Programming Assignments – C++

Question difficulty is indicated by the number of asterisks (‘*’). A question with ‘**’ is a difficult question. First give regular questions. If finished, provide the ones with ‘*’, then the ones with ‘**’.

1. Introduction

1) Write a program that outputs the figure of the first letter of your name using the first letter of your name. The height of the figure is 5 rows.

For example, suppose your name is ‘John’, then the figure is composed of the letter ‘J’ output is:

```
    JJJ
     J
     J
J    J
 JJJJ
```

1*) Write a program that outputs figures of your first name using the letters in your first name. The height of each figure is 5 rows.

For example, suppose your name is ‘JOHN’, then the figure is composed of the letter ‘J’ output is:

```
    JJJ   OOOO   H   H  N   N
     J   O    O  H   H  NN  N
     J   O    O  HHHHH  N N N
J    J   O    O  H   H  N  NN
 JJJJ     OOOO   H   H  N   N
```

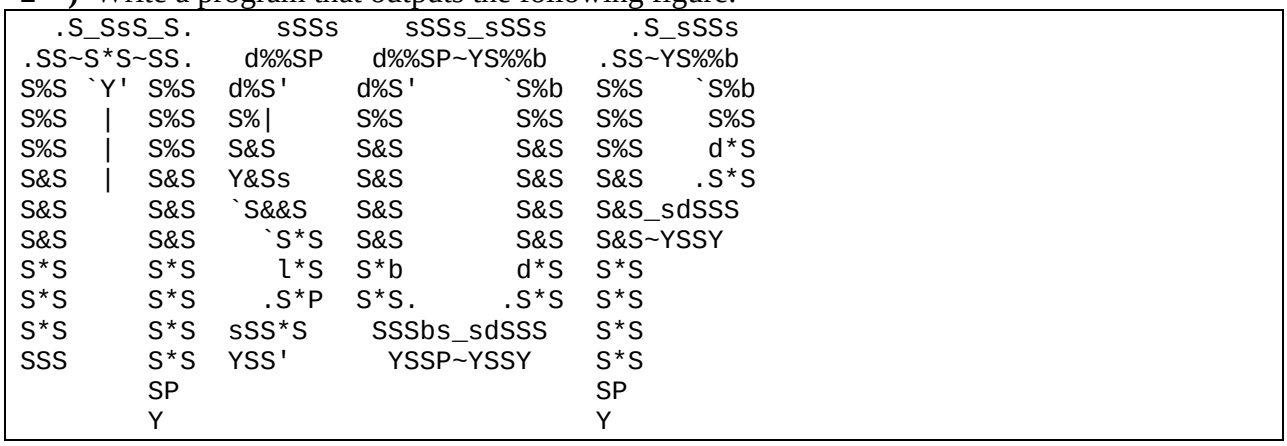
2) Write a program that outputs the following figure.

```
*******
*
* *****
* *   *
* * * *
* *** *
*     *
*******
```

2*) Write a program that outputs the following figure.

```
**   **  *****   *****  *****
* * * * *       *     * *    *
*  *  *  *****  *     * *****
*     *       * *     * *
*     *  *****   *****  *
```

2)** Write a program that outputs the following figure.



2. Variables – Integer & Float

1) Write a program calculates the area of the given rectangle. The length of the rectangle is 219 and the width is 72. You will use three variables in your program; `length`, `width` and `area`. Put the values into `length` and `width` then calculate `area` using necessary formula. At the end, write `area` to the screen.

1*) Write a program that calculates the number of minutes in a year. You will have three variables; `day`, `hour` and `minute`. Put the number of days in a year into the variable `day`. Then, multiply `day` by the number of hours in a day, and put the result into the variable `hour`. Finally, multiply `hour` by the number of minutes in an hour, and put the result into the variable `minute`. At the end, write the variable `minute` to the screen.

2) Write a program that calculates the average of three numbers. Your program should read three numbers from keyboard then put the average of these three numbers into `average3` (you are free to choose the variable names). At the end, it should write `average3` to the screen.

2*) Write a program that calculates the product of the numbers from 1 to 10. Don't calculate yourself, let computer do it for you. Use one variable named `product`. The variable `product` is equal to the multiplication expression of the numbers from 1 to 10. Then write `product` on the screen.

3) Write a program calculates your age when you enter your birth year from the keyboard. For example, if you enter `1984` from the keyboard, the program will write `25` to the screen.

3. Conditionals

1) Write a program that writes "This is an even number" if the given number is even, and "This is an odd number" if it is odd. The user will enter the positive integer number from keyboard.

Sample input:

```
7
```

Sample output:

```
This is an odd number
```

1*) Write a program that finds the smallest of three numbers given.

Sample input:

```
7
3
10
```

Sample output:

```
3
```

1)** Write a program that finds the greatest two of three numbers given. The order is not important. You cannot use nested conditions or logical operators such as 'AND'.

Sample input:

```
7
3
10
```

Sample output:

```
7
10
```

2) Write a program that writes "divisible" if the first number is divisible by the second. Otherwise it will write "not divisible". The user will enter two positive integers from the keyboard.

Sample input:

```
36
5
```

Sample output:

```
not divisible
```

2*) Write a program that outputs "sum of two" if the sum of any two of the three given numbers is equal to the other one. If the product of any two is equal to the remaining one then write "product of two". The user will enter three numbers from the keyboard.

Sample input 1:

```
1 3 2
```

Sample output 1:

```
sum of two
```

Sample input 2:

```
6 3 2
```

Sample output 2:

```
product of two
```

2)** Write a program that sorts three given numbers from smallest to largest.

Sample input:

```
12 7 11
```

Sample output:

```
7
11
12
```

4. Looping

1) Write a program that outputs only the numbers that have remainder 3 when divided by 7. The program stops when 0 is entered.

Sample input:

```
9 10 11 185 7 3 0
```

Sample output:

```
10
185
3
```

1*) Write a program that outputs the sum of the first 5 numbers. The program terminates when the input is 0 (it is guaranteed that there are at least 5 numbers).

Sample input:

```
9 10 11 185 7 3 12 4 1001 0
```

Sample output:

```
222
```

1)** Write a program that outputs the sum of the first 5 numbers and the last number (the number before 0). The program terminates when the input is 0 (it is guaranteed that there are at least 5 numbers).

Sample input:

```
9 10 11 185 7 3 12 4 1001 0
```

Sample output:

```
1223
```

2) Write a program that outputs the sum of the squares of the given numbers. The program stops when 0 is entered.

Sample input:

```
9 10 7 3 0
```

Sample output:

```
239
```

2*) Write a program that applies the following rule to the number n in each step until n becomes 1:

- If n is even, divide n by 2. Otherwise, multiply n by three and add 1 to it.
- Assign the new value to n.

The user will input the number n from keyboard.

Sample input:

```
9
```

Sample output:

```
9
28
14
7
22
11
34
17
52
26
13
40
20
10
5
16
8
4
2
1
```

2)** "Guess my number" game is a two player game. One of the players becomes the master and picks up a number between 1 and 10 inclusively, and the other player tries to guess the number in his mind. After each guess, if the wanted number is less or greater than the guessed number then the master says "less" or "greater", respectively. This goes on until the correct guess is achieved.

In this program, computer is the master and the user guesses the number of computer. In the program, you will define a variable named `secretnumber` which contains the secret number. You will assign the number to it inside the program. For example, write

```
secretnumber = 6;
```

in your program if you want the number to be 6. In each step, the user asks for a number. If the secret number is less than the guessed number, the computer writes "less". If it is greater, it writes "greater". If it is the correct number it writes "correct!", and the game finishes.

Suppose the secret number is 7.

Sample: '>' indicates the numbers user entered

```
>3
 greater
>6
 greater
>9
 less
>7
 correct!
```

2*)** "Guess my number" game is a two player game. One of the players becomes the master and picks up a number between 1 and 10 inclusively, and the other player tries to guess the number in his mind. After each guess, if the wanted number is less or greater than the guessed number then the master says "less" or "greater", respectively. This goes on until the correct guess is achieved.

In this program, user is the master and computer guesses the number of user. In each step, computer asks for a number. If the user's number is less than the guessed number, the user enters -1. If it is greater, the user enters 1. If it is the correct number, the user enters 0, and the game finishes. Try to find the number as fast as possible.

Suppose the user's number is 7.

Sample: '>' indicates the numbers user entered

```
 3
>1
 6
>1
 9
>-1
 7
>0
```

5. Arrays

1) Write a program that reads n numbers (n ≤ 20) from the keyboard and puts them into an array. Then add all the numbers in the array, and output the sum. The user first inputs n from the keyboard then the numbers.

Sample input:

```
5
9 10 7 0 -5 3
```

Sample output:

```
24
```

1*) Read n numbers (n ≤ 20) from the keyboard and put them into an array. Then write the numbers in the array that are divisible by 3 or 5.

Sample input:

```
7
15 19 7 21 6 37 18
```

Sample output:

```
15
21
6
18
```

1)** Given n numbers (n ≤ 20) find if the sequence of numbers is symmetric or not. If the sequence of numbers is symmetric, write "symmetric", otherwise write "not symmetric" on the screen.

Sample input 1:

```
8
15 19 7 21 6 37 18 1
```

Sample output 1:

```
not symmetric
```

Sample input 2:

```
7
15 19 7 21 7 19 15
```

Sample output 2:

```
symmetric
```

6. Variables – Char & String