CHAPTER 4 SUMMARY

1. The function *Chr* associates a character with each number from 0 through 255 as determined by the ANSI table. The function *Asc* is the inverse of the Chr function.
2. The *relational operators* are <, >, =, <>, <=, and >=.
3. The principal *logical operators* are And, Or, and Not.
4. A *condition* is an expression involving literals, variables, functions, and operators (arithmetic, relational, or logical) that can be evaluated as either True or False.
5. The value of a variable or expression of *Boolean data type* is either True or False.
6. An *If block* decides what action to take depending on the truth values of one or more conditions. To allow several courses of action, the If, ElseIf, and Else parts of an If statement can contain other If statements.
7. A *Select Case block* selects from one of several actions depending on the value of an expression, called the *selector*. The entries in the *value lists* should have the same type as the selector.
8. *List boxes*, *radio buttons*, and *check boxes* provide an efficient way for a program to select among a set of possible options.

CHAPTER 4 PROGRAMMING PROJECTS

1. Table 4.9 gives the price schedule for Eddie's Equipment Rental. Full-day rentals cost one-and-a-half times half-day rentals. Write a program that displays Table 4.9 in a list box when an appropriate button is clicked on and displays a bill in another list box based on the item number and time period chosen by a customer. The bill should include a $30.00 deposit. A sample output is shown in Fig. 4.20.

TABLE 4.9 Price schedule for Eddie's Equipment Rental.

Piece of Equipment	Half-Day	Full-Day
1. Rug cleaner	$16.00	$24.00
2. Lawn mower	$12.00	$18.00
3. Paint sprayer	$20.00	$30.00

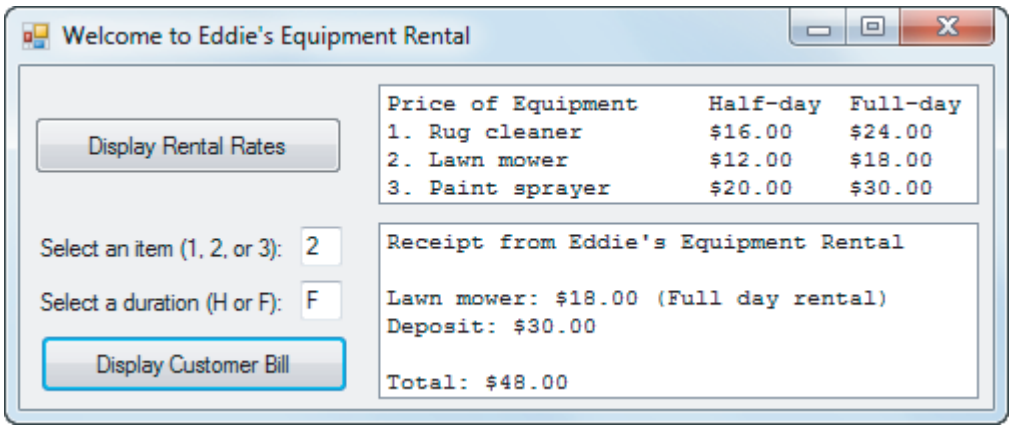


FIGURE 4.20 Form layout and sample output for Programming Project 1.

2. The American Heart Association suggests that at most 30% of the calories in our diet come from fat. Although food labels give the number of calories and amount of fat per serving, they often do not give the percentage of calories from fat. This percentage can be calculated by multiplying the number of grams of fat in one serving by 9 and dividing that number by the total number of calories per serving. Write a program that requests the name, number of calories per serving, and the grams of fat per serving as input, and tells whether the food meets the American Heart Association recommendation. A sample run is shown in Fig. 4.21.

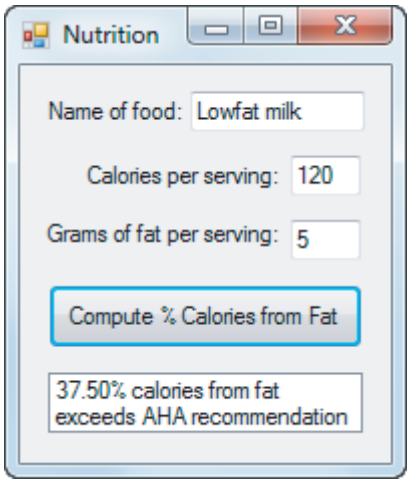


FIGURE 4.21 Possible output for Practice Problem 2.

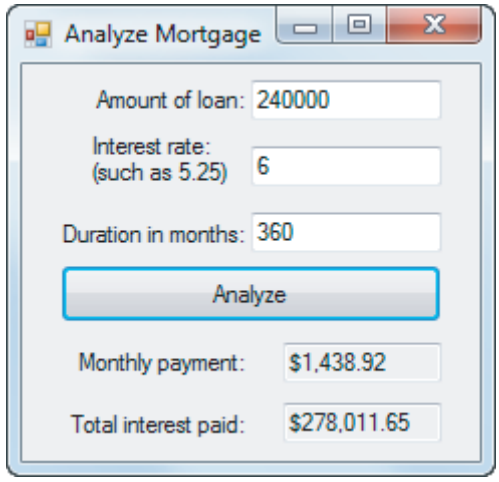


FIGURE 4.22 Possible output for Practice Problem 3.

3. Write a program to analyze a mortgage. See Fig. 4.22. The user should enter the amount of the loan, the annual percentage rate of interest, and the duration of the loan in months. When the user clicks on the button, the information that was entered should be checked to make sure it is reasonable. If bad data have been supplied, the user should be so advised. Otherwise, the monthly payment and the total amount of interest paid should be displayed. The formula for the monthly payment is

$$\text{payment} = p*r/(1 - (1 + r)\hat{}(-n)),$$

where p is the amount of the loan, r is the monthly interest rate (annual rate divided by 12) given as a number between 0 (for 0 percent) and 1 (for 100 percent), and n is the duration of the loan in months. The formula for the total interest paid is

$$\text{total interest} = n*\text{payment} - p.$$

4. Table 4.10 gives the 2008 federal income tax rate schedule for single taxpayers. Write a program that requests taxable income and calculates the federal income tax.

TABLE 4.10 2008 federal income tax rates for single taxpayers.

Taxable Income Over	But Not Over	The Tax Is	Of 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

5. Write a program to determine the real roots of the quadratic equation $ax^2 + bx + c = 0$ (where $a \neq 0$) after requesting the values of a, b, and c. Before finding the roots, ensure that a is nonzero. [***Note:*** The equation has 2, 1, or 0 solutions depending on whether the value of $b\text{^}2 - 4*a*c$ is positive, zero, or negative. In the first two cases, the solutions are given by the quadratic formula $(-b \pm \text{Math.Sqrt}(b\text{^}2 - 4*a*c))/(2*a)$.] Test the program with the following sets of coefficients:

$a = 1$	$b = -11$	$c = 28$	Solutions are 4 and 7
$a = 1$	$b = -6$	$c = 9$	Solution is 3
$a = 1$	$b = 4$	$c = 5$	No solution

6. Write a program to place an order from the restaurant menu in Table 4.11. Use the form in Fig. 4.23, and write the program so that each group box is invisible and becomes visible only when its corresponding check box is checked. After the button is clicked, the cost of the meal should be calculated. (***Note:*** The Checked property of the first radio button in each group box should be set to True in its Properties window. This guarantees that a selection is made in each visible group box. Of course, when the cost of the meal is calculated, only the visible group boxes should be considered.) See Fig. 4.24.

TABLE 4.11 Menu of Oceanside Burgers & Fries.

Burgers	Fries	Drinks
Regular (4.19)	Small (2.39)	Soda (1.69)
w/ cheese (4.79)	Medium (3.09)	Bottled Water (1.49)
w/ bacon (4.79)	Large (4.99)	
w/ bacon and cheese (5.39)		

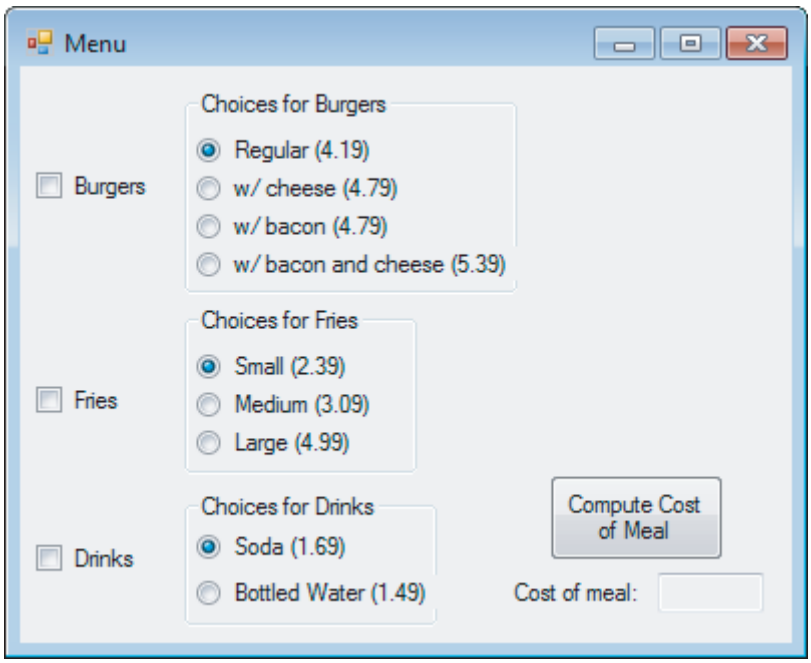


FIGURE 4.23 Form for Programming Project 6.

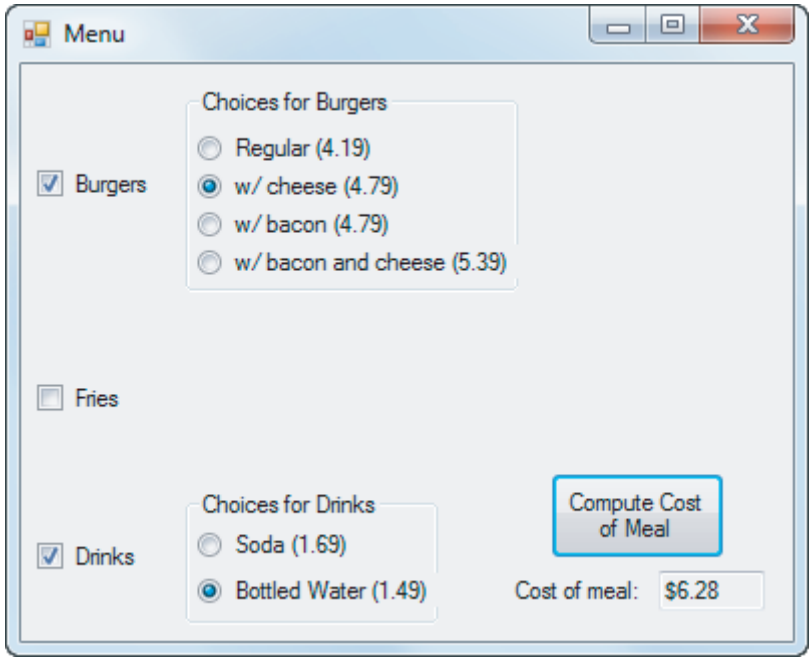


FIGURE 4.24 **Possible outcome of Programming Project 6.**

7. *College Admissions*. The admissions offices of colleges often rely on a point system. A point system similar to the one in Fig. 4.25 on the next page is used by a large state university. Write a program that allows an admissions officer to determine whether an applicant should be admitted. The numbers in brackets give the point count for each response. The GPA score entered into the text box at the top of the form should be from 2.0 to 4.0. The point value in the brackets to the right of the text box is 20 times the GPA and should appear automatically after the focus leaves the text box. A total of at most 40 points can be earned for the responses below the line. The program should calculate the total score and then admit an applicant whose score is at least 100.

8. Many employers offer their employees a retirement pension plan [known as a 401(k) plan]. Retirement pension plans are usually beneficial to an employee, since they force the employee to save. In addition, employers often match part of the employee's contribution; therefore the employee receives free money.

(a) Write a program that uses the form in Fig. 4.26(a) on the next page to ask an employee whether or not they would like to participate. When the program starts, the check box should be unchecked and the text box should be empty. If the employee clicks on the button without checking the check box, the statement "You have opted out of the retirement plan." should appear in the text box.

(b) Write a program that uses the form in Fig. 4.26(b) to ask an employee whether or not they would like to participate. When the program starts, both radio buttons should be unchecked and the text box should be empty. If the employee clicks on the button without checking a radio button, the message "You must make a selection." should be displayed in a message box. Otherwise, one of the two statements appearing in the text boxes in Fig. 4.26(a) and (b) should appear in the text box.

Note: In part (a), opting out is the default option. A study[1] has shown that employees are more likely to opt-in for the retirement plan when the question is posed as in part (b).

[1]Gabriel D. Carroll, James J. Choi, David Laibson, Brigitte Madrian, and Andrew Metrick, *Optimal Defaults and Active Decisions*, NBER Working Paper no. 11074, 2005.

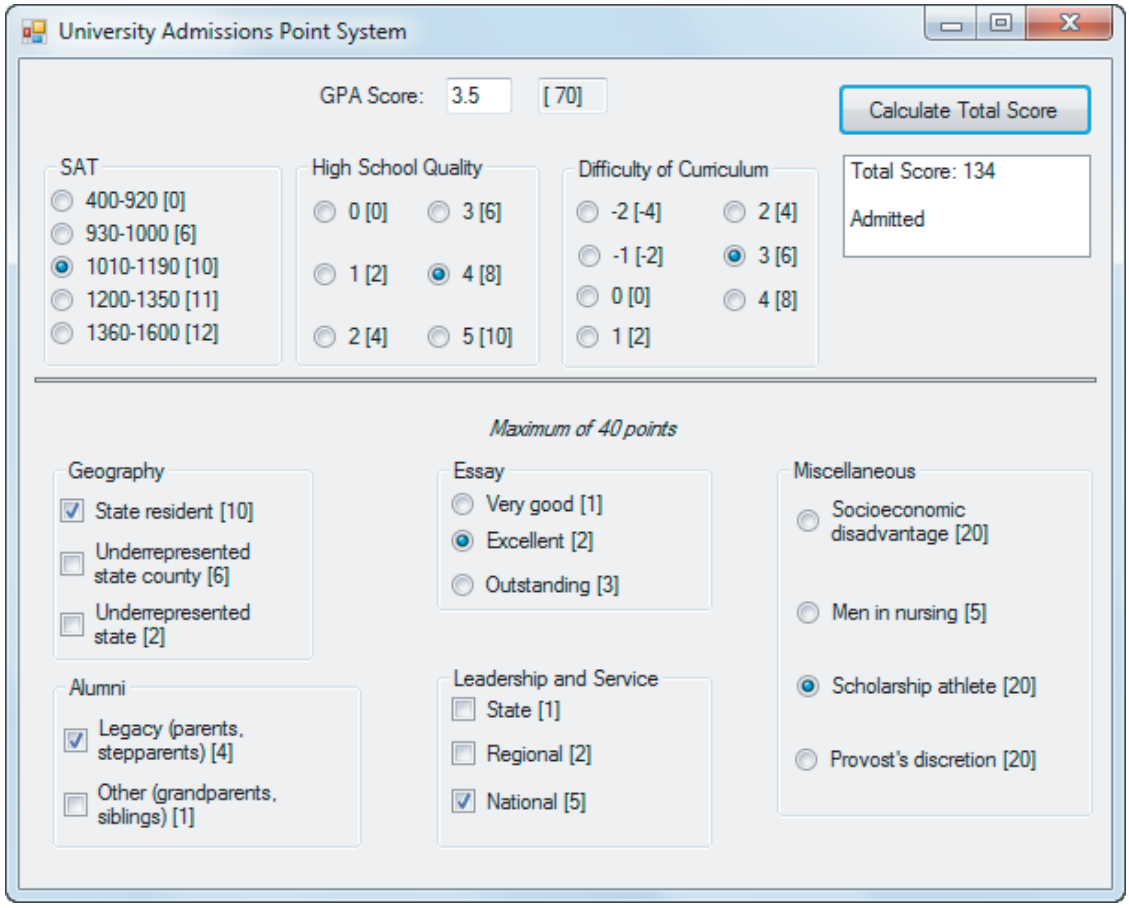
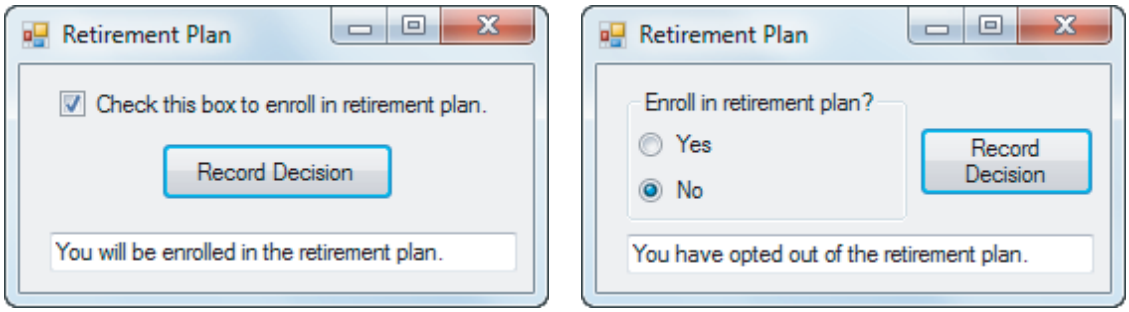


FIGURE 4.25 Sample run of Programming Project 7.



(a) (b)

FIGURE 4.26 Possible outputs for parts (a) and (b) of Programming Project 8.