Pointers

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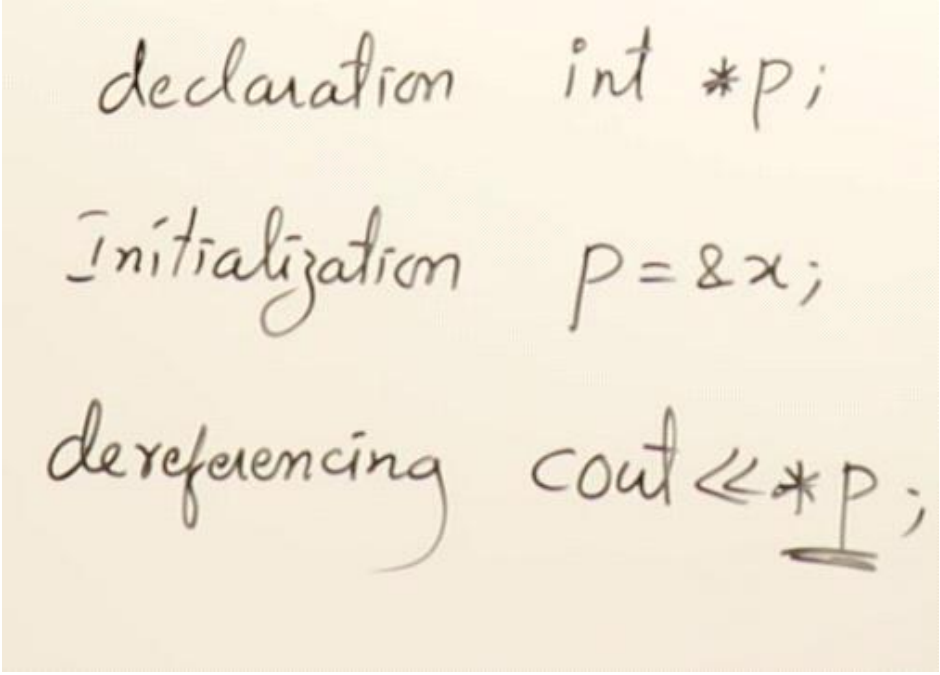
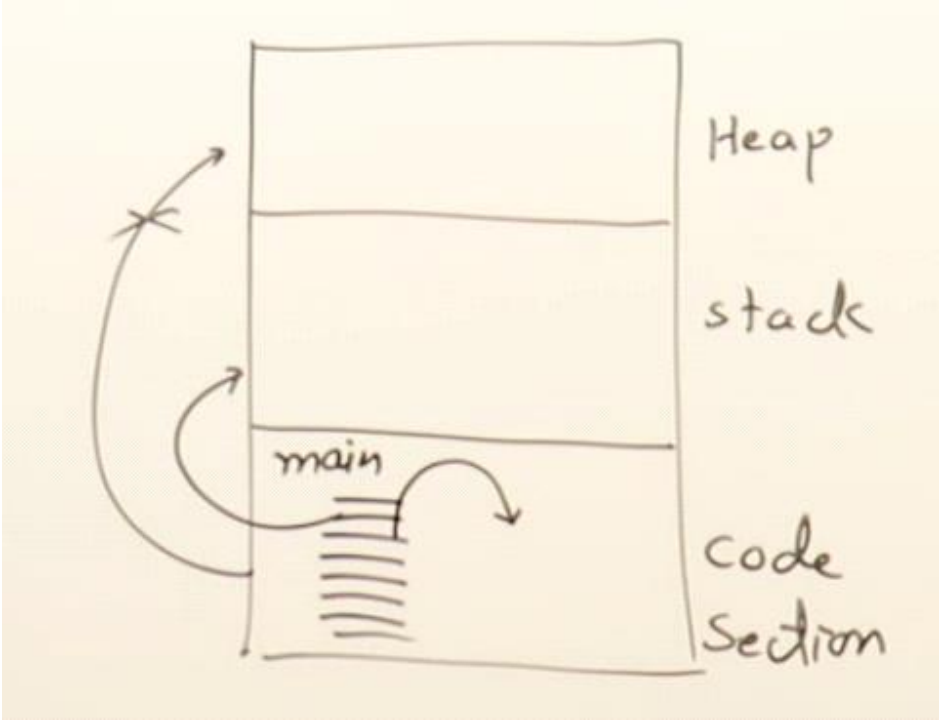
Pointers are basically a variable that stores the address of another variable as a data.



Why Pointers?

As we know our memory is divided into 3 part i.e. main Code section, stack and heap section. Our program can access main and stack section but it cannot access heap section directly. So, we access it indirectly using pointers.



Pointers are also used to access files in program as they cannot be directly accessed by the program.

Even different devices in computers (Like Keyboard, mouse, printer, etc.) are accessed with the help of pointers in Operating System.

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Note : we cannot use System programming with Java, C# as they don't have pointers but we can use System with JVM in Java and common language runtime in C# or .Net .

Heap Memory Allocation

```
#include<iostream>
using namespace std;
int main() {
    int* p, *q;
    p = (int*)malloc(sizeof(int) * 5); // C-Style
    q = new int[5]; // C++ Style
    for (int i = 0; i < 5; i++){
        p[i] = i*i;
        q[i] = i;
    }
    for (int i = 0; i < 5; i++){
        cout<<p[i]<<" "; // 0 1 4 9 16
    }
    free(p);
    delete[] q;
    return 0;
}
```

Pointer Arithmetic

```
#include<iostream>
using namespace std;
int main() {
    int arr[5] = {1,2,3,4,5};
    int *p = arr;
    for (int i = 0; i < 5; i++){
        cout<<*p + i<<endl;
    }
    return 0;
}
```

Problems with pointer

1. Pointers that are not initialized properly
   - *wild pointers*
2. Pointers that store the address of memory no longer allocated
   - *dangling pointers*
3. Losing the address of memory allocated to your program
   - *memory leaks*

Pointer to a Function W/O Arguments

```
#include<iostream>
using namespace std;
void diplay(){
    cout<<"Hello World"<<endl;
}
```

```
int main() {
    void (*fn)(); // initialization
    fn = diplay; //declaration
    (*fn)(); // Calling
    return 0;
}
```

Pointer to a Function With Arguments

```
#include<iostream>
#include<string>
using namespace std;
void diplay(int age, string name){
    cout<<"Hello "<<name<<endl;
}
int main() {
    void (*fn)(int, string); // initialization Don't give x, y arg name
    fn = diplay; //declaration
    (*fn)(20, "Sachin"); // Calling
    return 0;
}
```