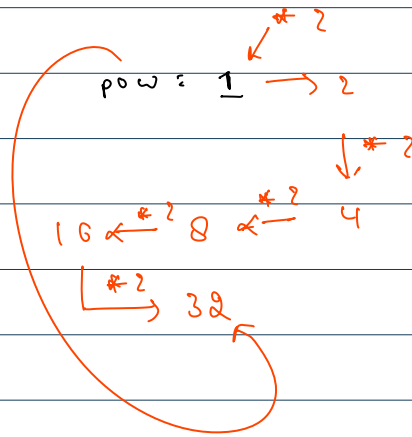


power of a number

$2^5$  base  $\rightarrow 2$   
exp/power  $\rightarrow 5$

```
while (n > 0) {
    n--;
}
```

$2^n$




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

        // 2^n
        int n = 20;
        // System.out.println(2^n);
        System.out.println(Math.pow(2, n));
        System.out.println((int) Math.pow(2, n));
    }
}
```

Arrays

An array is a non-primitive data structure of fixed size that stores multiple values of the same data type in a single variable.

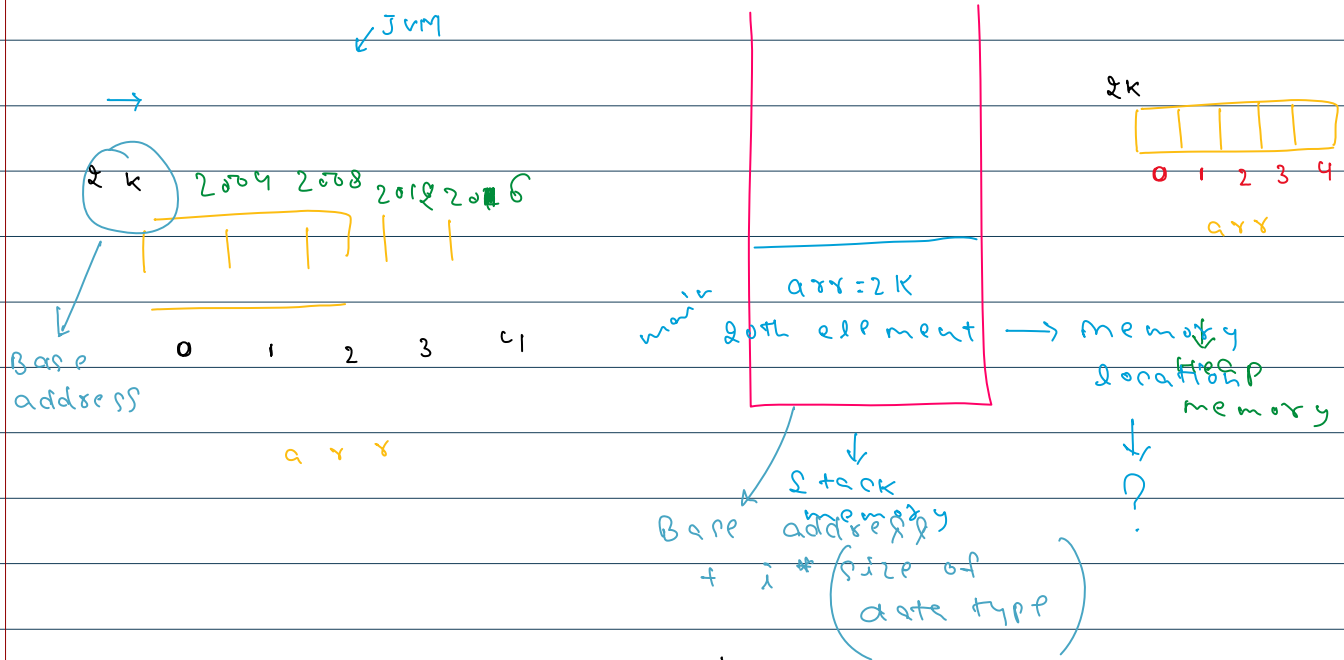
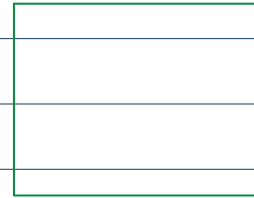
homogeneous

Array  $\rightarrow$    $\rightarrow$  Dorm beds  
 $\rightarrow$  Restaurant seating  
 $\rightarrow$  characters

```

public class Main {
    public static void main(String[] args) {
        int[] arr = new int[5];
    }
}

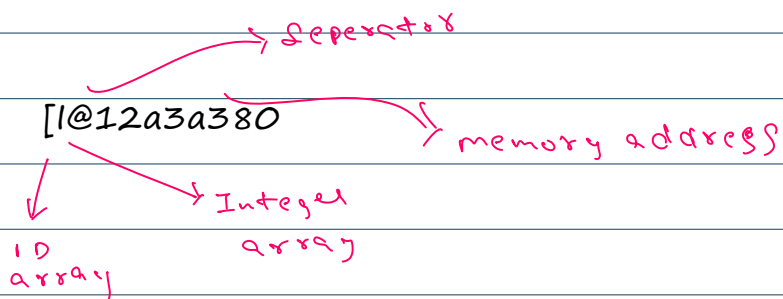
```



$$arr[i] = arr + i * \left( \begin{matrix} \text{size of} \\ \text{the} \\ \text{data type} \end{matrix} \right)$$

$$arr[1] = 2000 + 1 * 4 = 2004$$

$$arr[5] = 2000 + 5 * 4 = 2020$$



```

public class Main {
    public static void main(String[] args) {
        int[] arr = new int[5];

        System.out.println(arr[4]);

        arr[4] = 100;
        arr[2] = 25;

        System.out.println(arr[4]);
        System.out.println(arr[2]);

        System.out.println(arr);
        System.out.println(arr[0]);
    }
}

```

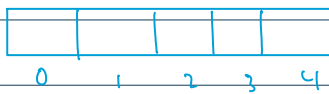
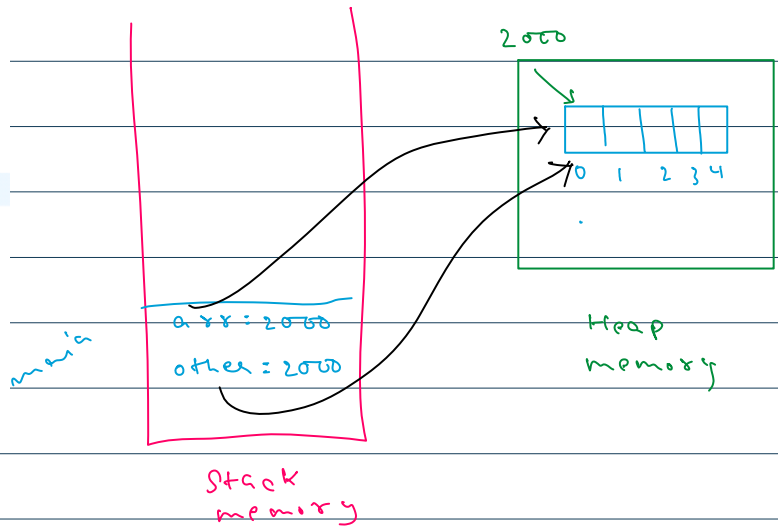
```

public class Main {
    public static void main(String[] args) {
        int[] arr = new int[5];

        System.out.println(arr);

        int[] other = arr;
        System.out.println(other);
    }
}

```



```

arr[0] = 25
arr[1] = 35
arr[2] = 75
arr[3] = 45
arr[4] = 55

```

→ 0, 1, 2, 3, 4

```

for (int i = 0; i < 5; i++) {
    arr[i] = user input;
}

```

```

public class Main {
    public static void main(String[] args) {
        int[] arr = new int[5];

        System.out.println(arr);

        int[] other = arr;
        System.out.println(other);
        System.out.println(other.length);
    }
}

```

```

public class Main {
    public static void main(String[] args) {
        int[] arr = new int[5];

        Scanner sc = new Scanner(System.in);

        for(int i=0; i<arr.length; i++){
            // System.out.println(i);
            arr[i] = sc.nextInt();
        }
        display(arr);
    }

    public static void display(int[] arr){
        for(int i=0; i<arr.length; i++){
            System.out.print(arr[i]+" ");
        }
        System.out.println();
    }
}

```

```

public class Main {
    public static void main(String[] args) {

        int[] arr1 = new int[5];
        int arr2[] = new int[5];
        int[] arr3 = {1,2,3,7,8,9};
        int arr4[] = {1,2,3,7,8,9};
        int[] arr5 = new int[]{1,2,3,7,8,9};
        int arr6[] = new int[]{1,2,3,7,8,9};

        display(arr1);
        display(arr2);
        display(arr3);
        display(arr4);
        display(arr5);
        display(arr6);
    }

    public static void display(int[] arr){
        for(int i=0; i<arr.length; i++){
            System.out.print(arr[i]+" ");
        }
        System.out.println();
    }
}

```

```

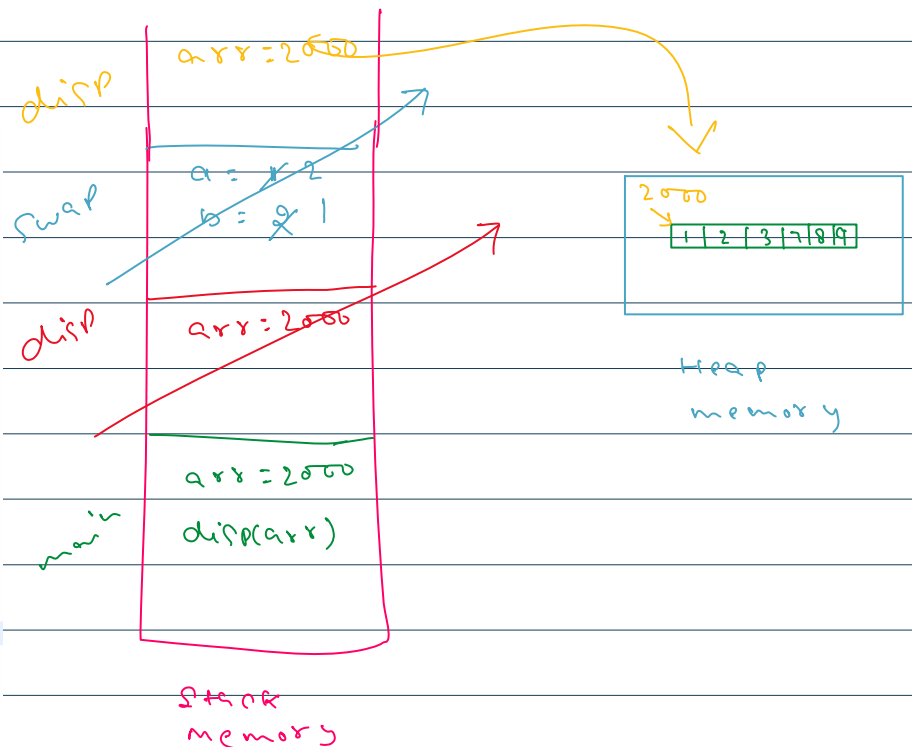
public class Main {
    public static void main(String[] args) {
        int[] arr = {1,2,3,7,8,9};

        display(arr);
        swap(arr[0], arr[1]);
        display(arr);
    }

    public static void display(int[] arr){
        for(int i=0; i<arr.length; i++){
            System.out.print(arr[i]+" ");
        }
        System.out.println();
    }

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

```



```

public class Main {
    public static void main(String[] args) {
        int[] arr = {1,2,3,7,8,9};
        display(arr);
        swap(arr, 0, 1);
        display(arr);
    }

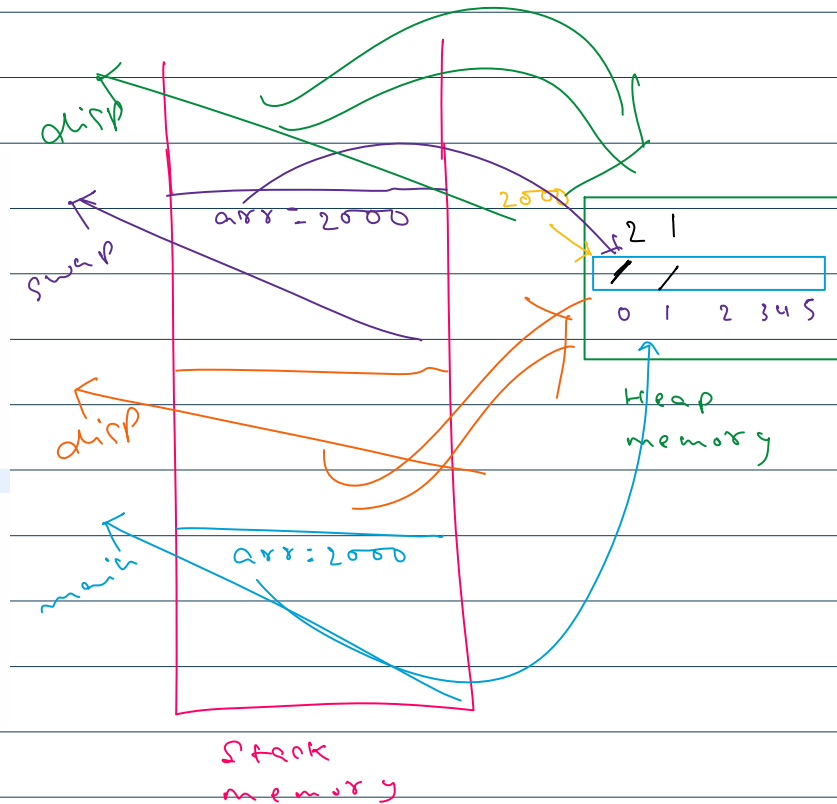
    public static void display(int[] arr){
        for(int i=0; i<arr.length; i++){
            System.out.print(arr[i]+" ");
        }
        System.out.println();
    }

    public static void swap(int[] arr, int i, int j){
        int temp = arr[i];
        arr[i] = arr[j];
        arr[j] = temp;
    }
}

```

JVM

arr[0], arr[1] swap



```

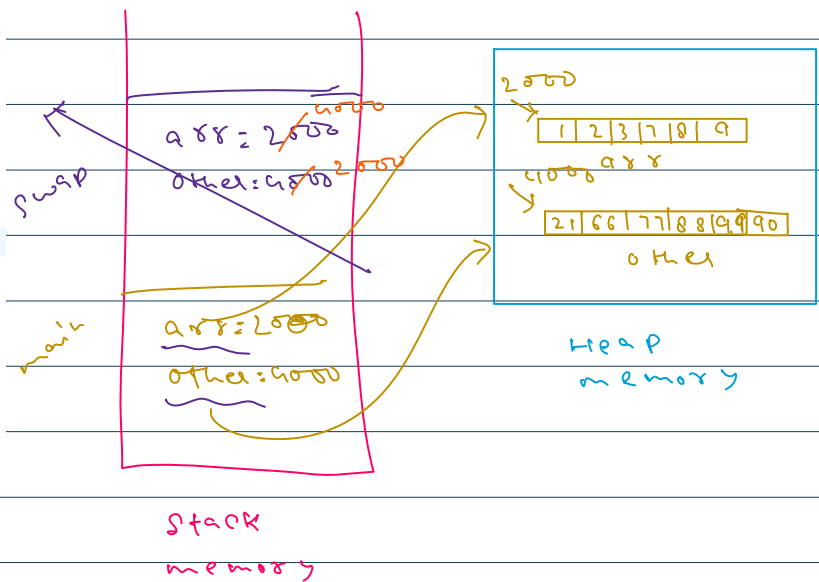
public class Main {
    public static void main(String[] args) {
        int[] arr = {1, 2, 3, 7, 8, 9};
        int[] other = {21, 66, 77, 88, 99, 90};
        System.out.println(arr[0]+" "+arr[1]);
        swap(arr, other);
        System.out.println(other[0]+" "+other[1]);
    }

    public static void swap(int[] arr, int[] other){
        int temp = arr;
        arr = other;
        other = temp;
    }
}

```

JVM

arr, other swap



```

public class Main {
    public static void main(String[] args) {

        int[] arr = {1, 2, 3, 7, 8, 9};
        int[] other = {21, 66, 77, 88, 99, 90};

        System.out.println(arr[0] + " " + arr[1]);
        System.out.println(other[0] + " " + other[1]);
        // swap(arr, other);
        int[] temp = arr;
        arr = other;
        other = temp;
        System.out.println(arr[0] + " " + arr[1]);
        System.out.println(other[0] + " " + other[1]);
    }

    public static void swap(int[] arr, int[] other){
        int[] temp = arr;
        arr = other;
        other = temp;
    }
}

```

## Reverse an array

Akaash → n srekA

arr → 

12	45	3	6	7	1
----	----	---	---	---	---

arr → 

1	7	6	3	45	12
---	---	---	---	----	----

0 1 2 3 4 5  
1 7 6 3 45 12

12	45	3	6	7	1
----	----	---	---	---	---

⇒ Reverse

arr[0], arr[5]  
arr[1], arr[4]  
arr[2], arr[3]

→ i: 0, 1, 2, 3

j: 5, 4, 3

j: n-1, n-2, n-3

i < j ⇒ continue

i = 0, j = 5

arr[0], arr[5]

arr[1], arr[4]

arr[2], arr[3]

arr[i], arr[j] → i++

arr[i+1], arr[j-1] → j--

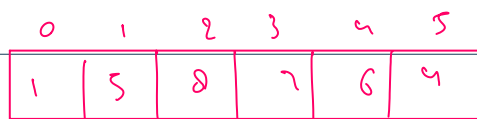
arr[i+2], arr[j-2] → j--

1	5	7	8	9	10	2	3	4
---	---	---	---	---	----	---	---	---

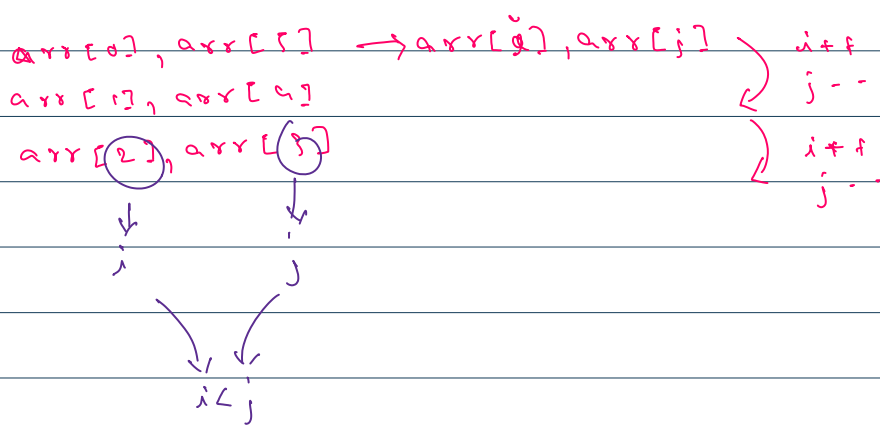
0 1 2 3 5 6 7 8

i: i-1 j: j-1

$n=8 \rightarrow n--$   
 $i=0$      $j=8$   
 $i=1$      $j=j-i=7$   
 $i=2$      $j=j-i=7-2=5$



$i=0, j=5$



```

public class Main {
    public static void main(String[] args) {

        int[] arr = {1, 2, 3, 6, 7, 8, 9};
        display(arr);
        reverseArray(arr);
        display(arr);
    }

```

```

    public static void display(int[] arr){
        for(int i=0; i<arr.length; i++){
            System.out.print(arr[i]+" ");
        }
        System.out.println();
    }

```

```

public static void reverseArray(int[] arr){
    int n = arr.length;
    int i = 0;
    int j = n-1;

    while(i<j){
        swap(arr, i, j);
        i++;
        j--;
    }
}

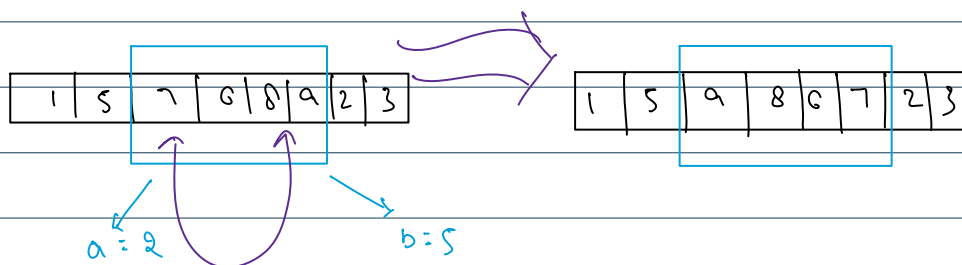
```

```

public static void swap(int[] arr, int i, int j){
    int temp = arr[i];
    arr[i] = arr[j];
    arr[j] = temp;
}
}

```

Reverse part of an array.



$arr[a], arr[b] \Rightarrow \text{swap}$

```

public class Main {
    public static void main(String[] args) {

```



```

int[] arr = {1, 2, 3, 6, 7, 8, 9};
display(arr);
reverseArray(arr, 2, 5);
display(arr);
}

```

```

public static void display(int[] arr){
    for(int i=0;i<arr.length;i++){
        System.out.print(arr[i]+" ");
    }
    System.out.println();
}

```

```

public static void reverseArray(int[] arr, int i, int j){
    int n = arr.length;

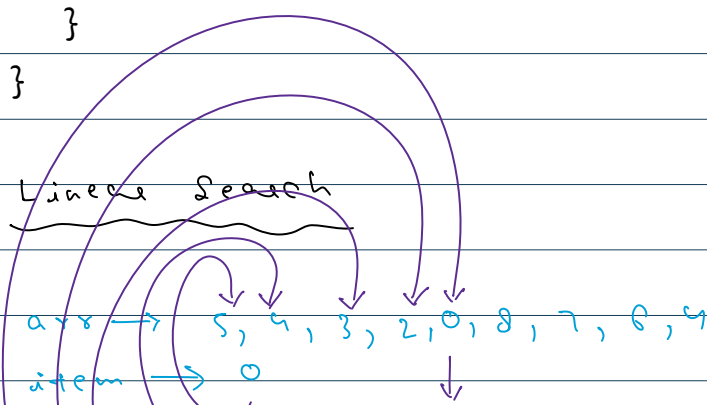
    while(i<j){
        swap(arr, i, j);
        i++;
        j--;
    }
}

```

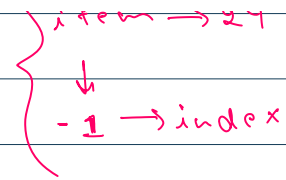
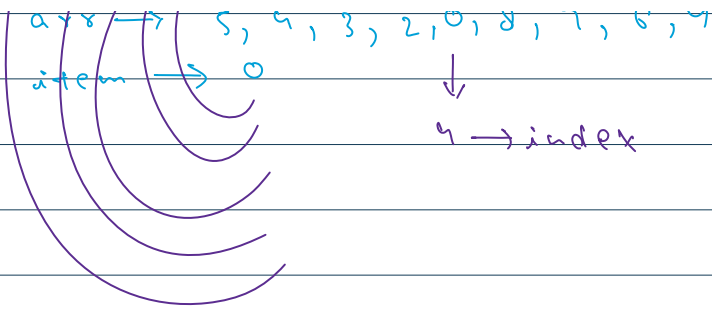
```

public static void swap(int[] arr, int i, int j){
    int temp = arr[i];
    arr[i] = arr[j];
    arr[j] = temp;
}

```



item → 29  
↓



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

        int[] arr = {1, 2, 3, 6, 7, 8, 9};
        int item = 8;
        int index = -1;

        for(int i=0; i<arr.length; i++){
            if(arr[i] == item){
                index = i;
                break;
            }
        }
        System.out.println(index);

    }
}
```

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

        Scanner sc = new Scanner(System.in);

        int n = sc.nextInt();
        int[] arr = new int[n];

        for(int i=0; i<n; i++){
            arr[i] = sc.nextInt();
        }
    }
}
```

```
}
```

```
int item = sc.nextInt();
```

```
int index = -1;
```

```
for(int i=0; i<arr.length; i++){
```

```
    if(arr[i] == item){
```

```
        index = i;
```

```
        break;
```

```
    }
```

```
}
```

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

```
}
```

```
}
```