Programming concept:

Easy Definitions:

Computer system:

It is a machine that can do the following duties:
Accept data
Process the data
Show the result
Store the result for the next time use.

Computer system has two types as below:

- Hardware
- Software.

Hardware: the physical part of computer is called hardware.

Software: collection of programs that give the direction to the hardware, how to perform the task.

System software: programs that manage the computer resources.

System software is divided into three types as below:

- Operating system.
- System support software.
- System development software.

Application software: programs that help the users to solve the problems.

Application softwares are divided in to two parts as below:

- General purpose software
- Specific purpose software.

Note:

Operating systems are UNIX, Linux, Ms. Windows, mac OS etc.
System support softwares are disk defragmenter, screen saver, antivirus tool, etc.

System development softwares: those software that creates the programs. They are as below:

Turbo C, C++, Borland, Dev, MS Visual Studio, Java Net Bean, etc.

Language: language is the source of communication.

Program: a set of instruction that tell that computer how to perform the tasks.

Note: we use a computer or programming language to write a program.

Kinds of language as in below:

- Natural language.
- Programming language.

Natural language: these are the languages through the human beings communicate with each other.

Like Pashto, Dari, Pashie, and French Chinese etc.

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Programming languages: these are the languages through the human being communicate with computer.
Like C, COBOL, Pascal, FORTRAN etc.

The programming languages are divided in two three types as below:

- Low level languages
- Mid-level languages.
- High level languages.

Machine or binary language: this is the language which is directly understandable for the computer it does not need any translation.
Or machine language is the language of Zero one (0-1).

Note: 0 means OFF and 1 means ON.

Assembly language: these is the one step higher than the machine language, in this language instead of 0-1 use some special codes that called mnemonics.

Note: assembly language is efficient for user but inefficient for the computer when we want to efficient or understandable it for the computer we user assembler.

High level languages: these are the languages in which the programs are written completely in English language. Like: C++, Vb, and Java…

Translators: these are the programs that change the program written in high level or mid-level language in to machine or binary language. Like: Interpreter, compiler, and assembler.

The high level languages are in divided in to two parts:

- Procedural languages/structured languages.
- OOP (Object Oriented Programming) languages

Programming language: is the special language used to create software.

History of programming languages:

- Basic languages (COBOL and FORTRAN)
- FORTRAN 1960 used for engineering.
- COBOL used for commercial.
- CPL 1963
- BCPL 1965
- B 1970 Created by Ken Thomson.
- C 1972 language was created by Dennis Ritchie at AT and Ts Laboratory in USA.

Note: C language is created for to run each kind of program.

Language translators: translators are system programmers, which translate programs written in any High or assembly language in to 0-1 or machine language.

Three types of language processors or translators as below:

- Assembler (the language that translate the assembly code).
- Complier (it changes the whole program at once in to machine code).
- Interpreter (it change the one one statement in to machine code).

Source code: a program written in programming language by a programmer is called source code.

Target program: the program produced by the compiler after the translating the source code is called the target program.

Note: in source code we can bring changes when it converted to object code/target program we cannot bring any changes.

Variable: an entity that may change its value during the program execution is called variable.

Variable is divided in to two types as below:

- Local variable.
- Global variable.

Local variable: A local variable is a variable which is either a variable declared within the function.

Global variable: A global variable (DEF) is a variable which is accessible in multiple scopes.

What is IDE?

An Integrated Development Environment (IDE) brings all of the programmer's tools into one convenient place.

Keyword: these are the word which is meaning is already defined to the language.

Constant: an entity that cannot be changed during the program execution.

Data type: are used to show the type of data.

Identifiers: refer to the names of data types, constants, variable, and function.

Printf (): used to send the data to the standard output (usually the monitor).

Scanf (): read the data from the standard input device (usually keyboard) and store it in a variable.

C instruction:

There are three types of instruction in C:

- Type declaration instruction (to declare the type of variables used in a C program)
- Arithmetic instruction (to preform arithmetic operations between constants and variables)
- Control instruction (to control the sequence of execution of various statements in a C program)

Control instruction in C:

There are four types of control instruction in C as below:

- Sequence control instruction (it control the sequence of program execution).
- Selection or decision control instruction (it allow the computer to take a decision that what instruction must be executed next).
- Repetition or loop control instruction (it helps computer to execute a statement or a group of statements repeatedly).

Nested if: if statement with in if statement is called nested if statement.

Operator: is a symbol or symbols which preform a specific operation.

Logical operators: are used to make a compound condition from simple one.

AND (&&): it combine the two conditions results and give true result.

OR (||): is used to combine the result of conditions and it returns true if one of them is true otherwise return false.

NOT (!): Is used to reverse the condition. If the condition is true returns false and if the condition is false it returns true.

Arithmetic operators: those operators which preform arithmetic operations.

Assignment operators (=): the operator which is used to assign value of an expression to a variable.

Increment operator (++): is used to increase the value of variable.

Decrement operator (--): is used to decrease the value of variable.

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Relation operator: is used to compare the two value of the same type.

Switch: the control statement that allows us to make a decision from the number of multiple choices is called a switch.

Switch is consist of:

- Case it is label.
- Break (almost always necessary).
- Default (this is optional).

Note: the following point when you use the switch:

- A float expression cannot be used.
- Cases can never be like:
- Case a+3:
- Multiple cases cannot use the same expressions.

Like:

```
Switch (a)
{
Case 3:
…….
Case 1+2:
}
```

The loop control structure:

Loop: the repetition of statements is called loop.

Or: when a statement or group of statements are repeated again and again is called loop.

The types of loop are in follow:

- For loop
- While loop
- Do while loop

For loop: use to execute one or more statements for a specified number of times.

```
For (initialization; testing; /condition; increment or decrement)
```

Nest loop: that consist of one outer with one or more inner loop.

While loop: this loop done for a fix number of time.

```
While (condition)
{
 // body of the loop
}
```

The break and continue statements:

Break: break cause immediate exit from a while, for, do while and switch structure.

Common uses of break:

- Escape early from a loop.
- Skip the remainder of a switch structure.

Continue: skips the remaining statements in the body of a while, for and do while loop.

Do while loop: this is the type of loop which at least execute its body once.

Note: we can use the do while loop for unspecific repetition of statements or and action.

```
Do {
// body of loop
    } while (condition);
```


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Array: is collection of homogenous data elements stored and accessed by single name.

Array: an array is a group of contiguous memory location that all have the same name and type.

Advantage of array:

- Array can store a large number of values with a single name.
- Arrays are used to process many values easily and quickly.
- The values stored in an array can be sorted easily.
- A search process can be applied on arrays easily.

Types of array:

- One-dimensional array.
- Multi-dimensional array

Array declaration:

The specifying array name array length and array type is called array declaration.

Array initialization:

The process of assigning values to array elements is called array initialization.

One – dimensional array/single dimensional array or linear list:

This is the type of array which all the elements are arranged in the form of list.

Note: in one-dimensional array the data is stored in a sequence of memory location.

Data-type array-name [size];

The bound for array in c language:

- The lower bound is zero (0).
- The upper bound is size-1.

Function: is a named block of code that preforms some action (specific action).

Function: a function is a group of statements that executed when it is called from a point of program.

Functions: are building blocks of c program that summarize piece of code to preform specific operation.

The functions: are used to complete the similar kinds of task again and again without writing the same code again.

Importance of function:

By using function we can:

- Prevent the writing of same code in a various places.
- The program will be very short.
- The real reason of function is dividing the program into different parts
- Program can be manage very easily.

Advantages of using function in program:

- Easier code.
- Easier to modify.
- Re use ability.

Types of function:

- User defined functions: a type of function written by programmer is known as user defined function.

- Built-in function: a type of function that is available as a part of language is called built – in function or library function.

User defined function consist of following:

- Function declaration or function prototype: it provides information to compiler about the structure of the function to be used in program.

Note: function declaration are written after heading files and before main function.

Declaration of function consist of:

- Function name (it indicate the name of the function that is created).
- Function return type (it indicates the types of the value that will be returned by function).
- Number and type of parameter (parameters are the values that are provided to a function when the function is called).

Giving parameters in two ways:

- Only data type: int add (int, int)
- Both data type and names of parameters are written: int (int a, int b)

Function definition: a set of statements that explains what a function does Is called function definition.

The function definition can be written in two locations as in below:

- Before main function.
- After main function.

Note: function declaration is not required if the function definition is written before the main function.

The function definition consists of two types:

- Function header.
- Function body.

Syntax:

```
Return type function name (parameters)
{
Statements;
}
```

Function call: the statements that activates a function is called function call.

There are two ways to call a function in C:

- Call by value: in call by value method, the value of variable is passed to the function as parameter.
- Call by reference: in call by reference method, the address of the variable is passed to the function as parameter.

Note:

Actual parameter: this is the argument which is used in function call.

Formal parameter: this is the argument which is used in function definition.

Difference between local and global variable:

Local variables are declare within a function.	Global variable are declares outside of any function.
Local variable can be used only in a function In where they declared.	global variable can be used in all functions
Local variable are created when the control Enter the function in which they are declared	global variables are created when the program starts execution
Local variables are destroyed when the control Leave the function.	Global variables are destroyed when the program terminates.

The End

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Contact us for more info:

Cell no:

0786265949

E-mail add: Faridullahqaderi0012@gmail.com

Fb:

Faridullah Qaderi

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