C Language

Chapter # 9

Elements of C language

Lecture: 11

Today's Lecture

► **What is Data Type?**

► **Categories of Data type.**

► **Different Data Types in C language.**

Data Type

► The Data type specifies the type of data that can be stored in a variable. It also defines a set of operations on the data.

► Every data type has a range of values and requires different amount of memory.

► The compiler allocates memory space for each variable or constant according to its data type.

Categories of Data Type

1. **Standard Data type**: A data type that is predefined in the language is called standard data type. Some examples are int, float, char etc.

2. **User-defined Data type**: C also allows the user to define his own data types known as user-defined data types.

Different data types in C language

Sr. No	Data type	Purpose
1	int	To store Numeric values
2	float	To store Real values
3	char	To store Character values

1. int Data type

▶ Integer data is the numeric value with no decimal point or fraction. int data type is used to store integer values.

Example:

10,15,-20,-18

Types of int data type

Type	Size(bytes)	Range
int	2 bytes	-32,768 to 32767
unsigned int	2 bytes	0 to 65535
long	4 bytes	-2,147,483,648 to 2,147,483,647
unsigned long	4 bytes	0 to 4,294,967,295

2. float Data type

Floating data is the numeric value with decimal point or fraction. float data type is used to store real values.

Example:

10.5. 3.5 , -5.7, -8.2

Types of float Data type

Type	Size(bytes)	Range	Precision
float	4 bytes	3.4×10^{-38} to $3.4 \times 10^{+38}$	6 decimal places
double	8 bytes	1.7×10^{-308} to $1.7 \times 10^{+308}$	15 decimal places
long double	10 bytes	1.7×10^{-4932} to $1.7 \times 10^{+4932}$	19 decimal places

3. char data type

► Char data type us used to store character value.

► It takes 1 byte in memory.

► It is used to represent a letter, number, or punctuation marks and a few other symbols.

► Character values are normally given in single quotes. 'a', '5', '#'.

► The character '5' is manipulated differently than integer 5.

► The characters can be added, subtracted and compared like numbers.

► For example: if we add '2' and '6' then the result is 104. because ASCII values of '2' and '6' are 50 and 54 respectively.

Overflow and Underflow

Overflow occurs when the value assigned to a variable is more than the maximum possible value.

Underflow occurs when the value assigned to a variable is less than the minimum possible value.

For example, an integer variable can store -32,768 to 32767.

if the assigned value is more than 32767, it is known as integer overflow.

But if the assigned value is less than -32,768, it is known as integer underflow.

Arithmetic Overflow and Arithmetic Underflow

The arithmetic overflow occurs when arithmetic calculation is performed on two very large numbers. The result may be too large to be represented in a particular variable. A garbage value may appear in this situation.

The arithmetic underflow occurs when arithmetic calculation is performed on two very small numbers. The result may be too small to be represented in a particular variable. The result may be represented as zero in this situation.

Cancellation Error

The cancellation error occurs due to the manipulation of very large and very small floating point numbers. The manipulation may show unexpected result. The large number may cancel out the smaller number when both numbers are added.

Suppose the user adds the numbers 1970.0 and 0.0000001243. The result of this addition may be 1970.000000 on some computers.

In this result, the value 0.0000001243 has been cancelled in the calculation.

The End

Read this topic from your books and ask question if any confusion.

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