

For the 5-year performance of Vantage Growth and Current Income Fund, find an equation for the line of best fit for the first ten data points, omitting the data for July 1, 1993.

13. What price does the equation predict for the value of the fund on July 1, 1993?
14. How does the predicted price compare with the actual price?
15. What do you conclude from this result?

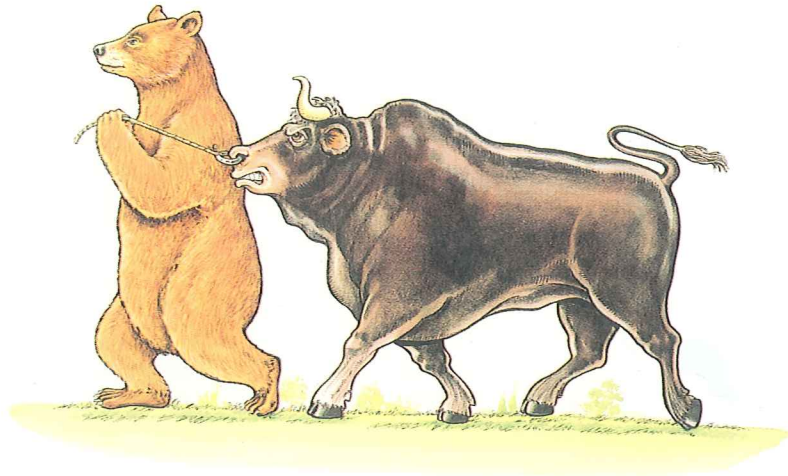
MIXED REVIEW

1. Find the total cost of 100 shares of Daring Ventures, Inc. at $63\frac{1}{2}$. The commission cost is 1.5%.

Determine the total savings on a loan of \$49,800 at 8.5% for 25 years if you make a down payment of 20% or 30% instead of 10%.

	Percent Down	Down Payment, D	Loan Amount, A	Monthly Payment, M	Total Payments, T	Savings Over 10% Down
2.	10%	\$4,980	\$44,820		\$108,270	
3.	20%					
4.	30%					

5. Why do some large lending institutions use a credit scoring system such as the one that appears on page 293 of Lesson 6–6?
6. Use the formula for the Future Value of a Periodic Investment on page 344 of Lesson 7–3 to find the amount that will be in an IRA account after 25 years if the account consistently pays a compounded rate of 7.5% per year and \$1,500 is contributed to the IRA every year.
7. Suppose that your name is Charles Lewis and your uncle sends you a check made out to “Chuck Lewis.” Show how you would endorse that check.
8. A certain insurance company expects 99.830% of all 34-year-old people to live at least one more year. What is the break-even premium for a \$50,000 policy issued to such a person by the company if the direct and indirect expenses for issuing the policy amount to \$15?
9. If you earn \$65,000 per year, how much do you pay in Social Security and Medicare taxes?
10. If you earn \$159,000 per year, how much do you pay in Social Security and Medicare taxes?
11. Suppose that your family’s take-home pay is \$3500 per month. How much can you afford to spend for credit card payments each month?



Maria read an article in the newspaper that referred to some investors who feared that a “bear market” might be developing. She was not sure what bears had to do with stock prices. Nelson told her that in a **bear market**, most stocks go down and that in a **bull market**, most stocks go up. He also told her that not all the stocks go up or down at the same time.

Maria also remembers from her study of the Federal Reserve System that the U.S. economy is affected by inflation. She also knows that though the rates of inflation have

varied from year to year, inflation has affected salaries and prices for a number of years. One means of measuring the effects of this inflation is the *Consumer Price Index*.

Maria has often heard her parents speak of nickel postage stamps and 10-cent newspapers as though their childhood was not that long ago. To Maria, 35 years might as well be 100, but she does know that most adults talk that way. She decides that when she is an adult, she will remember what she thought when she was a teenager and not tell her children about how low prices were when she was a kid.

OBJECTIVES: *In this lesson, we will help Maria to:*

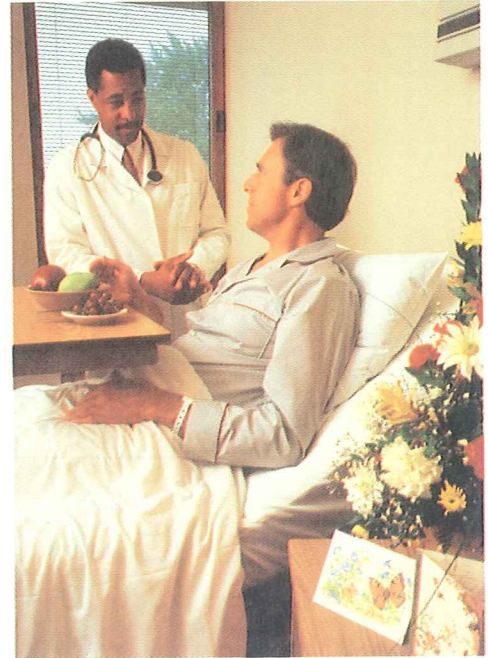
- *Understand the effects of inflation as charted by the Consumer Price Index.*
- *Use the Consumer Price Index to calculate changes in prices of products.*
- *Use a regression model to illustrate changes in the Consumer Price Index.*
- *Use the concept of probability to estimate whether to invest money in a mutual fund or stocks.*

THE CONSUMER PRICE INDEX

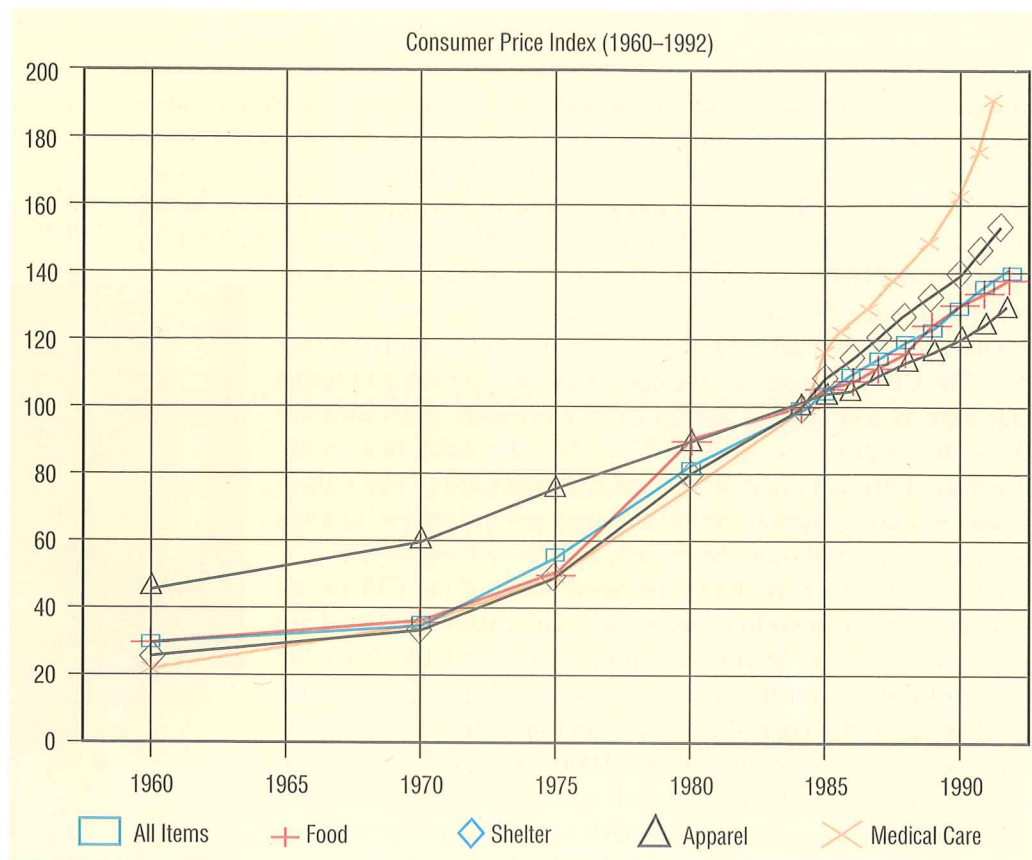
Inflation affects the cost of every product and service that we purchase because it cheapens the value of the dollar. Even though salaries may also have increased, the purchasing power of those salaries may be less than the salaries of 10 years ago. The **Consumer Price Index (CPI)** is an economic yardstick that can help Maria to judge the changes in the buying power of the dollar. Economists use the CPI to measure **inflation** (a general increase in prices) or **deflation** (a general decrease in prices). Periods of deflation are usually accompanied by high unemployment.

The Bureau of Labor Statistics compiles and publishes two CPIs. The CPI-W represents the consumption experience of urban wage earners and clerical workers; this represents approximately 40% of the population. The CPI-U is a broader index that covers all urban consumers, about 80% of the population. The CPI-U includes the consumption habits of diverse groups such as salaried workers, the unemployed, the retired, and the self-employed.

The following chart shows the breakdown of the CPI for all urban consumers in various categories. The categories listed are very general; more detailed categories are available from the Bureau of Labor Statistics and other sources. The chart illustrates the changes in the cost of all items and also the costs for four major categories for the years 1960–1992. These special categories are food, shelter, apparel, and medical care. The year 1984 is the base year, the year in which a **market basket** of items is assigned an arbitrary value of \$100. Each separate category, such as Shelter or Apparel, is also assigned a value of \$100 in 1984. As a result, all years that precede or follow 1984 have CPI



CONSUMER PRICE INDEX (1960–1992)					
Year	All Items	Food	Shelter	Apparel	Medical Care
1960	29.6	30	25.2	45.7	22.3
1970	36.8	39.2	35.5	59.2	34
1975	53.8	59.8	48.8	72.5	47.5
1980	82.4	86.8	81	90.9	74.9
1984	100	100	100	100	100
1985	107.6	105.6	107.7	105	113.5
1986	109.6	109	115.8	105.9	122
1987	113.6	113.5	121.3	110.6	130.1
1988	118.3	118.2	127	115.4	138.6
1989	124	125.1	132.8	118.6	149.3
1990	130.7	132.4	140	124.1	162.8
1991	136.2	135.8	146.3	128.8	177
1992	140.7	138.3	152.2	131	189.4



ALGEBRA REVIEW

Solve each proportion.

1. $\frac{x}{3} = \frac{8}{2}$

2. $\frac{x+1}{5} = \frac{x-1}{4}$

3. $\frac{2.5}{a} = \frac{1}{2}$

4. $\frac{3}{15} = \frac{b-1}{10}$

5. $\frac{7}{4x+2} = \frac{1}{2x-4}$

values that are proportionally related to the base year. Notice that in the combined category, “All Items,” a basket of goods that cost \$100 in 1984 would have cost \$29.60 in 1960 and \$140.70 in 1992.

Maria wanted to see the numbers displayed in a graph for easy comparison among the categories. She entered the numbers for each category in a spreadsheet and created the graph shown above. From the graph, Maria could see that the rate of price increase was not the same for every category. For example, the rate of increase for the price of shelter was greater than the rate for all items.

Ask Yourself

1. What is a bear market?
2. What is a bull market?
3. What is the Consumer Price Index?
4. Why do you think a period of deflation is usually accompanied by unemployment?

SHARPEN YOUR SKILLS

SKILL 1

EXAMPLE 1 Maria's research revealed to her that inflation can be measured by keeping track of the annual change in the CPI. For example, notice the "all-items CPI" between 1988 and 1989:

CPI (all items) for 1988: 118.3

CPI (all items) for 1989: 124

QUESTION What is the percent of increase in the CPI between 1988 and 1989?

SOLUTION

Use the rate-of-change formula from Lesson 8-2. The rate of change in the CPI is the change divided by the CPI for the earlier year.

$$r = \frac{|P_n - P_o|}{P_o} \quad \text{Rate-of-change formula}$$

$$\begin{aligned} r &= \frac{|124 - 118.3|}{118.3} \\ &= 0.04818 \end{aligned}$$

Since the CPI increased, the rate of inflation is 4.8%.

SKILL 2

EXAMPLE 2 Since 1984 is the base year for the CPI, Maria would like to compare her parents' spending power in 1984 with what they make now.

QUESTION Maria's parents spent \$20,000 in 1984. How much would they have needed in 1992 just to buy the same things?

SOLUTION

Write a proportion. Let x represent the unknown 1992 expenditure.

$$\frac{\text{1992 expenditure}}{\text{1992 CPI}} = \frac{\text{1984 expenditure}}{\text{1984 CPI}}$$

$$\frac{x}{140.70} = \frac{20,000}{100}$$

Next, use the *Rule of Proportions*.

$$\begin{aligned} x \cdot 100 &= 140.70 \cdot 20,000 \\ 100x &= 2,814,000 \\ x &= 28,140 \end{aligned}$$

If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

In 1992 it would have taken about \$28,000 to buy the same market basket of goods that \$20,000 would have bought in 1984.

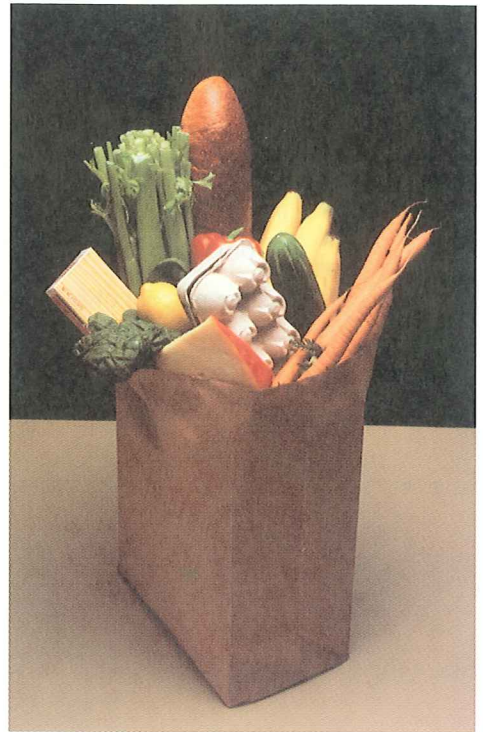
SKILL 3

EXAMPLE 3 Maria would like to estimate the cost of living for the year 2000.

QUESTION How can Maria use the CPI table for 1960–1992 to estimate the cost of living for the year 2000?

SOLUTION

Maria knew from talking with Nelson that she can use a graphing calculator to find a line of best fit. She decides to use the data points from the “All Items” column of the 1960–1992 CPI table. To make the data easier to work with, she simplifies the values for x that she will have to enter. She lets x represent the number of years after 1960 and y represent the CPI for each year in the table beginning with 1960 as shown below.

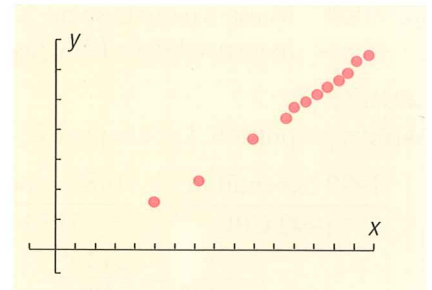


x	0	10	15	20	24	25	26	27	28	29	30	31	32
y	29.6	36.8	53.8	82.4	100	107.6	109.6	113.6	118.3	124	130.7	136.2	140.7



Maria enters the data in a graphing calculator and creates a scatter plot using the following range values.

Xmin: -2 Ymin: -10
 Xmax: 33 Ymax: 150
 Xscl: 2 Yscl: 20

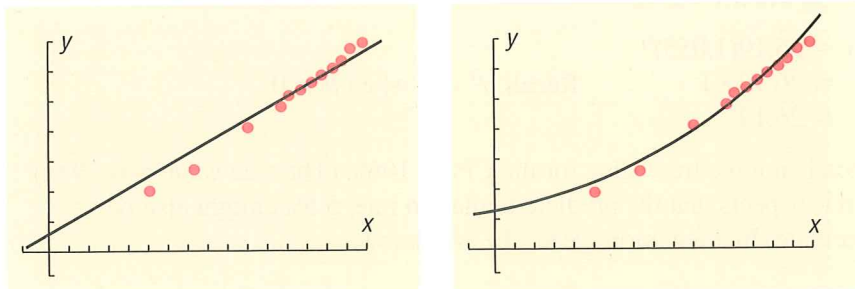


She knows that Nelson used a straight line as a model for his investigation of mutual funds. She decides to investigate the three other curves that the calculator provides as a model for data.

Two of the other three curves cannot use her data (they will not take 0 as a value for x). The two models that do accept all of her data are the *linear regression* equation that Nelson used and another curve called the **exponential regression equation**. The graphing calculator provides a correlation coefficient r for each model and values for two constants, a and b , that appear in the formulas for the models.

Regression Model	Formula	Equation	Correlation Coefficient
Linear	$y = a + bx$	$y = 10.73788254 + 3.850867094x$	$r = 0.973223596$
Exponential	$y = ab^x$	$y = 26.19388895(1.05527341)^x$	$r = 0.9876350425$

Maria uses her graphing calculator to graph each model on top of the scatter plot.



She decides to use the exponential model instead of the linear model for two reasons.

1. The exponential graph seems to fit the scatter points better.
2. She knows that the closer the correlation coefficient is to 1, the better the fit. The correlation coefficient for the exponential curve is closer to 1 than is the correlation coefficient for the straight line.

To estimate the cost of living for the year 2000, Maria notes the year 2000 is 40 years after 1960. Maria uses the ZOOM and TRACE features of the graphing calculator to find that y is about 225 when x is close to 40. To check, Maria substitutes into the exponential equation.

$$y = 26.19388895(1.05527341)^{40} \quad \begin{array}{l} \text{Substitute 40 for } x. \\ \text{To the nearest year.} \end{array}$$

$$y = 225$$

According to the exponential model, the CPI will be about 225 in the year 2000.

EXAMPLE 4 Maria would like to predict the rate of inflation for the year 2000.

QUESTION If the exponential model is correct, what will be the rate of inflation?

SOLUTION

Maria notices that the exponential equation is similar to the compound interest formula (see page 107 in Lesson 3–2).

$$B = p(1 + r)^n \quad \begin{array}{l} \text{where } p = \text{initial investment} \\ r = \text{interest rate for the period} \\ n = \text{number of periods} \end{array}$$

She compares the two formulas

$$B = p(1 + r)^n \qquad y = 26.19(1 + 0.055)^x$$

and notices that the compound interest formula is also an exponential model. She writes 1.055 as $1 + 0.055$ to sharpen the comparison and correctly concludes that the predicted annual increase in the CPI (the rate of inflation) is 0.055, or about 5.5%. She also notices that the model is not perfect, since in 1960 when x was 0,

$$\begin{aligned} y &= 26.19(1.055)^0 \\ &= 26.19 \cdot 1 && \text{Recall } b^0 = 1 \text{ when } b \neq 0. \\ &= 26.19 \end{aligned}$$

which is not the true value for the CPI in 1960. (The true value was 29.6.) Maria suspects that the predicted inflation rate, 5.5%, might also be inaccurate. In a few more years she will know.

SKILL 4

Maria asks her friend who knows about investments what she should expect her fund to be worth in 5 years if inflation continues at a low rate and what her fund might be worth if deflation occurs at a low rate. Her friend's opinion is that her \$1000 might drop to about \$700 if deflation were to occur. Her friend agrees with Maria that if a mild inflation occurs, the fund will probably be worth at least \$1800. Her friend also believes that the Federal Reserve will do whatever it can to avoid a deflation, since a deflation is usually accompanied by a recession and above-average unemployment. However, a deflation might occur anyway. The investor friend thinks that the probability of a deflation is only about 1 in 5; that is, about 0.20.

EXAMPLE 5 How can Maria use her new knowledge about inflation to help her with her decision about investing in a mutual fund?

QUESTION What is the expected value of her portfolio in 5 years?

SOLUTION

Maria decides to calculate the expected value of her portfolio in 5 years. If the probability of a deflation is 0.20 and inflation is the only other choice, then the probability of inflation can be found by solving the following probability formula for $P(\text{inflation})$.

$$\begin{aligned} P(\text{inflation}) + P(\text{deflation}) &= 1 \\ P(\text{inflation}) &= 1 - P(\text{deflation}) \\ &= 1 - 0.20 \\ &= 0.80 \end{aligned}$$

The expected value of her fund is found by using the expectation formula.

$$\begin{aligned} E &= a_1P_1 + a_2P_2 \\ &= 1800 \cdot 0.80 + 700 \cdot 0.20 \\ &= 1440 + 140 \\ &= 1580 \end{aligned}$$

The expected value of Maria's fund in 5 years is \$1580. She knows that this value is useful as a guide in deciding whether to invest in a fund or to stick to a savings account. She also knows that the actual value of the fund is likely to be around either \$1800 (if there is some inflation) or \$700 (if there is deflation), not around \$1580. In deciding whether to invest in the fund, Maria has to face the possibility that the fund will drop in value to \$700 in 5 years.

TRY YOUR SKILLS



Use the table of the Consumer Price Index (1960–1992) on page 389 to find the percent of increase in the CPI (all items) for the following time periods. Round your answers to the nearest tenth of a percent.

1. From 1989 to 1990
2. From 1984 to 1985

Use the table of the Consumer Price Index (1960–1992) on page 389 to write and solve a proportion that can be used to find how much money a family would need to buy a market basket of goods in the given year that was worth \$10,000 in 1987.

3. 1984
4. 1990

Suppose that an exponential regression model gives the following equations as a description of the cost of living over a five-year period. What would be the expected rate of inflation?

5. $y = 100(1 + 0.04)^x$
6. $y = 53.6(1.062)^x$

7. Suppose that the probability of low inflation is 0.15 and the only other possibility is moderate deflation. Find the probability of moderate deflation.
8. Suppose that there are three possibilities: low inflation with a probability of 0.3, severe deflation with a probability of 0.1, and perfect price stability (neither inflation or deflation). Find the probability of perfect price stability.

EXERCISE YOUR SKILLS

KEY TERMS

bear market
bull market
Consumer Price
Index (CPI)
deflation
exponential
regression
equation
inflation
market basket

1. How do economists use the Consumer Price Index?
2. In the table for the CPI, which category had the largest increase between 1984 and 1992? Which had the least increase?
3. Which category in the CPI table most nearly matched the “all items” column? Why do you think this happened?
4. The “all items” column in the table for the CPI consists of a market basket of 400 items. Why is this a better indication of how prices are behaving than the cost of a few selected items would be?

The prices given are for 1984. Find the cost of the indicated items in 1992. Use the table of the Consumer Price Index (1960–1992) on page 389.

5. \$500 worth of food
6. \$1000 in medical care
7. A \$25 market basket

Find the percent of change in the CPI for the indicated item.

8. Food between 1984 and 1985
9. Shelter between 1989 and 1990
10. Apparel between 1987 and 1988
11. Medical care between 1985 and 1986

Use a graphing calculator to make an exponential regression model for the cost of medical care from 1960 to 1992 as shown in the table on page 389. Then answer Exercises 12–16.

12. What is the equation for the model?
13. How accurately does the model agree with the actual cost of medical care in 1960?
14. What value does the model suggest for the average annual rate of increase in the cost of medical care between 1960 and 1992?
15. Use the graphing calculator to make a scatter plot of the data, and on the same calculator screen, graph the exponential regression equation that you found.
16. Do you think that a linear regression model would have given a more accurate picture than the exponential regression model for the increase in the cost of medical care from 1960 to 1992? Explain your answer.

Maria’s sister, Sarita, has become interested in a mutual fund that stresses both growth and current income. She believes that if there is inflation in the next 5 years, then her \$1000 investment will grow to about \$1750 but that if there is a deflation, then the fund may drop to \$800. She thinks that the next 5 years will be either inflationary or deflationary with a 20% probability that the economy will be deflationary.

17. What is the probability that the economy will be inflationary?
18. What is the expected value of Sarita’s fund in 5 years?

MIXED REVIEW

The following table shows cost and sales figures for a company that sells board games. Use a computer spreadsheet to fill in the missing information.

	Unit Cost	Number Produced	Fixed Cost	Total Cost	Unit Price	Revenue	Profit (Loss)
1.	\$8.93	15	\$310.00		\$25.00		
2.	7.50	125	310.00		25.00		

Use the following table for Exercises 3–5.

Comparison Table for Term and Whole Life Annual Premiums for a Policy with a Face Value of \$100,000			
Age	5-year Renewable Term	Whole Life	First-year Difference
20	\$205	\$ 775	\$570
25	207	918	711
30	218	1112	894

- What is the annual premium for a \$100,000 whole life policy for a 20-year-old person?
- What is the annual premium for a \$200,000 term policy for a 30-year-old person?
- Determine the difference that a 25-year-old person will pay in annual premiums the first year if he or she takes a term policy with a face value of \$250,000 instead of a whole life policy with the same face value.

Enter the following transactions in a check register form. Make up your own form with the following headings: Check Number, Date, Checks/Deposits, Amount, and Balance. Under “Checks/Deposits” have two lines for each entry, the top one labeled “To:” and the bottom one labeled “For:.” Find the new balance after each transaction. The starting balance is \$450.

- Check 201, September 27, to Aaron Jones, \$158.50 for car repair
- Deposit on September 29 of \$130
- Check 202, September 29, to Superior Supermarket, \$87.63 for groceries
- The probability that a person will be alive in 1 year is 0.98329. What is the probability that the person will die within 1 year?
- Last month, the Antonelli family spent \$241 on the car payment, \$452 on credit card payments, \$841 on the mortgage, \$86 on utilities, \$475 on food, and \$1500 on everything else. To the nearest tenth of a percent, what percent of their take-home pay did the family spend on credit payments?

CHAPTER 8 REVIEW

- How can you make money from stocks?
- How is buying bonds the same as lending money to a municipality or a corporation?
- Why are mutual funds suitable for small investors?
- What do you think is the most important factor in deciding whether or not to buy stocks?
- What method is used by brokers to buy and sell stocks on a security exchange?
- How does the Securities and Exchange Commission help to protect investors?
- Why is it important to adopt a long-term point of view when buying stocks whether directly in the stock market or indirectly through a mutual fund?

Use the prices per share shown below to find the number of whole shares of stock that you can afford to purchase if you have \$20,000 to invest in each of the following companies. Then find the total cost of the shares. Ignore brokerage commissions.

	Company	Price per Share	Number of Whole Shares	Total Cost
8.	NunnInc	42		
9.	OctOfAm	$7\frac{5}{8}$ <i>1.25</i>		
10.	OscarsPies	$18\frac{3}{4}$ <i>75</i>		
11.	OwlInd	150		

Find the capital gain or loss from buying 2500 shares at the given purchase price and selling them at the current market value. Ignore the effect of commissions.

	Company	Buy	Total Value	Sell	Total Value	Gain/Loss
12.	Disnel	$63\frac{1}{2}$		$68\frac{1}{2}$		
13.	AP & P	$18\frac{1}{2}$		$30\frac{1}{4}$		
14.	Banter	$24\frac{3}{8}$		$19\frac{5}{8}$		
15.	Zola	$43\frac{1}{2}$		89		