

1. Write a Java program that will take N integer numbers from the user and create an array of length N.
- Print the elements of the array with their indices.
 - Take another integer input from the user, resize the array by length 1, and add the new integer value to the array. Print the resized array.

Sample Input	Sample Output
N = 5 Enter a number: 11 Enter a number: 22 Enter a number: 33 Enter a number: 44 Enter a number: 55 Enter another number: 101	The elements of the array are: 0: 11 1: 22 2: 33 3: 44 4: 55 After resizing the array: 11 22 33 44 55 101

2. You are **given** an integer array with duplicate values. Write a Java program to update the array by replacing the duplicate values of the array with zero. Then print the updated array. [Your code should work for any given integer array]

Given Array	Sample Output
<code>int arr [] = {9, -5, 7, 9, -5, 5, 7};</code>	Before removing duplicates: 9 -5 7 9 -5 5 7 After replacing duplicates with 0: 9 -5 7 0 0 5 0

3. Write a Java program that asks the user for the length of an array and then creates an integer array of that length by taking inputs from the user. Then,
- A. Reverse the array by creating a new array of the same length and print it. (Out-of-Place)
 - B. Reverse the array **without** creating any new arrays and print it. (In-Place)

Sample Input	Sample Output
Enter the length of the array: 5 Enter a number: 7 Enter a number: -31	Reversed using a new array: 100 97 344 -31 7

Enter a number: 344 Enter a number: 97 Enter a number: 100	Reversed the original array: 100 97 344 -31 7
--	--

4. Take an integer N input from the user and create an integer array of N numbers by taking inputs from the user. Then, print the array. Next, **modify the array** by changing the positive numbers by 1 and the negative numbers by 0. If the element is zero, then it will be unchanged. Lastly, print the modified array.

Sample Input	Sample Output
N = 4 3 4 -2 1	Original array: 3 4 -2 1 After modifying: 1 1 0 1
N = 3 -4 0 2	Original array: -4 0 2 After modifying: 0 0 1

5. Write a Java program that will take N integer numbers from the user and create an array of length N. Take another number from the user and print the index of the number where it is found first. If not found then print 'Element not found'.

Note: Think about how to apply the concept of **flag** and **break** in this task.

Sample Input 1 N = 7 Enter a number: 45 Enter a number: 0 Enter a number: 17 Enter a number: 11 Enter a number: -34 Enter a number: -100 Enter a number: 17 17	Sample Input 2 N = 5 Enter a number: 4 Enter a number: 99 Enter a number: 23 Enter a number: -67 Enter a number: 34 55
--	--

Sample Output 1 17 is at index 2	Sample Output 2 Element not found
--	---

6. Write a Java program that asks the user for the length of an array then creates a double data-type array of that length by taking inputs from the user.

Then do the following:

- Show the maximum element and its index from the array.
- Show the minimum element and its index from the array.
- Show the summation of all the elements from the array.
- Show the average of all the elements from the array.

Sample Input	Sample Output
Enter the length of the array: 5 Enter a number: 7.5 Enter a number: -31.2 Enter a number: 344.0 Enter a number: 97.1 Enter a number: 100.4	Maximum element 344.0 found at index 2 Minimum element -31.2 found at index 1 Summation: 517.8 Average: 103.56

7. You are given an integer array. You need to create a new array that will contain only the unique elements of the given array. Finally, print the new array.

Given Array	Sample Output
<code>int arr [] = {23,100,23,56,100};</code>	Input array: 23 100 23 56 100 New array: 23 100 56
<code>int arr [] = {-5,10,-7,-5};</code>	Input array: -5 10 -7 -5 New array: -5 10 -7

8. Write a Java program that will take input of two arrays and elements from the user and check whether the second array is a subset of the first array. A subset is a set that contains only elements found in the original set.

Sample Input - 1	Sample Output - 1
Please enter the length of array 1: 5 Please enter the elements of the arr1: 5 3 2 72 8 Please enter the length of array 2: 3 Please enter the elements of the arr2: 5 3 72	Array 2 is a subset of Array 1.

Sample Input - 2	Sample Output - 2
Please enter the length of array 1: 5 Please enter the elements of the arr1: 7 2 33 1 6 Please enter the length of array 2: 3 Please enter the elements of the arr2: 1 8 2	Array 2 is not a subset of Array 1.

9. Take an integer N input from the user and create an array of length N by taking the elements as user input. Then, print the array. Next, sort the array in **descending** order using **Selection Sort** technique. Lastly, print the sorted array.

Sample Input	Sample Output
N = 6 Enter a number: 3 Enter a number: 6 Enter a number: 1 Enter a number: 2 Enter a number: 8 Enter a number: 5	Original Array: 3 6 1 2 8 5 Sorted Array: 8 6 5 3 2 1

10. You are given two arrays of the same length. The first array contains the marks of the students and the second array contains the name of the students. You need to sort the marks array in **ascending order** while maintaining the corresponding names of the students in the names array aligned with their respective marks. Use the **Bubble sort** technique to solve this problem. [Your code should work for any given arrays]

Given Array 1	Sample Output 1
<pre>int [] marks = {85, 90, 75, 44, 99}; String [] names = {"Bob", "Alice", "Max", "Marry", "Rosy"};</pre>	Sorted Array: 44 75 85 90 99 Marry Max Bob Alice Rosy

Given Array 2	Sample Output 2
<pre>int [] marks = {100, 47, 85, 94, 5, 50}; String [] names = {"Henry", "Mari", "Herry", "Jack", "Lily", "Oliver"};</pre>	Sorted Array: 5 47 50 85 94 100 Lily Mari Oliver Herry Jack Henry

Strings + Arrays

Task 3

Given an array of email addresses, print the number of valid email addresses satisfying the following conditions.

- a) Each email contains an '@' character
- b) There is at least one character before and after '@' character and it has to start with letter
- c) There is a '.' character after the character(s) after '@' character
- d) There is at least one character after '.' character

Sample Input	Sample Output
email_list = {"abc@gmail.com", "!@cv.bd", "123cse@bracu.ac.bd"}	1
email_list = {"cse110@gmail.com", "government@cv.", "eee@bracu.ac.bd"}	2

Task 7

You are given an integer array. You need to identify all the **prime numbers** and **perfect numbers** within the array and print the **indices** along with these **numbers** from the original array.

Sample Input	Sample Output
Sample Input: int arr[] = {6, 13, 28, 17, 3, 9, 11, 23, 10, 29, 12, 7}	Prime Numbers: 1: 13 3: 17 4: 3 6: 11
	7: 23 9: 29 11: 7 Perfect Numbers: 0: 6 2: 28

1)

(3) Given a sorted array of non-negative integers, find the first missing element. For example:

Given [0, 1, 2, 5, 8, 11, 32]

The first missing element is 3.

Given [1, 2, 3, 4, 6, 7, 8]

The first missing element is 0.

Given [0, 1, 2, 3, 4, 6, 7, 8]

The first missing element is 5.

Given [0, 1, 2, 3, 4, 5, 6, 7, 8]

The first missing element is 9.

Create a simple java program that does the followings:

1. The program prompts the user to enter 5 numbers.
2. The program then asks the user to enter the number he is looking for in the array.
3. If the number exists, the program prints the index of that number.

Example of the output:

```
run:
Enter five numbers:
Number 1: 39
Number 2: 25
Number 3: 88
Number 4: 69
Number 5: 0

Enter a number to search for: 88

The number is in index 2
```

3) Rotate an Array

Write a program to rotate an array to the right by k steps.

Example: Input:

Array = [1, 2, 3, 4, 5, 6, 7]

$k = 3$

Output:

Rotated Array: [5, 6, 7, 1, 2, 3, 4]

$Q = 8$ 5th element \rightarrow 5

5	6	7	8	9	1	2	3
0	1	2	3	4			

last 3 = 1st 3

1 2 3 5 6 7 8 9

$k \quad k+1 \quad k+2 \quad k+3 \quad k+4$

4)Find Kth Smallest Element

Write a program to find the kth smallest element in an unsorted array.

Example: Input:

Array = [7, 10, 4, 3, 20, 15]

k = 3

Output:

3rd smallest element: 7

5)Subarray with Given Sum

Write a program to find a subarray with a given sum.

Example: Input:

Array = [1, 4, 20, 3, 10, 5]

Sum = 33

Output:Subarray with given sum: [20, 3, 10]

6) Find Pairs with a Given Sum in an Array

Write a program that:

1. Takes an array of integers and a target sum as input.
2. Finds all pairs of numbers in the array that add up to the target sum.

Example:

Input:

Array = [2, 4, 3, 7, 1, 5]

Sum = 6

Output:

Pairs: (2, 4), (1, 5)

7)Convert All Strings to Uppercase

Write a program to:

1. Take an array of strings as input.
2. Use a loop to convert all the strings to uppercase.
3. Print the updated array.

Example:

Input: ["java", "python", "c++"]

Output: ["JAVA", "PYTHON", "C++"]

8)Print Words Longer than a Given Length

Write a program to:

1. Take a sentence as input.
2. Ask the user for a number k.
3. Use a loop to print all words in a array that are longer than k characters.

Input:

Enter a sentence:

Java is a popular programming language

Enter the number k: 4

Output:

Words longer than 4 characters: [popular, programming, language]

9)Replace Characters in Strings

Write a program to:

1. Take an array of strings as input.
2. Ask the user for a character to replace and a replacement character.
3. Use a loop to replace the characters in all strings.

Example:

Input:

Array = ["hello", "world"]

Replace = "o"

Replacement = "x"

Output: ["hellx", "wxrld"]