Data types:

The Storage representations and machine instructions to handle constants differ from machine to machine.

→ A variety of data types available to the needs of the application cables machines.

→ There are verity of data types available,

1. primary (or) Fundamental data types
2. Derived data types
3. User-defined data types

Primary Data types:

C compiler support 5 fundamental data types.

1. integer (int)
2. Character (char)
3. floating point (float)
4. Double-precision floating point (Double).
5. Void.

Size and range of Basic Datatypes:

Data types	Range:
1. Char	– -128 to 127
2. Int	– -32,768 to 32,767
3. float	– 3.4e-38 to 3.4e+38
4. double	– 1.7e-308 to 1.7e+308.

Primary Data types:

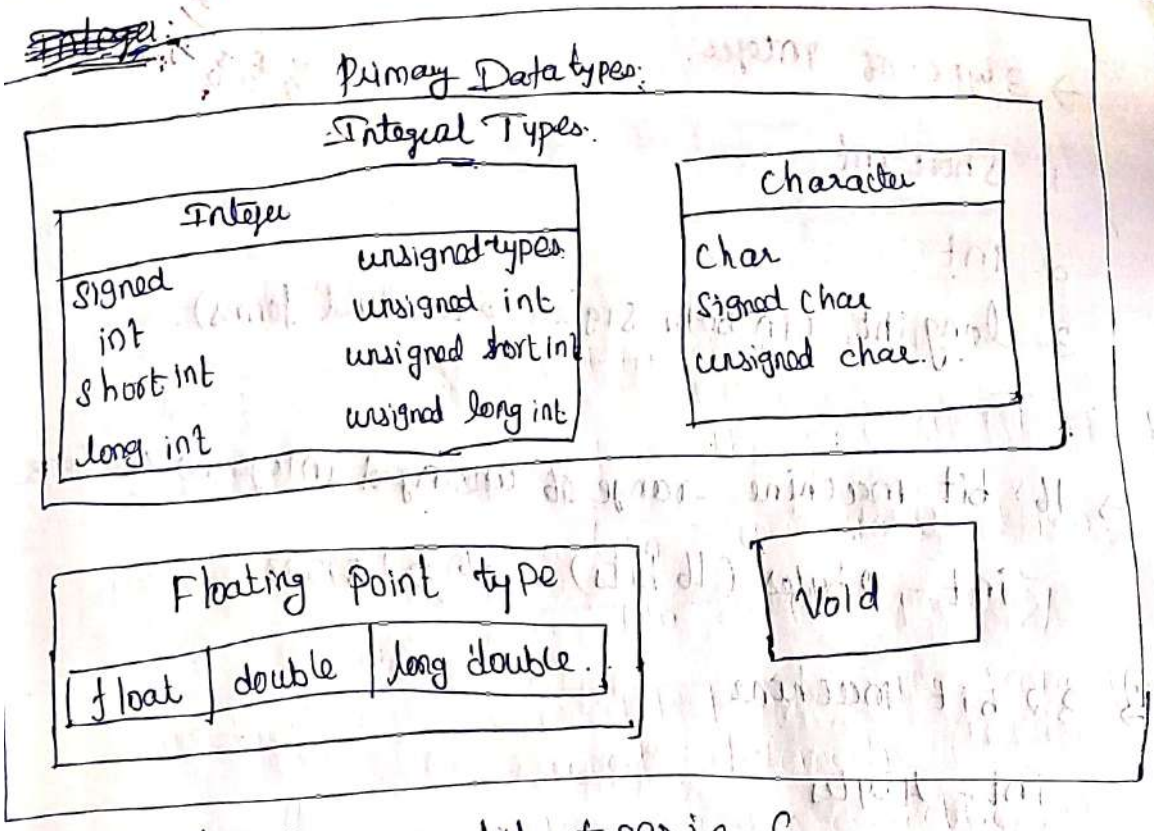


fig: Primary data types in C.

Integer:

Integer are whole numbers with a range of value supported by a particular machine.

Generally, integer occupy one word of storage. Since, word size of machines 16 (or) 32 bits the size of an integer that can be stored depends on the computer.

1. Signed (short int) - 1 byte (8 bits) - -128 to 127
2. unsigned short int - 1 byte (8 bits) - 0 to 255
3. int (or) short int - 2 bytes (16 bits) - -32,768 to 32767
4. Unsigned int - 2 bytes (16 bits) - 0 to 65537
5. (signed) long int - 4 bytes (32 bits) - -2,147,483,648 to 2,147,483,647
6. Unsigned long int - 4 bytes (32 bits) - 0 to 4,294,967,265

→ 3 types of integer.

1. Short int - small integer value.
2. int
3. long int (in both signed & considered forms).

→ 16 bit machine - range of unsigned integer no. 0 to 65,535

int - 2 bytes (16 bits) = 2^{16} ⇒ 65,538.

→ 32 bit machine

int - 4 bytes

Short int = 1 byte (8 bits) : 2^8 → 0 to 255

long int = 4 byte (32 bits) : 2^{32} → 0 to 4,29,49,67,295

Singed integer

int : → 2 bytes (16 bit) - 256.

256/2 → 128 (+ve) 0 to 127 unsided (+ve ah)

→ 128 (-ve) -127 to -1 Singed (half +ve, half -ve)

Short integer : → 65,538 → 0 to 65,537.

65,538/2 → 32,768 (+ve) ⇒ 0 to 32,767

32,768 (-ve) ⇒ -32,768 to -1.

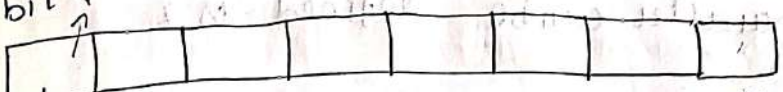
long int → 4,294,967,266 → 0 to 4,294,967,265

4,294,967,266/2 ⇒ (+ve) 0 to 2147,48367

(-ve) -2147,48367 to -1.

Ex:

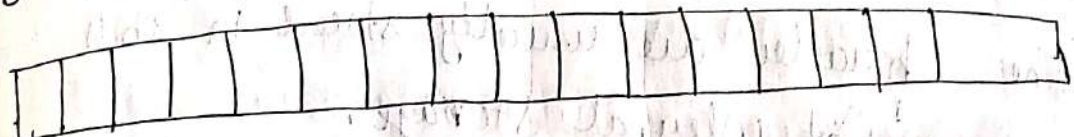
8 bit → Left most bit



$= 2^8 = 256$

Sign bit: 0 - +ve, 1 - ve.

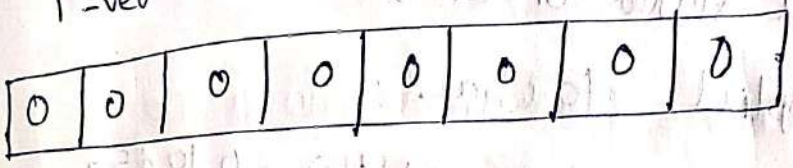
$2^7 \Rightarrow 128$ +ve, 128 -ve



0 +ve

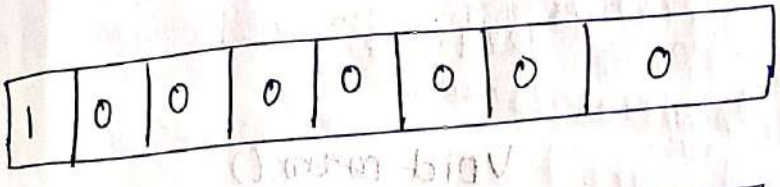
1 -ve

8bit

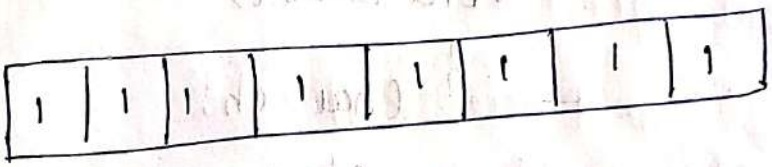


0

+ 128



-128



(-1)

0 0 0 0 0 0 0 0

1

(1st complement).

(-128) 1 0 0 0 0 0 0 0 - 2's comple

(-1) 0 0 0 0 0 0 0 0 - (1s complement)

1

0 0 0 0 0 0 1 - 2's complement.

Character (1 byte)

A single character can be defined as a character data types.

→ The character are usually stored in 8 bits (1 bytes) of internal storage.

→ The qualifier signed or unsigned may be explicitly applied to char.

unsigned char (+c) 1 bytes (8 bits) - 0 to 255 (only +ve value)

signed char (+-c) 1 bytes (8 bits) - -128 to 127.

+ & - value

0 to 31 — control char

32 to 126 — printable char

128 to 255 — extended ASCII char

ex:

```
Void main()
{ char ch;
  ch=65;
  printf("%c", ch);
} char print
```

```
Void main()
{ char ch;
  ch=65;
  printf("%d", ch);
}
```

Integer print

Floating point types:

→ The floating point no. are stored in 32 bits. when 6 digits of precision.

→ The Double can be used to defined number.

The double datatypes number uses 64 bits giving a 14 digits of precision. These are known as double precision numbers.

→

→ The extended precisions may be use long double.

→ The long double datatype number uses 80 bit. giving a 19 digits of precisions.

Void type.

→ It has no values. This is usually used to specify the types of function.

→ The types of fun. is said to be Void when it does not return any value to the calling function.

→ It also play the role of generic type, meaning that it can represent any of the other std. types.

Float 4 bytes (32 bits) $3.4e^{-38}$ to $3.4e^{38}$.
. point represents 6 digit.

Double 8 bytes (64 bits) $1.7e^{-}$
. point represents 15 digits

long double 10 bytes (80 bits)
. point up. 19 digits.