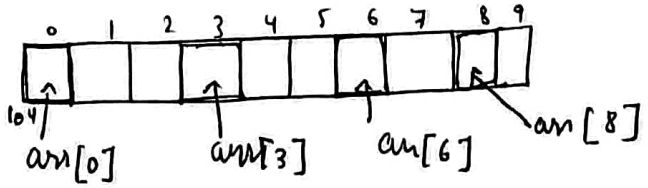
Pointers - 2

int arr[10]; →



address of arr[0]

⇒ &arr[0] ⟶ 104

&arr ⟶ 104 ← base address

```
int arr[] = {12, 14, 16, 18};

cout << arr;          address let = 104
cout << arr[0];       12
cout << &arr;         104
cout << &arr[0];      104
```

Catch → In case of arrays.

arr → Base Address
&arr →
&arr[0]

⇒ `int *p = &arr;`

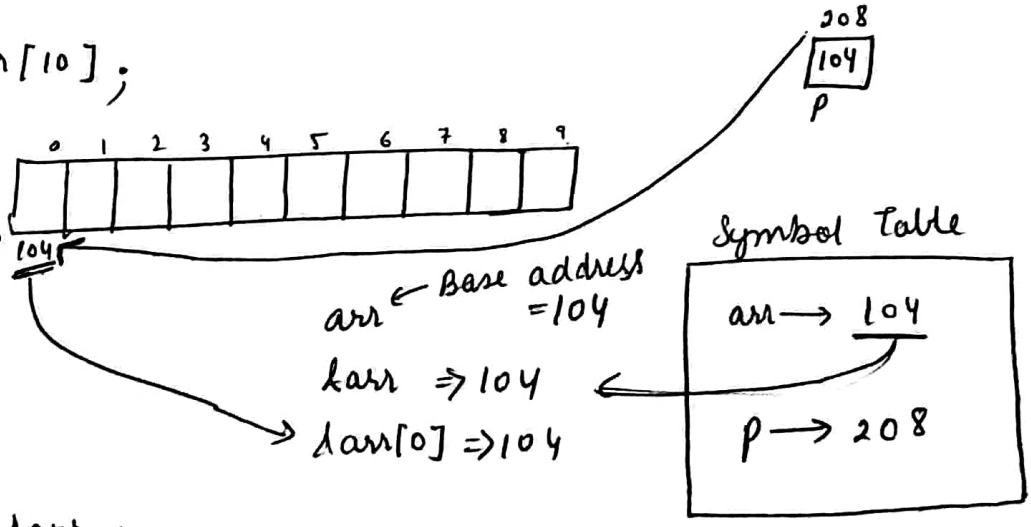
`cout << p;` ← p ka address

`cout << &arr;` } different

↖ address of arr (base address)

BTS →

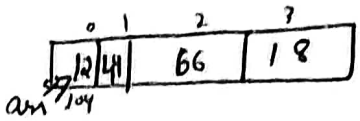
`int arr[10];`



`int *p = &arr;`

`cout << &p;` ⟶ 208

`cout << p;` ⟶ 104




```
cout << *arr ;
```
↳ o/p → 12

```
cout << *arr + 1 ;
```
⟶ *arr = 12 + 1 = 13

```
cout << *(arr) + 1 ;
```
*(arr) = 12 + 1 = 13

```
cout << *(arr+1);
```
*(arr+1) = *44

```
cout << *(arr+2);
```
o/p = 66

```
cout << *(arr+3);
```
o/p = 18.

```
cout << arr[0]; // 12
cout << arr[1]; // 44
cout << arr[2]; // 66
cout << arr[3]; // 18
```

⇒ **arr[i] ⇒ *(arr+i) ⇒ i[arr]** same thing

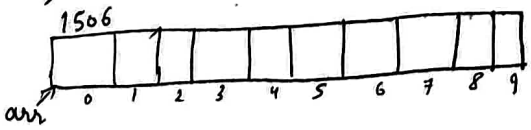
internally *(i+arr) same as *(arr+i).

```
int i = 0;
cout << arr[i];   ⇒ o/p → 12
cout << i[arr];     o/p → 12
cout << *(arr+i);   o/p → 12
cout << *(i+arr);   o/p → 12
```

*arr
↳ value at Base address
*(arr+0)
*(arr[0])

⇒ arr is the pointer to the first location of the array.

```
Int arr[10];
```



⊙ Can we change the base address of the array?

```
arr = arr + 2;
```
⟶ not allowed.

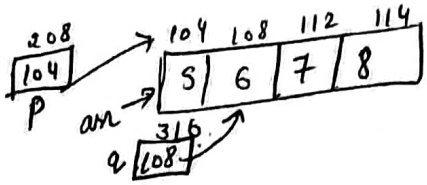
```
int *p = arr;
p = p+1;
```
⟶ allowed.

So we can do this by pointers. (access subpart of an array).

Why we were not able to change by arr = arr + 2;

The address of base address is already mapped with in symbol table, and we can't change entry in pointer. That's why we are not able to change it.

→ int arr[4] = {5, 6, 7, 8};
int *p = arr;
int *q = arr + 1;



→ cout →
arr → 104
&arr → 104
arr[0] → 5
&arr[0] → 104
p → 104
&p → 208
*p → 5
q → 108

&q → 316
*q → 6
*(p)+1 → 5+1 = 6
*(p)+2 → 5+2 = 7
*(q)+3 → 6+3 = 9
*(q+4) → Segmentation fault / garbage value / error.

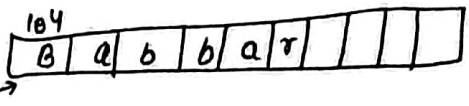
⊙ Difference between Pointer and Array →

	Array	Pointer
1. Size →	int arr[10] sizeof(arr); → 40 bytes	1. int *p = &arr; sizeof(p); → 8 bytes
	cout << sizeof(*p) << endl; → size of integer → 4/2 according to system architecture.	
	Total space taken by array.	Total space taken by pointer.
2.	arr = arr + 1 → X not possible	2. p = p + 1 → possible

arr = 104 cout << arr + 1 108	int *p = arr + 1; p 108	arr = arr + 1; not allowed. error because arr is a constant pointer. You can't change arr's in symbol table.

Character arrays →

char ch[10] = "Babbar";



Char * c = ch; → no difference in ch and &ch.

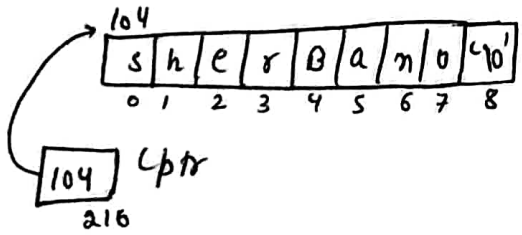
cout << c; → Babbar → why not 104? (The address)

So we observed that cout's behaviour is different for character pointers.

cout << ch; → Babbar
cout << &ch; → Base address → 104
cout << ch[0]; → B
cout << &c; → address of pointer
cout << *c; → B
cout << c; → Babbar.

*c = *(c+0)
= c[0] → B

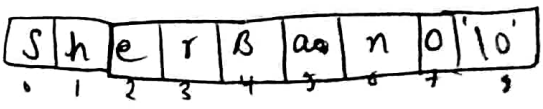
char name[10] = "SherBano";
char* cptr = &name[0];



cout →
name → SherBano
&name → 104
*(name+3) → r
cptr → ~~SherBano~~ SherBano ✓
&cptr → 216
*(cptr+3) → r
cptr+2 → erBano
*cptr → S ⇒ *cptr = *(cptr+0) = cptr[0] = S
cptr+8 → _ ← '\0' ← Null character.

c → whole string (0 to 7 index)

c+2 → 0+2 to 7th index



⊙ Special case →

```
char ch = 'K';
char* cptr = &ch;
cout << cptr;
```

o/p → K A ¢ d x ← Null character encountered.

K will be printed and other garbage value will be printed till it encounters a Null character.

⊙ `char name[10] = "Babbar";` ✓ allowed
`cout << name;` o/p → Babbar
`char* c = "Babbar";` ✓ allowed but BAD Practice.
`cout << c;` o/p → Babbar.

BTS · `char name[10] = "Babbar";`

2 Step process → ←

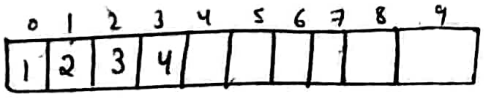
① temporary storage → "Babbar"
② Memory change → copy to name array's storage.

`char* c = "Babbar";` → BAD Practice

2 Step process →

① temp storage → "Babbar"
② c → points to first address of temp storage.

⊙ Pointer with function →




```
main(){
    int arr[10] = { 1, 2, 3, 4 };
    cout << "Size of array is " << sizeof(arr);
    solve(arr);
}
void solve(int arr[]){
    cout << "Size " << sizeof(arr);
}
```

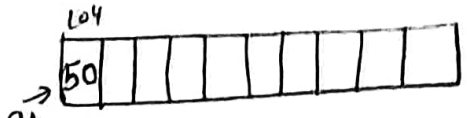
// o/p → 40

o/p → 8

because pointer is passed, not exact array

main()

int arr[10];



sizeof(arr) → 40

solve(int arr[])

104
arr

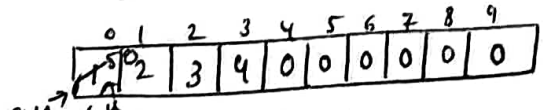
sizeof(arr) → 8

arr[0] = 50 → This will update in actual array.

*(arr+0)

So that's why array is pass by reference (because pointer is passed).

```
main(){
    int arr[10] = {1, 2, 3, 4};
    cout << sizeof(arr);
    for(int i=0; i<10; i++){
        cout << arr[i];
    } cout << "Calling solve fun";
    solve(arr);
    for(int i=0; i<10; i++){
        cout << arr[i];
    }
```



print → 1,2,3,4,0,0,0,0,0,0

print → 50,2,3,4,0,0,0,0,0,0

```
void solve(int arr[]){
    cout << "size" << sizeof(arr);   → 8
    cout << arr;   → 104
    cout << &arr;   → 216
    arr[0] = 50;
}
```

arr[0] = 50

*(arr+0) = arr[0] → 50

Yes, we can have two memory location with same name. (scope is changed.)

Ques → main(){

int a = 5;

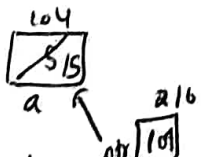
int *ptr = &a;

cout << a; → o/p → 5

solve(ptr);

cout << a; → o/p → 15

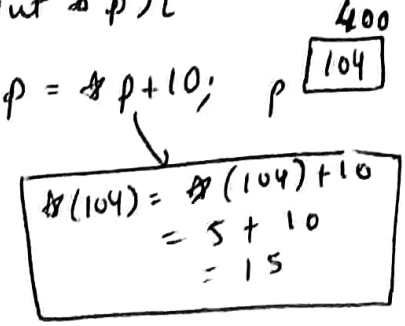
}



solve(int *p){

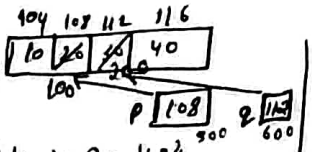
*p = *p + 10;

}



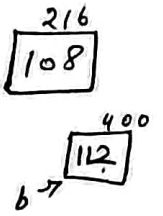
Ques →

```
main(){
    int an[4] = {10,20,30,40};
    int *p = &an[1];
    int *q = &an[2];
    update(p,q);
    //print entire anay.
}
```



o/p → 10, 100, 200, 40

```
update(int *a, int *b){
    *a = 100;
    *b = 200;
}
```



*a = 100 ↓ *(108) → 100

*b = 200 ↓ *(112) → 200

H.W →

Q→ Benefits of all pointer concepts.

Q→ Pointer to function topic, why do we need this?