REVIEW ON COMPUTER PROGRAMMING

Objectives

1. *Review the elements of computer programming with emphasis on good programming principles.*
2. *Adapt a systematic method of developing computer programs.*

COMPUTER PROGRAMMING

A computer requires a program to do any useful work. Programming languages are used to write computer program.

Computer Program is a set of instructions in a programming language intended to be executed on a computer to perform a task. Computer programming involves much more than simply writing a list of instructions. Problem solving is a crucial component of programming and requires a good deal of preplanning. Before writing a program to solve a particular problem, you must consider carefully all aspects of the problem and then develop and organize its solution.

Computer Problems

1. Write a program that reads in two integers and then outputs their sum, difference, and product.

2. A Celsius (centigrade) temperature (C) can be converted to an equivalent Fahrenheit temperature (F) according to the formula $F = \frac{9}{5}C + 32$. Write a program that reads in a Celsius temperature and then outputs the equivalent Fahrenheit temperature.

3. **(CP)** The relationship between the sides (a,b) of a right triangle and the hypotenuse (h) is given by the Pythagorean formula $a^2 + b^2 = h^2$. Write a program that reads in the lengths of the two sides of a right triangle and computes the hypotenuse of the triangle.

4. **(CP)** The area of a triangle whose sides are a, b, and c can be computed by the formula $A = \sqrt{s(s-a)(s-b)(s-c)}$ where s=(a + b + c)/2. Write a program that reads in the lengths of the three sides of a triangle and outputs the area of the triangle.

Using Conditional Statements

5. Write a program that gives the user the choice of computing the area of any of the following: a circle, a square, a rectangle, or a triangle. The program should include a loop to allow the user to perform as many calculations as desired. Use a procedure for each of the different kinds of calculations.

Using Repetitive Statement

6. Write a program to calculate the sum: $1+4+7+\cdots+100$.

7. Write a program to calculate the sum: $1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{\text{Terms}}$ where Terms is specified by the user. This sum is called harmonic series.

8. **(CP)** Write a program to list the numbers from 0 to 25, their squares, square roots, fourth power, and fourth root. The output should be in a neat five-column format.

9. Write a program that reads in a number N and then outputs the sum of the squares of the numbers from 1 to N. If the input is 3, for example, the output should be 14, because $1^2 + 2^2 + 3^2 = 1 + 4 + 9 = 14$. The program should allow the user to repeat this calculation as often as desired.

10. Write a program to compute the factorial of a number (N!). For example, 3! = 1 x 2 x 3 = 6. By convention, 0! is set equal to 1.

11. A *perfect number* is a positive integer that is equal to the sum of all those positive integers (excluding itself) that divide it evenly. The first perfect number is 6, because its divisors (excluding itself) are 1, 2, 3, and because 6 = 1 + 2 + 3. Write a program to find the first three perfect numbers (include 6 as one of the three).

12. Write a program to find all integer solutions to the equation 4x + 3y – 9z = 5 for values of x, y, and z between 0 and 10.

13. **(CP)** The value e^x can be approximated by the sum $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\cdots+\frac{x^n}{n!}$. Write a program that takes a value x as input and outputs this sum for n taken to be each of the values 1 to 100. The program should repeat the calculation for new values of x until the user says he or she is through.

Using Procedures or Functions for Subtasks

14. Write a program that reads in a real number (representing that many inches) and then outputs the area of a square with sides of that length and the area of a circle with a diameter of that length. Use two procedures to compute the two areas.

15. Write a procedure that has two formal parameters, one for the radius of a circle and one for the circumference. Given a radius, the procedure computes the circumference of the circle and stores the answer in the parameter for the circumference. Embed this in a program to compute the circumference of a circle.

Using Arrays

16. **(CP)** Write a program that reads 10 integers into an array, computes the average, largest, and smallest numbers in the array.

17. Write a program that allows the user to type in up to 10 positive numbers and then echoes back the numbers typed in but in reverse order.

18. **(CP)** Write a program that reads in an *m* by *n* matrix (*m* row by *n* column), then reads in an *n* by *p* matrix (*n* row by *p* column), and then computes the product matrix and displays the two matrices as well as their product matrix on the screen.