is cheaper for the third year?

Cable Zone

10. A phone company set the following rate schedule for an m -minute call from any of its pay phones.

$$c(m) = \begin{cases} 0.95 & \text{when } m \leq 6 \\ 0.95 + 0.24(m - 6) & \text{when } m > 6 \text{ and } m \text{ is an integer} \\ 0.95 + 0.24([m - 6] + 1) & \text{when } m > 6 \text{ and } m \text{ is not an integer} \end{cases}$$

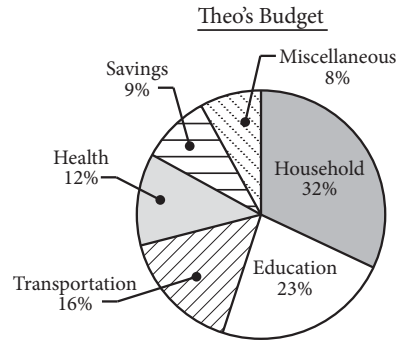
What is the difference in the costs of a $10\frac{1}{2}$ -minute call compared to an 11-minute call?
\$0.24

10-3 Charting a Budget

Exercises

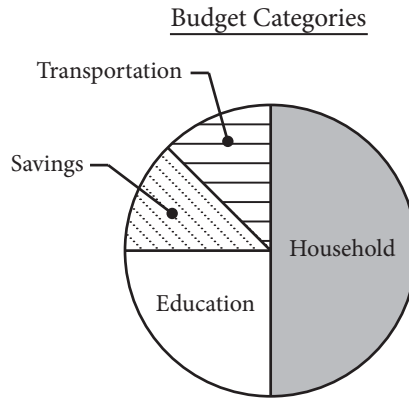
- Construct a pie chart to represent the percents that Theo has determined as his monthly expenses.

Household: 32%
 Education: 23%
 Transportation: 16%
 Health: 12%
 Savings: 9%
 Miscellaneous: 8%

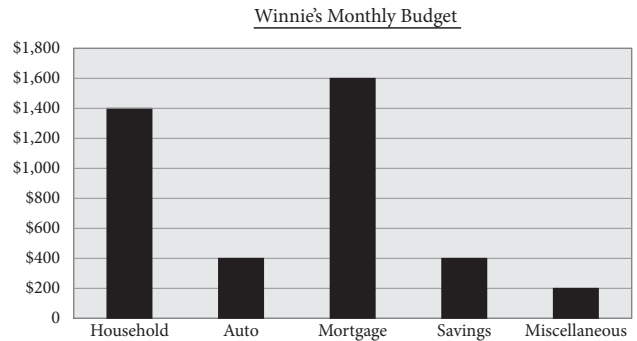
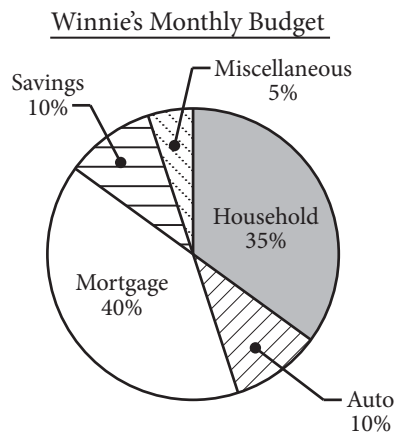


- Identify the approximate percentages allocated for each of the categories in the pie chart.

Household: 50%
Education: 25%
Transportation: 12.5%
Savings: 12.5%



- The pie chart shows Winnie's monthly budget allocation of \$4,000. Construct a bar graph using this information. Use the categories for the horizontal axis and the budgeted amounts for the vertical axis.



4. Create a year-long budget matrix to chart the following medical related expenses:
 Healthcare premium: \$120 twice a month; Prescriptions: \$80 monthly; Physical exams: \$225 semiannually; Dental insurance: \$60 quarterly; Eyeglasses: \$300 annually (June); Physical Therapy: \$100 (bimonthly beginning in February). **Sample budget given.**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Healthcare Prem.	240	240	240	240	240	240	240	240	240	240	240	240
Prescriptions	80	80	80	80	80	80	80	80	80	80	80	80
Physicals						225						225
Dental Insurance			60			60			60			60
Vision						300						
Physical Therapy		100		100		100		100		100		100

5. Vinny’s financial budget is as follows: the percentage budgeted for his retirement account is three times the percentage for his savings account. The percentage budgeted for his savings account is $\frac{1}{4}$ the percentage budgeted for his checking account. The percentage budgeted for his stock investments is $\frac{2}{3}$ the percentage budgeted for his retirement account. What is the percentage for checking? If \$1,200 is budgeted for the entire category, how much goes to each account?

40%; Checking \$480, Savings \$120, Retirement \$360, Stocks \$240

6. The bar graph shows budgeted monthly utility expenses for a one-year period.

- a. What is the total annual amount budgeted for utilities?

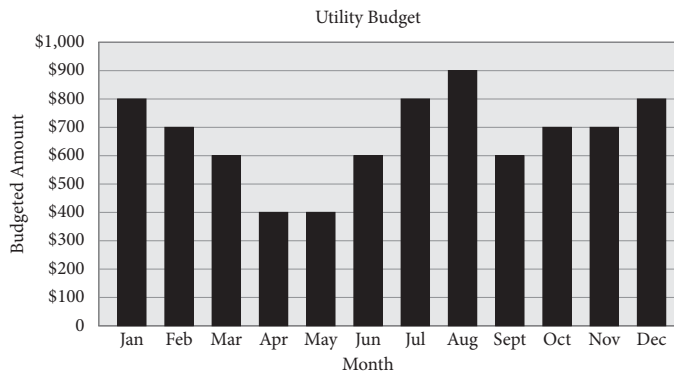
\$8,000

- b. What percent of the total yearly amount was budgeted for the months of June – September?

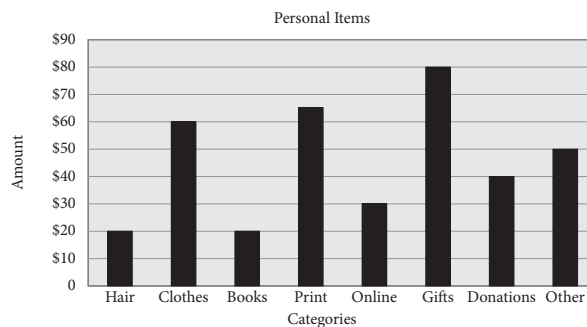
36.25%

- c. The homeowners replaced their furnace with a more energy efficient one. They were told that they could decrease their utility budget for the upcoming month of January by 20% from the previous January amount.

How much will they budget for utilities in January?
\$640



7. Construct a bar graph for the September budget category “Personal Items” using the following amounts: Hair cut \$20, Clothing purchases \$60, Books \$20, Newspapers/Magazines \$65, Online Subscriptions \$30, Gifts \$80, Donations \$40, and Other \$50.



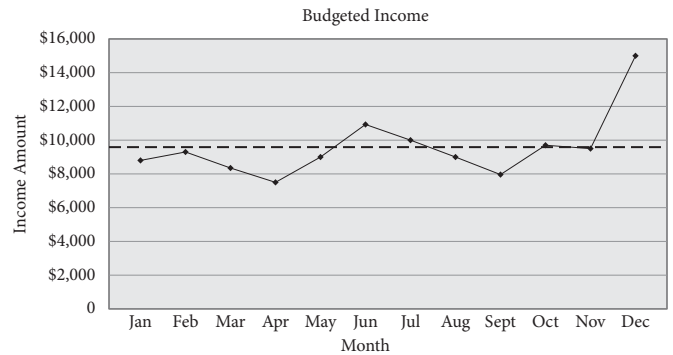
8. Tina's primary source of income pays a fixed amount and her secondary source of income varies monthly. In preparing her budget for the year, she has entered the amounts she has agreed to be paid when working her second job in the given months. She also has income from interest-bearing savings accounts and stock dividends. She used actual amounts from the previous year to set up this budget for the upcoming year.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Primary Source	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Secondary Source	1,300	1,800			1,500		2,500	1,500		2,200	2,000	4,000
Interest			250			280			310			350
Dividends			600			150			150			150
Other						3,000						3,000

- a. What is her budgeted income for each month?

8,800	9,300	8,350	7,500	9,000	10,930	10,000	9,000	7,960	9,700	9,500	15,000
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

- b. Construct a line graph of this budget.



- c. Determine the average monthly income to the nearest dollar.
\$9,587

- d. Draw a horizontal line on your graph representing that amount. What months fell below the average?

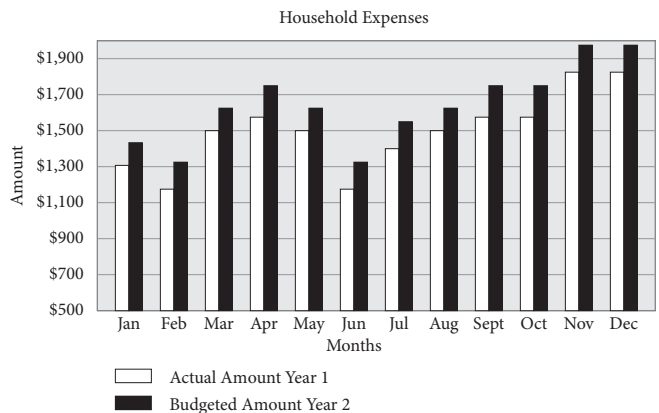
Parts b and d are shown on graph; Jan, Feb, Mar, Apr, May, Aug, Sept, and Nov.

9. Aida created a double bar graph to illustrate the actual amounts spent this year for household expenses and the budgeted amounts for the following year. The following year's amounts reflect a 5% increase over the COLA. For June, the actual amount is \$1,200 and the budgeted amount for Year 2 is \$1,320.

- a. What was the cost of living adjustment that Aida used to get the budgeted amounts?
11%

- b. Determine the budgeted amount for January of Year 2.
\$1,430

- c. The August actual amount was the exact amount Aida had budgeted for. This actual amount reflected an 8% increase over the previous year's actual amount for August. What was the previous year's actual amount for August rounded to the nearest dollar?
\$1,380

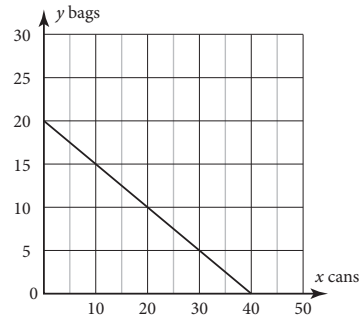


10. Under his "Household Expense" budget category, Mark has allocated \$60 per month for pet food. He can purchase "wet food" for \$1.50 per can or "dry food" for \$3 per bag.

- a. Determine a budget line equation for this situation.

$$1.50x + 3y = 60 \text{ or } 3x + 1.50y = 60$$

- b. Graph the budget line that will depict the different combinations of cans and bags that Mark can purchase while still remaining within his budget.



- c. Name a combination of bags and cans that will allow him to meet his budget exactly.

Answers vary; any point on the line

- d. Name a combination of bags and cans that will keep him under budget.

Answers vary; any point below the line

- e. Name a combination of bags and cans that will cause him to be over budget.

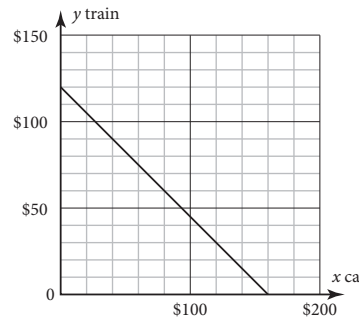
Answers vary; any point above the line

11. A consumer budgets \$480 per month for transportation. She has determined that the cost of a round-trip train ride is \$4 and the cost of each round-trip car ride (factoring in gas, oil, etc.) is \$3.

- a. Write a budget line equation for this situation.

$$3x + 4y = 480 \text{ or } 4x + 3y = 480$$

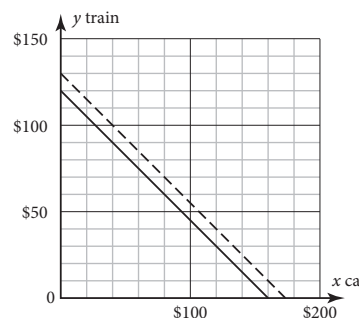
- b. Construct the budget line graph that models this situation.



- c. What do the points on the budget line represent?
combinations of car and train rides that stay exactly at the budgeted amount

- d. What do points below the budget line represent?
combinations of car and train rides that stay within the budgeted amount.

- e. Suppose that the budgeted amount increases to \$516. Construct the new budget line and the old budget line on the same axes.



- f. What does the region in between the two lines represent?

The gain in combinations of train/car rides that will stay within the budget.

10-4 Cash Flow and Budgeting

Exercises

1. Below is a budget table listing the actual amounts that were spent for each of the utilities categories during the first 6 months of the year. Freda wants to alter her current budget during the last six months and use the average of the actual amounts in each category.

	Jan	Feb	Mar	Apr	May	Jun	Average
Electric	110	140	135	135	130	140	a. \$131.67
Water	90	85	76	80	85	85	b. \$83.50
Cable	110	105	115	120	115	115	c. \$113.33
Wireless phone	80	90	120	140	110	110	d. \$108.33
Land line phone	40	35	35	35	40	45	e. \$38.33
Sanitation	60	70	70	60	60	60	f. \$63.33
Heating Fuel	450	520	500	300	100	50	g. \$320.00

2. Quincy Gallois is single and owns a co-op. He has calculated the following assets and liabilities. Find Quincy's net worth.

ASSETS

Current value of the co-op: \$180,000

Current value of car: \$12,500

Checking account balance: \$1,300

Combined savings: \$18,000

Balance in retirement account: \$30,000

Current value of owned electronics: \$20,000

LIABILITIES

Remaining balance on mortgage: \$120,000

Remaining balance on personal loan: \$4,600

Combined credit card debt: \$23,000

\$114,200

3. Celine's monthly liabilities and assets are given in the table. Determine Celine's debt-to-income ratio. Express that ratio as a percent.

Monthly Liabilities (Debt)		Monthly Pre-Tax Assets (Income)	
Mortgage Payment	\$2,560	Gross Salary	\$6,900
Student Loan Payment	\$350	Income from Rental Property	\$900
Minimum Credit Card Payment	\$50		
Car Loan Payment	\$120		

39.5%

Use the following financial information for Bill Marshall to answer Exercises 4 – 8.

Financial Report			
Income			
Architect, monthly after-tax income: \$8,000			
Consultant, monthly after-tax income: \$2,000			
Monthly Expenses			
Rent	\$2,800	Groceries	\$220
Car loan	\$200	Personal loan	\$300
Electricity	\$80	Land line phone	\$40
Sanitation	\$50	Auto insurance	\$300
Cable/Internet	\$100	Savings	\$600
Dining out	\$200	College loan	\$260
Gasoline	\$180	Cell phone	\$90
Water	\$40	Medical insurance	\$60
Renter's insurance	\$50	Entertainment	\$200
Credit card debt	\$500		
Non-Monthly Expenses			
Medical: \$300 in June, \$160 in October			
Auto-related: \$1,200 in July			
Home-related: \$300 in March, \$600 in September			
Life insurance: \$200 in February, June, October			
Computer: \$3,000 in January			
Vacation: \$1,200 in August			
Gifts: \$500 in May, \$400 in December			
Contributions: \$20 each week of the year			
Repairs: \$1,500 in November			

4. The Consumer Credit Counseling Service suggests that the monthly food budget be no greater than 30% of the income.
 - a. What is Bill's total monthly food bill including dining out?
\$420
 - b. What percent of his income is spent on food?
approximately 4%

5. Examine Bill's non-monthly expenses. Find the monthly average of the total of these expenses.
\$900

6. Use the cash flow to construct a cash flow plan for Bill. What is his monthly cash flow?

INCOME			
Primary Employment	8,000		
Secondary Employment	2,000		
Other Employment			
TOTAL INCOME	10,000		
FIXED EXPENSES		MONTHLY EXPENSES (per year)	
Rent/Mortgage	2,800	Medical/Dental	460
Car Loan Payment	200	Auto-related	1,200
Education Loan Payment	260	Home-related	900
Personal Loan Payment	300	Life Insurance	600
Health Insurance Premium	60	Computer	3,000
Cable/Internet	100	Vacation	1,200
Car Insurance Premium	300	Gifts	900
Homeowner's/Renter's Insurance	50	Contributions	1,040
TOTAL FIXED EXPENSES	4,070	Repairs	1,500
		TOTAL NON -MONTHLY EXPENSES (per year)	10,800
VARIABLE EXPENSES		TOTAL NON-MONTHLY EXPENSES (per month)	900
Groceries (food)	220		
Dining Out	200		
Fuel (car)	180		
Cell Phone	90		
Land Line Phone	40		
Electricity	80		
Water	40		
Sanitation	50		
Entertainment	200		
Savings	600		
Debt Reduction	500		
Other			
TOTAL VARIABLE EXPENSES	2,200		
TOTAL NON-MONTHLY EXPENSES	990		
MONTHLY CASH FLOW	2,830		

7. Create a frequency budget for Bill. Although his food, fuel, dining out, and entertainment expenses were listed as monthly for the cash flow, they should be considered as weekly expenses here. To find the weekly amount, multiply the monthly amount by 12 and then divide by 52 weeks. Round your answer up to the nearest dollar. Combine electricity, water, and sanitation under the "utilities" category. Any categories not mentioned in the template belong in the appropriate "other" section. What is Bill's surplus or deficit for the year?

AFTER TAX INCOME CATEGORIES	INCOME AMOUNTS	FREQUENCY	ANNUAL AMOUNT
Primary Employment	8,000	12	96,000
Secondary Employment	2,000	12	24,000
Interest			
Dividends			
Other Income			
TOTAL INCOME			120,000
WEEKLY EXPENSES	EXPENSE AMOUNTS		
Food	51	52	2,652
Personal Transportation	42	52	2,184
Public Transportation			
Household			
Childcare			
Dining Out	47	52	2,444
Entertainment	47	52	2,444
Other (contributions)	20	52	1,040
TOTAL WEEKLY EXPENSES			10,764
MONTHLY EXPENSES			
Rent	2,800	12	33,600
Utilities	170	12	2,040
Land Line/Cellular Telephone	130	12	1,560
Car Loan	200	12	2,400
Education Loan	260	12	3,120
Personal Loan	300	12	3,600
Health Insurance	60	12	720
Cable/Internet	100	12	1,200
Car Insurance	300	12	3,600
Renter's Insurance	50	12	600
Savings	600	12	7,200
Debt Reduction	500	12	6,000
Other			
TOTAL MONTHLY EXPENSES			65,640
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OTHER FREQUENCY EXPENSES			
Medical/Dental	460	1	460
Auto-related	1,200	1	1,200
Home-related	900	1	900
Life insurance	200	3	600
Computer purchase	3,000	1	3,000
Vacation	1,200	1	1,200
Gifts	900	1	900
Contributions			0
Repairs	1,500	1	1,500
Taxes			
Other			
TOTAL OTHER FREQUENCY EXPENSES			9,760
TOTAL EXPENSES			86,164
ANNUAL SURPLUS or DEFICIT			33,836

8. Use the year-long budget template on the next two pages to create a year-long budget for Bill.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
INCOME												
Primary Employment	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
Secondary Employment	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Other Employment												
TOTAL INCOME	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
FIXED EXPENSES												
Rent/Mortgage	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Car Loan Payment	200	200	200	200	200	200	200	200	200	200	200	200
Education Loan Payment	260	260	260	260	260	260	260	260	260	260	260	260
Personal Loan Payment	300	300	300	300	300	300	300	300	300	300	300	300
Health Insurance Premium	60	60	60	60	60	60	60	60	60	60	60	60
Cable/Internet	100	100	100	100	100	100	100	100	100	100	100	100
Car Insurance Premium	300	300	300	300	300	300	300	300	300	300	300	300
Homeowner's/Renter's Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Life Insurance		200				200				200		
VARIABLE EXPENSES												
Groceries (food)	220	220	220	220	220	220	220	220	220	220	220	220
Dining Out	200	200	200	200	200	200	200	200	200	200	200	200
Fuel (car)	180	180	180	180	180	180	180	180	180	180	180	180
Cell Phone	90	90	90	90	90	90	90	90	90	90	90	90
Land Line Phone	40	40	40	40	40	40	40	40	40	40	40	40
Electricity	80	80	80	80	80	80	80	80	80	80	80	80
Water	40	40	40	40	40	40	40	40	40	40	40	40
(continued on next page)												

(continued from previous page)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sanitation	50	50	50	50	50	50	50	50	50	50	50	50
Medical/Dental						300				160		
Auto-related							1,200					
Home-related			300						600			
Vacation								1,200				
Gifts					500							400
Contributions	87	87	87	87	87	87	87	87	87	87	87	87
Repairs											1,500	
Entertainment	200	200	200	200	200	200	200	200	200	200	200	200
Savings	600	600	600	600	600	600	600	600	600	600	600	600
Debt Reduction	500	500	500	500	500	500	500	500	500	500	500	500
Computer	3,000											
Other												
TOTAL EXPENSES	5,287	2,287	2,587	2,287	2,787	2,587	3,487	3,487	2,887	2,447	3,787	2,687