```
    lstOutput.Items.Add(name)
End Sub
```

22.
```
Private Sub btnDisplay_Click(...) Handles btnDisplay.Click
    Dim loopNum As Integer, answer As String = ""
    Do
      If loopNum >= 1 Then
        answer = InputBox("Do you want to continue (Y/N)?")
        answer = answer.ToUpper
      Else
        answer = "Y"
      End If
      If (answer = "Y") Or (loopNum = 0) Then
        loopNum += 1
        txtOutput.Text = CStr(loopNum)
      End If
    Loop Until (answer <> "Y")
End Sub
```

23. Write a program that displays a Celsius-to-Fahrenheit conversion table in a list box. Entries in the table should range from 10 to 95 degrees Celsius in increments of 5 degrees. **Note:** The formula $f = (9/5 * c) + 32$ converts Celsius to Fahrenheit.

24. The *coefficient of restitution* of a ball, a number between 0 and 1, specifies how much energy is conserved when a ball hits a rigid surface. A coefficient of .9, for instance, means a bouncing ball will rise to 90% of its previous height after each bounce. Write a program to input a coefficient of restitution and an initial height in meters, and report how many times a ball bounces when dropped from its initial height before it rises to a height of less than 10 centimeters. Also report the total distance traveled by the ball before this point. The coefficients of restitution of a tennis ball, basketball, super ball, and softball are .7, .75, .9, and .3, respectively.

25. Write a program that requests a word containing the two letters *r* and *n* as input and determines which of these appears first. If the word does not contain both letters, the program should so advise the user. (Test the program with the words "colonel" and "merriment.")

26. Write a program that finds the smallest number in a sequence of nonnegative numbers entered by the user from input dialog boxes. The user should be told to type in the number −1 to indicate that the entire sequence has been entered.

27. Write a program that finds the range of a sequence of nonnegative numbers entered by the user from input dialog boxes. (The *range* is the difference between the largest and the smallest numbers in the sequence.) The user should be told to type in the number −1 to indicate that the entire sequence has been entered.

In Exercises 28 and 29, write a program corresponding to the flowchart.

28. The flowchart in Fig. 6.3 on the next page requests a whole number greater than 1 as input and factors it into a product of prime numbers. **Note:** A number is *prime* if its only factors are 1 and itself.

VideoNote
Sieve of Eratosthenes (Homework)

29. The flowchart in Fig. 6.4 on the next page finds the greatest common divisor (the largest integer that divides both) of two positive integers input by the user. Write a program that corresponds to the flowchart.

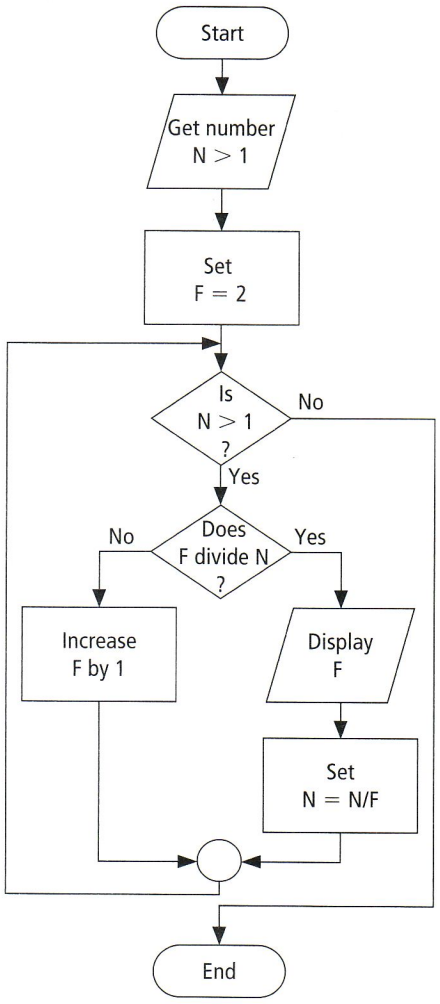


FIGURE 6.3 **Prime factors.**

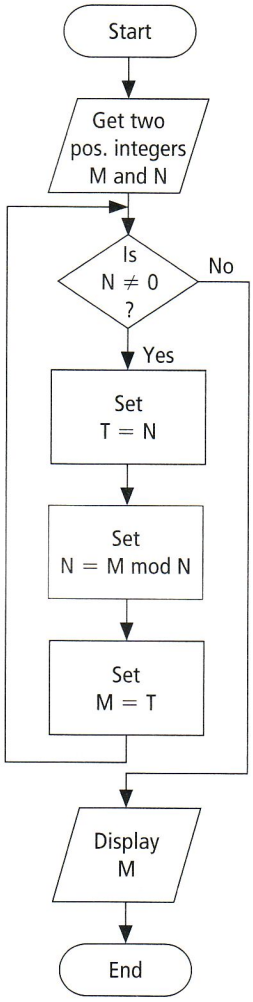
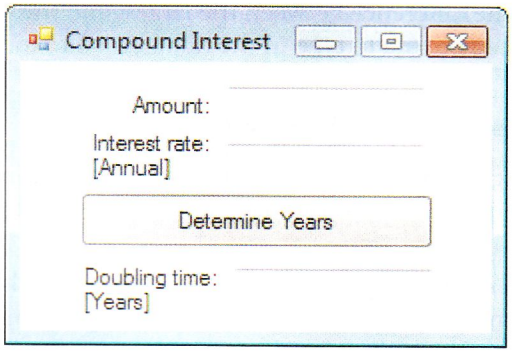


FIGURE 6.4 **Greatest common divisor.**

30. Illustrate the growth of money in a savings account. When the user presses the button, values for Amount and Interest Rate are obtained from text boxes and used to calculate the number of years until the money doubles. Use the form design shown below.

Note: The balance at the end of each year is $(1 + r)$ times the previous balance, where r is the annual rate of interest in decimal form.



OBJECT	PROPERTY	SETTING
frmInterest	Text	Compound Interest
lblAmount	Text	Amount:
txtAmount		
lblRate	AutoSize	False
	Text	Interest rate: [Annual]
txtRate		
btnDetermine	Text	Determine Years
lblDouble	AutoSize	False
	Text	Doubling time: [Years]
txtDouble	ReadOnly	True

24. Accept a word as input and determine if its letters are in alphabetical order. (Test the program with the words "almost", "imply", and "biopsy".)

25. Estimate how much a young worker will make before retiring at age 65. Request the worker's name, age, and starting salary as input. Assume the worker receives a 5% raise each year. For example, if the user enters Helen, 25, and 20000, then the text box should display the following:

```
Helen will earn about $2,415,995.
```

26. When $1000 is invested at 5% simple interest, the amount grows by $50 each year. When money is invested at 5% interest compounded annually, the amount at the end of each year is 1.05 times the amount at the beginning of that year. Display the amounts for 9 years for a $1000 investment at 5% simple and compound interest. See Fig. 6.6.

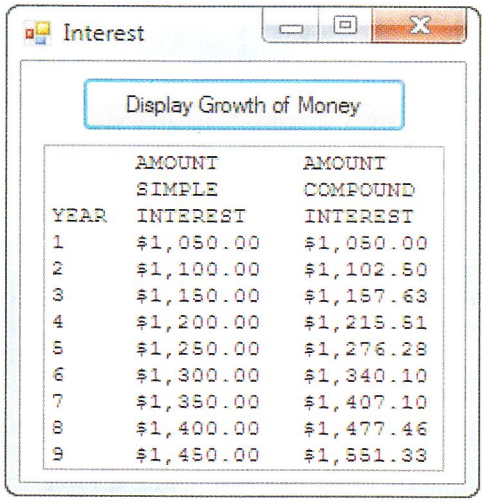


FIGURE 6.6 Output of Exercise 26.

FIGURE 6.7 Possible output for Exercise 27.

27. According to researchers at Stanford Medical School, the ideal weight for a woman is found by multiplying her height in inches by 3.5 and subtracting 108. The ideal weight for a man is found by multiplying his height in inches by 4 and subtracting 128. Request a lower and upper bound for heights and then produce a table giving the ideal weights for women and men in that height range. For example, when a lower bound of 62 and an upper bound of 71 are specified, Fig. 6.7 shows the output displayed in the list box.

28. Request a sentence, and then determine the number of sibilants (that is, letters *S* or *Z*) in the sentence. Carry out the counting with a Function procedure.

29. Refer to the annuity discussed in Exercise 36 of Section 6.1. Assume that the first deposit is made at the end of January 2010, and display the balances in the account at the end of each year from 2010 to 2019. See Fig. 6.8 on the next page.

30. Consider the car loan discussed in Exercise 35 of Section 6.1. The loan will be paid off after five years. Assume that the car was purchased at the beginning of January 2010, and display the balance at the end of each year for five years. See Fig. 6.9. ***Note:*** The last payment will be slightly less than the other payments, since otherwise the final balance would be a negative amount.

31. *Radioactive Decay.* Cobalt 60, a radioactive form of cobalt used in cancer therapy, decays over a period of time. Each year, 12% of the amount present at the beginning of the year will have decayed. If a container of cobalt 60 initially contains 10 grams, determine the amount remaining after five years.

(b) The amount of caffeine in the body 24 hours after the person drinks the coffee.

(c) Suppose the person drinks a cup of coffee at 7 a.m. and then drinks a cup of coffee at the end of each hour until 7 a.m. the next day. How much caffeine will be in the body at the end of the 24 hours?

2. The *Rule of 72* is used to approximate the time required for prices to double due to inflation. If the inflation rate is r%, then the Rule of 72 estimates that prices will double in $72/r$ years. For instance, at an inflation rate of 6%, prices double in about 72/6 or 12 years. Write a program to test the accuracy of this rule. For each interest rate from 1% to 20%, the program should display the rounded value of $72/r$ and the actual number of years required for prices to double at an r% inflation rate. (Assume prices increase at the end of each year.) See Fig. 6.13.

3. Write a program to provide information on the height of a ball thrown straight up into the air. The program should request as input the initial height, h feet, and the initial velocity, v feet per second. The height of the ball (in feet) after t seconds is given by the formula $h + vt - 16t^2$ feet. The four options to be provided by buttons are as follows:

(a) Determine the maximum height of the ball. ***Note:*** The ball will reach its maximum height after $v/32$ seconds.

(b) Determine approximately when the ball will hit the ground. ***Hint:*** Calculate the height after every .1 second and determine when the height is no longer a positive number.

(c) Display a table showing the height of the ball every quarter second for five seconds or until it hits the ground. See Fig. 6.14.

(d) Quit.

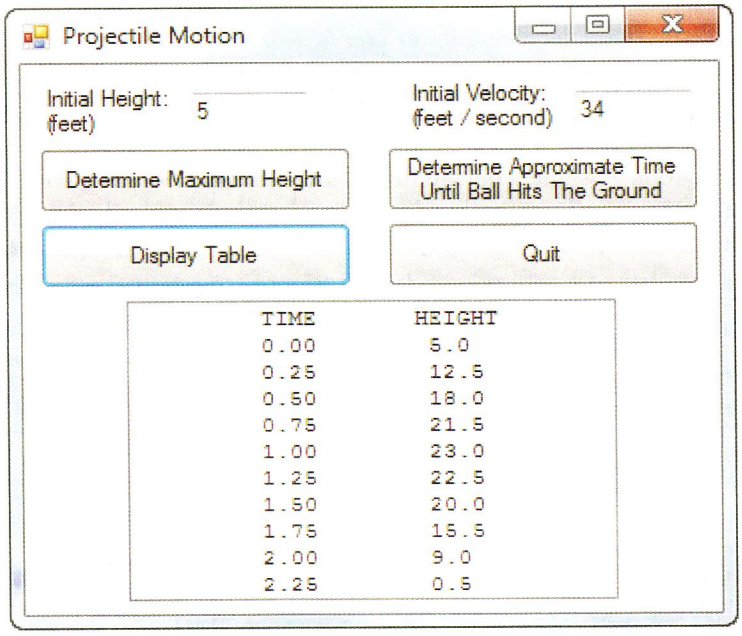


FIGURE 6.14 Sample Output for Programming Project 3.

4. A *palindrome* is a word or phrase that reads the same forwards and backwards, character for character, disregarding punctuation, case, and spaces. Some examples are "racecar", "Madam, I'm Adam.", and "Was it a cat I saw?". Write a program that allows the user to input a word or phrase and then determines if it is a palindrome. The program should use a Boolean-valued Function procedure named IsPalindrome that returns the value True when the word or phrase is a palindrome and the value False otherwise.