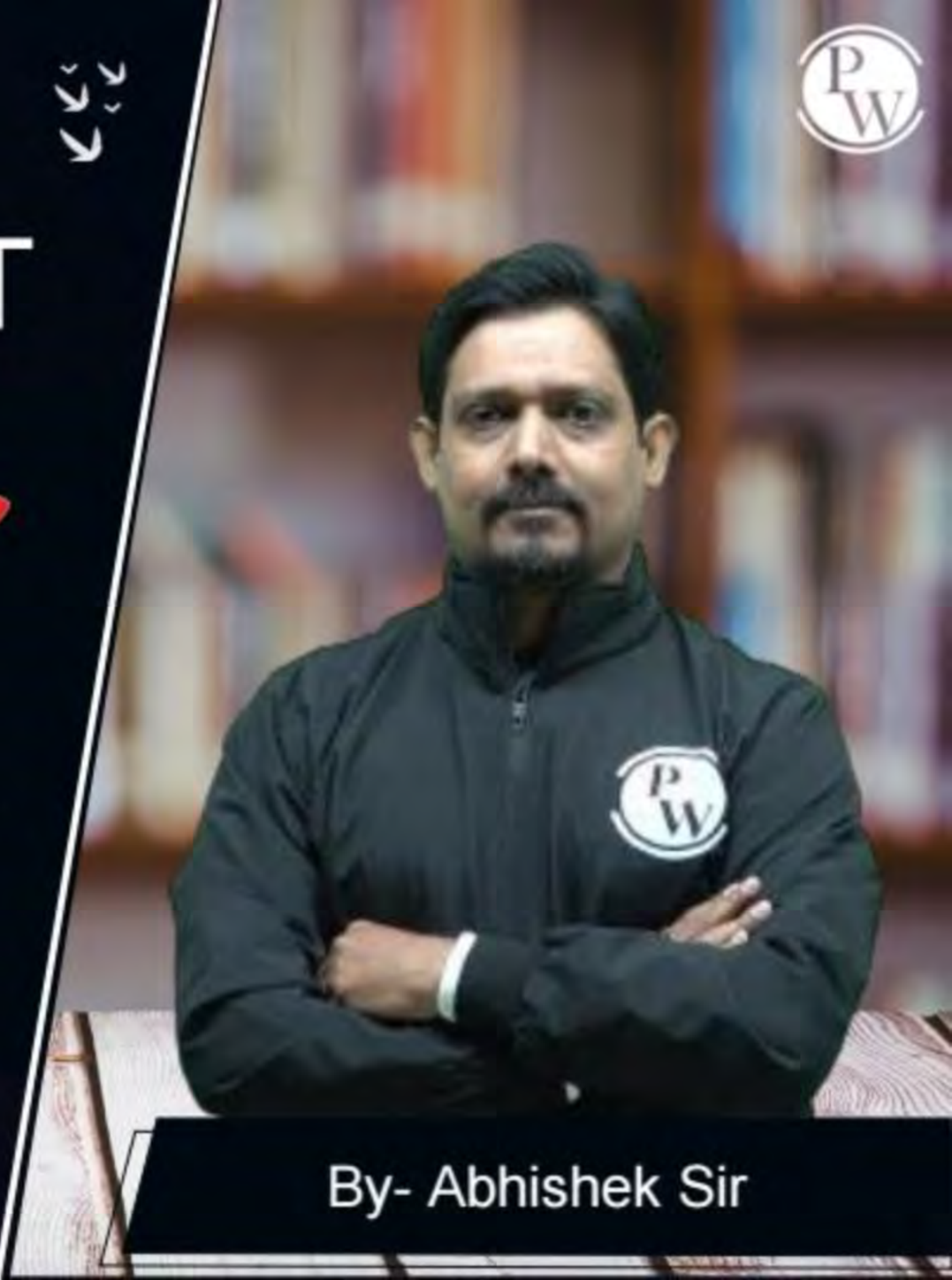
Computer Science & IT

C Programming

Array & Pointers

Lecture No. 02



By- Abhishek Sir

Recap of Previous Lecture

- Topic
- Topic
- Topic
- Topic
- Topic

Double pointer

Call by reference

Slide

Topics to be Covered

- Topic
- Topic
- Topic
- Topic
- Topic

problem with pointer

pointer Arithmetic

Array.

Slide

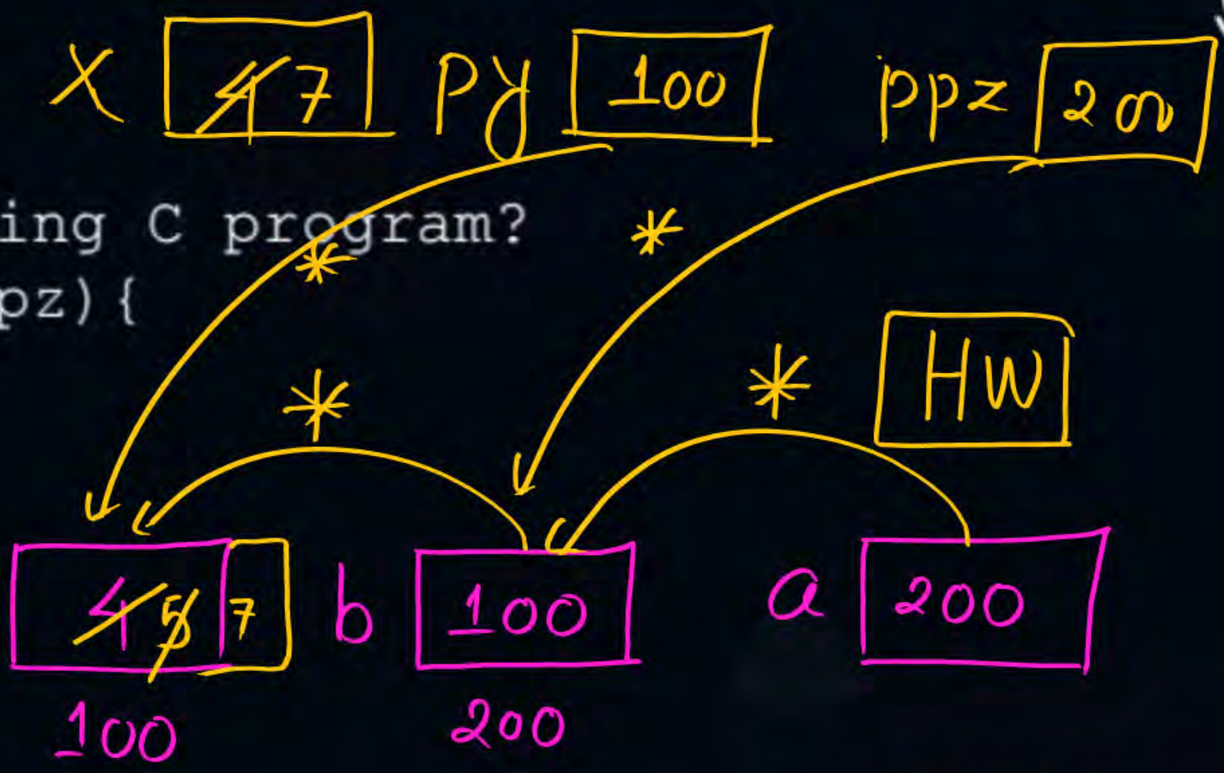
GATE 2008

What is printed by the following C program?

```
int f(int x, int *py, int **ppz){
      int y, z;
     **ppz += 1; z = **ppz;
     *py += 2; y = *py;
     x += 3;
     return x+y+z;
}
void main(){
     int c, *b, **a;
     c = 4; b = &c; a = &b;
     printf("%d", f(c, b, a));
}
```

7+5+7=19

4, 100, 200



z = 5

y = 7

fc

Answer 19

Slide

Size of Pointer

Variable

```
include <stdio.h>

int main(){
    int *p;
    char *p1;
    float *p2;

    printf("%lu", sizeof(p));
    printf("%lu", sizeof(p1));
    printf("%lu", sizeof(p2));

    return 0;
}
```

Sizeof(p)

int Size 4B ✓

Short int 2B

float - 4B

Double 8B

char 1B

int *ptr

float *ptr

Double*ptr;

Size of pointer

Variable fixed

Function returning Pointer

```
#include<stdio.h>
int* fun() {
   int a;
   return &a;
}
```

local variable

local variable deallocate :

Does not exists

```
int main() {
   int *ptr;
   ptr = fun();
   printf("%d", *ptr);
   return 0;
}
```

Dangling pointer

Slide

Function returning Pointer

Dangling pointer : Address of memory that does not exists.

Slide

Question

Consider the following program in C language:

```
#include<stdio.h>a
main(){
    int i;
    int*pi=&i;
    scanf("%d",pi);
    printf("%d\n",i+5);
}
```

Which one of the following statements is **TRUE**?

(A) Compilation fails.

(B) Execution results in a run-time error.

(C) On execution, the value printed is 5 more than the address of variable i.

(D) On execution, the value printed is 5 more than the integer value entered.

Slide

Question

Consider the following program in C language:

```
#include<stdio.h>a
main(){
    int i;
    int*pi=&i;
    scanf("%d",pi);
    printf("%d\n",i+5);
}
```

Which one of the following statements is **TRUE**?

(A) Compilation fails.

(B) Execution results in a run-time error.

(C) On execution, the value printed is 5 more than the address of variable i.

(D) On execution, the value printed is 5 more than the integer value entered.

Slide

```c
#include<stdio.h>
int main(){
    int i=10;
    int *ptr;
    printf("%d", *ptr);
}
```

ptr = &i; missing

ptr | Garbage | 101110

Uninitialized pointer

10110

Array

Pointer arithmetic
Array definition
Declaration of array
[ ] operator
Initialization of array
Concept of base address and
Pointer
Memory diagram of array
Array index out of bound
Data type associated with array
Const association
Pointer arithmetic
Access element of array using
Index
Question

Slide

Pointer Arithmetic

pointer ⇒ Address int *ptr;

post/pre

(1) ++, -- ptr++, ptr--, ++ptr, --ptr,

(2) Addition & Substraction with pointer variable allowed

ptr = ptr + 4, ptr = ptr - 4

(3) Same case for Similar pointer type

int * ptr1
int * ptr2
~~ptr~~

Substraction of pointer is also allowed

ptr2 - ptr1

Slide

Pointer Arithmetic

int a = 10, a+4 = 10+4 = 14

* int *ptr; ptr+4 ⇒ ptr+4(Size of int) = ptr+4×4 = ptr+16
* char *ptr; ptr+1 ⇒ ptr+1(Size of char) = ptr+1×1 = ptr+1
* double *ptr ptr+1 ⇒ ptr+1(Size of double) = ptr+1×8 = ptr+8

Slide

Pointer Arithmetic

ptr + c $\Rightarrow$ ptr + c * Size of data type

Amount of Incrementation depends upon data type

Array.

Slide

Array

* Array is collection of similar Data type

* Array always store in Sequential manner one after another.

50 students marks

50 variables

Maintain

Track

difficult

Array of 50 integer

Slide

Array

Declaration of array

Name

int a[4];

[ ] array Subscript operator.

14B

4×4 = 16B

Initialize the array

int a[4] = {1,2,3,4};

Slide

Array

```
int a[4] = { 1, 2, 3, 4, 5, 6 };
```

warning

Excess element

Ignored.

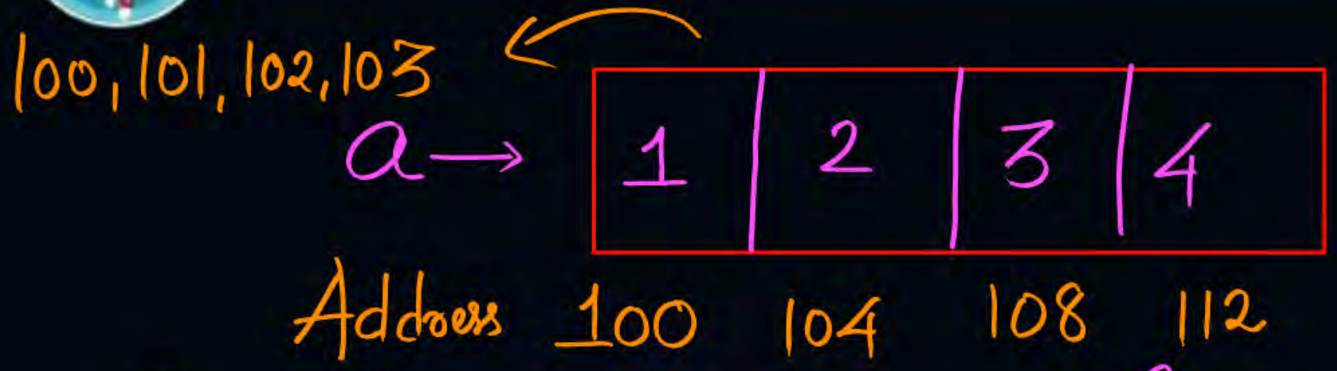
```
int a[4] = { 1, 2 };
```

rest position not assigned

filled with '0'

Slide

Array



int Size = 4B

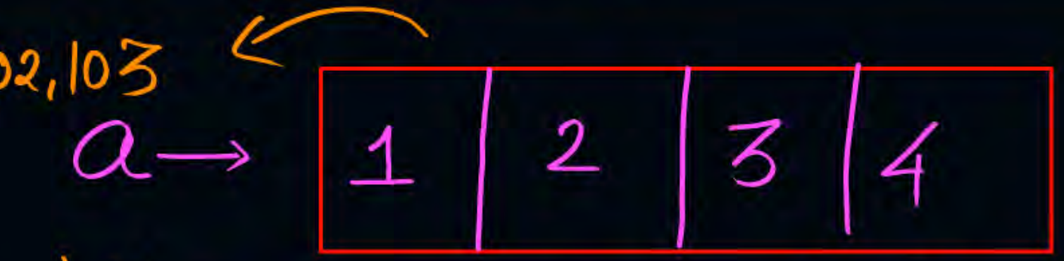
Base Address : Address of first element of array is called base Address

Byte Addressability : 1 Byte = 1 Address (CO)

Slide

Array

100, 101, 102, 103



Address 100 104 108 112

a[0] a[1] a[2] a[3]

first element a[0] ✓

Second element a[1]

Third element a[2]

Fourth element a[3]

Index

How to Access Array element

using Array Index

Index starts from 0

Slide

Array

100, 101, 102, 103

a → | 1 | 2 | 3 | 4 |

Address 100 104 108 112

a[0] a[1] a[2] a[3]

a → Address of first element of array

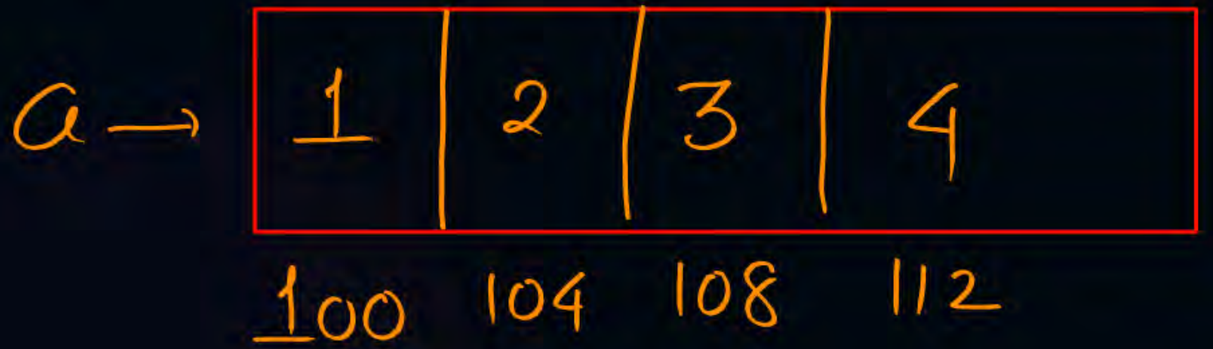
if you take name of array variable then it represent Address of first element

a is Address of integer

Slide

Array

$$a[i] = *(a+i) = *(i+a) = i[a]$$



$a[0] = *(a+0) = *a = 1$

$a[1] = *(a+1) = *(100+1) = *(104) = 2$

$a[2] = *(a+2) = *(100+2) = *(108) = 3$

$a[3] = *(a+3) = *(100+3) = *(112) = 4$

Slide

Question

Assume that array elements are stored from 1000, 1004, 1008, 1012, 1016

```
int main (){
      int a[] ={10,20,30,40,50};
      int i,*b,;
      b = a+4;          //1000 is assigned
      printf("%d", b[-1]);
      return 0;
}
```

The value printed by the program is_____?

Question

```
include<stdio.h>
int main()
{
int a[] = {1,23,4,5};
int *b= a+3;

printf("%d " b[-2]);
}
```

b = 100

104 108 112

(A) 1
(B) 23
(C) 4
(D) 5

b = a+3 = 100+3×4
= 112

b[-2] *(112-2)
*(112-2×4) = *(104)

Slide

Question

Assume that array elements are stored from 1000, 1004, 1008, 1012, 1016

```
int main (){
      int a[] ={10,20,30,40,50};
      int i,*b,*b1;
      b = a;          //1000 is assigned
      b1 = a+4        //1000 +4 ×4 = 1016 assigned
      i = b1-b;
      printf("%d",i);
      return 0;
}
```

The value printed by the program is_____?

2 mins Summary

Topic

Topic

Topic

Topic

Topic

problem with pointer

pointer Arithmetic

Array

THANK - YOU