

# TURIN POLYTECHNIC UNIVERSITY IN TASHKENT

## FUNDAMENTALS OF COMPUTER ARCHITECTURE

### LABORATORY PRACTICE n.3.2

#### **Ex 1.**

Write a C program working as a simple *prefix calculator*: the program must read a prefix expression, consisting of an operator (+, -, \*, /) followed by two real numeric operands, then display the operation in the standard format and the result of the expression itself.

**Example:** the following is a possible program execution (underlined text is typed by the user).

Input expression: + 3.5 5.2

Operation result: 3.5 + 5.2 = 8.7

#### **Ex 2.**

Write down a C program which:

- Reads three real numbers (*a*, *b* and *c*)
- Checks whether *a*, *b* and *c* may (or may not) represent the sides' lengths of a triangle. If yes, the program must also determine the triangle type, distinguishing among the following cases:

- Equilateral triangle
- Isosceles triangle
- Scalene triangle
- Rectangular triangle

Recall that, in any triangle, the length of each side must be smaller than the sum of the lengths of the other two sides.

#### **Ex 3.**

Write down a C program in order to:

- read a positive integer number *n*.
- read *n* integer numbers from the keyboard.
- compute and display the average of the *n* values introduced by the user.

**Example:** let *n* = 5 and assume that the following 5 numbers are introduced: 2 4 6 8 10. Then, the program must display the value 6.4 (as resulting from the computation: (2+4+6+8+10)/5).

#### **Ex 4.**

Write down a C program able to:

- read a sequence of integer numbers, terminated by the introduction of a zero.
- compute the sum of all the positive and, separately, all the negative numbers among the ones which have been introduced.
- display the two values obtained in this way.

**Example:** assume that the following sequence of numbers is introduced: -1 2 4 -3 5 6 1 -8 0. Then, the program has to print out the values 18 (= 2+4+5+6+1) and -12 (= -1 + -3 + -8).

#### **Ex 5.**

Write down a C program in order to print a table reporting the decimal value of the ASCII code used for representing each letter (both small and capital) in the English alphabet. The table must be

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composed of 26 rows and 4 columns, where for each row a small letter, its ASCII code, the corresponding capital letter and its ASCII code are specified.

In order to solve this problem, properly use an iterative statement.

**Example:** the following (few) lines give the idea of what the program should display.

```
'a' 97 'A' 65
'b' 98 'B' 66
'c' 99 'C' 67
'd' 100 'D' 68
...
'z' 122 'Z' 90
```

### Ex 6.

Write down a C program which:

- reads two positive integer numbers  $x$  and  $y$ .
- computes the value of the greatest common divider (gcd) between  $x$  and  $y$ .
- prints out such a value.

Recall that the greatest common divider between two numbers  $x$  and  $y$  is the largest integer value  $v$  dividing both  $x$  and  $y$  perfectly, i.e., producing a remainder equal to 0.

In order to solve this problem, use the Euclid's method, which consists of the following steps:

1. given  $x$  and  $y$ , denote with  $M$  and  $m$  the maximum and minimum values between them, respectively
2. let  $r$  be the remainder of the division between  $M$  and  $m$ :  $r = M \% m$
3. if  $r$  is equal to 0, then  $m$  is the gcd we are looking for
4. if  $r$  is not equal to 0, then go back and repeat from point 2, replacing the values of  $M$  and  $m$  with  $m$  and  $r$ , respectively

**Example:** assume that the values specified by the user are  $x=15$  and  $y=40$ . Then, the chain of divisions that must be executed is  $40\%15=10$ ,  $15\%10=5$ ,  $10\%5=0$ . Value 5 is hence the greatest common divider between 15 and 40.

### Ex 7.

Write down a C program which: • reads a positive integer number  $n$  • reads  $n$  integer values and:

- displays the message “ascending sequence” if every number of the sequence (beyond the first one) is larger than the previous one
- displays the message “descending sequence” if every number of the sequence (beyond the first one) is smaller than the previous one
- displays the message “neither ascending nor descending sequence” if none of the two conditions above is satisfied

**Example:** assume  $n=10$  and the following 10 numbers introduced: -2 5 7 13 18 24 40 56 90 137. Then, the program must print out the message: “ascending sequence”.

### Ex 8.

Implement a C program for:

- reading an integer number  $n$ , with value at least equal to 2.
- reading  $n$  real values from the keyboard.
- determining the **two** largest values among these ones, displaying them (in any order).

**Example:** let  $n=9$  and assume that the following 9 values are introduced:

```
1.5 3.8 14.3 0.0 -2.1 78.1 -5.9 4.4 9.2
```

Then, 78.1 and 14.3 are the two largest values that must be printed (the order is not important)