# 3. C Data Types

C data types indicates what type of data to be stored and what is the range of data that we can store or carried out on those particulars.

Data type can be classified as follows:-

- Primitive data type (int, char, float, double)
- Derived data type (function, pointer, files, array)
- User defined data type (structure, union etc)

C Data Types
```
                              C Data Types
                                   |
         ┌─────────────────────────┼─────────────────────────┐
  Primitive data type       Derived data type        User defined data type
         |                         |                         |
   ┌──┬──┴──┬──────┐       ┌───────┼───────┐          ┌──────┴──────┐
  int char float double  function      pointer     structure      union
                            |              |
                          files         array
```
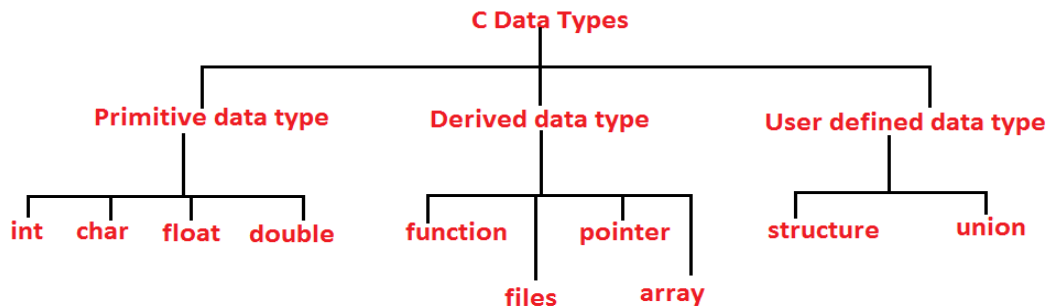
Integer and char having two types of register i.e. **signed** and **unsigned**.

Unsigned : In unsigned register number should always be positive.
Signed : in signed register number may be positive or negative.

If the sign qualifier is not mentioned then by default signed register is assumed.
In case of char if the sign qualifier is not mentioned then the type of char is signed or unsigned depends upon machine. The size of different data type along with their format specifier are mentioned below:

Data type	Size(in bytes)	Range	Format specifier
signed char	1	-128 t0 127	%c
unsigned char	1	0 t0 255	%c
short int	2	-32768 to 32767	%hi
int or signed int	2(16 –bit compiler)	-32768 to 32767	%i or %d
	4(32/64 –bit compiler)	-2147483648 to 2147483647	%i or %d
unsigned int	2(16 –bit compiler)	0 to 65535	%i or %d
	4(32/64 –bit compiler)	0 to 4294967295	%i or %d
long int or signed long int	4	-2147483648 to 2147483647	%li or %ld
unsigned long	4	0 to 4294967295	%li or %ld
Float	4	1.2E-38 to 3.4E+38	%f or %e or %g
double	8	2.3E-308 to 1.7E+308	%lf or %le
long double	10(16-bit compiler)	3.4E-4932 to 1.1E+4932	%Lf or %Le or %Lg
	12(32-bit compiler)	3.4E-4932 to 1.1E+4932	%Lf or %Le or %Lg

3. C Data Types

Note : depending upon compiler, size of data type will vary.
We can also find the size of data types using following code:

/* THIS PROGRAM FINDS THE SIZE OF DIFFERENT DATA TYPES */

```c
#include<stdio.h>
int main()
{
    printf("size of char=%d\n",sizeof(char));

    printf("size of unsigned int=%d\n",sizeof(unsigned int));
    printf("size of signed int=%d\n",sizeof(signed int));

    printf("size of float=%d\n",sizeof(float));

    printf("size of signed long int=%ld\n",sizeof(signed long int));
    printf("size of unsigned long int=%ld\n",sizeof(unsigned long int));

    printf("size of double=%Ld\n",sizeof(double));
    printf("size of long double=%Ld\n",sizeof(long double));

    printf("size of short int=%i\n",sizeof(short int));
    return 0;
}
```

Why we use data types in programming language, like C Data Types?

We have a concepts of C Data Types but have you think, Why we uses data types?. If such question are coming in your mind then I can say you have learnt something from this tutorials. Now, data types are used to identify and classify difference types of data. Which helps to perform different types of operation based on the data.

Example:
What will be the results of the following expression
"4*4+5%2"
Computer doesn't know about the above expression. We have to teach each part to the computer to perform the operation. Which is done by the program with the help of data types. So Data types are very simple but useful concept for the programming language.