

# Writing C Program

# First C Program

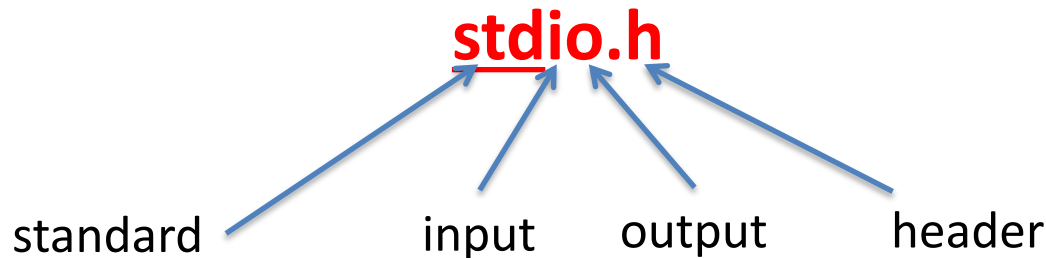
```
#include <stdio.h>
```

# Hash Sign

```
int main(){  
    printf("Hello to C programming.");  
    return 0;  
}
```

- ❖ **Header files** are helping files that contain function declarations, definition of variables and macros.

Some important header files are **stdio.h**, **conio.h**, **stdlib.h** and **math.h**.



# First C Program

- ❖ **int main():** main is the mandatory function for c programming; actually only the main() function of a program is executed. Other functions must be called through main() function. Any function in C is started with { and ended with }.
- ❖ After writing each function name, parameters are placed within (). If no parameter exist, still need to write ().
- ❖ “int” before the main function indicates “integer” or “whole number”. This is called returning parameter. If nothing is written before main, the default returning parameter is “int”; other returning parameter is “void” means nothing will return by main function.
- ❖ ; is used to terminate a statement in C program.

# First C Program

- ❖ **printf():** f stands for format. printf() function prints something on monitor according to the format given within “...” within ().
- ❖ **Input:** taking something inside the computer memory. Different types of input devices are used- keyboard, mouse, joystick, etc. only **keyboard** is the standard input device.

**scanf()** is the generalized standard input function, which takes input from keyboard.

- ❖ **Output:** sending data from computer memory to outside of computer. Some output devices are monitor, printer, plotter, etc. only **monitor** is the standard output device.

**printf()** is the generalized standard output function, which shows information on monitor.

# Second C Program

**Exercise:** calculating area of a circle from its radius.

```
#include <stdio.h>
#define pi 3.14159

int main(){
    float radius, area;

    printf("Enter radius: ");
    scanf("%f", &radius);
    area = pi * radius * radius;
    printf("Area of circle is %.2f", area);
    return 0;
}
```

**& Ampersand Sign**

## Algorithm:

1. Take value of radius as input to computer memory called "radius";
2. Calculate area from the radius and put it to another memory called "area"; and
3. Print the value of area on monitor screen.

# Second C Program

## **#define pi 3.14159**

- It's macro definition. **#** symbol is used before any macro definition.
- There is no symbol of pi on keyboard. So, name of memory location is given "pi".
- Value of pi never be changed, so the value has been placed using "#define" command.
- Please note that no **;** (statement termination symbol) is used after any macro definition.

# Second C Program

**float radius, area;**

- Two memory locations have been defined using two variable names- “radius” and “area”. Values of radius and area will be put on these two memory locations.
- “float” is the type of memory location. Since, only 0 (zero) and 1 (one) can be stored in computer memory, declaration of type is mandatory for defining any memory location.
- Types of memory location may be “char”, “int”, “long”, “float” and “double”. Type indicates how data is stored in computer memory using only 0 and 1.

# Second C Program

## char

- This is the short form of character. There are two types of character- ASCII (8 bits or 1 Byte) and UniCode (16 bits or 2 bytes). C supports only ASCII character.

ASCII = American standard code for information interchange (only English)

Unicode = Universal code (All symbols for worldwide different languages)

- What is code? A character say “B” cannot be written in a computer memory. So, each character is represented by some numbers, for example “B” is represented by 66. Then, this number is converted to binary format, say 01000010. Finally, the binary number is stored in computer memory. In this case, 66 is code for “B”.

0	1	0	0	0	0	1	0
---	---	---	---	---	---	---	---

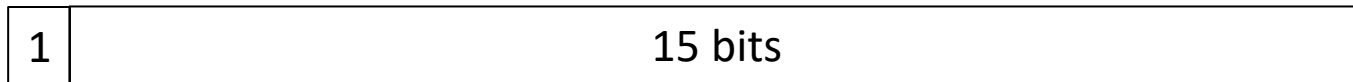
- C is a case sensitive language, so, “A” and “a” are not the same. Some codes used in ASCII are “0” = 48, “A” = 65 and “a” = 97.



# Second C Program

# int

- This is the short form of integer. Integer means whole number. An integer number may be either positive (say, 12) or negative (say, -12).
- 2 bytes (16 bits) are used to represent an integer number inside computer memory. one bit is used for sign to indicate whether the number is positive or negative. The remaining 15 bits are used for storing the number.



0 (zero) in sign bit indicates positive number and 1 (one) indicates negative number.

- Negative number is represented by 2's complement for the benefits of operation like  $+$ ,  $-$ ,  $*$ ,  $/$ . ( $*$  is the multiplication sign used in computer)

Binary of 12, 0000 0000 0000 1100

1's complement, 1111 1111 1111 0011

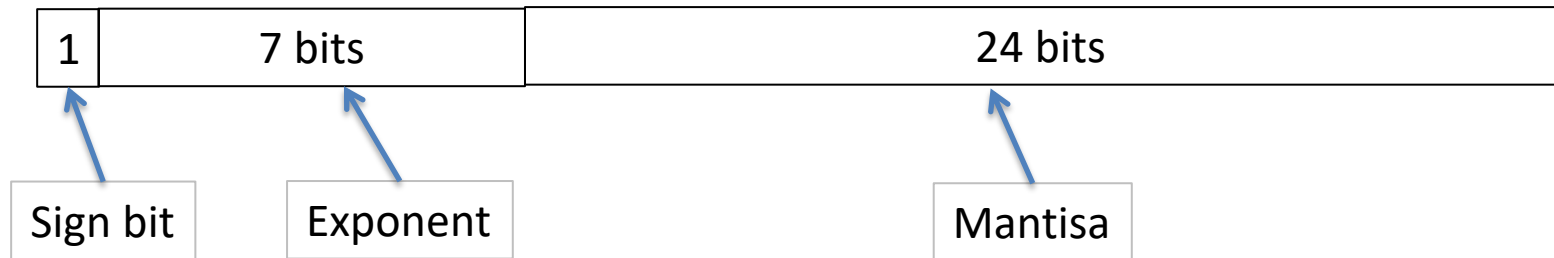
2's complement (binary of -12),     1111 1111 1111 0100

- In an “int” location, we can write any number between -32768 to 32767. “long” (4 byte) is used to write a longer range.

# Second C Program

## float

- This is the short form of floating point number. floating point numbers are real or fractional number, like, 12.5. Memory location (4 bytes) of a floating point number is divided into three parts: sign (1 bit), exponent (7 bits) and Mantisa (24 bits).



- The binary of 12.5 is 1100.1. The point need to float in such a way that only 1 will stay before the point, i.e.,  $1.1001 \times 2^3$ . This is positive number, so a 0 (zero) will be placed in sign bit, binary of 3 (i.e., 0000011) will be placed in Exponent and the bits after point (in this case, 1001) will be placed in Mantisa.
- Range of a floating point number is increased by using double (8 bytes).

# Second C Program

```
printf("Enter radius: ");  
scanf("%f", &radius);
```

- This two statements are used to take input of radius inside the computer memory. The first statement is called “prompt”, i.e., this statement prompts someone to insert input. The second statement actually takes the input.
- Arguments or parameters of `scanf()` function has two parts: format and variables. Format part indicates the types of input and format of giving input. `&` (ampersand) is used before each variable name, except string type variable. String type variable will be discussed later.
- All function names in C program are represented by only lower case letters.
- There is no gap or space between function name and `(` symbol.

# Second C Program

**area = pi \* radius \* radius;**

- This statement calculates the area of the circle from collecting value from the memory locations called “pi” and “radius” and then stored the result in the memory location called “area”.
- Unlike mathematics, = is not the equal sign. This is called **assignment sign**. That means, calculated value from the right side of this sign will be put to the memory location written in the left side. Hence, there is only one variable is possible before = sign where the value can be stored.
- To avoid ambiguity with “x” character, \* is used as the multiplication sign in computer programming.

# Second C Program

**printf("Area of circle is %.2f", area);**

- When the value in the memory location "area" is 10.2432, the above statement will show the following on computer monitor:

**Area of circle is 10.24**

- Arguments or parameters of **printf()** function has two parts: format and variables. Format part indicates the types of output and format of providing output.
- Please note that, **unlike** scanf() function, **&** (ampersand) is not used before the variable name.
- printf() function starts printing of every character before **%** sign. In the location of % sign and associated character, say "%.2f" in this case, the value of the variable will be printed. ".2" means after decimal point, only two digits will be printed. "f" indicates floating point number.

# Some common formats used in scanf() and printf() functions

## Some General

Symbols	Meaning
c	Character
d	Decimal integer
e	Floating point number in exponential notation (scientific notation)
f	Floating point number
o	Octal integer
S	String.
x	Hexadecimal integer
[...]	String which may include whitespace character

## Some special

Symbols	Meaning
6d	Decimal integer will be printed taking 6 characters space
.2f	Floating point number to be printed up to 2 digits after point
[^'\n']	Taking string input until a new line (i.e., enter) is pressed.

# Steps of writing a C Program

**Step 1:** Write down the algorithm, i.e., activities to be performed in a sequential order.

**Step 2:** Find out variables and their types to be declared. Consider inputs, outputs, intermediate variable and any variables required for program structure.

**Step 3:** Find out the header files to be included.

**Step 4:** Find out whether any other macros are needed.

**Step 5:** Write down the program structure and put each of the above in the appropriate location in a sequential order.

# Features of a good Program

1. **Integrity**: Accuracy of calculation.
2. **Clarity**: Readability of program. Put appropriate indentations.
3. **Simplicity**: Use straightforward program structure.
4. **Efficiency**: Reduce execution time and memory utilization.
5. **Modularity**: Divide big program into smaller functions. Each function will perform only one task.
6. **Generality**: make the program general for operation, avoid any hard coding.



# Assignments

Write C program to solve the following exercise

1. Volume of a sphere,  $V = \frac{4}{3}\pi r^3$

2. Volume of Cylinder,  $V = \pi r^2 h$

3. Area of Surface Area of Cylinder,

$$A = 2\pi r(r + h)$$

4. (a) Converting Celsius to Fahrenheit; and

(b) Converting Fahrenheit to Celsius:

$$\frac{C}{5} = \frac{F - 32}{9}$$