Review Questions

Multiple Choice

1. A _____ -controlled loop uses a true/false condition to control the number of times that it repeats.
   a. Boolean
   b. condition
   c. decision
   d. count

2. A _____ -controlled loop repeats a specific number of times.
   a. Boolean
   b. condition
   c. decision
   d. count

3. Each repetition of a loop is known as a(n) _____.
   a. cycle
   b. revolution
   c. orbit
   d. iteration

4. The while loop is a _____ type of loop.
   a. pretest
   b. no-test
   c. prequalified
   d. post-iterative

5. A(n) _____ loop has no way of ending and repeats until the program is inter-rupted.
   a. indeterminate
   b. interminable
   c. infinite
   d. timeless

6. The -= operator is an example of a(n) _____ operator.
   a. relational
   b. augmented assignment
   c. complex assignment
   d. reverse assignment

7. A(n) _____ variable keeps a running total.
   a. sentinel
   b. sum
   c. total
   d. accumulator

8. A(n) _____ is a special value that signals when there are no more items from a list of items to be processed. This value cannot be mistaken as an item from the list.
   a. sentinel
   b. flag
   c. signal
   d. accumulator

9. GIGO stands for _____.
   a. great input, great output
   b. garbage in, garbage out
   c. GIGahertz Output
   d. GIGabyte Operation

10. The integrity of a program's output is only as good as the integrity of the program's _____.
   a. compiler
   b. programming language
   c. input
   d. debugger

11. The input operation that appears just before a validation loop is known as the _____.
   a. prevalidation read
   b. primordial read
   c. initialization read
   d. priming read

12. Validation loops are also known as _____.
   a. error traps
   b. doomsday loops
   c. error avoidance loops
   d. defensive loops

True or False

1. A condition-controlled loop always repeats a specific number of times.
2. The while loop is a pretest loop.
3. The following statement subtracts 1 from x: x = x − 1
4. It is not necessary to initialize accumulator variables.
5. In a nested loop, the inner loop goes through all of its iterations for every single iteration of the outer loop.
6. To calculate the total number of iterations of a nested loop, add the number of iterations of all the loops.
7. The process of input validation works as follows: when the user of a program enters invalid data, the program should ask the user "Are you sure you meant to enter that?" If the user answers "yes," the program should accept the data.

Short Answer

1. What is a condition-controlled loop?
2. What is a count-controlled loop?
3. What is an infinite loop? Write the code for an infinite loop.
4. Why is it critical that accumulator variables are properly initialized?
5. What is the advantage of using a sentinel?
6. Why must the value chosen for use as a sentinel be carefully selected?
7. What does the phrase "garbage in, garbage out" mean?
8. Give a general description of the input validation process.

Algorithm Workbench

1. Write a `while` loop that lets the user enter a number. The number should be multiplied by 10, and the result assigned to a variable named `product`. The loop should iterate as long as `product` is less than 100.

2. Write a `while` loop that asks the user to enter two numbers. The numbers should be added and the sum displayed. The loop should ask the user if he or she wishes to perform the operation again. If so, the loop should repeat, otherwise it should terminate.

3. Write a `for` loop that displays the following set of numbers:

   `0, 10, 20, 30, 40, 50 . . . 1000`

4. Write a loop that asks the user to enter a number. The loop should iterate 10 times and keep a running total of the numbers entered.

5. Write a loop that calculates the total of the following series of numbers:

$$\frac{1}{30} + \frac{2}{29} + \frac{3}{28} + \ldots \frac{30}{1}$$

6. Rewrite the following statements using augmented assignment operators.

   a. `x = x + 1`
   b. `x = x * 2`
   c. `x = x / 10`
   d. `x = x - 100`

7. Write a set of nested loops that display 10 rows of # characters. There should be 15 # characters in each row.

8. Write code that prompts the user to enter a positive nonzero number and validates the input.

9. Write code that prompts the user to enter a number in the range of 1 through 100 and validates the input.

Programming Exercises

1. Bug Collector

A bug collector collects bugs every day for five days. Write a program that keeps a running total of the number of bugs collected during the five days. The loop should ask for the number of bugs collected for each day, and when the loop is finished, the program should display the total number of bugs collected.

2. Calories Burned

Running on a particular treadmill you burn 4.2 calories per minute. Write a program that uses a loop to display the number of calories burned after 10, 15, 20, 25, and 30 minutes.

3. Budget Analysis

Write a program that asks the user to enter the amount that he or she has budgeted for a month. A loop should then prompt the user to enter each of his or her expenses for the month and keep a running total. When the loop finishes, the program should display the amount that the user is over or under budget.

4. Distance Traveled

The distance a vehicle travels can be calculated as follows:

$$distance = speed \times time$$

For example, if a train travels 40 miles per hour for three hours, the distance traveled is 120 miles. Write a program that asks the user for the speed of a vehicle (in miles per hour) and the number of hours it has traveled. It should then use a loop to display the distance the vehicle has traveled for each hour of that time period. Here is an example of the desired output:

```
What is the speed of the vehicle in mph? 40 Enter
How many hours has it traveled? 3 Enter
Hour            Distance Traveled
1                    40
2                    80
3                    120
```

5. Average Rainfall

Write a program that uses nested loops to collect data and calculate the average rainfall over a period of years. The program should first ask for the number of years. The outer loop will iterate once for each year. The inner loop will iterate twelve times, once for each month. Each iteration of the inner loop will ask the user for the inches of rainfall for that month. After all iterations, the program should display the number of months, the total inches of rainfall, and the average rainfall per month for the entire period.

6. Celsius to Fahrenheit Table

Write a program that displays a table of the Celsius temperatures 0 through 20 and their Fahrenheit equivalents. The formula for converting a temperature from Celsius to Fahrenheit is

$$F = \frac{9}{5}C + 32$$

where F is the Fahrenheit temperature, and C is the Celsius temperature. Your program must use a loop to display the table.

7. Pennies for Pay

Write a program that calculates the amount of money a person would earn over a period of time if his or her salary is one penny the first day, two pennies the second day, and continues to double each day. The program should ask the user for the number of days. Display a table showing what the salary was for each day, then show the total pay at the end of the period. The output should be displayed in a dollar amount, not the number of pennies.

8. Sum of Numbers

Write a program with a loop that asks the user to enter a series of positive numbers. The user should enter a negative number to signal the end of the series. After all the positive numbers have been entered, the program should display their sum.