University of Central Punjab

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FACULTY OF INFORMATION TECHNOLOGY

Operating System

Lab No 3

C Programming

Faculty of Information Technology

UCP Lahore Pakistan

Edited by Muneeb Ali Muzaffar

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Topics to be covered

Basic C program coding

a. Data Type
b. Input/output
c. Control structures (If/else/switch)
d. Looping
e. Functions with/without parameters
f. Command Line Arguments
g. Dynamic memory allocation
h. Structures

Objectives:

- Students able to understand the concept of C Programing.

Pre-requisite:

- GCC installed in the system
- Visual studio code must be installed.
- Basic concept of C++

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Basic C programing

Data Type

Type	Size (Bytes)	Format Specifier
int	at least 2, usually 4	%d
char	1	%c
flaot	4	%f
double	8	%lf
short int	2 usually	%hd
unsigned int	at least 2, usually 4	%u
long int	at least 4, usually 8	%li
long long int	at least 8	%lli
unsigned long int	at least 4	%lu
unsigned long long int	at least 8	%llu
long double	at least 10, usually 12 or 16	%lf
signed char	1	%c
unsigned char	1	%c

Input/output

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```
#include <stdio.h>
nt
main()                                                                    {


                                                                          }
 printf(" Iello, World!");
 return 0;
```

The #include <stdio.h> is a preprocessor command. This command tells compiler to include the contents of stdio.h (standard input and output) file in the program. The stdio.h file contains functions such as scanf () and printf () to take input and display output respectively. If you use printf () function without writing #include <stdio.h>, the program will not be compiled. The execution of a C program starts from the main () function. The printf () is a library function to send formatted output to the screen. In this program, the printf () displays Hello, World! Text on the screen. The return 0; statement is the "Exit status" of the program. In simple terms, program ends with this statement.

CP Task 1 (0.5 Marks)

Write a C program that ask the user to enter a length and width of a rectangle. It calculates the rectangle area and display it on screen.

Area of rectangle = length * width

Sample Output:

What is the length of rectangle? 10
What is the width of rectangle? 20
The area of rectangle is 200.

C if Statement

The syntax of the `if` statement in C programming is:

```
f (test expression)
{
// statements to be executed if the test expression is true
}
```

How if statement works?

The `if` statement evaluates the test expression inside the parenthesis `()`.
If the test expression is evaluated to true, statements inside the body of `if` are executed.
If the test expression is evaluated to false, statements inside the body of `if` are not executed.

C if...else Statement

The `if` statement may have an optional `else` block. The syntax of the `if..else` statement is:

```
if (test expression) {
  // statements to be executed if the test expression is true
}
else {
  // statements to be executed if the test expression is false
}
```

How if...else statement works?

If the test expression is evaluated to true, statements inside the body of `if` are executed.

Statements inside the body of `else` are skipped from execution. If the test expression is

evaluated to false, statements inside the body of `else` are executed statements inside the body of `if` are skipped from execution.

CP Task 2 (0.5 Marks)

Prompt a user to enter the length of three sides of a triangle. Determine if these three sides form a valid triangle. If so than determine if the triangle is scalene, isosceles or equilateral.

Hint:

In triangle no one side can be greater than the sum of other two sides.

- Scalene: No sides of the triangle are equal to each other.
- Isosceles: Two sides of the triangle are equal.
- Equilateral: All three sides are equal.

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Looping

The syntax of the `for` loop is:

```
for (initializationStatement; testExpression; updateStatement)
{
  // statements inside the body of loop
}
```

How for loop works?

The initialization statement is executed only once. Then, the test expression is evaluated. If the test expression is evaluated to false, the `for` loop is terminated. However, if the test expression is evaluated to true, statements inside the body of `for` loop are executed, and the update expression is updated. Again the test expression is evaluated. This process goes on until the test expression is false. When the test expression is false, the loop terminates.

CP Task 03 (0.5 Marks)

Write a program to perform sorting of numbers (Bubble Sort). The program shall take an array of 20 integers as input, if user wants to enter less than 20 numbers, user shall terminate it with -99. The program shall then sort the sequence in ascending order and print both the original and sorted sequence.

Sample Input:

Input Sequence: 15 3 2 16 7 9 12 25 5 56 8 2 -99

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Sample Output:

The entered sequence is: 15 3 2 16 7 9 12 25 5 56 8 2

Updated sequence is: 2 2 3 5 7 8 9 12 15 16 25 56

Functions

A function is a block of code that performs a specific task.

```
#include <stdio.h> void
functionName(){
} int
main(){
  functionName();
}
```

CP Task 4 (0.5)

Write a **void** checkPrimeNumber() function which takes input from the user, checks whether it is a prime number or not and displays it on the screen. **(2+2+1)**

Sample Output: -

Enter the number: = 66
Output: Not Prime

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Command Line Arguments

Command line argument is a parameter supplied to the program when it is invoked. Command line argument is an important concept in C programming. It is mostly used when you need to control your program from outside. Command line arguments are passed to the main() method.

```
int main (int argc , char ** argv)
#include <stdio.h>
int main(int argc, char **argv){
printf("No of arguments %d",argc); return
0;
}
```

CP Task 5 (0.5)

Write a C program to receive two integers from command line and Multiply them.

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Dynamic memory allocation

The name "malloc" stands for memory allocation.
The `malloc()` function reserves a block of memory of the specified number of bytes. And, it returns a pointer of `void` which can be casted into pointers of any form.

```
ptr = (castType*) malloc(size); ptr =
(int*) malloc(100 * sizeof(float));
```

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CP Task 6 (0.5)

Write a C program to display second min number in an array. User enter integers and you need to calculate the size of array and allocate run time memory for array.

Sample Output: -

Enter the array elements: = ./a.out 1 2 3 4 5 6 7 8 9 0 Output:
1

Structures

Syntax of struct

```
struct structureName { dataType member1; dataType member2;
};
```

CP Task 7 (0.5)

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Write a C program stores the information (id, name, age and pay) of an employee and displays it on the screen using structures

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CP Task 8 (10.5)

You are given a file "task1.txt" containing record of 10 employees (Fig. 1). Write a C program to manage employee's information using structures. The information of an employee contains ID (i.e. Emp01), Name (i.e. without space), gender (i.e. m/f), job position (i.e. internee/developer without spaces), experience in years (i.e. 1/2) and pay. All the data will be saved to a file in specific format as depicted in Fig. 1. Maximum number of employees are 100. The program will prompt the user a Menu for different operations as shown below:

========== **MENU** ==========

1. Add a record
2. Search a record by ID
3. Show all records
4. Show employees having pay less then basic pay (20000)
5. Save and exit

Task1.txt

Emp01 Asad M internee 1 14000
Emp02 Ahmad M developer 2 50000
Emp03 Ayesha F sqaanalyst 5 35000
Emp04 Amjad M dataanalyst 3 30000
Emp05 Bushra F personalassistant 4 25000
Emp06 Bisma F developer 2 40000

Fig. 1. File format (ID Name Gender Position Pay)

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Hint. You can read all the records at a time using structures array. You can update file by opening it in append mode.

Functions prototype

void printStd(employee tmp) void readData(employee rec[], int &count) void addRecord(employee rec[], int *count) void searchByID(char reg[], employee rec[], int count) void showAllRecord(employee rec[], int count)
void showBelowBasicpay(employee [], int count, int basicpay)

REFERENCE LINK

HTTPS://WWW.PROGRAMIZ.COM/C-PROGRAMMING/C-FILE-INPUT-OUTPUT