S4_1

Data types in C

Flowcharts-**RAPTOR**- recap

Pictorial representation of computation

Algorithm Name: **Add 2 numbers**

Step 1: **Start**

Step 2: [Read the numbers]

Read number_1, number_2

Step 3: [Computation of Sum]

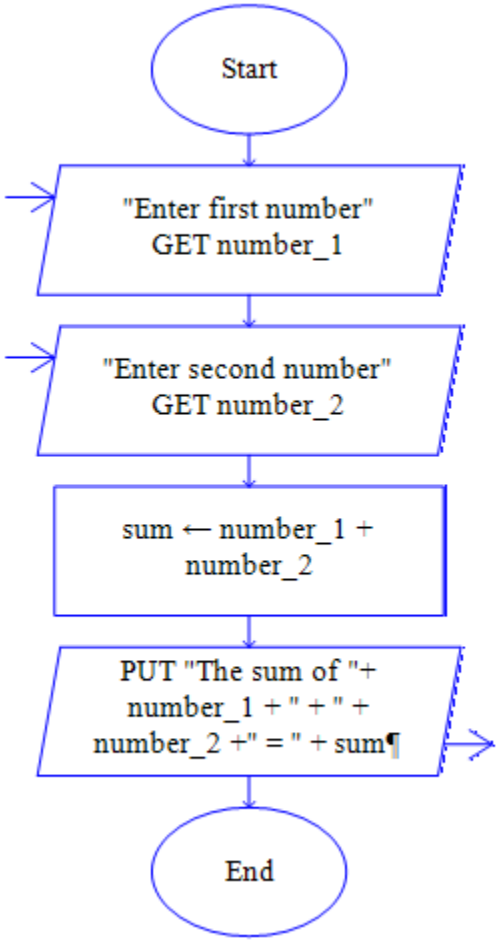
Sum ← number_1 + number_2

Step 4: [Print the Sum]

Print 'Sum is =', Sum

Step 4: [End of algorithm]

Stop



Learning objectives

To learn and appreciate the following concepts

- ✓ Data types in C
- ✓ Variable declaration and use

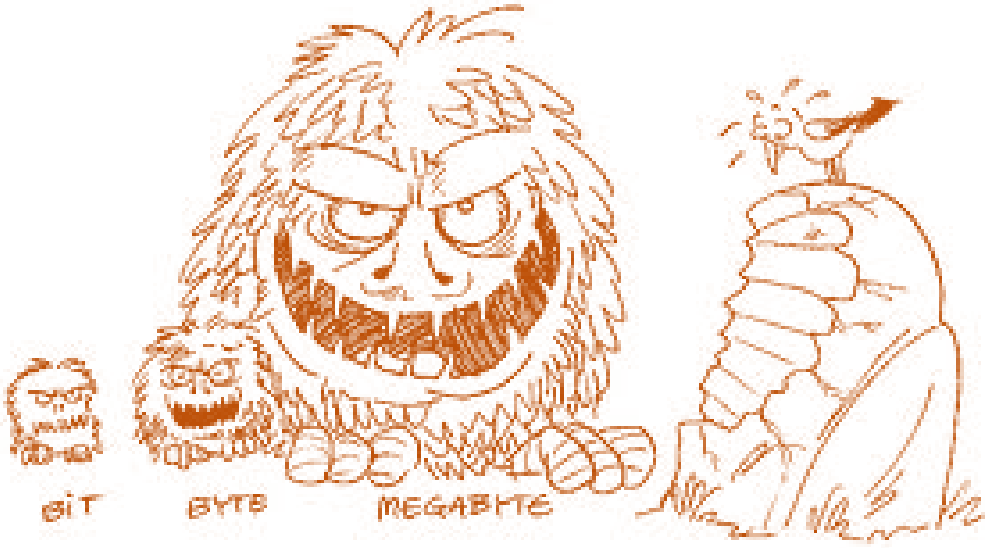
Learning Outcomes

At the end of session the student will be able to

- ✓ understand different data types
- ✓declare a variable with an appropriate data type

The Big Picture

- Processor works with finite-sized data
- All data implemented as a sequence of *bits*
  - Bit = 0 or 1
  - Represents the level of an electrical charge
- *Byte* = 8 bits
- *Word* = largest data size handled by processor
  - 32 bits on most older computers
  - 64 bits on most new computers

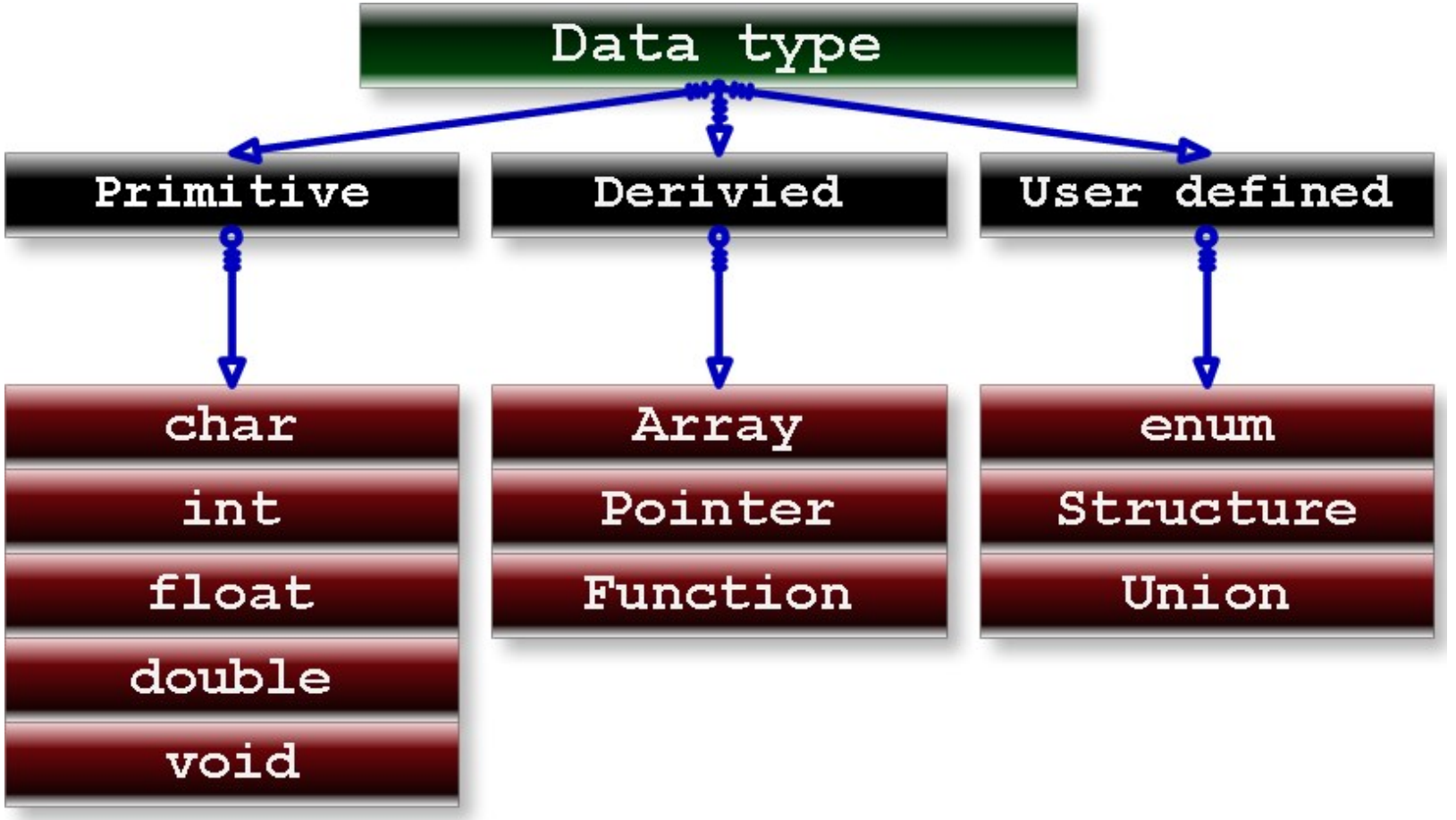


Why data types?

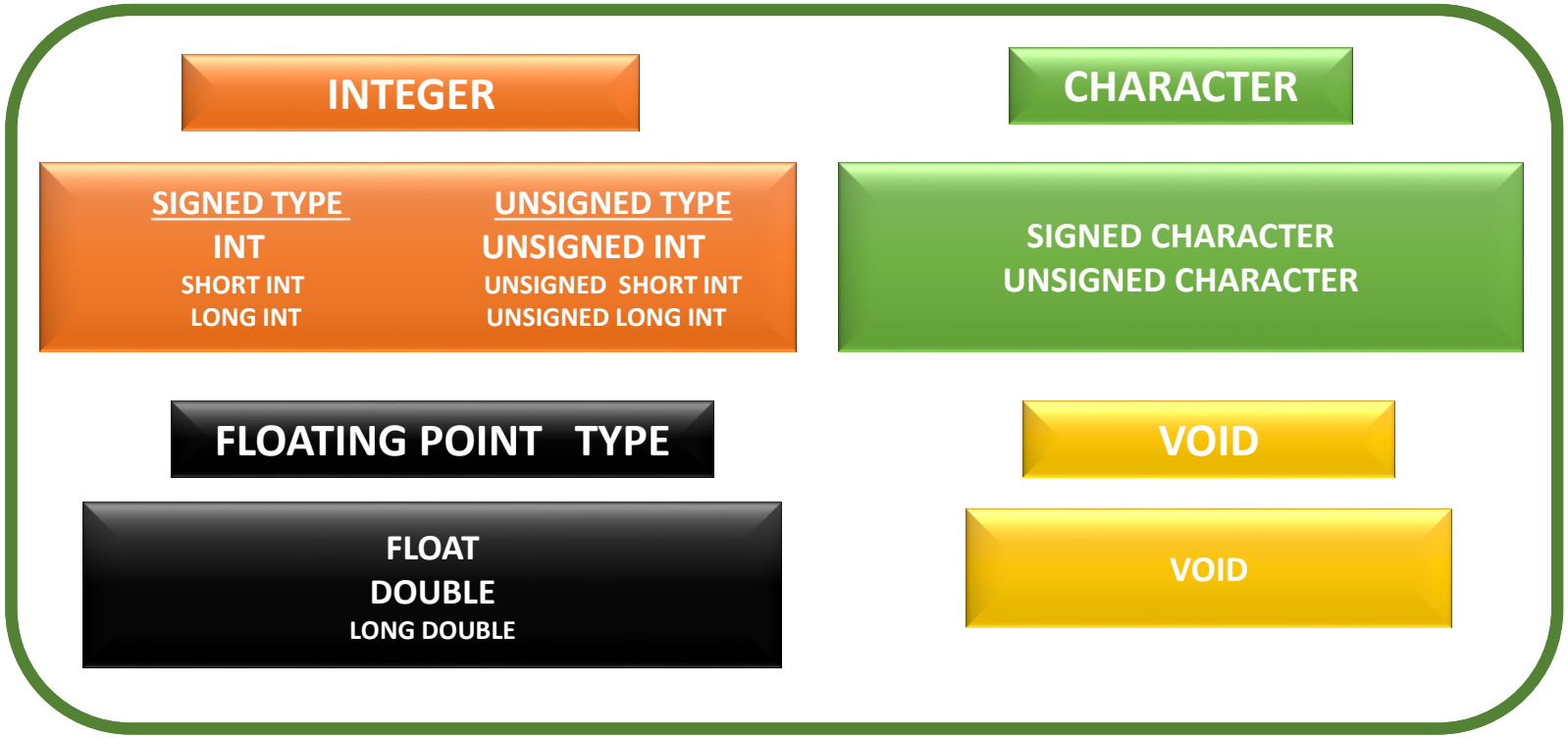
- Computational problems!
  - Need a space for the data. **Variable**
  - Every **variable** should get some space in memory.
  - **How much space for each variable?** Based on **type of data**; done by **variable declaration**
  - So, variable must be **declared before it is used;**
  - ***int x;*** **declaration signifies what**? **variable name, type and size**
  - Help the compiler/OS decide **how many bits** should be reserved for a variable.

Compiler must know the **data type** to allocate appropriate amount of memory for the variable.

C Data Types


Data type
Primitive
Derivied
User defined
char
int
float
double
void
Array
Pointer
Function
enum
Structure
Union

Primary (built-in or Basic) Data types

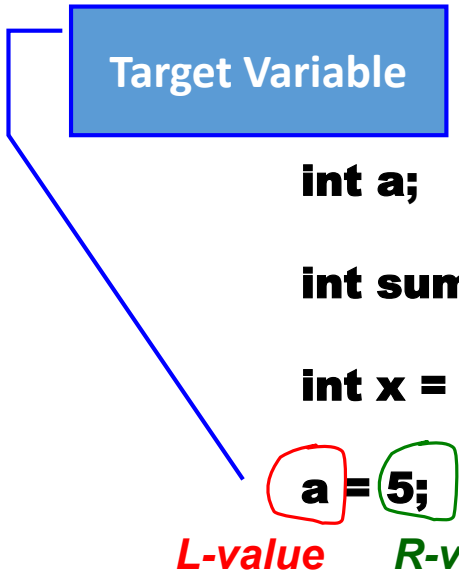


Basic Data types

Basic data types: **int, float, double, char, and void**

- ✓**int:** can be used to store integer numbers (values with no decimal places).
- ✓**float:** can be used for storing floating-point numbers (values containing decimal places).
- ✓**double:** the same as type float, and roughly twice the size of float.
- ✓**char:** can be used to store a single character, such as the letter *a*, the digit character *6*, or a semicolon.
- ✓ **void:** is used to denote nothing or empty.

Understanding Variable declaration and use




```
int a;                  // declaring a variable of type int

int sum, a1, a2;        // declaring 3 variables

int x = 7;              // declaring and initializing a variable

a = 5;                  // assigning to variable a the value 5
```

```
a1 = a;                 // assigning to variable a1 the value of  a

a1=a1+1;  // assigning to variable a1 the value of a1+1
          // (increasing value of a1 with 1)
```

Using and Displaying Variables

```
#include <stdio.h>
int main ()
{
        int sum;
        sum = 50 + 25;
        printf ("The sum of 50 and 25 is %d “, sum);
        return 0;
}
```

Variable sum **declared** of type int

Variable sum **assigned** expression 50+25

Value of variable sum is **printed**

The **printf** has now 2 arguments: first argument a **string**, and the second that holds **variable** with integer value of summation.

Integer Type

- The basic integer type is **int**
  - The size of an **int** depends on the machine and on PCs it is normally 16 or 32 or 64 bits.

- **modifiers** (type specifiers)
  - **short** : typically uses less bits
  - **long** : typically uses more bits
  - **signed** : both negative and positive numbers (default)
  - **unsigned**: only positive numbers

SIZE AND RANGE OF VALUES FOR A 16-BIT MACHINE INTEGER TYPE

	Type	Size	Range
short	short int or signed short int	8	-128 to 127
	unsigned short int	8	0 to 255
Integer	int or signed int	16	-32,768 to 32,767
	unsigned int	16	0 to 65,535
Long	long int or signed long int	32	-2,147,483,648 to 2,147,483,647
	unsigned long int	32	0 to 4,294,967,295

Let us have some **hands-on** to understand how we can declare and use a **variable** through a program

Algorithm Name: **Add 2 numbers**

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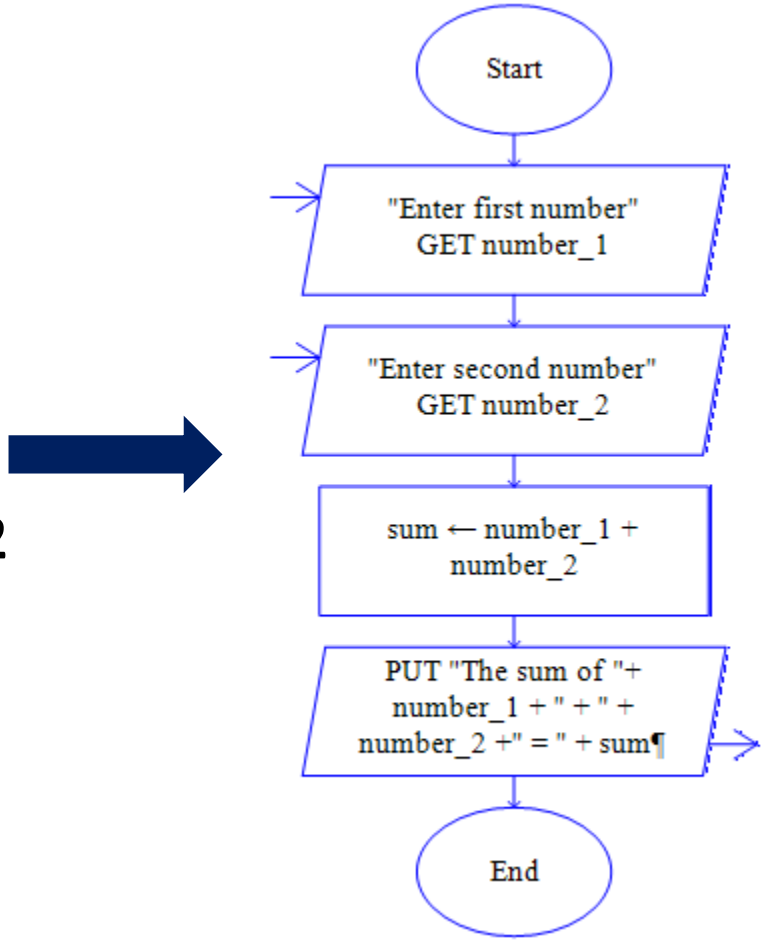
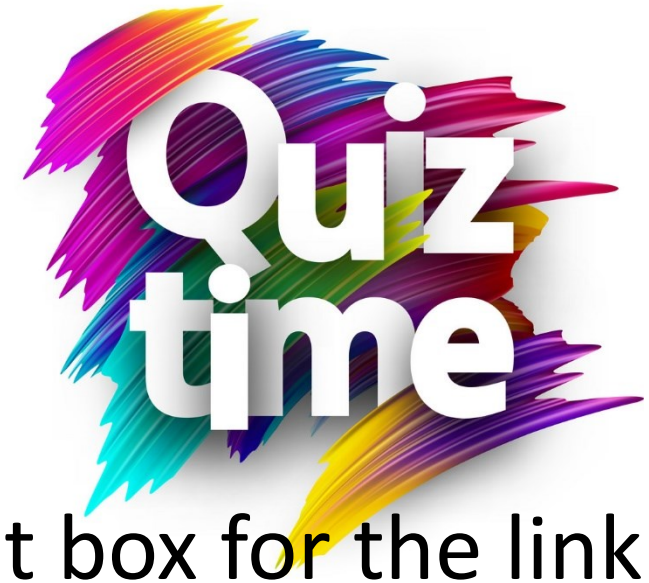


Add 2 number - Program

```
/* C Program to add two given numbers*/
#include <stdio.h>

int main(){
    int number_1,number_2,sum;
    printf("Enter the 2 numbers");
    scanf("%d %d",&number_1,&number_2);
    sum = number_1 + number_2;
    printf("The sum is %d", sum);
    return 0;
}
```



Go to posts/chat box for the link to the question

submit your solution in next 2 minutes

The session will resume in 3 minutes

Summary

- The basic (primitive) data types in C are
  - int
  - float
  - char
  - double
  - void

- Size of a data type is **machine dependent**