Helwan University

Programming Language I

(Spring 2016)

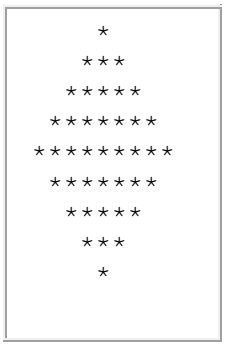
Sheet 1: Revision and Introduction

1. Write a program to find the smallest of several integers.
2. Write a program to calculate and print the product of the odd integers from 1 to 15.
3. Write a program that prints the powers of the integer 2, namely 2, 4, 8, 16, 32, 64, etc. Your while loop should not terminate (i.e., you should create an infinite loop). To do this, simply use the keyword true as the expression for the while statement. What happens when you run this program?
4. Write a program that asks the user about his salary in L.E and then displays his salary in $ if you know that ($=7.5 L.E).
5. Write a program to convert a given temperature in degrees Fahrenheit (F) to degrees Celsius (C) using the formula: C = 5 / 9 (F - 32)
6. Read the time in seconds and distance in meters from the user and calculate speed, where speed=distance/time.
7. Write a program that print characters till user types character z.
8. Write a program to calculate the following sequences?
    a. S=1+2+3+4+…n
    b. S=1+3+5+7+…n
    c. S=n!=n*(n-1)*(n-2)*1
    d. S=1-2+3-4+5... +-n
    e. S=1+1/2+1/3+1/4+….1/n
    f. S=1/2+3/4+5/6+….n
    g. S=1!+2!+3!+4!+5!+ ….n!
9. (Cryptography) A company wants to transmit data over the telephone, but is concerned that its phones could be tapped. All of the data are transmitted as four-digit integers. The company has asked you to write a program that encrypts the data so that it can be transmitted more securely. Your program should read a four-digit integer and encrypt it as follows: Replace each digit by (the sum of that digit plus 7) modulus 10. Then, swap the first digit with the third, swap the second digit with the fourth and print the encrypted integer. Write a separate program that inputs an encrypted fourdigit integer and decrypts it to form the original number.
10. Calculate the value of pi from the infinite series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \cdots$$

    Print a table that shows the approximate value of pi after each of the first 1,000 terms of this series
11. Use the function that calculates pi to calculate the area of the circle given its radius.
12. Use the function that calculates pi to calculate the value of the angle in radian form given its degree form then calculate its sin and cosine.

13. Write a program that prints the following diamond shape. You may use output statements that print either a single asterisk (*) or a single blank. Maximize your use of repetition (with nested for statements) and minimize the number of output statements.



14. Write a program that display a menu as following
    a. Press 1 to let user enter 2 numbers and print their multiplication value
    b. Press 2 to let user enter a range of 2 numbers and the program will calculate the summation of all numbers in this Range.
    c. Press 3 to let user enter many numbers until a negative value entered then the program print the Maximum and Minimum value entered.
    d. Press 0 to Exit program.
15. (Perfect Numbers) An integer is said to be a perfect number if the sum of its factors, including 1 (but not the number itself), is equal to the number. For example, 6 is a perfect number, because 6 = 1 + 2 + 3. Write a function perfect that determines whether parameter number is a perfect number. Use this function in a program that determines and prints all the perfect numbers between 1 and 1000. Print the factors of each perfect number to confirm that the number is indeed perfect. Challenge the power of your computer by testing numbers much larger than 1000.
16. (Prime Numbers) An integer is said to be prime if it is divisible by only 1 and itself. For example, 2, 3, 5 and 7 are prime, but 4, 6, 8 and 9 are not.
17. Write a function that determines whether a number is prime.
18. Use this function in a program that determines and prints all the prime numbers between 2 and 10,000. How many of these numbers do you really have to test before being sure that you have found all the primes?
    a. Initially, you might think that n/2 is the upper limit for which you must test to see whether a number is prime, but you need only go as high as the square root of n. Why? Rewrite the program, and run it both ways. Estimate the performance improvement.

19. Write a function NumberOfDigits that returns the number of digits in an integer
20. (Reverse Digits) Write a function that takes an integer value and returns the number with its digits reversed. For example, given the number 7631, the function should return 1367.
21. Input an integer containing only 0s and 1s (i.e., a "binary" integer) and print its decimal equivalent. Use the modulus and division operators to pick off the "binary" number's digits one at a time from right to left. Much as in the decimal number system, where the rightmost digit has a positional value of 1, the next digit left has a positional value of 10, then 100, then 1000, and so on, in the binary number system the rightmost digit has a positional value of 1, the next digit left has a positional value of 2, then 4, then 8, and so on. Thus the decimal number 234 can be interpreted as 2 * 100 + 3 * 10 + 4 * 1. The decimal equivalent of binary 1101 is 1 * 1 + 0 * 2 + 1 * 4 + 1 * 8 or 1 + 0 + 4 + 8, or 13.