

# Memory Management

## TABLE OF CONTENTS

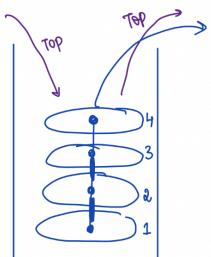
1. Introduction to stack
2. Types of memory
3. How arrays are stored?
4. Questions



## Introduction to stack



Idli Cooker



- 1. can insert and remove from Top
- 2. only have access to the top plate

LIFO → Last In First Out

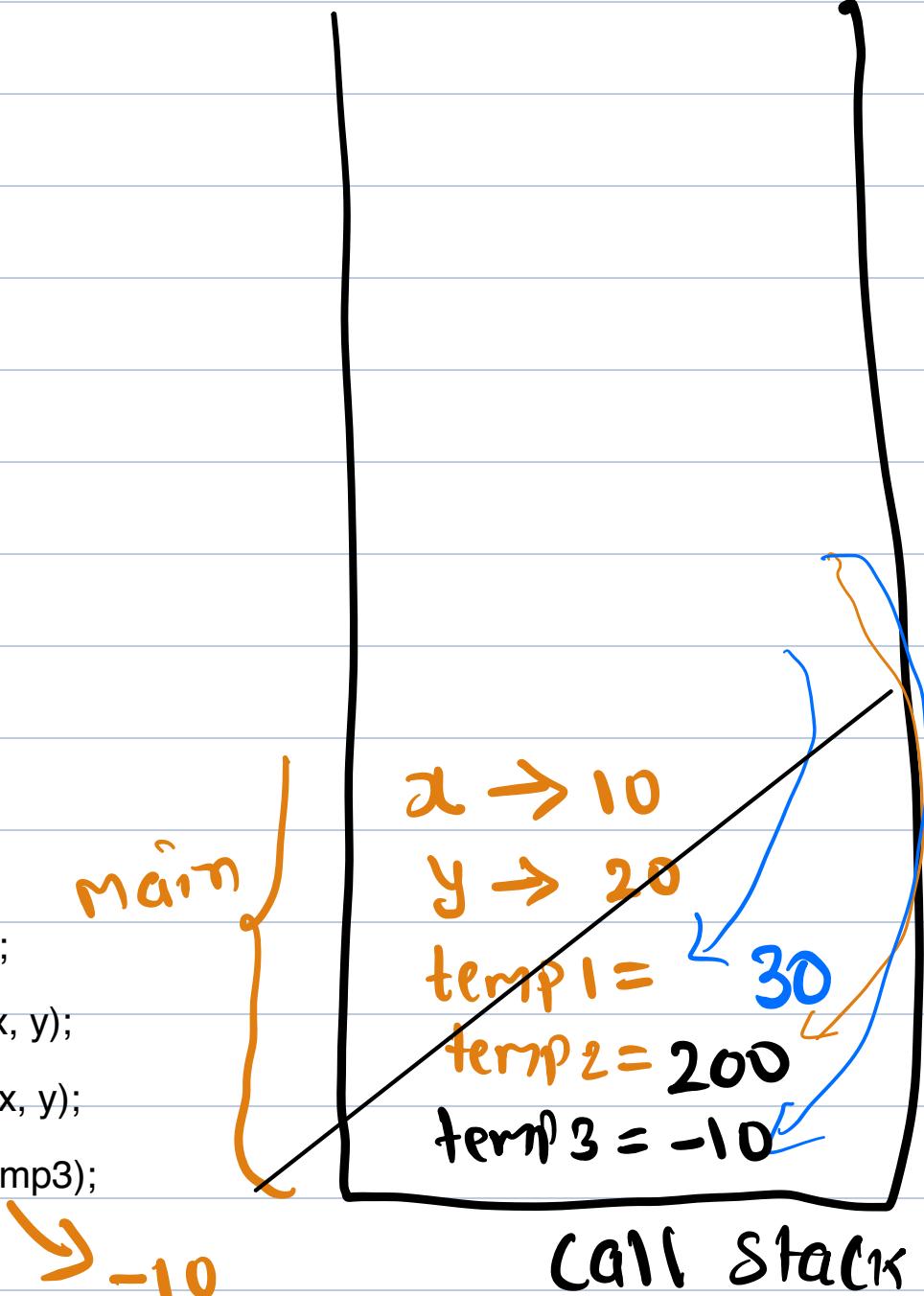


```
int add (int x, int y) {  
    return x + y;  
}
```

```
int product (int x, int y) {  
    return x * y;  
}
```

```
int subtract (int x, int y) {  
    return x - y;  
}
```

```
public static void main() {  
    ✓ int x = 10;  
    ✓ int y = 20;  
    ✓ int temp1 = add (x, y);  
    ✓ int temp2 = product (x, y);  
    ✓ int temp3 = subtract (x, y);  
    System.out.println (temp3);  
}
```





```
static int add (int x, int y) {  
    return x + y;  
}
```

extra  
q

w → 300

```
static int fun (int a, int b) {  
    int sum = add (a, b);  
    int ans = sum * 10;  
    return ans;  
}
```

add  
q

x → 10 y → 20

return 10 \* 20

300

```
static void extra (int w) {  
    System.out.println ("Hello");  
    System.out.println (w);  
}
```

fun

a → 10 b → 20  
sum = 30  
ans = 300

300

```
public static void main() {  
    ✓ int x = 10;  
    ✓ int y = 20;  
    ✓ int z = fun (x, y);  
    ✓ System.out.println (z);  
    ✓ extra(z);  
}
```

main

x → 10  
y → 20  
z = 300

300

Stack

O/P: 300  
Hello  
300



Object : User define container to store data.



House.

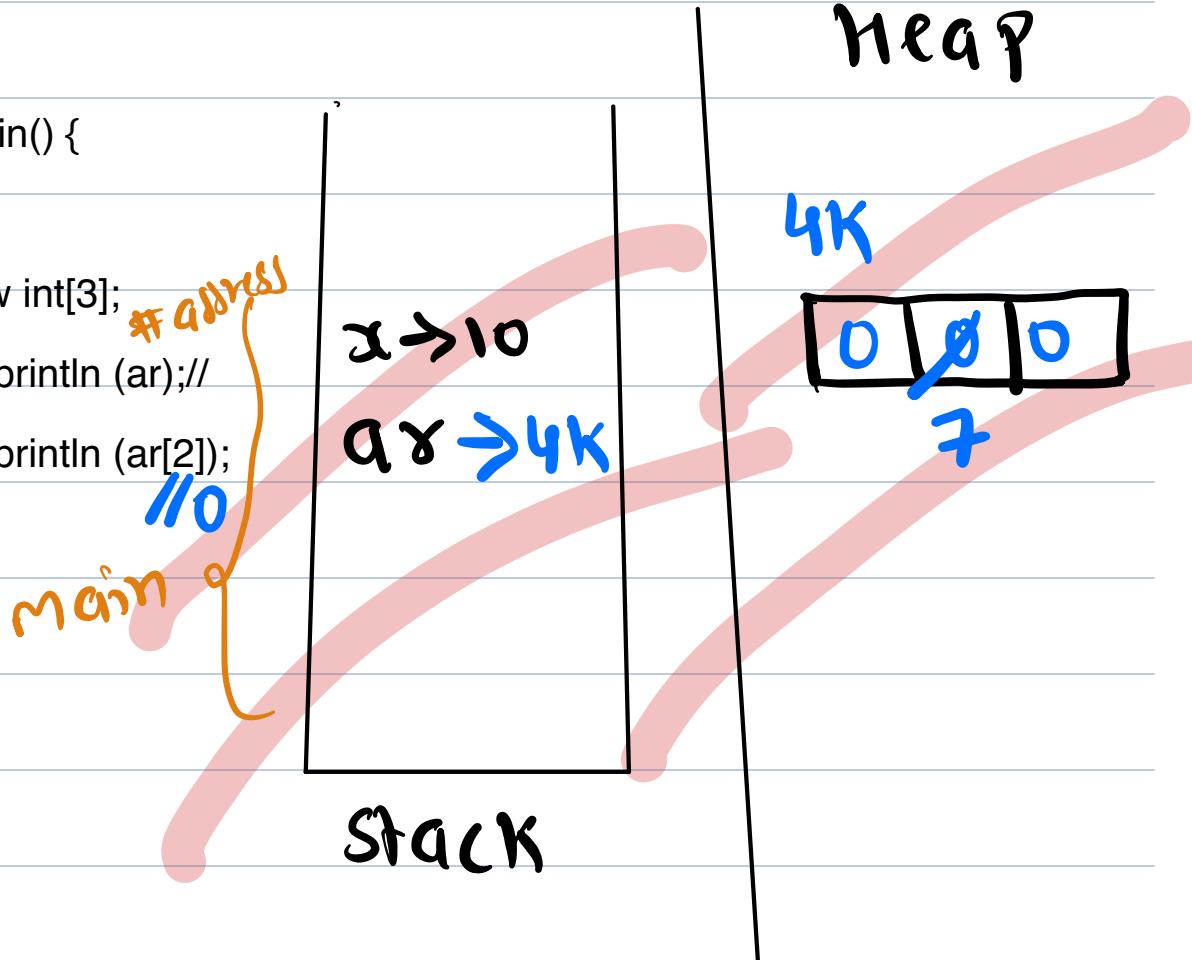
## Types of Memory

Stack → All primitive datatype (int, double, char etc.) and reference variable are stored.

Heap → The data pointed by the reference variable is stored in heap like array, ArrayList, dynamic etc.

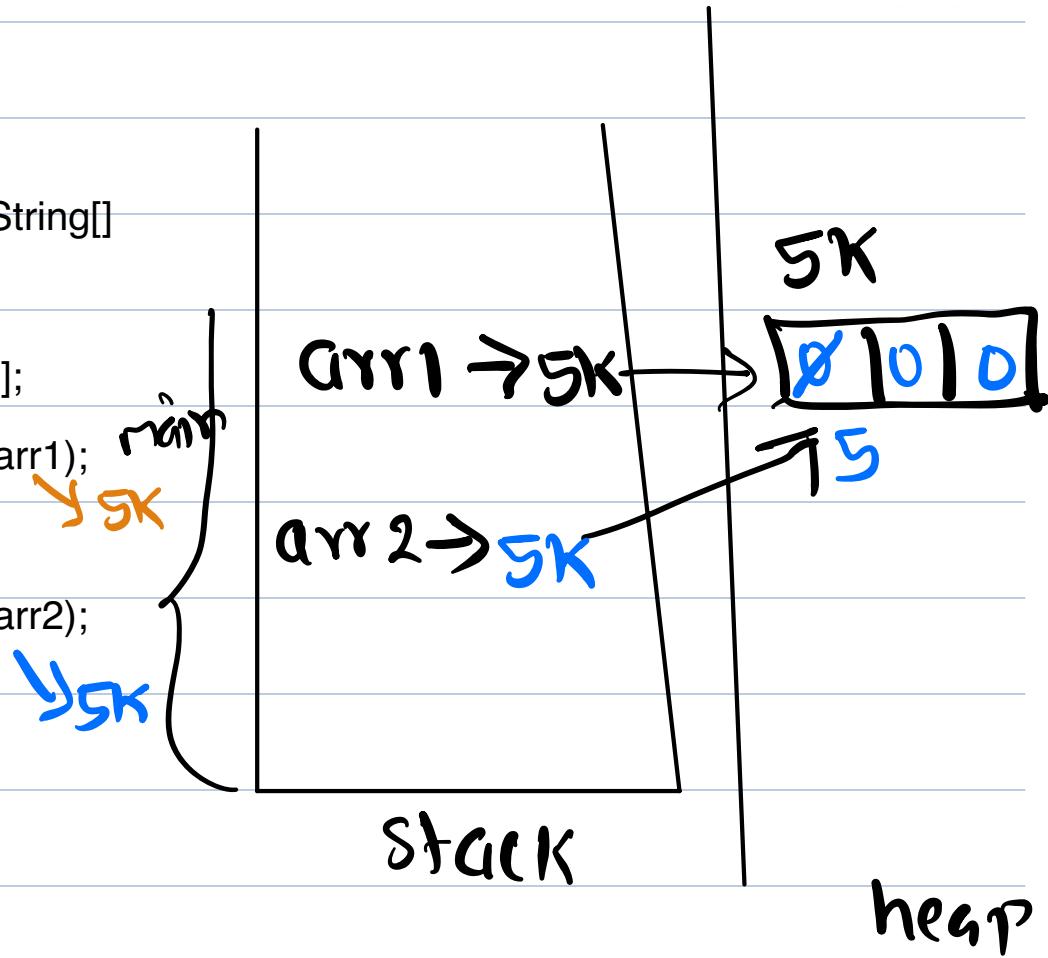


```
public static void main() {  
    ✓ int x = 10;  
    ✓ int[] ar = new int[3];  
    ✓ System.out.println (ar); //  
    ✓ System.out.println (ar[2]);  
    ar[1] = 7;  
}  
  
main ↗  
    ↗ addrs  
    ↗ 10  
    ↗ 4K  
    ↗ 7
```





```
public class Main() {  
    public static void main(String[] args) {  
        ✓ int[] arr1 = new int[3];  
        ✓ System.out.println (arr1);  
        int[] arr2 = arr1;  
        System.out.println (arr2);  
    }  
}
```



$\text{arr1}[0] = 5$   
 $\text{print}(\text{arr2}[0]); \rightarrow 5$



```
public static void main(String[] args) {
```

✓ int[] arr = new int[3];

✓ System.out.println (arr); // 4K

✓ arr[1] = 10;

✓ arr[2] = 20;

✓ System.out.println (arr[1]); // 10

✓ System.out.println (arr[2]); // 20

✓ arr = new int[5];

✓ System.out.println (arr); // print

different address

// 8K

✓ System.out.println (arr[1]); // 0 ✓

✓ System.out.println (arr[2]); // 0 ✓

}

Stack

arr → 4K

8K

Heap

4K



10 20

8K

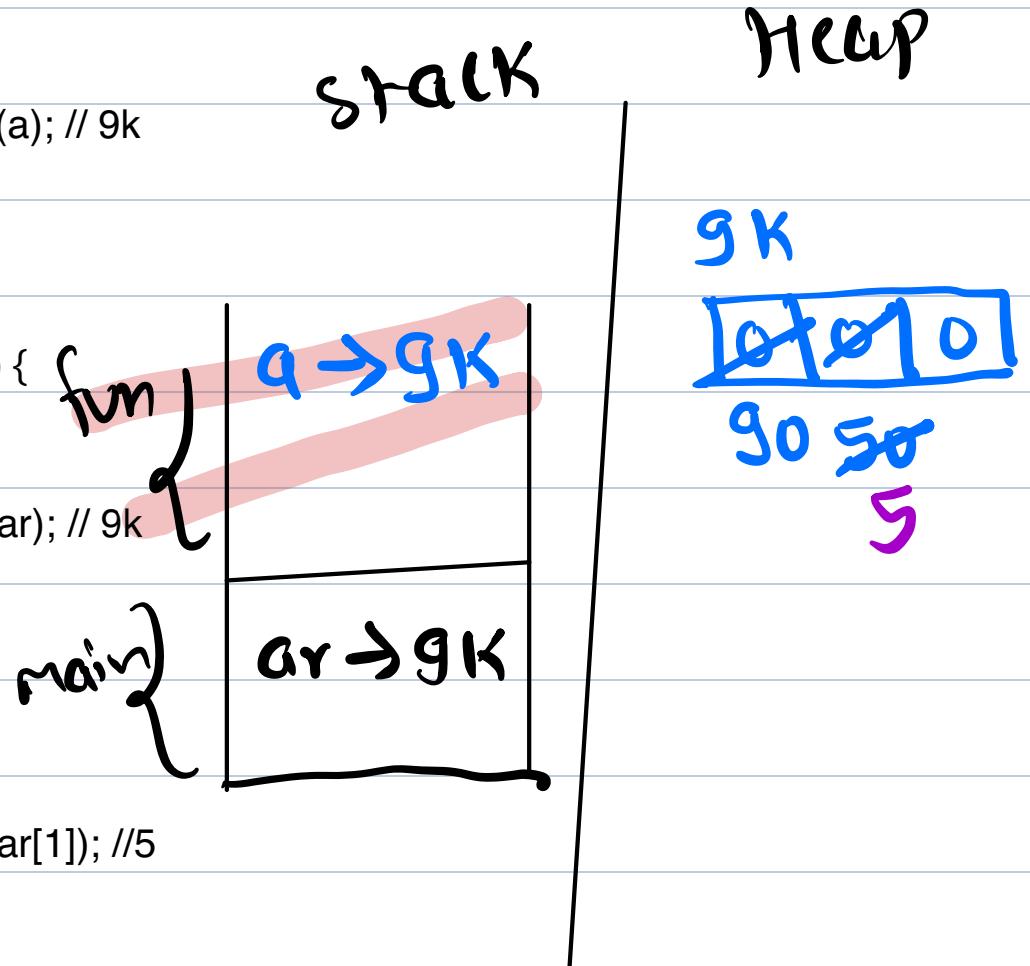


0 0 0 0



```
static void fun (int [] a) {  
    System.out.println (a); // 9k  
    a[1] = 5;  
}
```

```
public static void main() {  
    ✓ int[] ar = new int[3];  
    ✓ System.out.println (ar); // 9k  
    ✓ ar[0] = 90;  
    ✓ ar[1] = 50;  
    ✓ fun(ar);  
    ✓ System.out.println (ar[1]); // 5
```



Stack

Heap



```
static void change (int a) {  
    a = 50;  
}
```

```
public static void main(String  
args[]) {
```

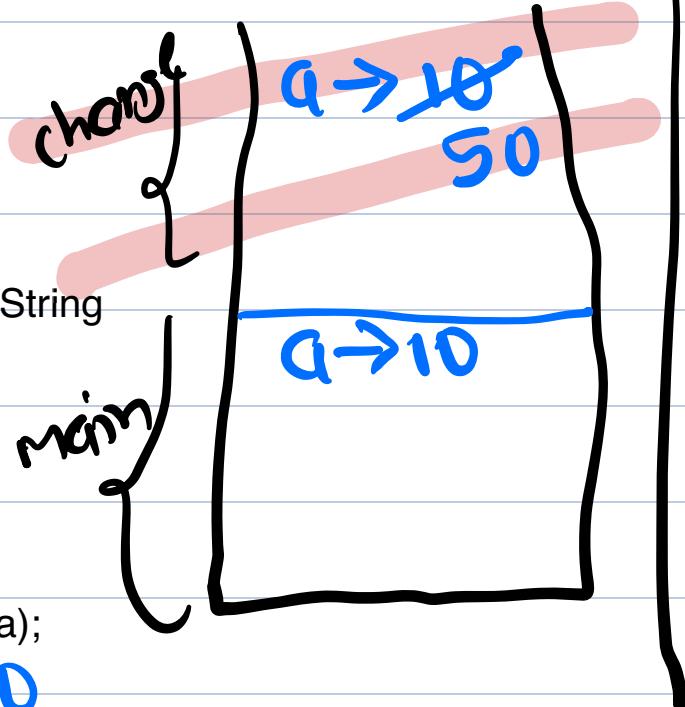
✓ int a = 10;

✓ change(a);

```
    System.out.println(a);
```

```
}
```

10



Heap

(int[] a)

```
static void change (int[] a) {
```

```
    a[0] = 50;
```

```
}
```

```
public static void main(String  
args[]) {
```

✓ int[] a = {10};

✓ change(a);

```
    System.out.println (a[0]);
```

```
}
```

|| 50

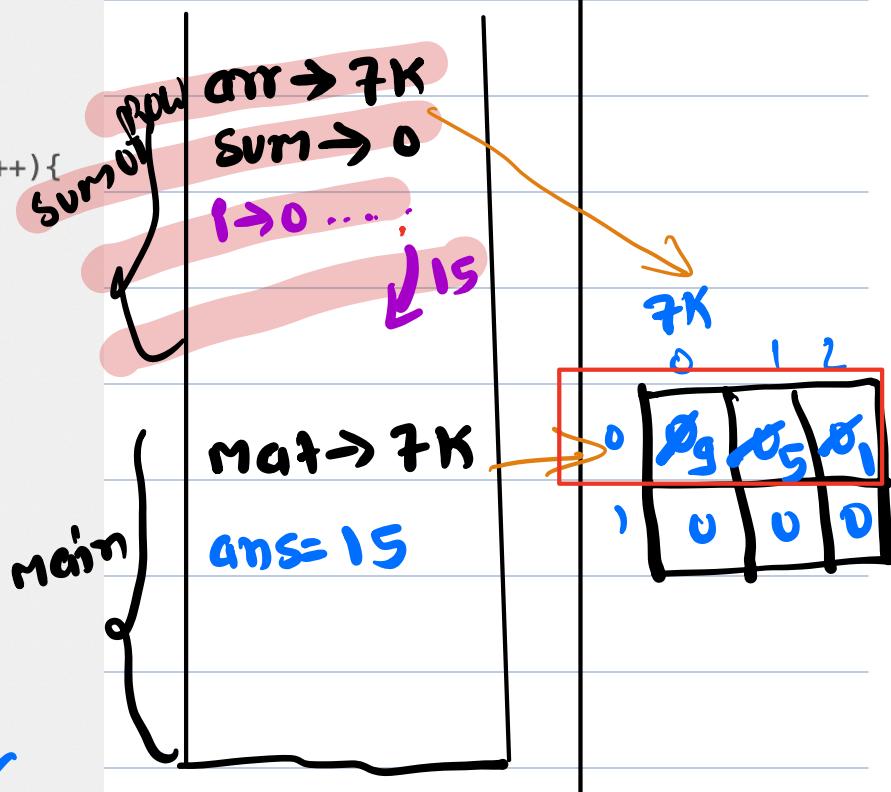


Heap

4K

8/20

```
static int sumOfRow(int[] arr){  
    System.out.println(arr); // 7k  
    int sum = 0;  
    for (int i = 0; i < arr.length; i++){  
        sum = sum + arr[i];  
    }  
    return sum;  
}  
  
public static void main() {  
    ✓ int[][] mat = new int[2][3];  
    ✓ mat[0][0] = 9;  
    ✓ mat[0][1] = 5;  
    ✓ mat[0][2] = 1;  
    ✓ int ans = sumOfRow(mat[0]); // 7k  
    ✓ System.out.println(ans); // 15 ✓  
}
```



Break: 10:35 PM

# Ques

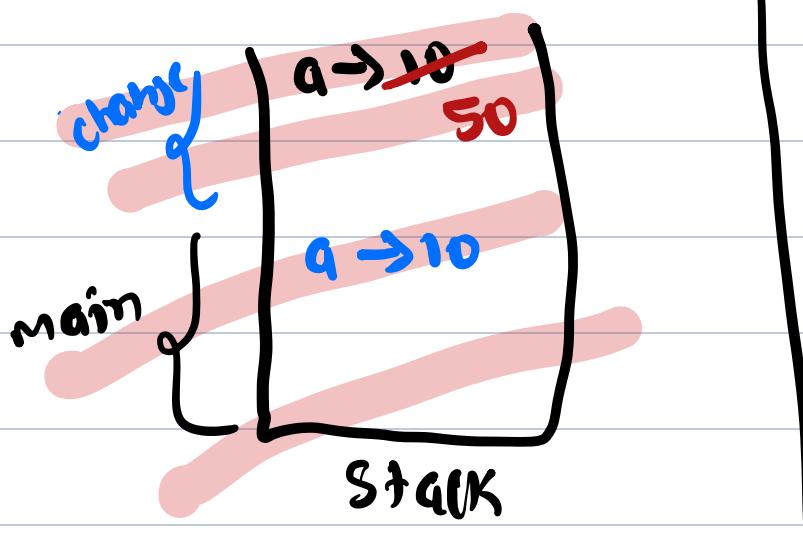
## Java

```
static void change(int a) {  
    a = 50;  
}  
  
public static void main(String args[]) {  
    ✓ int a = 10;  
    ✓ change(a);  
    System.out.println(a); → 10  
}
```

## Python

```
def change(a):  
    a = 50  
  
def main():  
    a = 10  
    change(a)  
    print(a)  
  
if __name__ == "__main__":  
    main()
```

Ans



## Quiz 2:

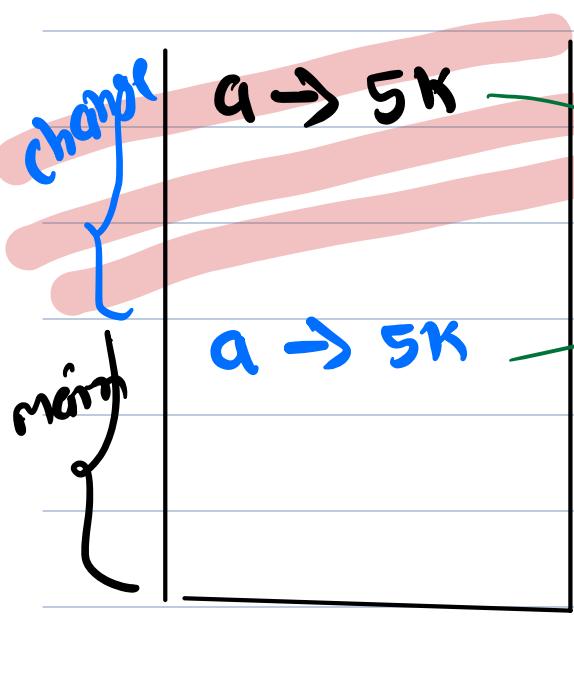
### Java

```
static void change(int[]a) {  
    a[0] = 50;  
}  
  
public static void main(String args[]) {  
    ✓ int[]a = {10};  
    ✓ change(a);  
    ✓ System.out.println(a[0]); → 50  
}
```

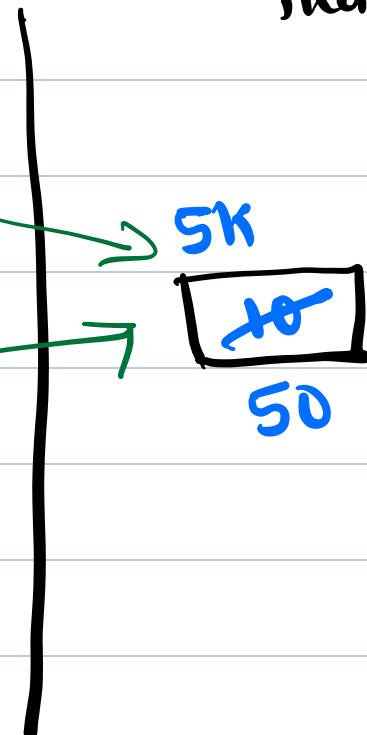
### Python

```
def change(a):  
    a[0] = 50  
  
def main():  
    a = [10]  
    change(a)  
    print(a[0])  
  
if __name__ == "__main__":  
    main()
```

### Stack



### Heap



# Quiz 3

**Java**

```

static void test(int[]a) {
    a = new int[1];
    a[0] = 50;
}

public static void main(String args[]) {
    ✓ int[]a = {10};
    ✓ test(a);
    ✓ System.out.println(a[0]); //10
}

```

**Python**

```

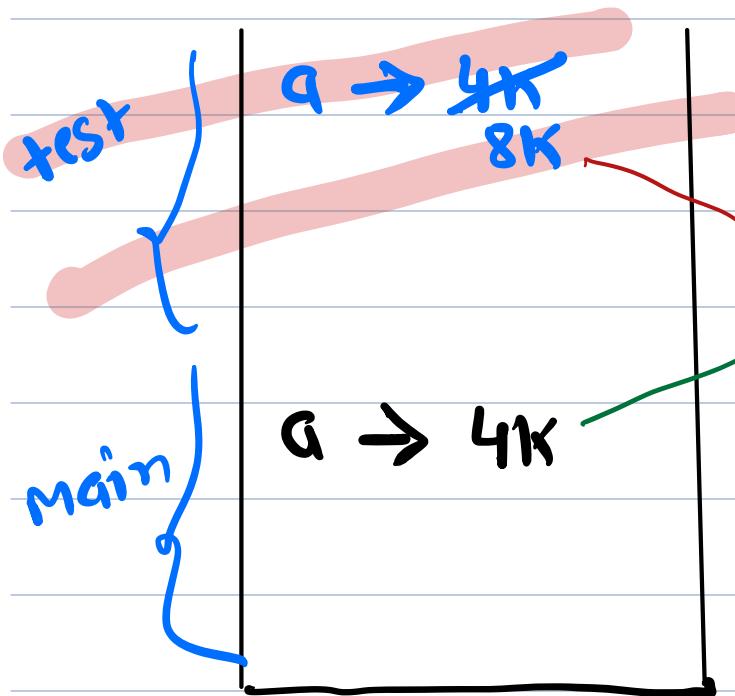
def test(a):
    a = [0]
    a[0] = 50

def main():
    a = [10]
    test(a)
    print(a[0])

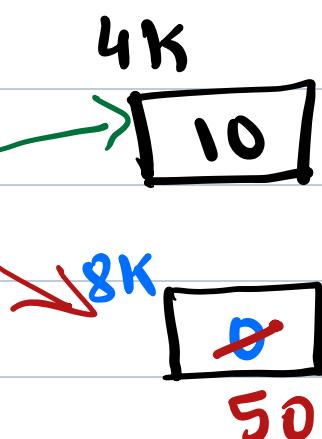
if __name__ == "__main__":
    main()

```

**Stack**



**Heap**



# Quiz 4

## Java

```

static void fun(int[] a) {
    a = new int[1];
    a[0] = 100;
}

public static void main() {
    ✓ int[] a = {10, 20, 30};
    ✓ fun(a);
    ✓ System.out.println(a[0]); // 10
}

```

## Python

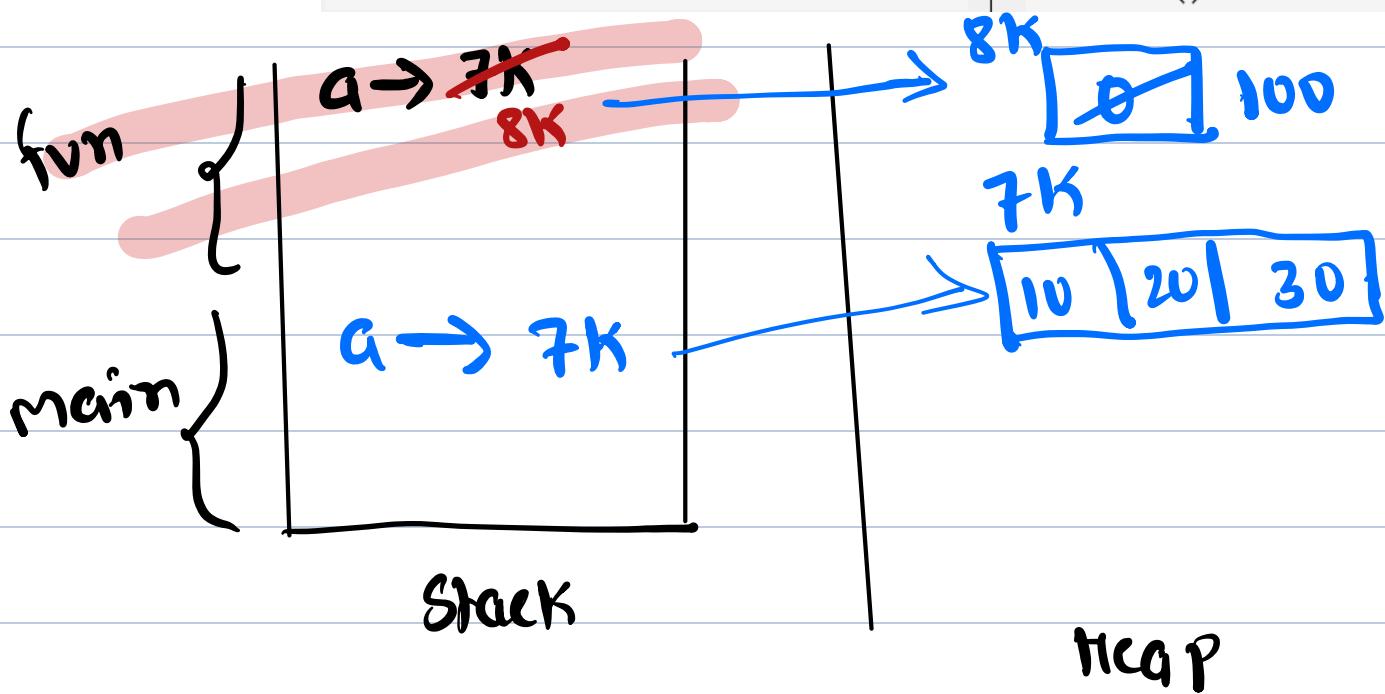
```

def fun(a):
    a = [0]
    a[0] = 100

def main():
    a = [10, 20, 30]
    fun(a)
    print(a[0])

if __name__ == "__main__":
    main()

```



# Quiz 5

## Java

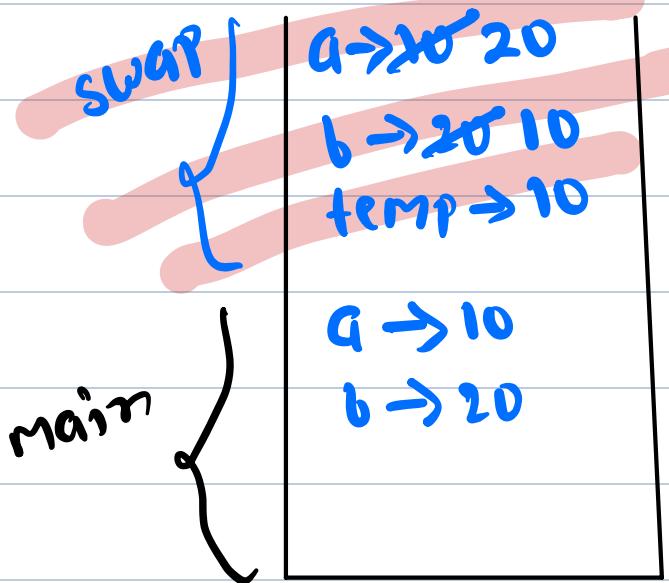
```
static void swap(int a,int b) {  
    int temp = a;  
    a = b;  
    b = temp;  
}  
  
public static void main(String args[]) {  
    ✓ int a = 10;  
    ✓ int b = 20;  
    ✓ swap(a,b);  
    System.out.println(a + " " + b);  
}
```

10      20

## Python

```
def swap(a, b):  
    temp = a  
    a = b  
    b = temp  
  
def main():  
    a = 10  
    b = 20  
    swap(a, b)  
    print(a, b)  
  
if __name__ == "__main__":  
    main()
```

## Stack



## Heap

# Quib :

```

Java
static void swap(int[] a, int[] b) {
    int temp = a[0];
    a[0] = b[0];
    b[0] = temp;
}

public static void main(String args[]) {
    int[] a = {10};
    int[] b = {20};
    swap(a, b);
    System.out.println(a[0] + " " + b[0]);
}

```

```

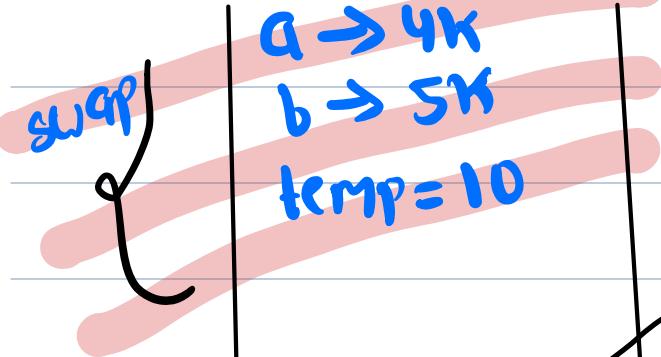
Python
def swap(a, b):
    temp = a[0]
    a[0] = b[0]
    b[0] = temp

def main():
    a = [10]
    b = [20]
    swap(a, b)
    print(a[0], b[0])

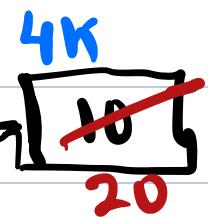
if __name__ == "__main__":
    main()

```

Stack

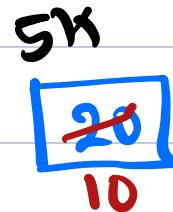


Heap



main

a → 4K  
b → 5K



# Quiz 7!

## Java

```
static int[] fun(int[]a) {
    a = new int[2];
    a[0] = 50; a[1] = 60;
    return a;
}

public static void main(String args[]) {
    ✓int[]a = {10,20,30};
    ✓a = fun(a);
    ✓System.out.println(a[0]);
}
```

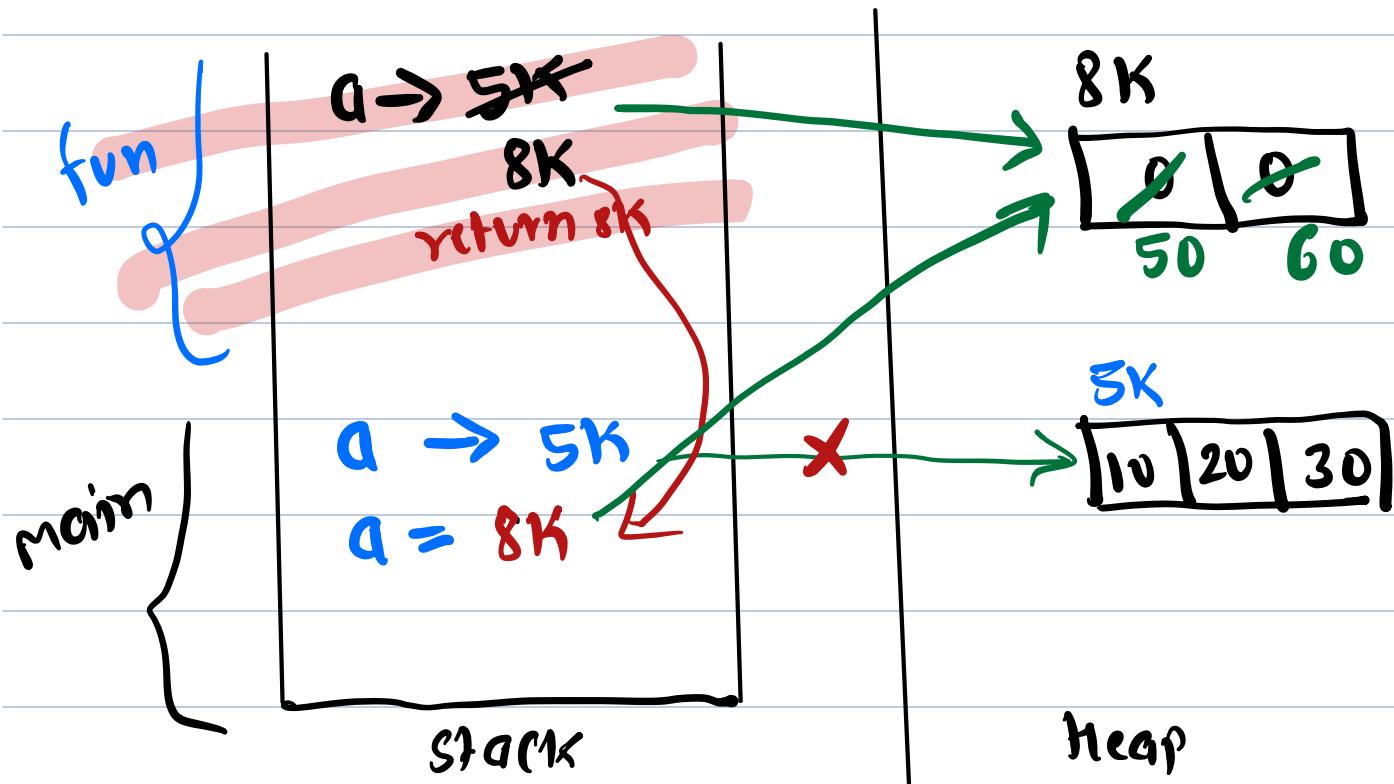
50 → 8K

## Python

```
def fun(a):
    a = [0, 0]
    a[0] = 50
    a[1] = 60
    return a

def main():
    a = [10, 20, 30]
    a = fun(a)
    print(a[0])

if __name__ == "__main__":
    main()
```



## Quiz 8

### Java

```

static void test(int[]a) {
    a = new int[2];
    a[0] = 94;
}

public static void main(String args[]) {
    ✓ int[]a = {10,20,30};
    ✓ test(a);
    ✓ System.out.println(a[0]); 1110
}

```

### Python

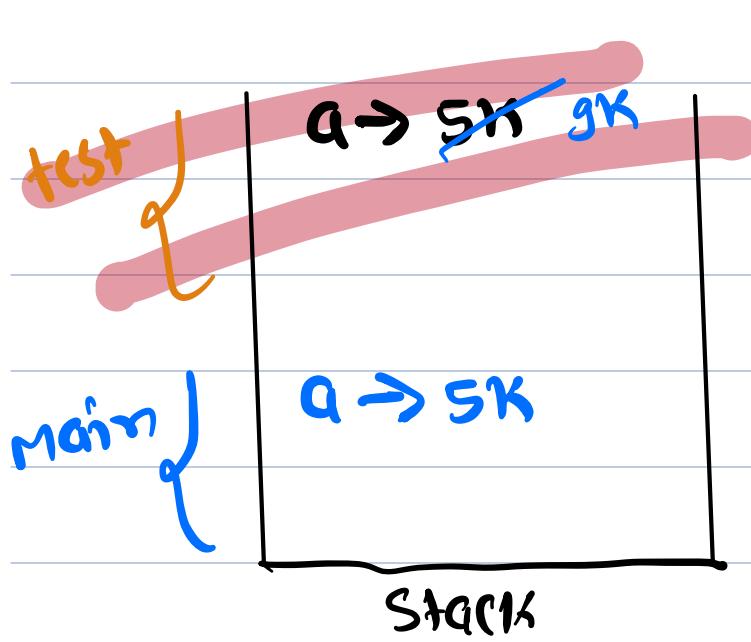
```

def test(a):
    a = [0, 0]
    a[0] = 94

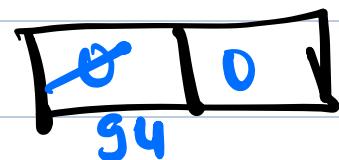
def main():
    a = [10, 20, 30]
    test(a)
    print(a[0])

if __name__ == "__main__":
    main()

```



gK



SK



Heap

Doubt session

## Java

```
static void test(int[] a) {  
    b = new int[2];  
    b[0] = 94;  
}  
  
public static void main(String args[]) {  
    int[] a = {10, 20, 30};  
    test(a);  
    System.out.println(a[0]);  
}
```

## Python

```
def test(a):  
    a = [0, 0]  
    a[0] = 94  
  
def main():  
    a = [10, 20, 30]  
    test(a)  
    print(a[0])  
  
if __name__ == "__main__":  
    main()
```

