IFC-II Data Structures

Programming Assignments followed by Oral	40 Marks
End Semester Exam	60 Marks

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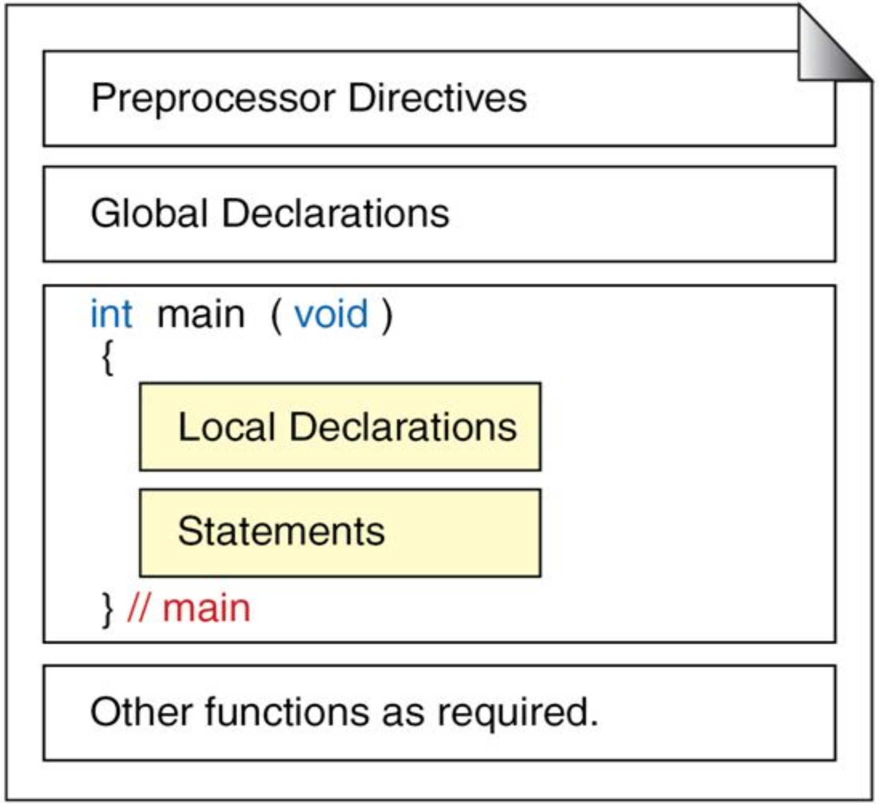
Introduction to imperative programming

- **Basic syntax of languages like C or C++**
  - Data types
  - variables
  - limitations of data types
  - control statements
  - functions
  - compilation and execution as independent steps
  - global, static, local variables
  - structures
  - user defined types
  - pointer and recursion.

02 Hrs

Structure of C Program



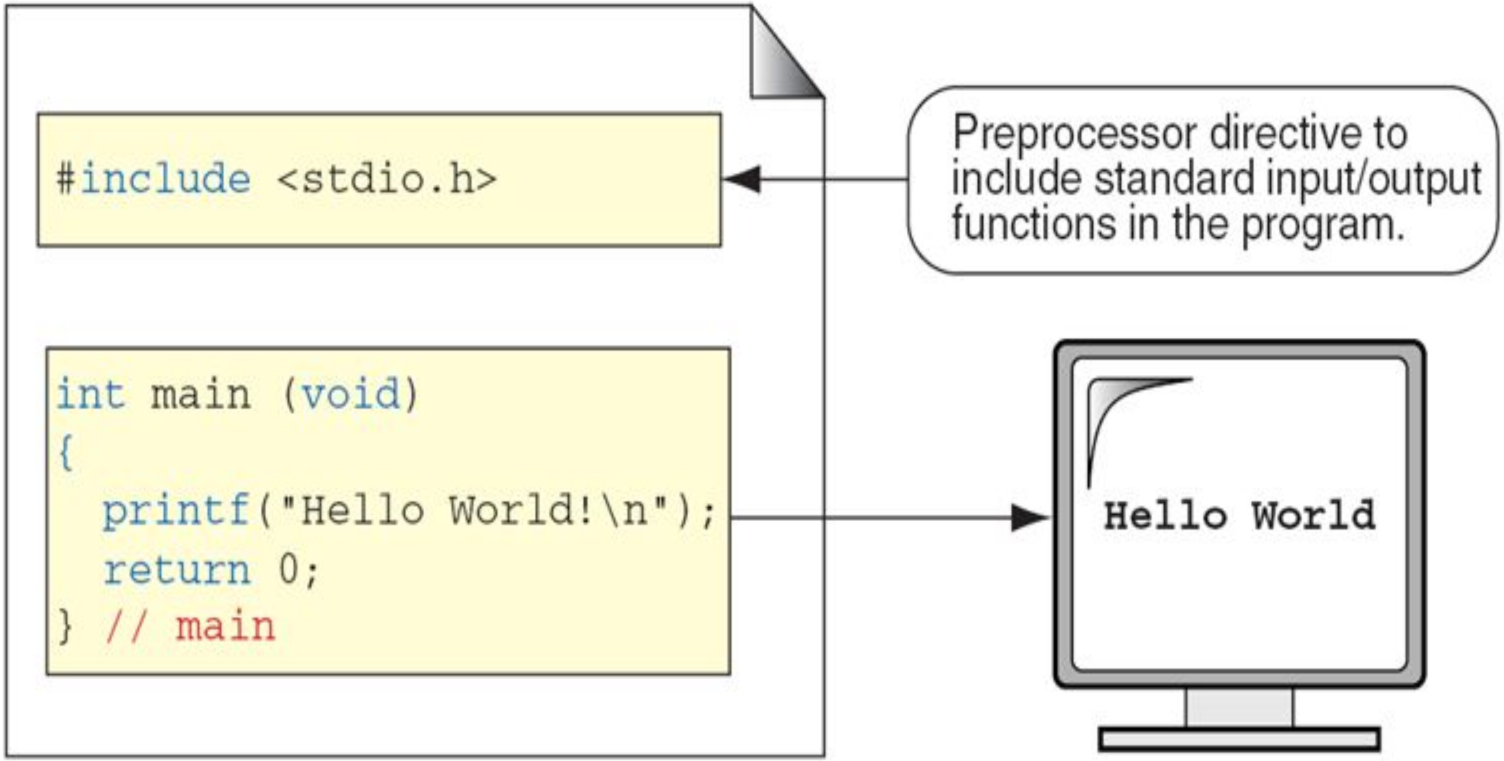
Preprocessor Directives

Global Declarations

```
int  main  ( void )
{
    Local Declarations

    Statements
} // main
```

Other functions as required.

Structure of C Program



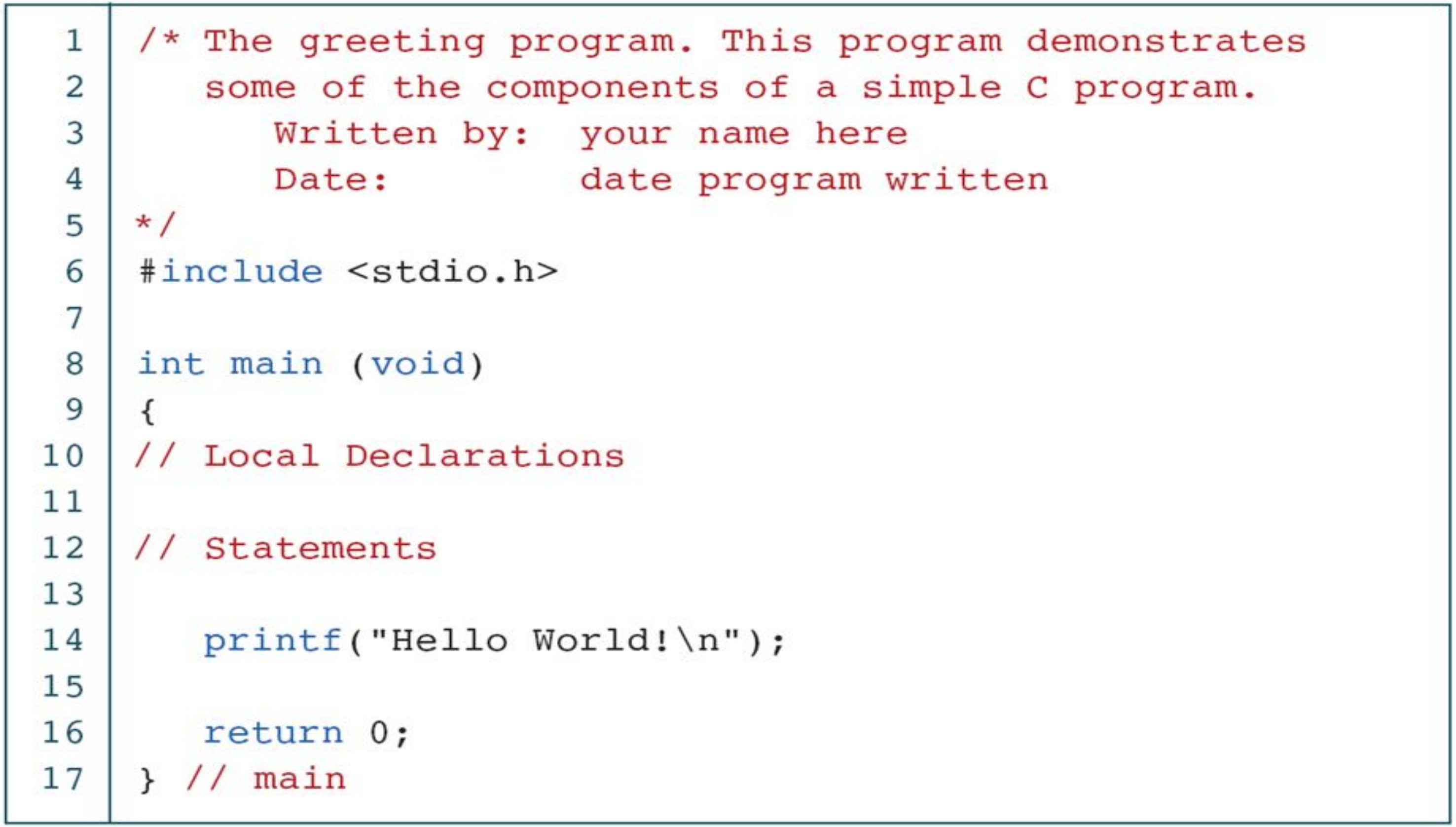
```c
#include <stdio.h>
```

Preprocessor directive to include standard input/output functions in the program.

```c
int main (void)
{
  printf("Hello World!\n");
  return 0;
} // main
```

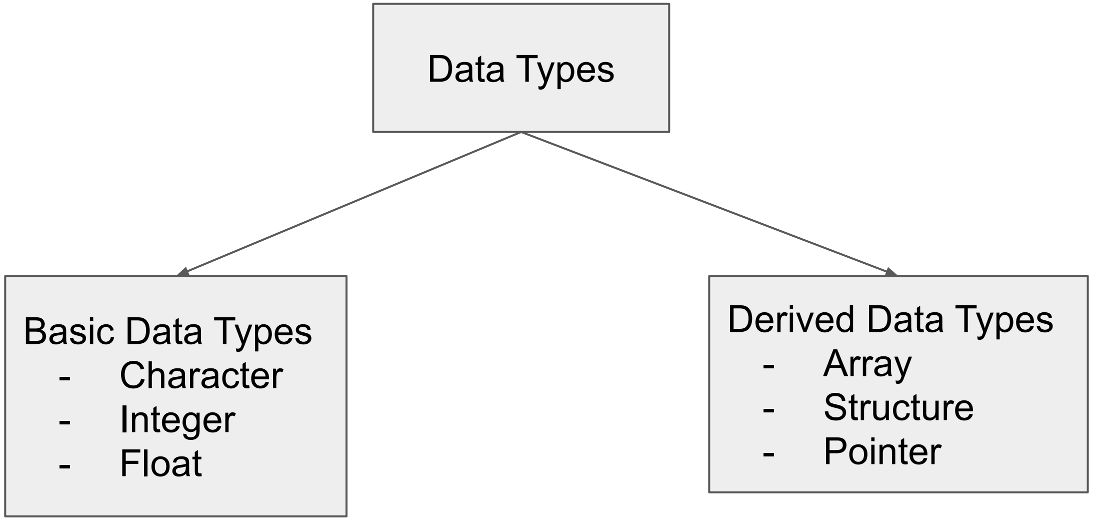
```
Hello World
```

Structure of C Program



```c
/* The greeting program. This program demonstrates
   some of the components of a simple C program.
      Written by:  your name here
      Date:        date program written
*/
#include <stdio.h>

int main (void)
{
// Local Declarations

// Statements

   printf("Hello World!\n");

   return 0;
} // main
```

Data Types



Data Types

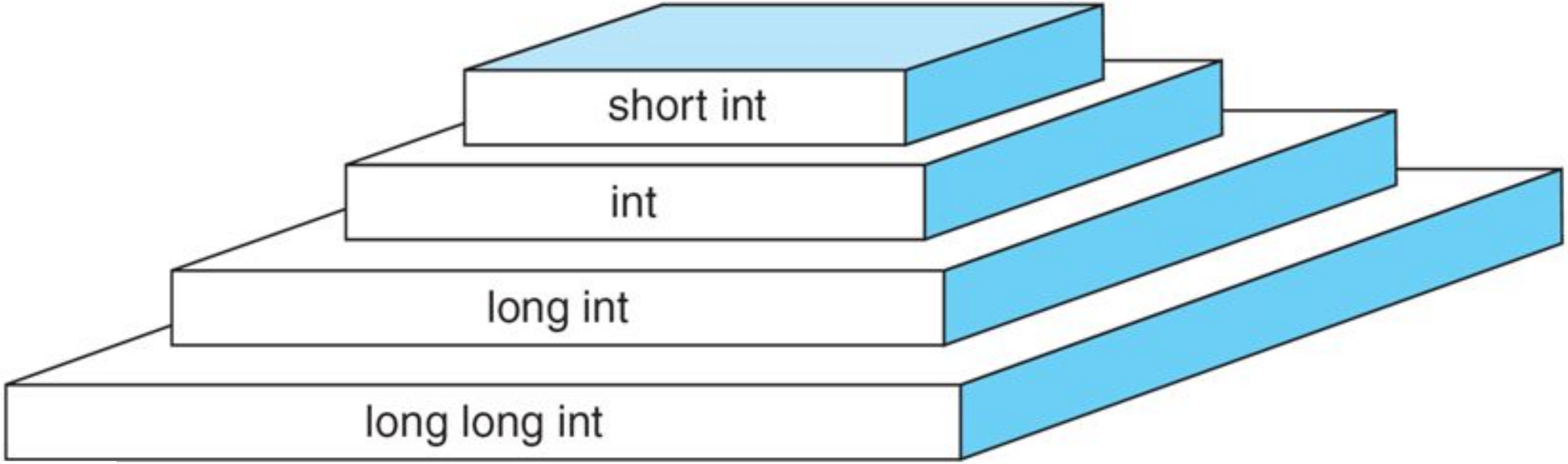
Basic Data Types
- Character
- Integer
- Float

Derived Data Types
- Array
- Structure
- Pointer

Character Data Types

- Keyword char is used for declaring character type variable
- e.g. char ch;
- Size = 1 byte

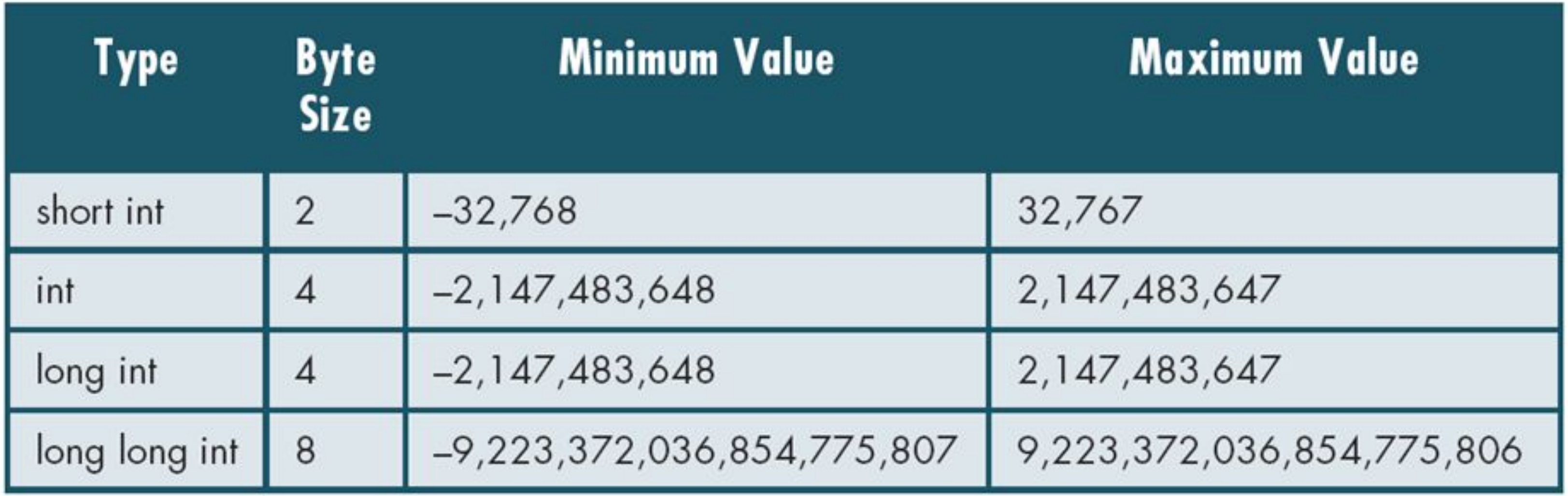
Integer Data Types



Note

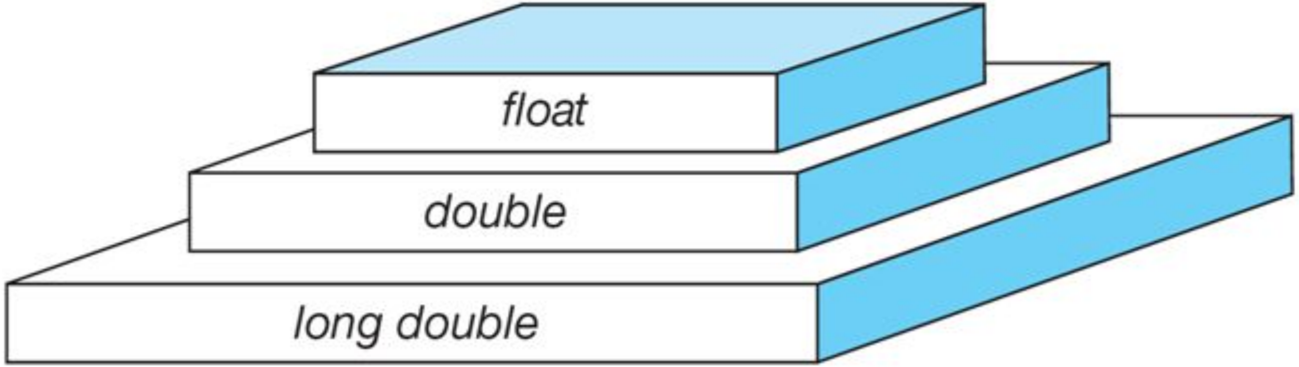
sizeof (short) ≤ sizeof (int) ≤ sizeof (long) ≤ sizeof (long long)

Integer Data Types



Type	Byte Size	Minimum Value	Maximum Value
short int	2	–32,768	32,767
int	4	–2,147,483,648	2,147,483,647
long int	4	–2,147,483,648	2,147,483,647
long long int	8	–9,223,372,036,854,775,807	9,223,372,036,854,775,806

Floating Point Data Types

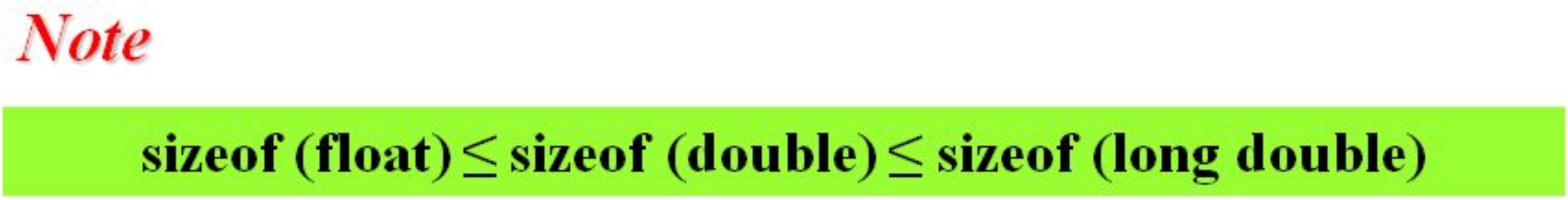


Note

sizeof (float) ≤ sizeof (double) ≤ sizeof (long double)

Floating Point Data Types

Type	Storage Size	Value Range	Precision
Float	4 byte	1.2E-38 to 3.4E+38	6 decimal places
Double	8 byte	2.3E-308 to 1.7E+308	15 decimal places
Long Double	10 byte	3.4E-4932 to 1.1E+4932	19 decimal places



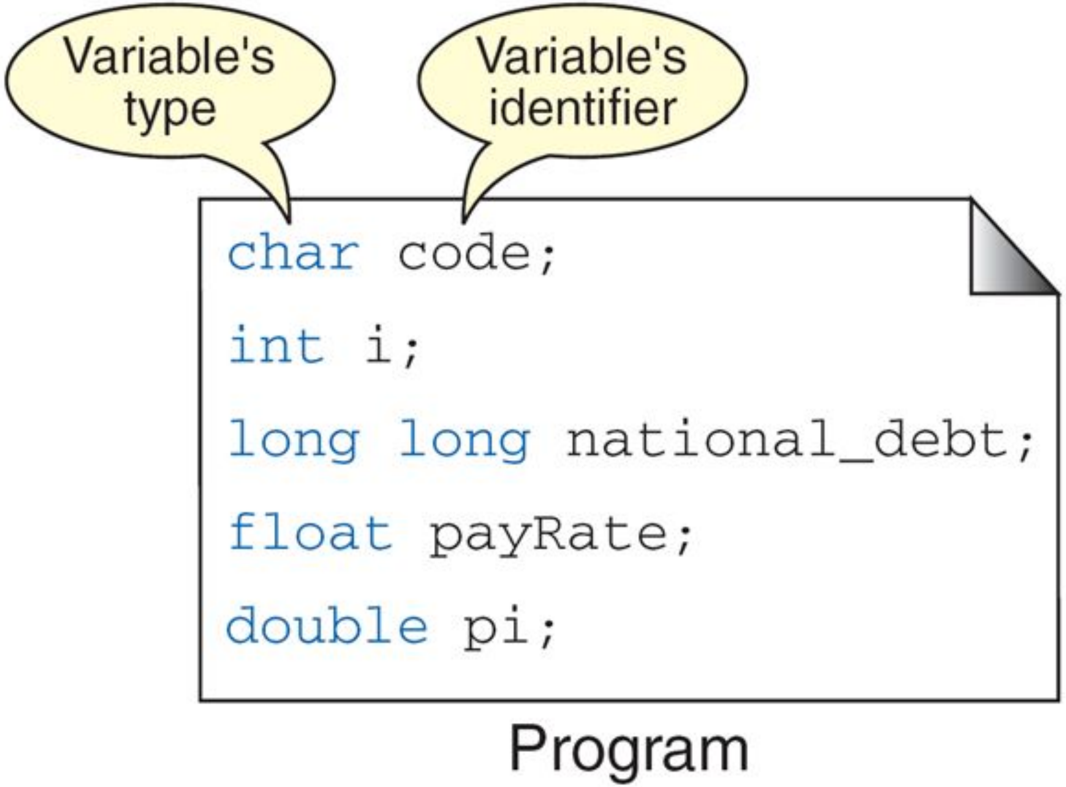
Note

sizeof (float) ≤ sizeof (double) ≤ sizeof (long double)

Variables

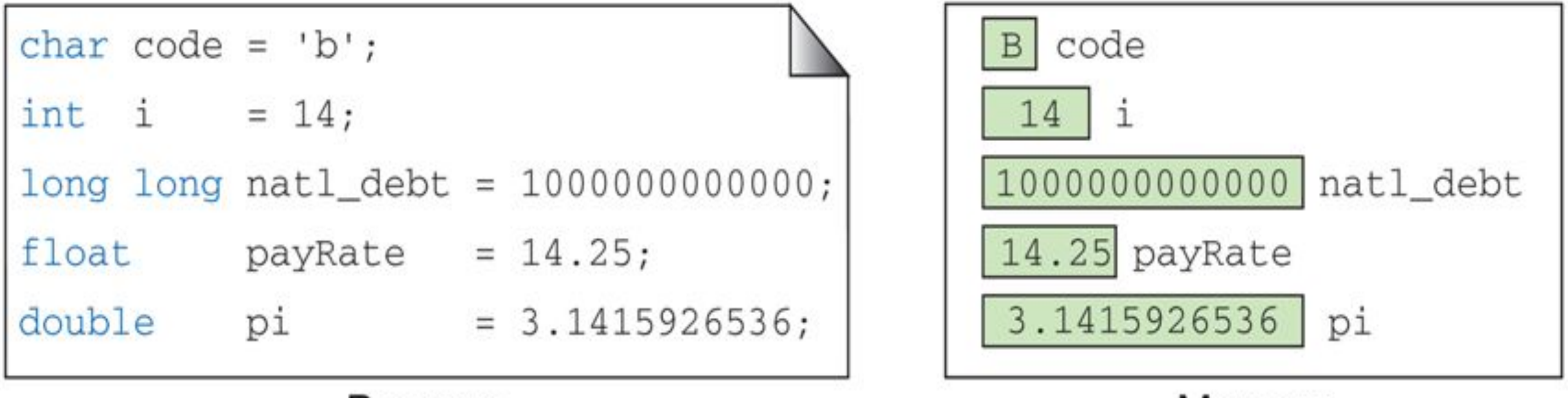
- Variables are the names given to memory locations that have a type, such as integer or character. The type determines the values that a variable may contain.
    - Variable Declaration
    - Variable Initialization

Variables Declaration



```
char code;
int i;
long long national_debt;
float payRate;
double pi;
```

Variables Initialization



```
char code = 'b';
int  i     = 14;
long long natl_debt = 1000000000000;
float      payRate    = 14.25;
double     pi         = 3.1415926536;
```

Note

When a variable is defined, it is not initialized. We must initialize any variable requiring prescribed data when the function starts.

Types of Operators

- Arithmetic Operators e.g +, -, *, /, % etc
- Relational Operators e.g. <, >, <=, >=, ==, != etc
- Logical Operators e.g. &&, ||, ! etc
- Assignment Operators e.g. =
- Unary Operators e.g. -, ++, -- etc
- Conditional Operators : Conditional operators is a Ternary Operator, which operates on three operands
  e.g. ? :

Conditional Operator

```
void main()
{
        int a=10,b=20;
        a>b?printf("a>b"):printf("a<b");

}
```

Conditional Operator

```
void main()
{
        int a=10,b=20;
        a>b?printf("a>b"):printf("a<b");

}
```

```
void main()
{
        int a=10,b=20,big;
        big=a>b ? a : b;
        printf(“Big is %d”, big);
}
```