LESSON 1: MS WINDOWS, PROGRAMMING ENVIRONMENT, INPUT AND OUTPUT FUNCTIONS

I/ MS WINDOWS

The Desktop.

Create shortcuts

- Place the mouse on the desktop and try to create a Shortcut to the calculator giving it the name My Calculator.
- The calculator is called calc.exe and it is found in c:\windows\System32 or c:\windows\SysWOW64

Adjust time

- Change the time of your clock to the actual time.
- Change the month to November.
- Change the day to 4.
- Change the year to 2016
- Select as time zone the one for Hanoi

Adding – removing Tool Bars

- Add the tool bar for Quick start.
- Add the tool bar for Desktop.
- Remove the tool bar for Desktop.
- Try to add another one. If it is helpful, keep it.

Using The Windows Explorer

Create a folder structure

- Given a folder structure like following. Create a structure according to the given structure

Deleting Folders or files

- Create a new file using MsWord. Save the file to a given folder
- Delete the file
- Delete the folder
- Copy and Move folders or files
- Copy the document memo to folder fred
- Move the entire folder fred to the folder billr
- Having several copies of a file in a folder

The Search

- Searching for the last file created: Open the Windows explorer, select a folder, and search for the last one created.
- Search for the file calc.exe in drive C.
- Search the files modified between two given days, for example, l5/01/2019 and 27/10/2019
- Search files or folders that start with M, but only in the folder users, not in subfolders.

The Recycle Bin

- Restore elements in the Recycle Bin
- Deleting element in the Recycle Bin
- Delete folders from the Recycle Bin .
- Empty the Recycle Bin .

Configuring the Screen

Change the wallpaper to an image you have in your computer

Screensaver
Choose a picture. Set waiting time and some other functions

Configuration
Change the resolution of your display

Adding and removing programs

Installing or uninstalling

Select a program that interests you from the ones we show next and install it through the Internet. Then you can try it and uninstall it if you do not like it.

Install DevC++

Configuring the printer

- Change the orientation of the paper
- Change the configuration of the page so that the printer will print them in reverse order.

System tools

- Search through the system information what version you have installed in certain programs, for example Microsoft Word, Excel, Access, etc. without opening them

LESSON 2: PROGRAMMING ENVIRONMENT OF C. VARIABLE AND TYPES. EXPRESSION. INPUT – OUTPUT FUNCTIONS

Install Dev C++

Use Dev C++ IDE

Introduce structure of a C program

- Ask students to type an arbitrary C program
- Ask them to compile and run it. Debug and correct if the program has errors
- Assign statement
- Operators and expression in C
- Precedence of operators.

Exercise 1: Write the following C program

```
#include <stdio.h>
void main()
{
 int ki,gu,kik,guk,x;

 printf("sum of odd and sum of even numbers ending with sum of odd and
even numbers <50\n");
 printf(" input x ");
 scanf("%d",&x);
 ki=0; gu=0; kik=0; guk=0;
 if ( x % 2) { gu +=x; guk++; }
   else { ki +=x; kik++;};
 while( ki < 50)
  {
   printf(" input x ");
   scanf("%d",&x);
   if(x % 2 ){ ki +=x; kik++;}
    else {gu +=x; guk++;};
  };
 printf("kik= %d, ki = %d \n", kik,ki);
 printf("gu=%d,gu= %d \n",guk,gu);
}
```

Compile and run it.

Exercise 2: Write a program that asks the user to type the width and the length of a rectangle and then outputs to the screen the area and the perimeter of that rectangle.

Exercise 3: Write a program that asks the user to type 5 integers and writes the average of the 5 integers. This program can use only 2 variables.

Exercise 4: Write a program that asks the user to type 2 integers A and B and exchange the value of A and B.

Exercise 5: Write a program that asks the user to type the price without tax of one kilogram of tomatoes,the number of kilograms you want to buy and the tax in percent units. The program must write the total price including taxes.

LESSON 3: CONTROL FLOW STATEMENTS

Control flow statements :

- Decision making statements
- **if** statement
- **if ... else** statement
- **switch**
- **Looping** statements
- **while** statement
- **do** statement
- **for** statement

If statement

EXERCISE 1

Write a program that asks the user to type an integer and writes "YOU WIN" if the value is between 56 and 78 (both included). In the other case it writes "YOU LOSE".

Nested if statements

EXERCISE 2

Write a program that prints the insurance to pay for a car according to the following rules:

- A LIFAN car costs 100$
- A DAEWOO car costs 200$
- A FORD car costs 300$
- A TOYOTA car or a BMW car costs 500$
- A PORSCHE car costs 1000$
- A VOLGA costs nothing
- Any other car generate an error message.

The program should prompt the user from appropriate information, using a code to determine the kind of car (i.e. L or l represents a LIFAN car, V or v represents a VOLGA car, . . . and anything else represents some other kind of car)

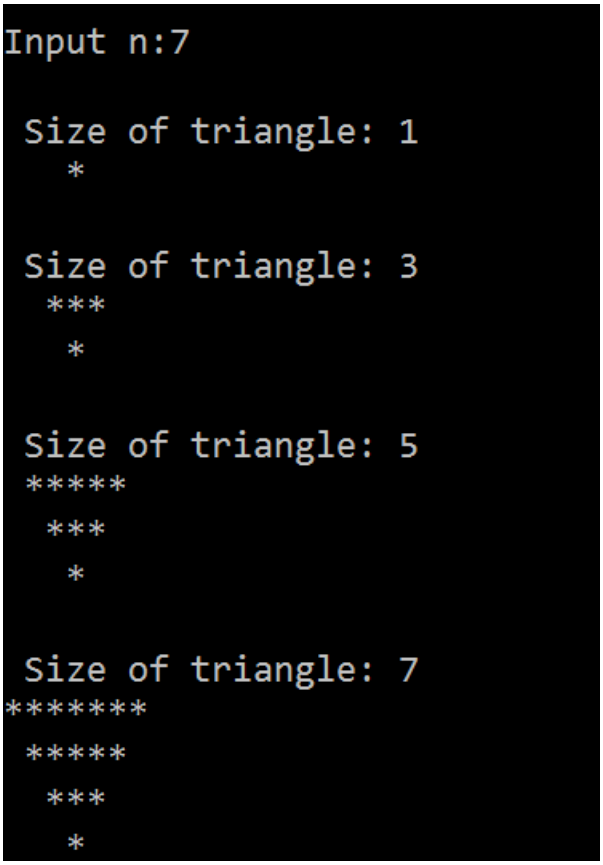
After printing the insurance fee, the program should ask the user if (s)he wants to insure another car. The user use one of the following character Y, y, N, n to reply. The program will terminate when the user type N or n.

EXERCISE 3

Write a program that asks the user to type an integer N and that indicates if N is a prime number or not.

EXERCISE4

Write a program that asks the user to type the value of an odd number N and display output like the following :



LESSON 4: CONTROL FLOW STATEMENTS (CONTINUED)

EXERCISE 5

Read positive numbers and print the average between them when you type a number smaller than 1.

EXERCISE 6

Write a program that asks the user to type the value of N and compute N !.

EXERCISE 7

Write a program that asks the user to type the values of x and n and compute the following expressions:

$$S = \sqrt{x + \sqrt{x\sqrt{x + \cdots + \sqrt{x}}}}$$ n square root signs

$$S = 1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \cdots + \frac{x^n}{n}$$

$$S = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!}$$

$$S = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \cdots + \frac{(-1)^n x^n}{n!}$$

Analyse the expression, choose the appropriate loop type

LESSON 5 + 6: ARRAYS

- Array declaration
- Operations with one dimentional arrays (list)
    - Reading and printing a list
    - Sum and average of elements in a list
    - Finding minimum and maximum value in a list
    - Searching
    - Sorting
    - Insertion, deletion
- Multi-dimensional arrays

EXERCISE 1

Read n integers into an array, print the input values from last to first, then sum the elements of the array.

EXERCISE 2

Compute the maximum value of an array. Return the index of the maximum value in an array.

EXERCISE 3

Read an integer n and type n integers into array A. Enter an integer V. Write a program that search if V is in array A. The program writes "V is in the array" or "V is not in the array"

EXERCISE 4

Write a program that sort an array values into ascending order.

EXERCISE 5

Write a program that read n float numbers into an array, then add one element before the k^{th} element.

EXERCISE 6

Write a program that do multiplication of the matrix x and matrix y and store the result in matrix z.

LESSON 7: STRINGS

- Header declarations.
- String declaration.
- String as an array of characters
- How to input a string
- Built-in functions for character and string processing.

Exercise 1

Write a program which asks you to enter a string. The program shortens your string to n characters. If the string is already shorter than n, the program should not change the string.

Use strlen function

Explain the role of NULL character in a string

Exercise 2 Write a program that takes two strings r, s and outputs "true" if the second string s contained within the first.

Use built in functions : strstr

Exercise 3

Write a program which asks you to enter two strings *s* and *t* and an integer number *n* The program prints the position of the first occurrence of t within a substring of s. n is the position where the substring begins. If *t* is not found in the substring of *s*,the program prints zero

For example, if s is "avbprogramvb", t is "vb" and n is 4, the program prints 1.

Copy the substring of s starting with character n to a new string u. Use function strstr to find the first occurence of t in u. Print 1 if strstr return a nonzero value, 0 otherwise.

Exercise 5 Write a program that takes two strings and outputs the number of times that each character appears in both of them and a string of the characters found. How many times does your code process a character?

Create a new string that contains founded characters to avoid counting a character twice or more.

Exercise 6 Write a program that converts a decimal number into binary.

Use strcat function. Follow the division algorithm given in Unit 3 of the first part.

LESSON 8: FUNCTION

Exercise 1

Write a C function that takes a positive integer n as an argument and returns the largest power of 2 less than or equal to n.

Exercise2

Write function *prime* that indicates an integer N is a prime number or not (return 1 if N is prime and 0 otherwise)

Read m integers. Calculate and print average of prime numbers using function *prime*

Exercise 3

Write a function to calculate the following function

$$f(x) = \begin{cases} \cos 4.5x^2 + 5\sin(x^3 - 1) & \text{if } x < 0 \\ 7 & \text{if } x = 0 \\ \log_2 x + \sqrt{x^2 + 5} & \text{if } x > 0 \end{cases}$$

a) Save the following numbers -1.5, -1,. . . .100 to X. Calculate the values of f with the inputs are elements of X and save to array Y.

b) Input an integer n ($1 \le n \le 20$) . Save the elements of array Y greater than n to array Z and print out their sum.

c) Sort array Z in ascending order .

Exercise 4 Given a mathematical function H(x, y) defined as follows

$$H(x, y) = \begin{cases} 3x^2 - \ln y & \text{if } x < y - 2 \\ \dfrac{x + y}{2} + 8 & \text{if } y - 2 \le x \le y + 2 \\ y^3 + 2\sin x & \text{if } x > y + 2 \end{cases}$$

$x, y \in \mathbf{R}$;

a) Write the C function Comp_H(float, float) that receives 2 real numbers x, y, computes and returns the value of G(x, y).

b) Write a program using the C function Comp_H(float) to compute the values of G(x, y) at the following inputs: (-2, 5), (-1.5, 4), (-1, 3), …, (5, -9), (5.5, 10), (6, 11) (the difference between 2 successive x is 0.5, between 2 successive y is - 1), then store all outputs in array B.

c) Display all B's elements in ascending order.

LESSON 9
ARRAY OF STRUCTURE

EXERCISE 1

Suppose we have the user-defined structure *baby*, including:

- *Name* is a string
- *BirthYear* is an integer
- *BirthMonth* is an integer
- *Weigh*t is a real number
- *Sex* is an integer that receives only 2 values :1 for boys and 0 for girls

a) Read information about n babies (1<=n<=10) into array B

b) Read month M ($1 \leq M \leq 12$) and year Y ($2000 \leq Y \leq 2009$)from the keyboard. Display information of babies that were born in month M of year Y with the following format:

Name	Weight	Sex
Suri Cruise	3.45	F
Romeo Beckham	4.35	M

- Name is displayed in a 40 character space, left justified
- Weight is displayed using ten characters with two digits after the decimal point, right justified.
- Sex is displayed with 'M' and 'F'

Write message "No baby was born in the month M/Y" if no baby matches.

c) Read information about babies until we get weight 0 .

EXERCISE 2

Fractions are stored in the following structure:

```
struct fraction
{int numerator,denominator;}
```

a) Write a function called *frac_value* that will receive the numerator and the denominator of a fraction and returns its value as a real number.

b) Read n($1 \leq n \leq 100$) fractions into array *fract* . Calculate and print out sum of such fractions

c) Read the numerator and the denominator of a fraction from the keyboard. Calculate number of fractions in array *fract* that have the same value with the inputted fraction using function *frac_value*

EXERCISE 3

Brief information about a book can be described by the following structure

```
struct book_info
{     char name[25]; // name of book
      char auth[30]; // name of author
      int price; // price of the book. Unit: USD $
};
```

Write a C program that

a. Input form keyboard information of some books. Stop when inputted book's name is empty string or the number of books reachs 50. Store information on books in array **`books`**.

b. Output to the display (monitor) information of the cheapest books (there may be more than one book at lowest cost) in the following format

   ```
   Book name (width: 25) Author (width: 30) Price (width:8.1)
   ```

c. Input from keyboard a string **`A`** and output to the display all books written by author **`A`** in the following format

   ```
   No. (width: 2) Book name (width: 25)  Price (width: 8.1)
   ```

   If there is no book written by author **`A`** output the message

   ```
   No information on books written by author A
   ```

LESSON 10
PRACTICE EXAM

Students are given an exercise of programming. They are allowed to write a program in 30 minutes. Time for checking result is 15 minutes