Practice Exercises

1. Calculating arithmetic operations

Write a program which will allow user to input a valid arithmetic expression (number operation number) and will print out the result.

E.g. Input 5 + 6 Output "5 + 6 = 11"

1.1 Enhance the program to print the result of division as a floating point number.

E.g. Input 10 / 3 Output "10 / 3 = 3.333"

1.2 Enhance the program to use "switch" operator instead of if/else

2. Grades to letters

Write a program that allows the user to enter the grade scored in a class: 0-100. Notify the user of their letter grade: 0-59 F 60-69 D 70-79 C 80-89 B 90-100 A

E.g. Input 88 - Output "Your grade is B"

2.1 Enhance the program to work in "interactive" mode: let the user to continue requests and receive output, until -1 is not entered.

3. Calculate the sum

Write a program which will input number N in range of [1-1000] and print the sum of all multiples of 3 and 5 below N.

E.g. If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.

4. Calculate sum of the digits

Write a program which will input an integer number and will print the sum of the digits of the number.

E.g. Input 123 - Output 6 (which is 1 + 2 + 3)

5. Inverse the number

Write a program which will input an integer number and calculate the inverse of the number. Print the output.

E.g. Input 163 - Output 361

6. Prime numbers

Input a number and check if it is a prime number. Print the answer.
6.1 Input number N and print all prime numbers in the range 1-N

7.Palindrome numbers

Input a number and check if it is a palindrome number. Print the answer.
E.g 1789871 is a palindrome

8. Concatenate numbers
Input 2 numbers and concatenate them together
e.g. for 35 and 47 the output number should be 3547

9. Power of 2
Input a number and check if it is a power of 2.

10. Draw rectangle

Write a program which will input two integer - N and M. The program should "draw" a rectangle of NxM size using "*" and spaces.

E.g. Input 6 4

Output

```
******
*    *

*    *
******
```

Enhance the program to input the character to be use for "drawing"

E.g. Input 6 4 $

```
$$$$$$
$      $

$      $
$$$$$$
```

11. Draw triangle

Write a program which will input an integer number - N, and "draw" two types of right-angled triangle of height N.

E.g Input 5

Output

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

12. Draw triangle-2

Write a program which will input an integer number - N, and "draw" isosceles triangle with base N.

E.g. input 5

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

Enhance the program to print a triangle of height N.

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

13. Guess a number

Write a program that calculates a random number 1 through 100. The program then asks the user to guess the number. If the user guesses too high or too low then the program should output "too high" or "too low" accordingly.

The program must let the user continue to guess until the user correctly guesses the number. Output how many guesses it took the user to correctly guess the right number.

Tip: use standard library functionality to generate the random number:

http://en.cppreference.com/w/cpp/numeric/random/rand

14. Guess a number (roles changed)

Write a program which asks the user to think a of random number from 1 to 100 and try to guess the number. The user must tell the computer whether the guessed number is too high or too low.

Modify the program so that no matter what number the user thinks of (1-100) the computer can guess it in 7 or less guesses.

15. Minimum and maximum

Write a program to input 10 numbers and find the minimal and maximal numbers in the sequence. Print the results.

16. Occurence of numbers

Write a program which will allow user to input numbers in range 1-10 (as much as the user would like to, till -1 is entered). Calculate and print how many times each of the numbers have been entered.

17. Decimal to binary

Write a program to input a number and convert it to binary (e.g in 4 bits)

e.g Input 5 , Output 0101

Enhance the program to support also negative numbers (calculate 2's complement)

18. Binary to decimal

Write a program to input a binary number (a sequence of 0-1s) and convert it to decimal. Print the results.

19. Remove a number

Write a program that asks the user to type 10 integers of an array and an integer value N. The program must search if the value N exists in the array and must remove the first occurrence of N, shifting each following element left and adding a zero at the end of the array. The program must then print the final array.

20. Input a sequence of N numbers and print it in reverse order.

21. Print the sum of all numbers in the given sequence of N whole numbers.

22.. Input a sequence of N whole numbers and print Yes if the numbers in the sequence are sorted in ascending/descending order.

23. Input a sequence of N numbers and sort the sequence in ascending/descending order.

24. Delete the M-th element in the sequence of N numbers (e.g. delete the 3rd element from the [1,4,5,6,3] sequence and end up with [1,4,6,3] sequence).

25. Insert the number K into sequence of N numbers in the beginning/end. Do the same but insert the element into M-th place.

26. Input a word/string (sequence of symbols) and make all of the letters capital/small.

27. Input a word/string and check if it is anagram (e.g. “mary” and “army” are anagram, i.e. have the same symbols but in different order).

28. Given two strings, check if one is a substring of the other (e.g. “cat” is a substring “complicated”