Memory Management

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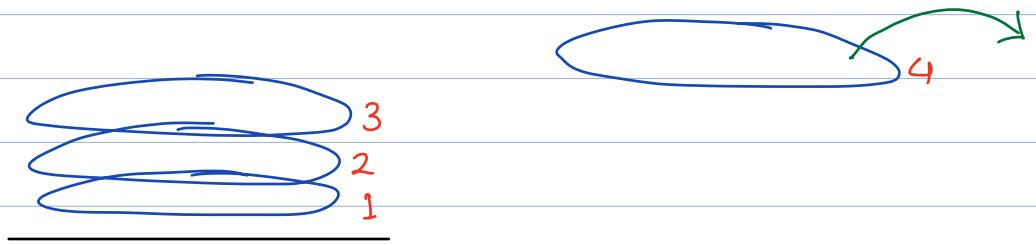
- Introduction to call stack
- Types of memory
- Quizes.

LIFO

Last in first Out.



which plate was placed last ? plate 4 Last In

which plate will be removed first ? plate 4 First out

→ Stack —— LIFO

Egs CD disk containers

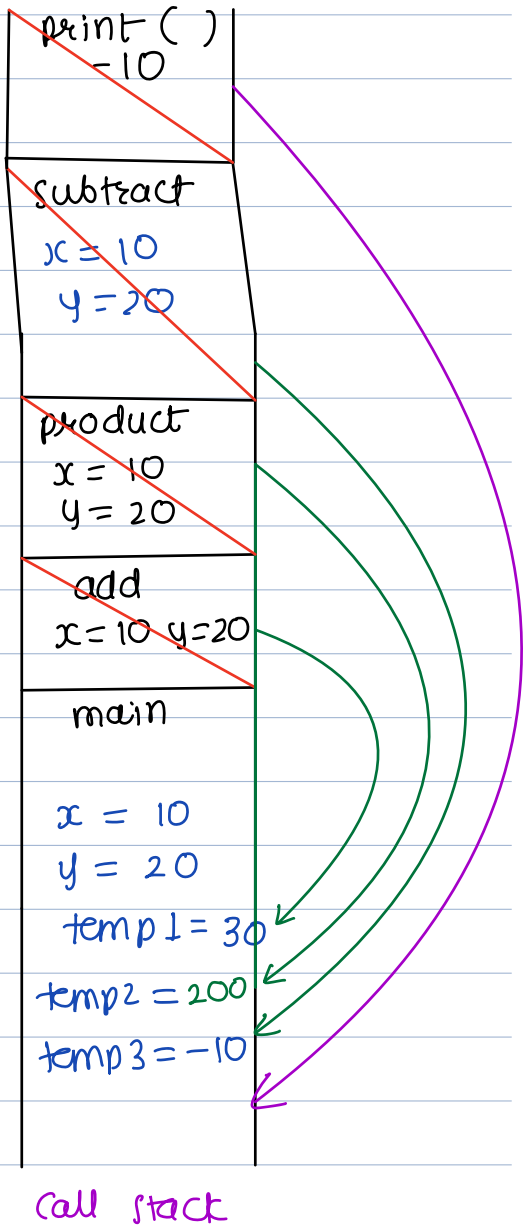
Chairs on top of each other.

Pack of tennis balls or shuttle

Introduction to call stack

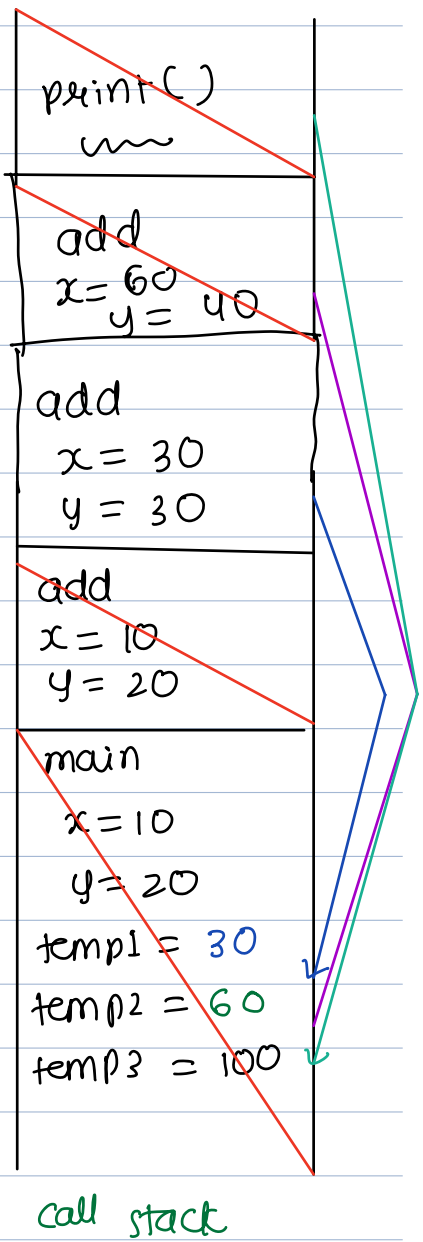
Call stack stores function call in LIFO manner.

```
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
}

main () {
    int x = 10
    int y = 20
    int temp1 = add(x, y)
    int temp2 = product(x, y)
    int temp3 = subtract(x, y)
    print (temp3)
}
```



Call stack

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

main () {
    int x = 10 ✓
    int y = 20 ✓
    int temp1 = add(x, y)
    int temp2 = add(temp1, 30)
    int temp3 = add(temp2, 40)
    print(temp3)
}
```



call stack

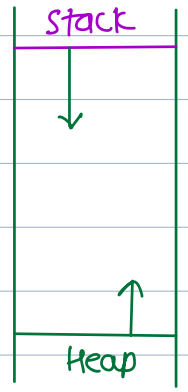
Types of memory

Stack

Any primitive data types, reference variables....

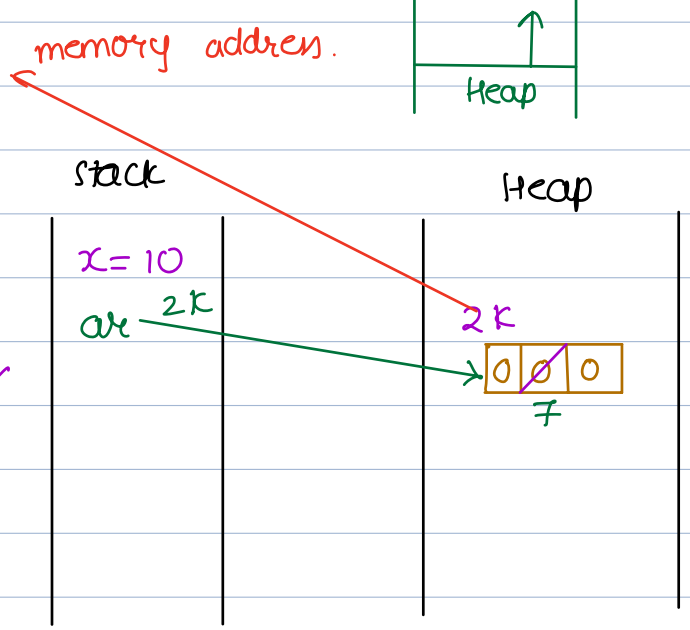
Heap

Object, Array, ArrayList etc....



Eg

```
main () {
    int x = 10 ✓
    int [] ar = new int [3] ✓
    print (ar) ✓ // 2K
    print (ar[2]) // 0
    ar[1] = 7 ✓
}
```

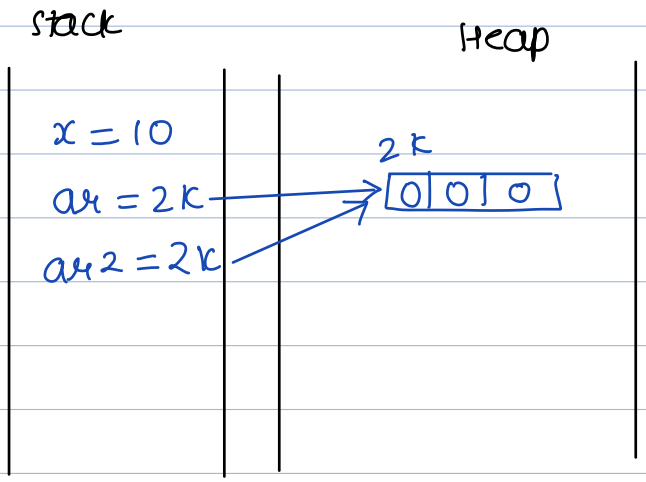


primitive data types { stack ✓ or Heap }

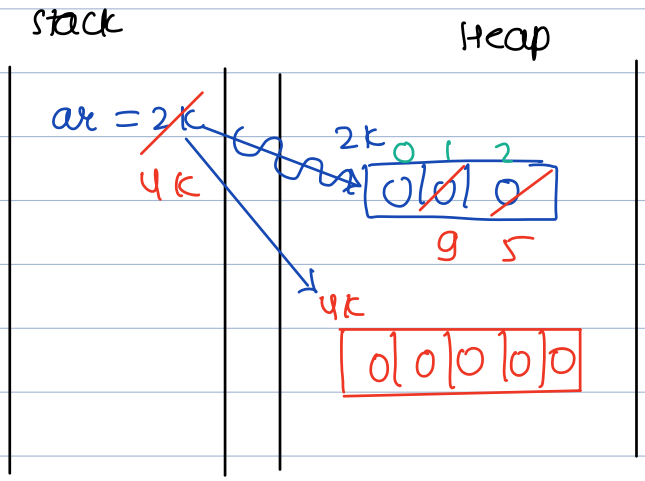
Reference / address { stack ✓ or Heap }

Container / Array / ArrayList { stack or Heap ✓ }

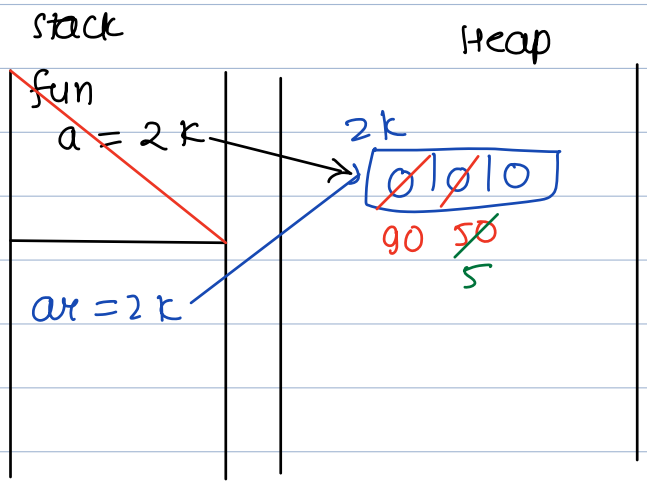
```
main () {
    int x = 10 ✓
    int[] ar = new int[3] ✓
    int[] ar2 = ar
    print(ar) ✓ // 2K
    print(ar2) // 2K
}
```



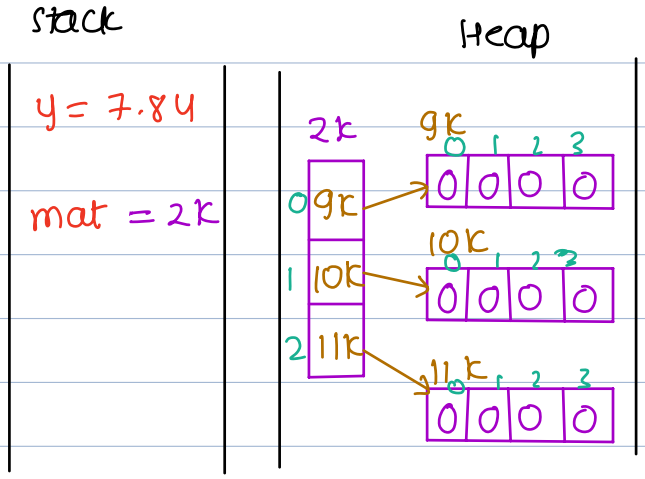

```
main () {
    int[] ar = new int[3] ✓
    print(ar) // 2K
    ar[1] = 9 ✓
    ar[2] = 5 ✓
    ar = new int[5] ✓
    print(ar) // 4K
}
```



```
void fun(int[] a) {
    print(a) ✓ // 2K
    a[1] = 5 ✓
}

main {
    int[] ar = new int[3] ✓
    print(ar) ✓ // 2K
    ar[0] = 90 ✓
    ar[1] = 50 ✓
    fun(ar) ✓
    print(ar[1]) // 5
}
```

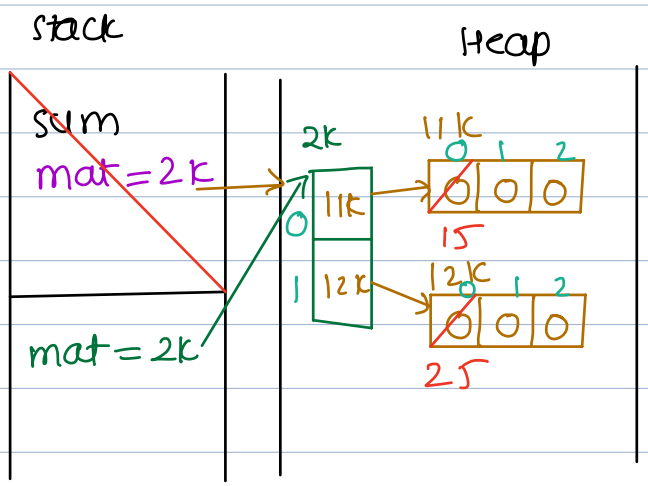



```
main() {
    float y = 7.84f ✓
    int[][] mat = int[3][4]
    print(mat) ✓ // 2K
    print(mat[1]) // 10K
    print(mat[1][3])
                // 0
}
```



```
void sum(int[][] mat) {
    print(mat)
    print(mat[0][0] + mat[1][0])  // 40
}
```

```
main() {
    mat = new int[2][3]  ✓
    mat[0][0] = 15
    mat[1][0] = 25
    sum(mat)
}
```



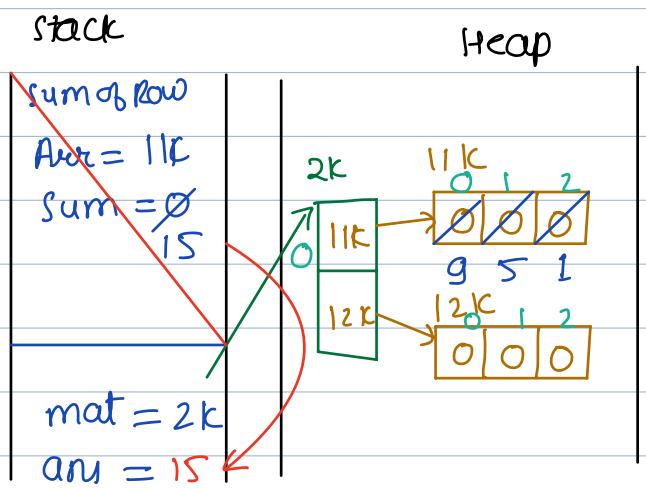
```
int sumRow(int[] arr) {
    print(arr) // 11K
    int sum = 0
    for i ⟶ 0 to arr.length - 1 {
        sum += arr[i]
    }
    return sum
}
```

11K

```
main() {
    int[][] mat = new int[2][3]
    mat[0][0] = 9
    mat[0][1] = 5
    mat[0][2] = 1
    ans = sumofRow(mat[0])
    print(ans) // 15
}
```

11K

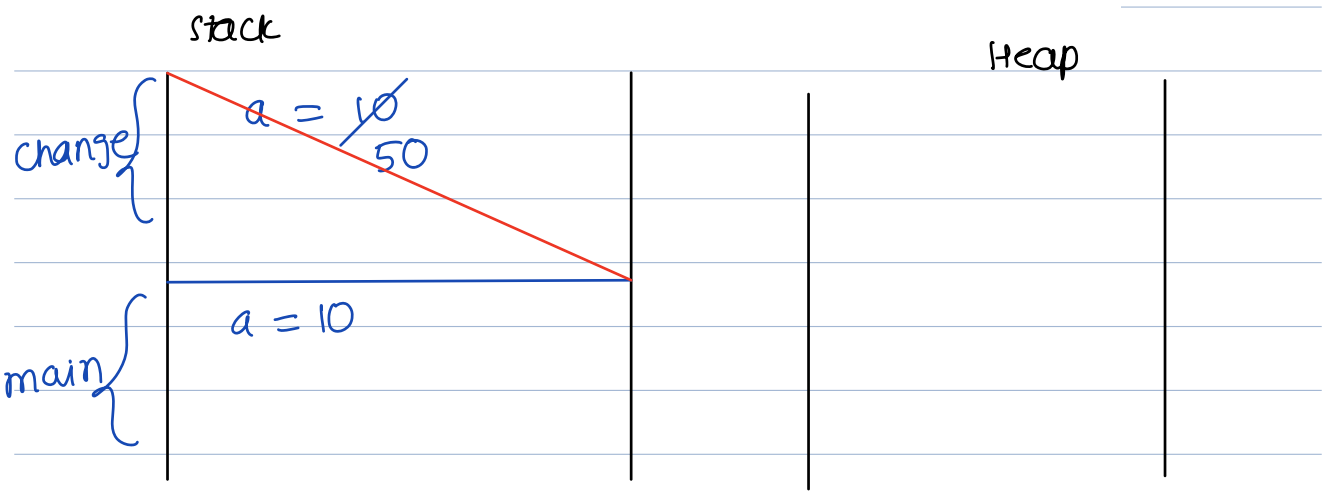
Break : 22:40



4. Quiz 1

Predict the Output :

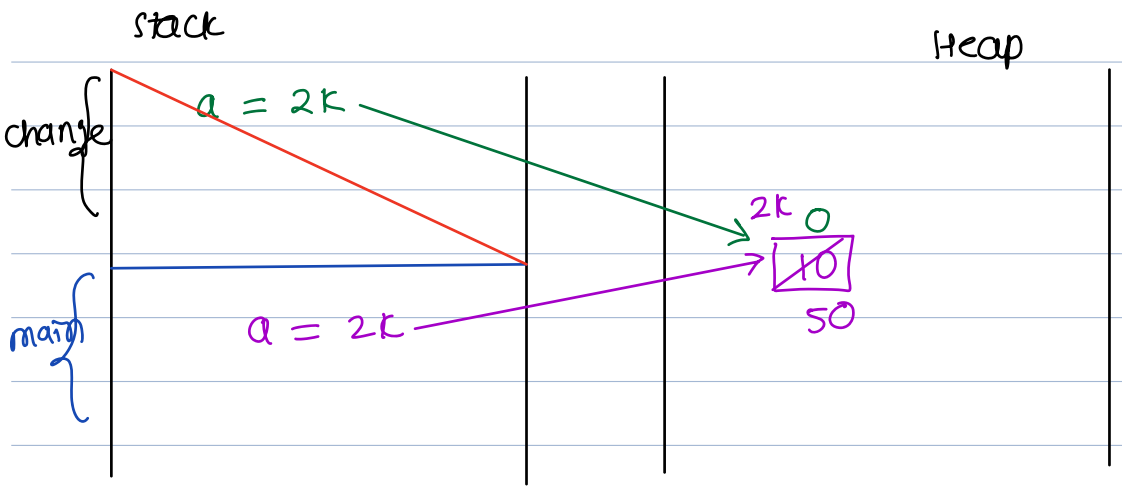
```
static void change(int a) {
    a = 50;
}

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



6. Quiz 2

Predict the output :

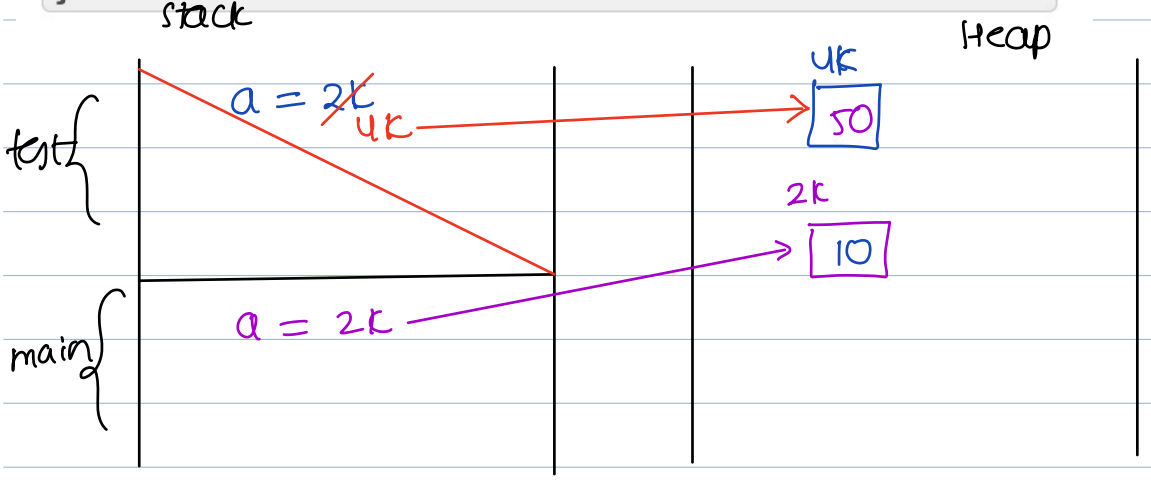
```
static void change(int[]a) {
    a[0] = 50;
}

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



8. Quiz 3

Predict the output :

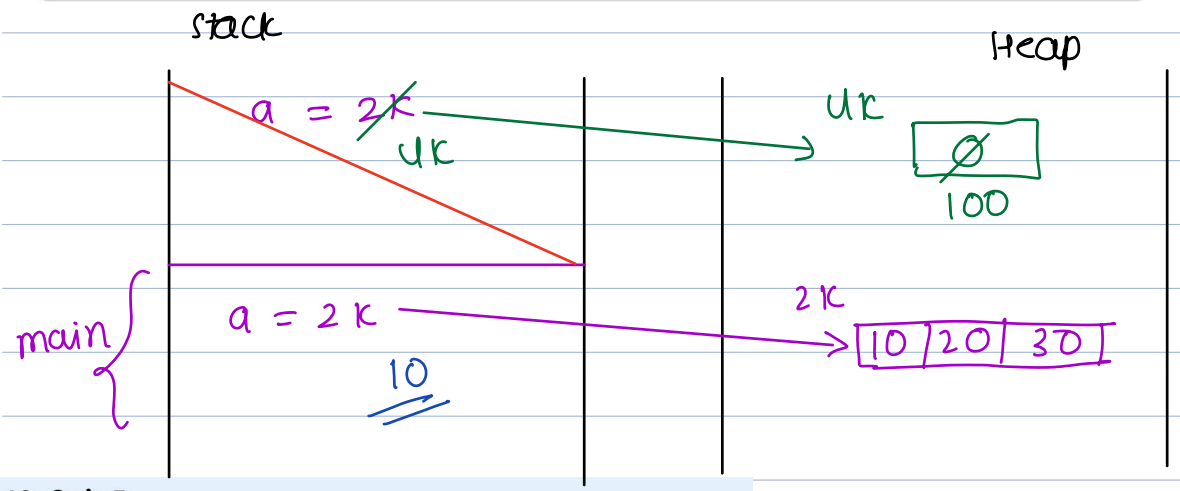
```
static void test(int[]a) {
    a = new int[1];
    a[0] = 50;
}

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



10. Quiz 4

Predict the output:

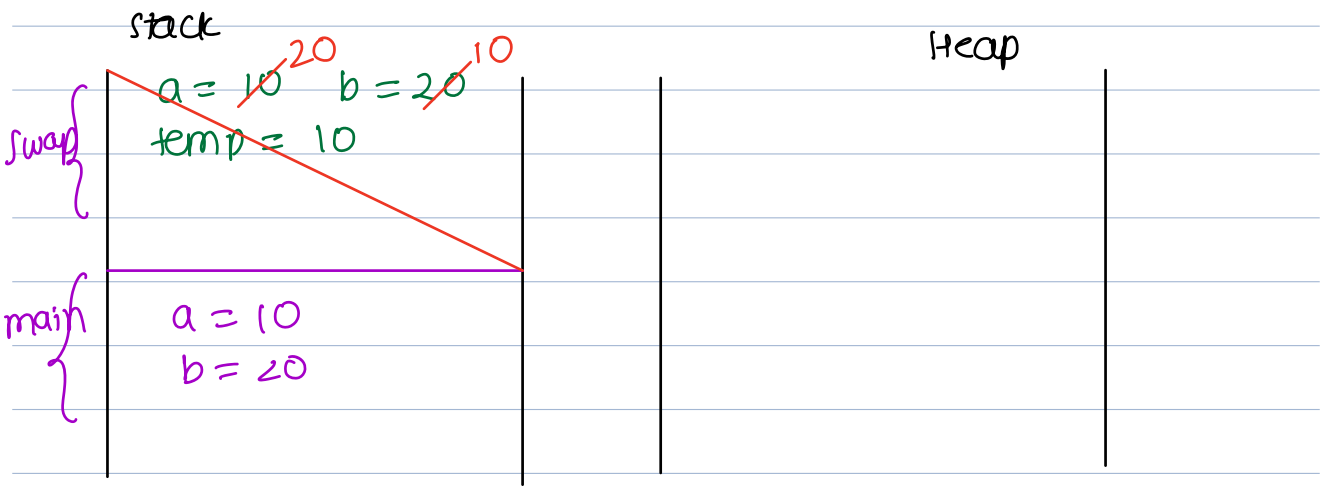
```
static void fun(int[] a) {
    a = new int[1];
    a[0] = 100;
}
public static void main() {
    int[] a = {10, 20, 30};
    fun(a);
    System.out.println(a[0]);
}
```



12. Quiz 5

Predict the output :

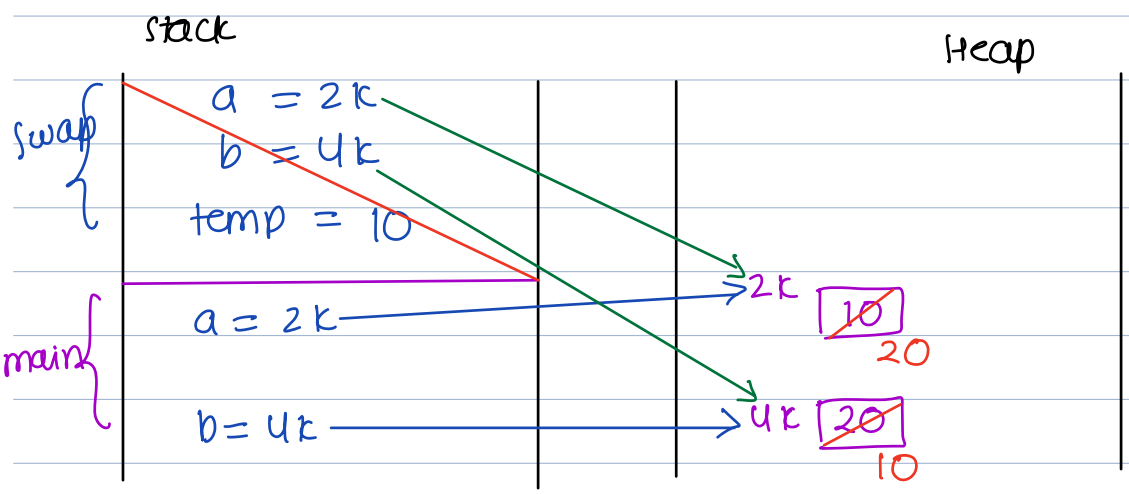
```
static void swap(int a,int b) {
    int temp = a;
    a = b;
    b = temp;
}

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



14. Quiz 6

Predict the output :

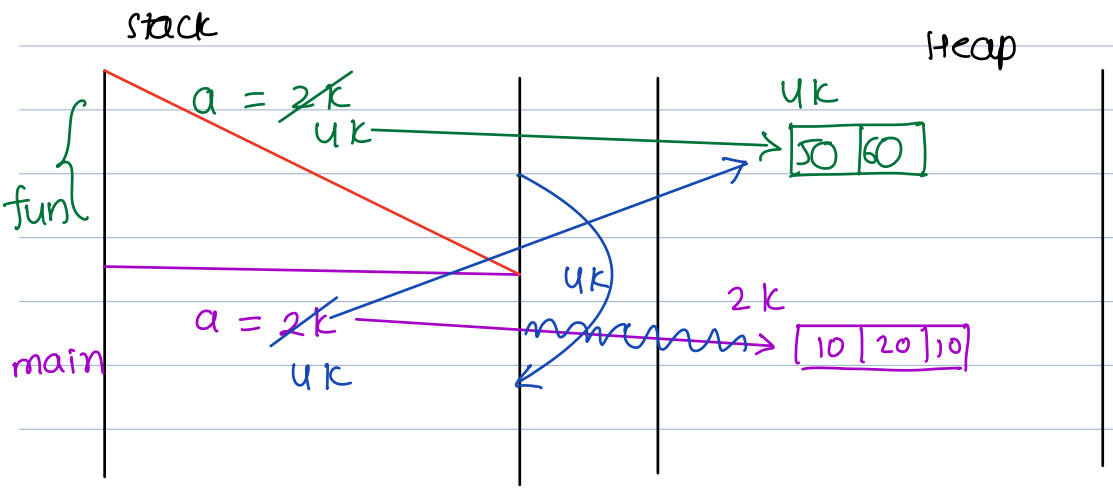
```
static void swap(int[]a,int[]b) {
    int temp = a[0];
    a[0] = b[0];
    b[0] = temp;
}

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



16. Quiz 7

Predict the output :

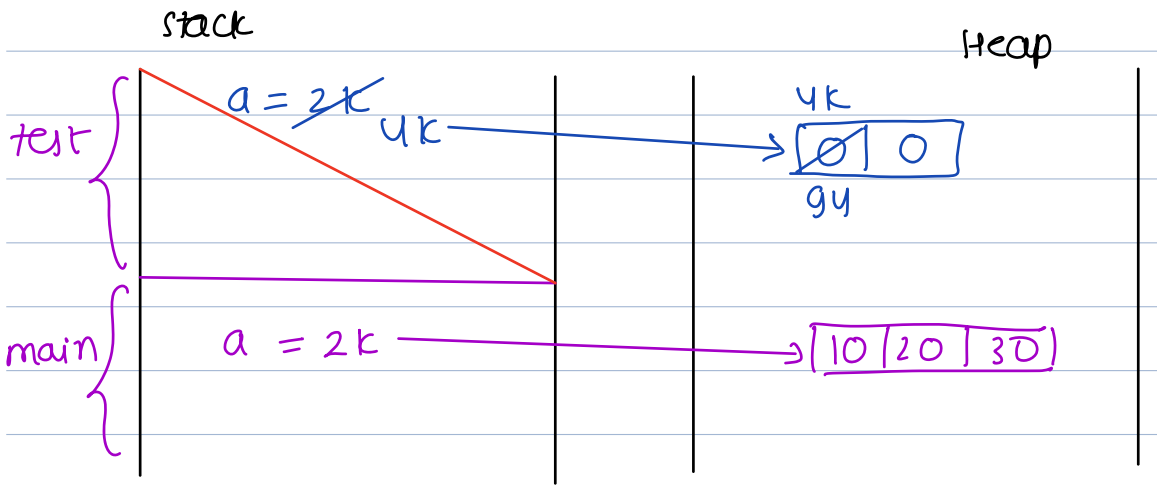
```
static int[] fun(int[]a) {
    a = new int[2];
    a[0] = 50; a[1] = 60;
    return a;
}

public static void main(String args[]) {
    int[]a = {10,20,30};
    a = fun(a);
    System.out.println(a[0]); // 50
}
```



18. Quiz 8

Predict the output :

```
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]); // 10
}
```



Doubt session

1 2 3 4
5 6 7 8

2 * 4

1
2 5
3 6
4 7
8

any [N+M-1] [min (n, m)]

1 2
3 4
5 6
7 8

4 * 2

1
2 3
4 5
6 7
8