

Programming and Data Structures

Deadline: 26-Aug-2016

Assignment: I

Note that, for the following C programs, you can not use arrays, or any mathematical functions from math.h, or string functions from string.h, or character functions from ctype.h. However, you can use operators, expressions, if, else, switch, case, break, default, continue, while, do-while, and for loops. For declaring datatypes, you can use int, char, float, double, signed, unsigned, long, short.

1. Given a year $1000 \leq n \leq 9999$, write a C program to identify whether it is a leap year or not.
2. A cashier has currency notes of denominations 10, 50 and 100. If the amount to be withdrawn is input through the keyboard in hundreds, find the total number of currency notes of each denomination the cashier will have to give to the withdrawer.
3. Given three points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) , write a C program to check if they are collinear or not. If they are not collinear, then find the perimeter and area of the triangle.
4. Any character is entered through the keyboard, write a C program to determine whether the character entered is a upper case letter, a lower case letter, a digit or a special symbol. The following table shows the range of ASCII values for various characters.

Characters	ASCII Values
A–Z	65 – 90
a–z	97 – 122
0–9	48 – 57
special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127

5. According to the Gregorian calendar, it was Monday on the date 01/01/1900 (DD/MM/YYYY). Given a year $y > 1900$ as input, write a C program to find out what is the day on 1st January of the year y .
6. Given a n -digit number where $1 \leq n \leq 5$, write a C program to calculate the sum of its digits. (Hint: Use the modulus operator '%')
7. Given a n -digit number where $1 \leq n \leq 5$, write a C program to reverse the number.
8. Given a non-negative integer $n < 2^{16}$, write a C program to convert it into its equivalent binary representation.

9. Given an integer $2 \leq n \leq 2^{16} - 1$, write a C program to check whether it is a prime or not. If it is a composite number, print all the prime factors of n.
10. If sum of cubes of each digit of the number is equal to the number itself, then the number is called an Armstrong number. For example, $153 = 1^3 + 5^3 + 3^3$. Write a C program to print out all Armstrong numbers between 1 and 1000.
11. Write a C program to enter the numbers till the user wants and at the end it should display the count of positive, negative and zeros entered. 'Y/y' denotes the user's willingness and 'N/n' denotes the user's unwillingness and exit from the program.
12. Given an angle x in degree, calculate $\sin(x) = x - (x^3/3!) + (x^5/5!) - (x^7/7!) + \dots$ until $x^i/i! \leq 10^{-5}$. Remember that before putting x into the expansion, convert x^0 to radian. ($180^0 = \pi$ radian).
13. Write a program to produce the following * rhombus when input is 5:

```

      *
    * *
  * * *
* * * *
* * * * *
  * * * *
    * * *
      * *
        *

```

14. Write a C program to produce the following output when the input is D:

```

A B C D C B A
A B C   C B A
A B     B A
A       A

```

15. Write a C program to print the first $n \geq 1$ numbers of a Fibonacci sequence. In a Fibonacci sequence, $F_1 = 1$, $F_2 = 1$, and $F_n = F_{n-1} + F_{n-2}$, i.e. the sum of two successive terms gives the third term. Following are the first 7 numbers of the Fibonacci sequence:

```

1 1 2 3 5 8 13

```

16. Write a program to produce the following Pascal's triangle when input is 5:

```
  1
 1 1
1 2 1
1 3 3 1
1 4 6 4 1
```