SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF INFORMATION TECHNOLOGY

23ITT101-PROGRAMMING IN C AND DATA STRUCTURES

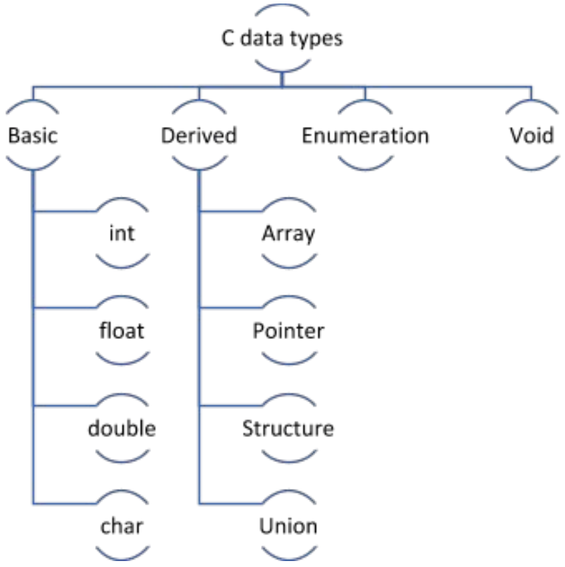
I YEAR - II SEM

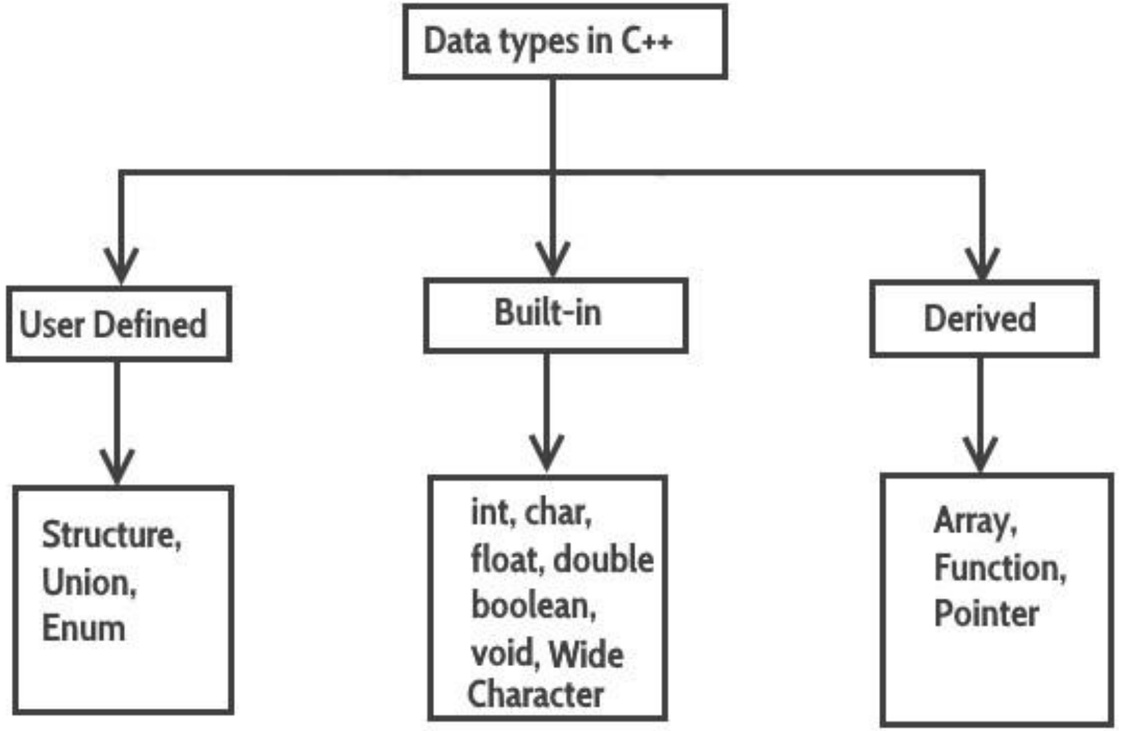
UNIT 1 – INTRODUCTION TO C

TOPIC 6 –Data Types

DATA TYPES

- C language is rich in its data types.
- The variety of data types available allow the programmer to select the type appropriate to the needs of the application as well as the machine.
- ANSI C supports three classes of data types:
  1. Primary (or fundamental) data types
  2. Derived data types
  3. User-defined data types



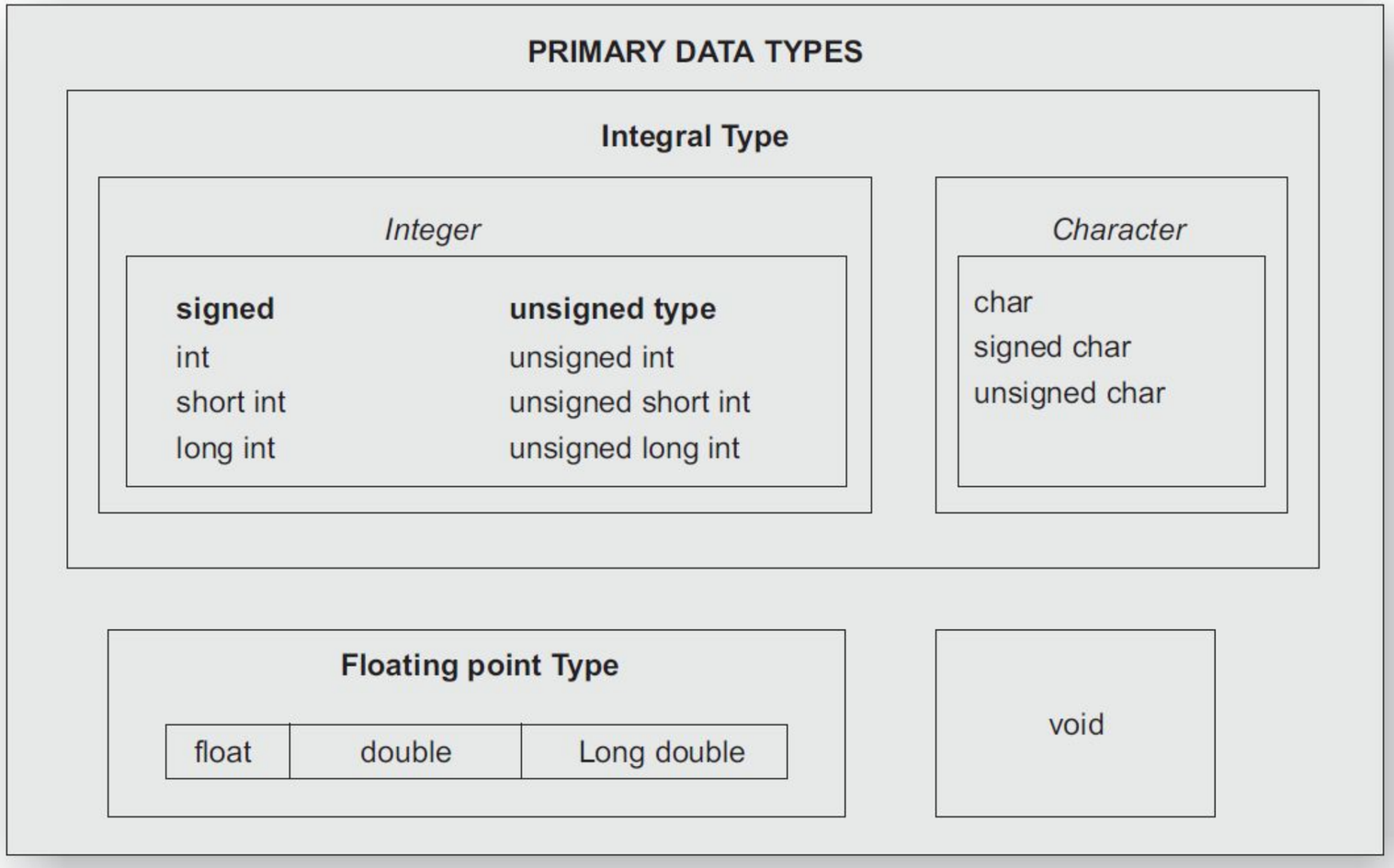


PRIMARY/ FUNDAMENTAL/ BUILT-IN/ BASIC DATA TYPES

- All C compilers support five fundamental data types, namely:
  1. Integer (int)
  2. Character (char)
  3. Floating Point (float)
  4. Double-precision floating point (double)
  5. Empty data type (void).
- Many of them also offer extended data types such as long int and long double

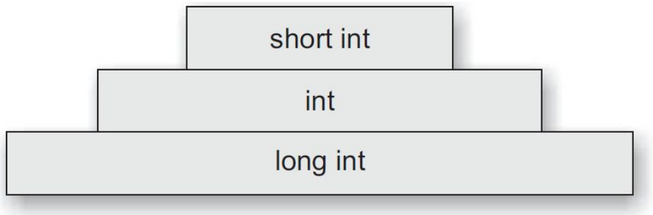
DATA TYPE	TYPE OF DATA	MEMORY	RANGE
int	Integer	2 Bytes	– 32,768 to 32,767
char	character	1 Byte	– 128 to 128
float	Floating point number	4 bytes	3.4e – 38 to 3.4e+38
double	Floating point number	8 bytes	1.7e – 308 to 1.7e+ 308
	with higher precision		

PRIMARY/ FUNDAMENTAL/ BUILT-IN/ BASIC DATA TYPES



INTEGER DATA TYPE

- Integers are whole numbers with a range of values supported by a particular machine.
- Generally, integers occupy one word of storage, and since the word sizes of machines vary (typically, 16 or 32 bits)
- The size of an integer that can be stored depends on the computer.
- If we use a 16 bit word length, the size of the integer value is limited to the range –32768 to +32767.
- C has three classes of integer storage (both signed and unsigned forms), namely:
- short int
- Int
- long int.



Integer types

Signed Integer	Unsigned Integer
It represents both positive and negative integers	It represents only positive integers
The data type qualifier is **signed int or int.** Variables are defined as: signed int a; Int b;	The data type qualifier is **unsigned int or unsigned** Variables are defined as: unsigned int a; unsigned b;
By default all int are signed	Unsigned int have to be declared explicitly
It reserves 16-bit (2 bytes) in memory	It reserves 16-bit (2 bytes) in memory
Range -2^{15} to $+2^{15}$ i.e. -32,768 to 32,767	Range from 0 to $+2^{16}$ i.e. 0 to 65,535
Its conversion character is **d**	Its conversion character is **u**

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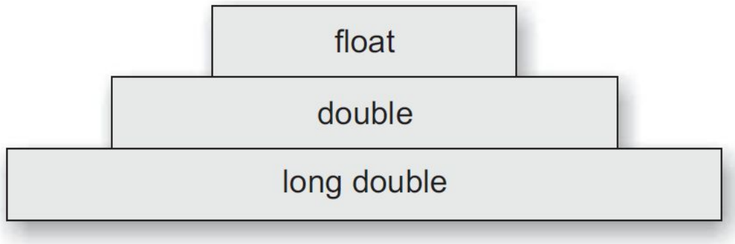
FLOATING POINT DATA TYPE

- Floating point (or real) numbers are stored in 32 bits (on all 16 bit and 32 bit machines), with 6 digits of precision.
- Floating point numbers are defined in C by the keyword **float**.
- When the accuracy provided by a float number is not sufficient, the type **double** can be used to define the number.
- A **double** data type number uses 64 bits giving a precision of 14 digits.
- These are known as double precision numbers.
- Double type represents the same data type that float represents, but with a greater precision.
- To extend the precision further, we may use **long double** which uses 80 bits.



Floating-point types

CHARACTER & VOID DATA TYPE

- **Character Data Type**:
  - A single character can be defined as a character(**char**) type data.
  - Characters are usually stored in 8 bits (one byte) of internal storage.
  - The qualifier signed or unsigned may be explicitly applied to char.
  - Unsigned chars have values between 0 and 255, signed chars have values from –128 to 127.

- **Void Data Type:**
  - The void type has no values.
  - This is usually used to specify the type of functions.
  - The type of a function is said to be void when it does not return any value to the calling function.

DATA TYPES & CONTROL STRING

Entire Data types in c:

Data type	Size(bytes)	Range	Format string
Char	1	128 to 127	%c
Unsigned char	1	0 to 255	%c
Short or int	2	-32,768 to 32,767	%i or %d
Unsigned int	2	0 to 65535	%u
Long	4	-2147483648 to 2147483647	%ld
Unsigned long	4	0 to 4294967295	%lu
Float	4	3.4 e-38 to 3.4 e+38	%f or %g
Double	8	1.7 e-308 to 1.7 e+308	%lf
Long Double	10	3.4 e-4932 to 1.1 e+4932	%lf