

■ Comments

1. In the function `FICA_Tax`, care has been taken to avoid computing social security benefits tax on income in excess of \$106,800 per year. The logic of the program makes sure an employee whose income for the year crosses the \$106,800 threshold during a given week is taxed only on the difference between \$106,800 and their previous year-to-date earnings.
2. The two functions `TaxMarried` and `TaxSingle` use Select Case blocks to incorporate the tax brackets given in Tables 5.5 and 5.6 for the amount of federal income tax withheld. The upper limit of each Case clause is the same as the lower limit of the next Case clause. This ensures that fractional values for *adjPay*, such as 138.50 in the `TaxSingle` function, will be properly treated as part of the higher salary range.

CHAPTER 5 SUMMARY

1. A *general procedure* is a portion of a program that is accessed by event procedures or other general procedures. The two types of general procedures are *Function procedures* and *Sub procedures*.
2. *Function procedures* are defined in blocks beginning with Function headers and ending with End Function statements. A function is executed by a reference in an expression and returns a value.
3. *Sub procedures* are defined in blocks beginning with Sub headers and ending with End Sub statements. A Sub procedure is accessed (called) by a statement consisting of the name of the procedure.
4. In any procedure, the *arguments* appearing in the calling statement must match the *parameters* of the Sub or Function statement in number, type, and order. They need not have the same names.
5. The *lifetime* of a variable or constant is the period during which it remains in memory. (The value of the variable might change over its lifetime, but it always holds some value.)
6. The *scope* of a variable or constant is the portion of the program that can refer to it. A variable or constant declared inside a Function, Sub, or event procedure has *local* scope and is visible only inside the procedure.
7. *Structured programming* uses modular design to refine large problems into smaller subproblems. Programs are coded using the three logical structures of sequences, decisions, and loops.

CHAPTER 5 PROGRAMMING PROJECTS

1. Write a program to determine a student's GPA. See Fig. 5.25. The user should enter the grade (A, B, C, D, or F) and the number of credit hours for a course, and then click on the *Record This Course* button. The user should then repeat this process for all his or her courses. After all the courses have been recorded, the user should click on the *Calculate GPA* button. A Function procedure should be used to calculate the quality points for a course. **Hint:** This program is similar to Example 5 in Section 5.1.
2. A fast-food vendor sells pizza slices (\$1.75), fries (\$2.00), and soft drinks (\$1.25). Write a program to compute a customer's bill. The program should request the quantity of each item ordered in a Sub procedure, calculate the total cost with a Function procedure, and use a Sub procedure to display an itemized bill. A sample output is shown in Fig. 5.26.

A screenshot of a Windows application window titled "GPA". It contains two text input fields: "Grade (A,B, ...):" and "Credit hours:". Below these are two buttons: "Record This Course" and "Calculate GPA". At the bottom, there is a label "GPA:" followed by a text input field.

FIGURE 5.25 Form design for Programming Project 1.

A screenshot of a Windows application window titled "Restaurant Bill". It has three text input fields: "How many pizza slices?" (value 3), "How many fries?" (value 4), and "How many soft drinks?" (value 5). To the right of these is a button labeled "Compute Total Cost". Below the inputs is a table showing the bill details.

ITEM	QUANTITY	PRICE
pizza slices	3	\$5.25
fries	4	\$8.00
soft drinks	5	\$6.25
TOTAL		\$19.50

FIGURE 5.26 Sample output for Programming Project 2.

3. A furniture manufacturer makes two types of furniture—chairs and sofas. The cost per chair is \$350, the cost per sofa is \$925, and the sales tax rate is 5%. Write a program to create an invoice form for an order. See Fig. 5.27. After the data on the left side of Fig. 5.27 are entered, the user can display an invoice in a list box by pressing the *Process Order* button. The user can click on the *Clear Order Form* button to clear all text boxes and the list box, and can click on the *Quit* button to exit the program. The invoice number consists of the capitalized first two letters of the customer's last name, followed by the last four digits of the zip code. The customer name is input with the last name first, followed by a comma, a space, and the first name. However, the name is displayed in the invoice in the proper order. The generation of the invoice number and the reordering of the first and last names should be carried out by Function procedures.



VideoNote
Hardware
store
(Homework)

A screenshot of a Windows application window titled "Furniture Order Form". It is divided into two main sections. The left section contains input fields for "Customer name: (Last, First)" (value: "Smith, William"), "Address:" (value: "123 Geary Street"), "City, State, Zip:" (value: "Alameda, CA 94501"), "Number of chairs ordered:" (value: 4), and "Number of sofas ordered:" (value: 9). The right section displays the generated invoice. At the bottom are three buttons: "Process Order", "Clear Order Form", and "Quit".

Customer name: (Last, First) Smith, William

Address: 123 Geary Street

City, State, Zip: Alameda, CA 94501

Number of chairs ordered: 4

Number of sofas ordered: 9

Invoice Number: SM4501

Name: William Smith

Address: 123 Geary Street

City: Alameda, CA 94501

Number of Chairs: 4

Number of Sofas: 9

Cost: \$9,725.00

Sales Tax: \$486.25

Total Cost: \$10,211.25

Process Order Clear Order Form Quit

FIGURE 5.27 Sample run for Programming Project 3.

4. Table 5.9 contains seven proverbs and their truth values. Write a program that presents these proverbs one at a time and asks the user to evaluate them as true or false. The program should then tell the user how many questions were answered correctly and display one

TABLE 5.9 Seven proverbs.

Proverb	Truth Value
The squeaky wheel gets the grease.	True
Cry and you cry alone.	True
Opposites attract.	False
Spare the rod and spoil the child.	False
Actions speak louder than words.	True
Familiarity breeds contempt.	False
Marry in haste, repent at leisure.	True

Source: “You Know What They Say . . .,” by Alfie Kohn, *Psychology Today*, April 1988.

of the following evaluations: Perfect (all correct), Excellent (5 or 6 correct), You might consider taking Psychology 101 (less than 5 correct).

- 5.** *Five, Six, Pick up Sticks.* Write a program that allows the user to challenge the computer to a game of Pick-up-Sticks. Here is how the game is played. The user chooses the number of matchsticks (from 5 to 50) to place in a pile. Then, the computer chooses who will go first. At each turn, the contestant can remove one, two, or three matchsticks from the pile. The contestant who removes the last matchstick loses. See Fig. 5.28.

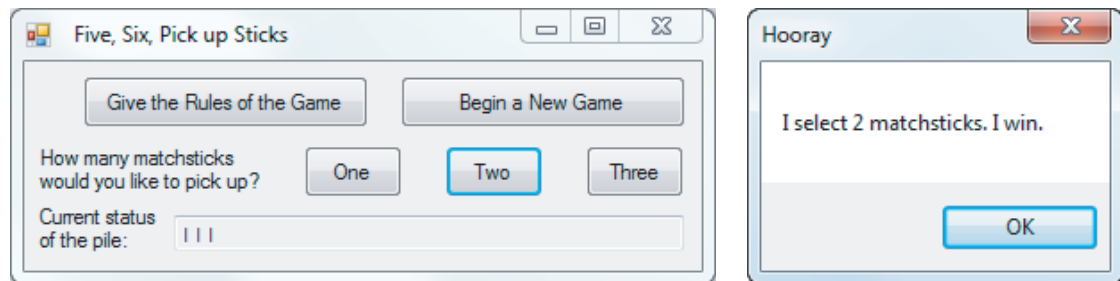


FIGURE 5.28 A possible outcome of Programming Project 5.

The computer should make the user always select from a pile where the number of matchsticks has a remainder of 1 when divided by 4. For instance, if the user initially chooses a number of matchsticks that has a remainder of 1 when divided by 4, then the computer should have the user go first. Otherwise, the computer should go first and remove the proper number of matchsticks. [**Note:** The remainder when n is divided by 4 is $(n \text{ Mod } 4)$.] After writing the program, play a few games with the computer and observe that the computer always wins.