

# Data types Variable Declaration

Day-3

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## Data Types

- ① Size required to store data
- ② internal binary representation of data
- ③ Kind of operations

### Primitive

int

char

float

double

void

### Non Primitive

## Variable Declarations

C89      ~~16 bit~~

int → 2 bytes  
Turbo

C99

C11

C17

~~64bit~~  
int ~~4 bytes~~

int a,b; 4bytes

char m; 1byte

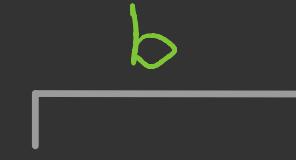
float k; 4bytes

double d1; 8bytes

$$\begin{aligned}
 & 4 + 4 + 1 + 4 + 8 \\
 & = 21
 \end{aligned}$$



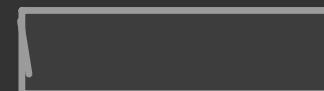
4 bytes



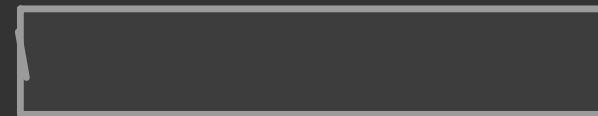
4 bytes



1 byte



4 bytes



8 bytes

character

Real

Real

int a, b=5;  
char m='A';  
float K=3.5;  
b=6;

Garbage  
value

The diagram illustrates the memory layout for the variables defined in the code. It consists of four boxes arranged horizontally. The first box, labeled 'a' at the top, is empty. The second box, labeled 'b' at the top, contains the value '5'. The third box, labeled 'm' at the top, contains the character 'A'. The fourth box, labeled 'K' at the top, contains the float value '3.5'.

## Float vs double

float  $\rightarrow$  4 bytes

0.7

double  $\rightarrow$  8 bytes

float  $x = 0.7;$



double  $y = 0.7;$ , 4 bytes



8 bytes

$$0.7 \times 2 = 1.4$$

$$0.4 \times 2 = 0.8$$

$$0.8 \times 2 = 1.6$$

$$0.6 \times 2 = 1.2$$

$$0.2 \times 2 = 0.4$$

$$0.4 \times 2 = 0.8$$

$$0.8 \times 2 = 1.6$$

0.101100110011...

1

0

1

0

0

1

char m = 65; ✓

## int vs char

### character encoding ASCII

char m='A'; <sup>m</sup>  
65

int >L = 65;

$$\begin{array}{c} x \\ \boxed{65} \\ 46 \end{array} \qquad \begin{array}{c} m \\ \boxed{65} \\ 1b \end{array}$$

'Q'	62	
'A'	65	
'B'	66	
:		
'Z'	90	
32		
'O'	48	
'I'	49	
'a'	97	
'b'	98	
:		
'Z'	122	
57		
'g'		

256 character  
Codes = 0 to 255

255

so 1 byte = 8 bits

int x = 'A';

1

65

## Block Structure

- C is a block structured programming language
- A block is a group of instructions
- Outer blocks are usually functions
- Function is a block of statements, which has some name for identification
- A C program can have any number of blocks
- Even in the smallest C program, there is at least one function.
- If there is only one function in the program then its name must be **main()**
- You can write declaration statements outside the function body, but action statements must be written inside the function body.

```
add()  
{
```

  ≡  
  ≡

}

```
lcm()
```

{

  ≡

```
is_prime()  
{
```

  ≡  
  {  
    ≡

  }

}

Function names must be unique

int a, b; ← Global variable

```
main()
```

{

  ≡  
  ≡

}

  int x; ← local  
  variable