

## ALGEBRA REFRESHER

Very often we want to summarize a set of numbers or scores with just one number. The mean, median, and mode are *statistics* used to do this.

The *mean* is the sum of the scores divided by the total number of scores.

The *median* is the score that lies in the middle when the scores are ordered from least to greatest. If there are an even number of scores then the median is the average of the two middle scores.

The *mode* is the score that occurs the most times. If no score occurs most frequently then the set of numbers has no mode.

**Find the mean, median, and mode. Round to the nearest tenth.**

**Example** {70, 70, 70, 74, 75, 76, 82, 91, 97}

Mean:  $\frac{70 + 70 + 70 + 74 + 75 + 76 + 82 + 91 + 97}{9} = 78.3$  The mean is 78.3.

Median: 70, 70, 70, 74, **75**, 76, 82, 91, 97 The median is 75.

Mode: **70, 70, 70**, 74, 75, 76, 82, 91, 97 The mode is 70.

- {60, 68, 68, 78, 78, 89, 90, 90}
- {56, 89, 23, 48, 56, 91, 184, 56}
- {200, 220, 220, 220, 240, 400, 800, 1000, 1000, 2000}
- {4.1, 4.5, 4.5, 5.3, 5.3, 5.3, 6.5, 6.5, 6.9, 8.2, 8.3}

Sometimes when many scores are repeated, frequencies are used to express the results. Frequency means how many times a score is repeated.

**Find the mean, median, and mode. Round to the nearest tenth.**

**Example** Thirty-two students took a test. The scores are shown in the table.

Score	65	76	82	83	84	87
Frequency	1	3	4	8	9	7

Mean:  $\frac{65 + 3(76) + 4(82) + 8(83) + 9(84) + 7(87)}{32} = 82.8$  The mean is 82.8.

Median: There are 32 scores. The first score is 65. The 16th score is 83 and the 17th score is 84. The median is  $(83 + 84) \div 2 = 83.5$ .

Mode: The score that occurs most often is 84. The mode is 84.

5.

Score	60	65	74	75	82	85	86	90	92
Frequency	1	3	7	10	9	7	8	4	2

6.

Score	205	214	254	301	420	475	500
Frequency	6	9	14	60	34	18	54

# Owning a Car

IF YOU DON'T ALREADY DRIVE YOU ARE probably looking forward to the day when you will. Your parents and teachers have probably already told you that driving is not just for fun, and a car is most certainly not a toy. Driving is a big responsibility. Unless you are a very careful driver, you might injure yourself and others.

A car is one of the most expensive items you will ever purchase. After the initial purchase of a car, there are also fixed ownership costs and variable operating costs. Even though you take good care of it, a car gradually loses its resale value.

The young people in this chapter explore some of the differences

between buying a new car and buying a used car and between owning and leasing a car. They learn about estimating and budgeting the different operating costs and what protection different kinds of insurance offer. Maria suffers "sticker shock" when she first sees the prices at a new car dealership. She learns, however, that dealers are willing to negotiate.

With his father, Alex learns that it can be wise to buy a used car. Freda looks closely at the mileage her car gets as she does the driving for the T-shirt business. She and Hari discover that leasing a car can make sense, particularly for a business. Finally, Trevor learns about automobile insurance. In particular, he researches the different kinds of auto insurance available and how the rates are determined for a driver and a car.

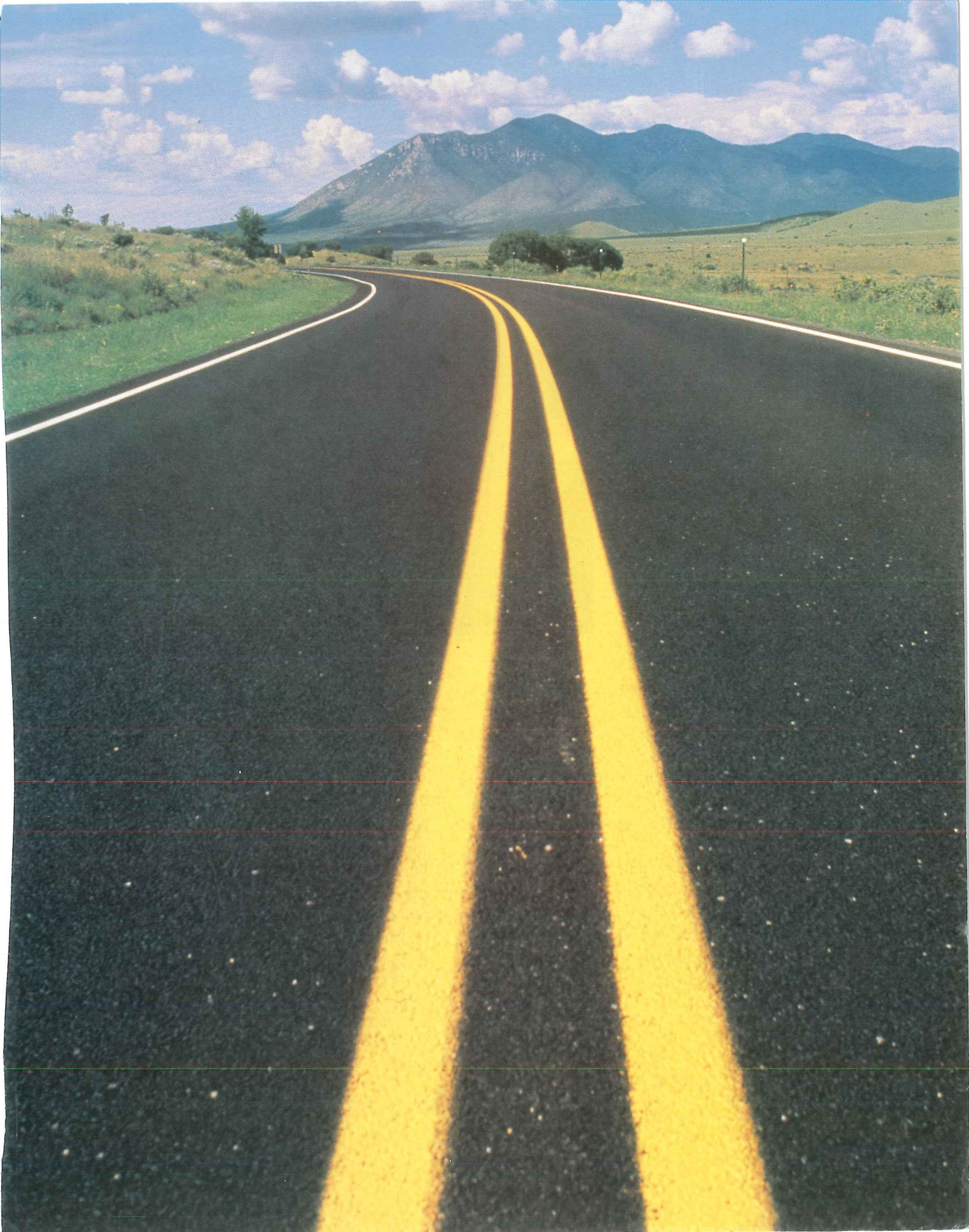
## 10-1 New Cars: Selecting and Financing

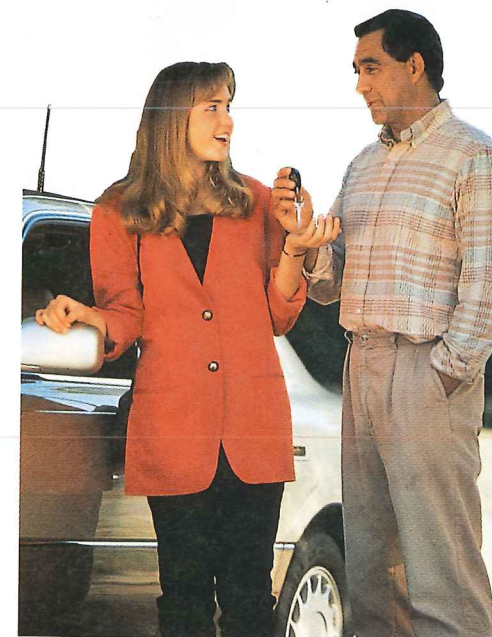
## 10-2 Equity and Depreciation for New and Used Cars

## 10-3 Owning and Operating Costs

## 10-4 Insurance Costs





**W**

hen Maria's father told her that it is expensive to own and maintain a car, she thought that he just didn't want her driving too much. Then he told her that if she could save half of her weekly paycheck for six months, he would help her buy a car. That was a challenge. Much to her surprise, she was able to set a goal and achieve it.

Maria wanted a new car, so she and her father visited several new car dealers. At first, Maria was shocked by what she found. Each new car had a sheet of paper stuck to the inside of one of the windows. On the paper was a list of various features of that car: automatic

transmission, power steering, air conditioning, AM/FM stereo with cassette deck, cruise control—and on and on. Many of the features had prices listed beside them.

The total price at the bottom of the list surprised Maria the most. She wondered how ordinary people could buy new cars. Maria's father explained that the sticker price was not what the dealer actually expected to receive for the car. Then Maria was really confused. How was she to know what price to pay for a car?

Maria wondered whether there were other things that she should know before spending her hard-earned money for a car.

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

- Find out how to shop for a new car.
- Calculate the percent of markup.
- Calculate monthly car payments.
- Compare terms for financing a car.

## SHOP BEFORE GOING TO A CAR DEALER

Maria has been reading consumer magazines such as *Car and Driver*, *Motor Trend*, *Consumer Reports*, and *Changing Times*. She was able to find many of these in bookstores, in newsstands, and in her local and school library. From these sources she has learned a lot about the cost and quality of different cars.

Maria still does not understand why there is such a difference between the **sticker price** that appears on a car window and what the consumer finally pays. But she found that books such as *Edmund's New Car Prices* and the *Kelley Blue Book New Car Price Manual* give useful information about what dealers pay for cars and options. The sticker price is the suggested retail price of the car. The range between the dealer's cost and the sticker price is where Maria can negotiate.

**Markup** is the amount that a dealer adds to his cost to arrive at the sticker price. Maria noticed that some cars and some options have a higher markup than others. She also knows that the purchase price is not everything. She will try to choose a reputable dealer with a good service department, one that will be convenient for her when service is required.



## DEALING WITH DEALERS

Maria has shopped around and is prepared to bargain. She knows that she must be able to walk away from a car and go to another dealer if the price does not suit her. "Falling in love" with a car will often lead to paying too much. Maria has learned three essentials for bargaining:

1. Use competitive conditions to your advantage.
2. Know the dealer's costs.
3. Allow the dealer a reasonable profit.

What is a reasonable profit? You and the dealer might have different ideas about that. There are, of course, many other factors involved. But most of them come down to the amount of the original markup and the laws of supply and demand. In other words, if many people want a particular model car, then the dealer will not be motivated to reduce the price very much. Following are some of the tactics that car dealers might use in their efforts to attract buyers and sell cars.

**Bait and Switch** Maria saw an advertisement in the newspaper that seemed too good to be true. It was. When Maria and her father visited the dealer, they found that the advertised car was not available. But the salesperson tried to interest them in another, more expensive car. This was Maria's first encounter with the bait-and-switch technique.

**Financing** Maria's father explained that when the time comes for **financing**, that is, borrowing the money needed for a car, they will obtain a loan from their own bank or credit union rather than from a company recommended by the auto dealer. This is because sometimes the dealer, in cooperation with the finance company, tries to add special fees or insurance charges to the purchase price. The terms of financing include the amount to be borrowed, the purchaser's down payment, the interest rate, and the number of months of the loan. Maria will consider all of these and weigh them in light of her own financial resources. The **finance charge** is the amount that the credit will cost.

**Trade-In** If Maria has a car to **trade in**, that is, to sell to the dealer when she buys a new car, then her negotiations will be even more complicated, and she will have to be even more careful. Sometimes, to get a buyer's interest, a dealer will talk about paying a high price for a trade-in and later lower the amount. In this case the dealer is using a highball strategy. In a similar way a dealer might quote you an unrealistically low price for a new car and then, when you return after shopping around, explain that, on review, the original quote must be raised. This approach is called the lowball. In most cases it is better not to mention that there is a trade-in until the price of the new car has been settled. If the price offer for your old car seems too low, you can always sell it yourself.

## ALGEBRA REVIEW

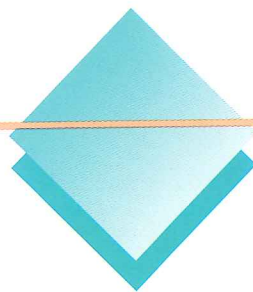
Solve each equation or, if needed, select a variable, write an equation, and then solve.

- $0.2 \cdot \$5647 = c$
- $7.5\% \cdot \$7800 = c$
- Find 2.3% of \$4568.
- Five is what percent of 15?
- Ten is what percent of 25?
- What percent of \$7560 is \$529.20?
- Add \$4500 to 9% of \$4500.
- Find 1.12% of \$9800.
- \$585.12 is 12% of what number?
- \$500 is 10% of what number?

### Ask Yourself

- What should you do before shopping for a car?
- What are some of the tactics a car dealer might use to interest a potential buyer?
- What does financing mean?

## SHARPEN YOUR SKILLS



### SKILL 1

**EXAMPLE 1** The sticker price for a Starfire two-door convertible is \$14,255. Using her car books, Maria finds the dealer's cost is \$12,450.

**QUESTION** What is the percent of the dealer's markup?

**SOLUTION**

The markup  $m$  is the difference between the sticker price  $s$  and the dealer's cost  $d$ .

$$\begin{aligned}m &= s - d \\m &= 14,255 - 12,450 \\m &= 1805\end{aligned}$$

The markup is \$1805.

To find  $p$  the percent of markup, Maria writes an equation using the following question to help her.

What percent of 12,450 is 1805?

$$p(12,450) = 1805$$

$$p = \frac{1805}{12,450}$$

$$p = 0.145$$

Divide both sides by 12,450.

To the nearest thousandth

The percent of markup is 14.5%.

## SKILL 2

**EXAMPLE 2** Maria compares the prices of the following options listed on the sticker with dealer's costs she finds in her car books.

Option	Dealer's Cost	Sticker Price
Air conditioning	\$356	\$420
Roof rack	116	138
Automatic transmission	645	774
AM/FM radio, tape deck	440	506

**QUESTION** How can Maria use a spreadsheet to show the markup and percent of markup for the options?



### SOLUTION

Maria uses the formula  $+C3-B3$  for cell D3 and  $+D3/B3$  for cell E3. To find the totals she uses the sum function of the spreadsheet. Her spreadsheet looks like the following. Notice that she formatted column E for percent.

	A	B	C	D	E
1		Dealer	Sticker		Percent of
2	Option	Cost	Price	Markup	Markup
3	Air conditioning	356	420	64	18%
4	Roof rack	116	138	22	19%
5	Automatic transmission	645	774	129	20%
6	AM/FM radio, tape deck	440	506	66	15%
7	Total	1557	1838	281	18%

## SKILL 3

Recall the monthly payment formula for repaying a loan from Lesson 5-1.

$$M = \frac{Pr(1+r)^n}{(1+r)^n - 1}$$

where  $M$  = monthly payment  
 $P$  = amount of loan  
 $r$  = monthly interest rate  
 $n$  = number of payment periods

**EXAMPLE 3** Maria's friend Bryan plans to buy a new Moonbeam car with a list price of \$19,490 and finance it through his credit union. He can make a down payment of 10% or 20% and then pay off the loan at a 6% annual interest rate over a period of 3 years or 5 years.

**QUESTION** What will be the monthly payments and the total cost of the car under the different payment plans?



## SOLUTION

Bryan has four ways to pay:

- 10% down for 3 years
- 10% down for 5 years
- 20% down for 3 years
- 20% down for 5 years

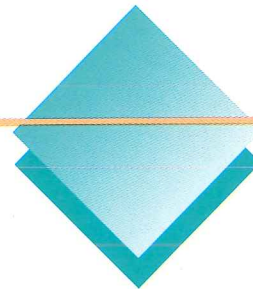


He decides to use a spreadsheet to compare costs. The loan amount is the original cost minus the down payment. Use the monthly payment formula to calculate the payments for each plan. Since the APR is 6%, the monthly interest rate is  $0.06 \div 12 = 0.005$ . To find the total payments, remember to multiply the unrounded amount by the number of payments. The total cost includes the down payment. The finance charge is the difference between the total cost and the original cost.

	A	B	C	D	E	F	G	H	I
1	Original	Percent	Down	Loan		Monthly	Total	Total	Finance
2	Cost	Down	Payment	Amount	Years	Payment	Payment	Cost	Charge
3	19490	10%	1949	17541	3	533.63	19210.72	21159.72	1669.72
4	19490	10%	1949	17541	5	339.12	20347.00	22296.00	2806.00
5	19490	20%	3898	15592	3	474.34	17076.20	20974.20	1484.20
6	19490	20%	3898	15592	5	301.44	18086.22	21984.22	2494.22

From the spreadsheet Bryan concludes that if he can afford to make higher monthly payments he will save money.

## TRY YOUR SKILLS



A car costing the dealer \$12,800 has a sticker price of \$15,232.

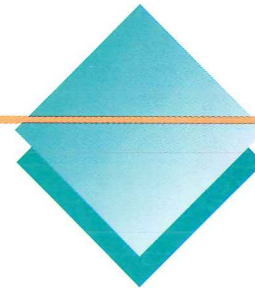
1. Find the markup.
2. Find the percent of markup.

A car costing the dealer \$11,250 is marked up 18.5%.

3. Find the markup.
4. Find the sticker price.

A car is to be sold for \$13,200. The annual interest rate is 8.4% with a 20% down payment for 3 years.

5. Find the monthly interest rate.
6. Find the monthly payment.
7. Find the total cost of the car.
8. Find the finance charge.



## EXERCISE YOUR SKILLS

The following is a portion of the Moonbeam price list, which also appears in the Reference Section of the book.

KEY TERMS
finance charge
financing
markup
sticker price
trade-in

Moonbeam	Dealer Cost	Sticker Price
Model A, 4-door wagon, 8 cylinder	\$12,725	\$14,722
Model B, 4-door sedan, 6 cylinder	14,062	16,295
Model C, 4-door sedan, 4 cylinder	11,053	12,755
Options		
Conventional spare tire	\$ 62	\$ 73
Air conditioning	695	817
Electronic climate control	850	1000
Antilock brake system	838	985
Rear window defroster	136	160
AM/FM radio and cassette player	132	155
Rear-facing third seat	132	155
Cruise control	178	210
Stripe, painted	51	61

Find the percent of markup for each of the following. Round to the nearest tenth of a percent.

1. Model A
2. Model B
3. Model C
4. Air conditioning
5. Electronic climate control
6. Antilock brake system
7. AM/FM radio and cassette player
8. Rear facing third seat

Find the total dealer cost and total sticker price for each of the following.

9. Model B with air conditioning, rear window defroster, AM/FM radio and cassette player, cruise control
10. Model A with electronic climate control, anti-lock brakes, rear window defroster, rear-facing third seat
11. Model C with air conditioning, rear window defroster, AM/FM radio and cassette player, stripe
12. Find the percent of markup for each of the total suggested retail prices in Exercises 9, 10, and 11.
13. Find the monthly payment for Model B at the sticker price with air conditioning, rear window defroster, AM/FM radio and cassette player, and cruise control. Financing terms are 6% annual interest rate, 20% down, 3 years to pay.

14. Using the sticker price, find the monthly payment for the car and options described in Exercise 10. Terms are 8.4% interest rate, 15% down, 4 years to pay.
15. Using the sticker price, find the total amount paid for the car and options described in Exercise 11. Terms are 6% interest rate, 20% down, 5 years to pay.

Exercises 16–22 are based on the purchase of Model A at the sticker price with air conditioning, anti-lock brake system, rear window defroster, AM/FM radio and cassette player, rear-facing third seat, and cruise control.

16. Find the total dealer cost.
17. Find the total sticker price.
18. Find the percent of markup. Round to the nearest tenth of a percent.
19. Find the monthly payment at 6% APR for 6 years with 20% down.
20. Find the monthly payment at 6% APR for 4 years with 10% down.
21. In Exercises 19 and 20, which of the terms of financing has the lower monthly payment?
22. In Exercises 19 and 20, which of the terms of financing has the lower total cost?
23. Compare the terms of financing, and discuss reasons why a person might wish to select one or the other.
24. The cash price for certain used cars is shown in the following table. The annual interest rate is 9%. The payment period is 4 years. The down payment can be 10% or 20%. Use a spreadsheet program or calculator to complete the table.

Original Cost	Percent Down	Down Payment	Loan Amount	Years	Monthly Payment	Total Payment	Total Cost	Finance Charge
\$7500	10%			4				
7500	20%			4				
8000	10%			4				
8000	20%			4				

25. For the used car in Exercise 24 with an original cost of \$7,500, how much will be saved by making a 20% down payment?
26. Suppose the dealer agrees to finance the \$8000 in Exercise 24 at a 5% annual interest rate if you make a down payment of 25%. How much will you save over putting 20% down at the 9% rate?

## MIXED REVIEW

- Find the value of \$2500 after it has been invested at a 7% annual return and compounded annually for 5 years.
- How long will it take for an investment to double if it increases in value by 10% a year?
- If 1400 out of 5000 people interviewed pay their credit card bills in full each month, what percent of the sample does not pay their bills in full each month?
- Use the formula for the Future Value of a Periodic Investment to find the value of an IRA into which annual contributions of \$2000 have been made for 20 years. Assume that the investment has had an annual compounded return of 8% a year over the entire period.
- If Marci can afford a monthly payment of \$360, how much can she afford to borrow at a yearly interest rate of 9.5% for 5 years?
- The cost function for a small business is given by the equation  $c = 2.5n + 125$ , where  $n$  is the number of items produced. The revenue function for the business is given by the equation  $r = 6n$ . Use a graphing calculator to find the intersection of the graphs of the functions, that is, the break-even point of the business.
- Use a graphing calculator to find the linear regression equation that is the line of best fit for the following table values.

Number of Years After Start	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5
Value of Mutual Fund (in \$)	9	9.6	9.8	10.3	10.9	11.4	12.0	12.5

- Use IRS Form 1040A to find the refund or payment due for the following married couple. Social Security numbers are shown in parentheses.

(012-46-3774)	(012-49-1132)	Dependents:
Alex and Nina Black		Hal, age 16 (422-55-9031)
9500 Banyon Drive		Gladys, age 17 (422-55-9032)
Orlando, Florida 32819		Withheld: from Alex, \$3200
Filing a joint return		from Nina, \$950
Wages: Alex, \$57,500		Interest income: \$4,100
Nina, \$28,000		Dividend income: \$2,455

- You are a real-estate broker who has just sold a house for \$325,000. You earn 5% on the first \$125,000 and 6% on any amount over \$125,000. Determine your total commission.
- Your checkbook shows a balance of \$285.35. Your bank deducts a service charge of \$2.50 each month but does not pay interest and does not charge for each check. The only check that you wrote during the month was for \$185.44 and was mailed the day before the bank's monthly statement arrived. What will the bank show as the closing balance?