TASK 1: Maximum Subarray

AIM

To find the contiguous subarray with the largest sum using brute force and optimized approach.

ALGORITHM

Brute Force:

1. Consider all possible subarrays.
2. Compute sum of each subarray.
3. Store the maximum sum.

Optimized (Kadane's Algorithm):

1. Initialize maxSum and currentSum with first element.
2. Traverse array and update currentSum = max(arr[i], currentSum + arr[i]).
3. Update maxSum = max(maxSum, currentSum).

PROCEDURE

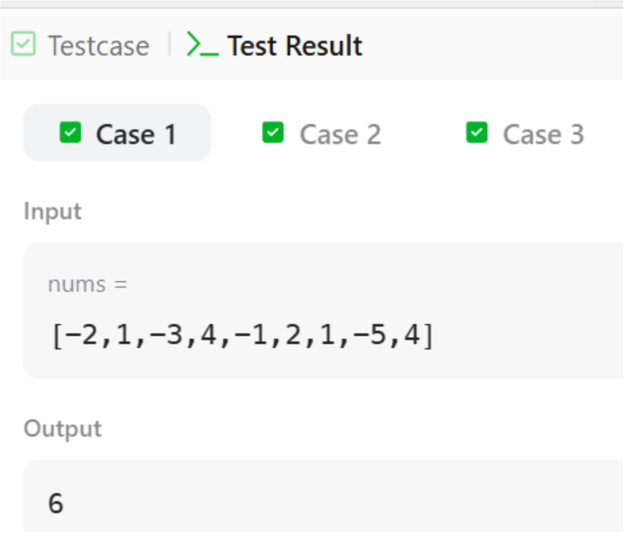
1. Input an integer array.
2. Apply brute force and optimized algorithm.
3. Print maximum subarray sum.

PROGRAM (Java – Optimized)

```
class Solution {
    public int maxSubArray(int[] nums) {
        int maxSum = nums[0];
        int currSum = nums[0];

        for(int i = 1; i < nums.length; i++) {
            currSum = Math.max(nums[i], currSum + nums[i]);
            maxSum = Math.max(maxSum, currSum);
        }
        return maxSum;
    }
}
```

OUTPUT



Input

nums =

```
[-2,1,-3,4,-1,2,1,-5,4]
```

Output

```
6
```

RESULT

The program successfully finds the maximum subarray sum.

TASK 2: Birthday Bar

AIM

To determine the number of contiguous segments whose sum equals Ron’s birth day and month.

ALGORITHM

1. Loop through array.
2. For each index, calculate sum of next m elements.
3. If sum equals d, increment count.

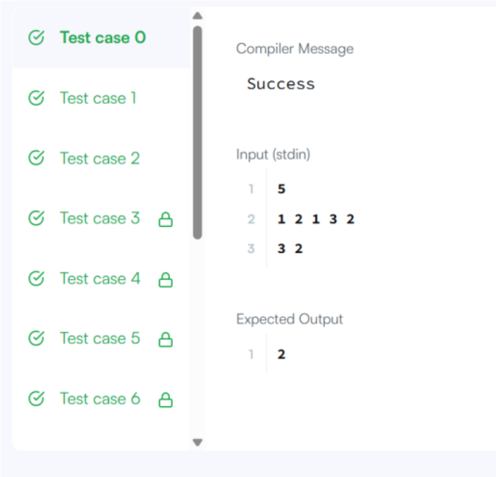
PROCEDURE

1. Read array, day (d), month (m).
2. Check each subarray of length m.
3. Print count.

PROGRAM (Java)

```
static int birthday(List<Integer> s, int d, int m) {
    int count = 0;
    for(int i = 0; i <= s.size() - m; i++) {
        int sum = 0;
        for(int j = i; j < i + m; j++) {
            sum += s.get(j);
        }
        if(sum == d) count++;
    }
    return count;
}
```

OUTPUT



Compiler Message

```
Success
```

Input (stdin)

```
5
1 2 1 3 2
3 2
```

Expected Output

```
2
```

RESULT

The program outputs the number of valid chocolate segments.

TASK 3: Max Subarray

AIM

To find maximum subarray and subsequence sums.

ALGORITHM

1. Use Kadane’s algorithm for subarray sum.
2. For subsequence, sum all positive numbers.

PROCEDURE

1. Read test cases and arrays.
2. Apply Kadane’s algorithm.
3. Print both results.

PROGRAM (Java)

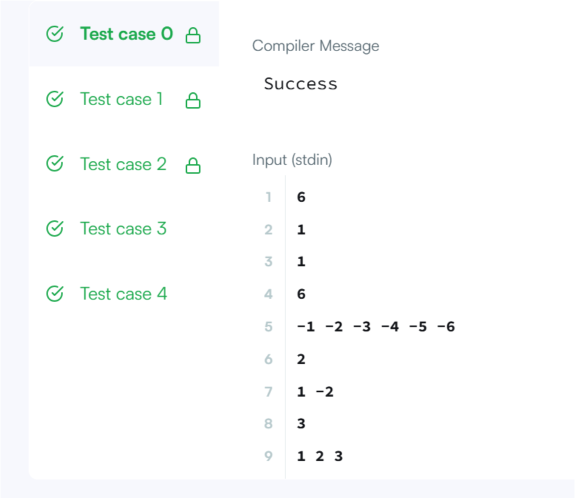
```java
static void maxSubarray(int[] arr) {
   int maxSub = arr[0], curr = arr[0];
   int maxSeq = 0;
   boolean allNeg = true;
   int maxVal = arr[0];

   for(int x : arr) {
      if(x > 0) { allNeg = false; maxSeq += x; }
      maxVal = Math.max(maxVal, x);
   }

   for(int i = 1; i < arr.length; i++) {
      curr = Math.max(arr[i], curr + arr[i]);
      maxSub = Math.max(maxSub, curr);
   }

   if(allNeg) maxSeq = maxVal;
   System.out.println(maxSub + " " + maxSeq);
}
```

OUTPUT



Compiler Message

```
Success
```

Input (stdin)

```
6
1
1
6
-1 -2 -3 -4 -5 -6
2
1 -2
3
1 2 3
```

RESULT

The program prints maximum subarray and subsequence sums.

TASK 4: Maximum Sum Circular Subarray

AIM

To find maximum circular subarray sum.

ALGORITHM

1. Find normal max subarray using Kadane.
2. Find minimum subarray sum.
3. Circular sum = totalSum – minSubarray.
4. Answer = max(normalMax, circularMax).

PROCEDURE

1. Input array.
2. Apply Kadane's algorithm twice.
3. Print maximum sum.

PROGRAM (Java)

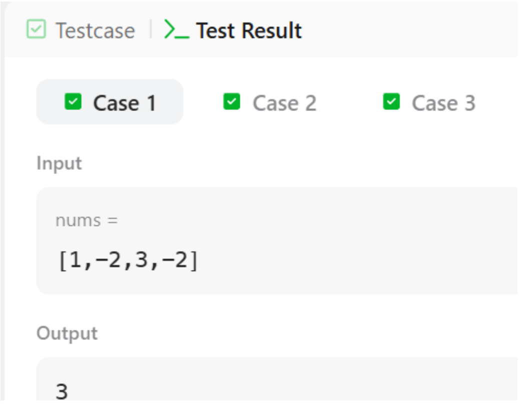
```
class Solution {
    public int maxSubarraySumCircular(int[] nums) {
        int total = 0;
        int maxSum = nums[0], currMax = 0;
        int minSum = nums[0], currMin = 0;

        for(int n : nums) {
            currMax = Math.max(n, currMax + n);
            maxSum = Math.max(maxSum, currMax);

            currMin = Math.min(n, currMin + n);
            minSum = Math.min(minSum, currMin);

            total += n;
        }
        if(maxSum < 0) return maxSum;
        return Math.max(maxSum, total - minSum);
    }
}
```

OUTPUT



Input

nums =

```
[1,-2,3,-2]
```

Output

```
3
```

RESULT

The program returns maximum circular subarray sum.

TASK 5: String to Integer (atoi)

AIM

To convert a string to integer following given rules.

ALGORITHM

1. Remove leading spaces.
2. Check sign.
3. Convert digits until non-digit.
4. Handle overflow.

PROCEDURE

1. Input string.
2. Parse characters and compute integer.
3. Return integer value.

PROGRAM (Java)

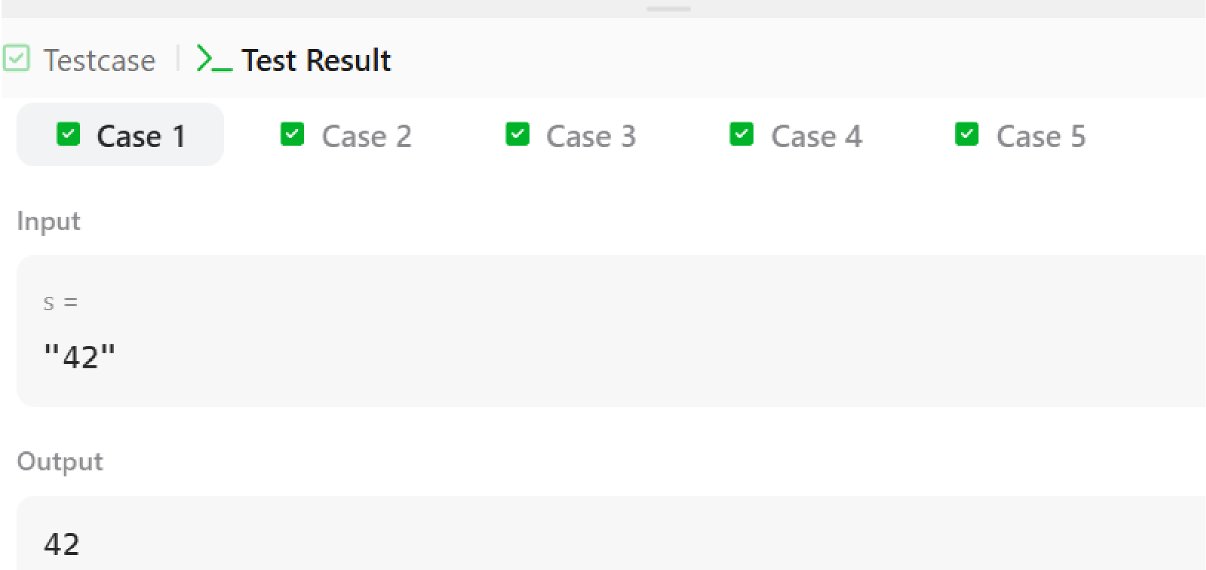
```
class Solution {
    public int myAtoi(String s) {
        s = s.trim();
        if(s.length() == 0) return 0;

        int sign = 1, i = 0;
        long res = 0;

        if(s.charAt(0) == '-') { sign = -1; i++; }
        else if(s.charAt(0) == '+') i++;

        while(i < s.length() && Character.isDigit(s.charAt(i))) {
            res = res * 10 + (s.charAt(i) - '0');
            if(res * sign > Integer.MAX_VALUE) return Integer.MAX_VALUE;
            if(res * sign < Integer.MIN_VALUE) return Integer.MIN_VALUE;
            i++;
        }
        return (int)(res * sign);
    }
}
```

OUTPUT



☑ Testcase | >_ Test Result

☑ Case 1 ☑ Case 2 ☑ Case 3 ☑ Case 4 ☑ Case 5

Input

```
s =
"42"
```

Output

```
42
```

RESULT

The program correctly converts string to integer.

TASK 6: Alternating Characters

AIM

To find minimum deletions required to make string alternating.

ALGORITHM

1. Compare adjacent characters.
2. If same, increment deletion count.

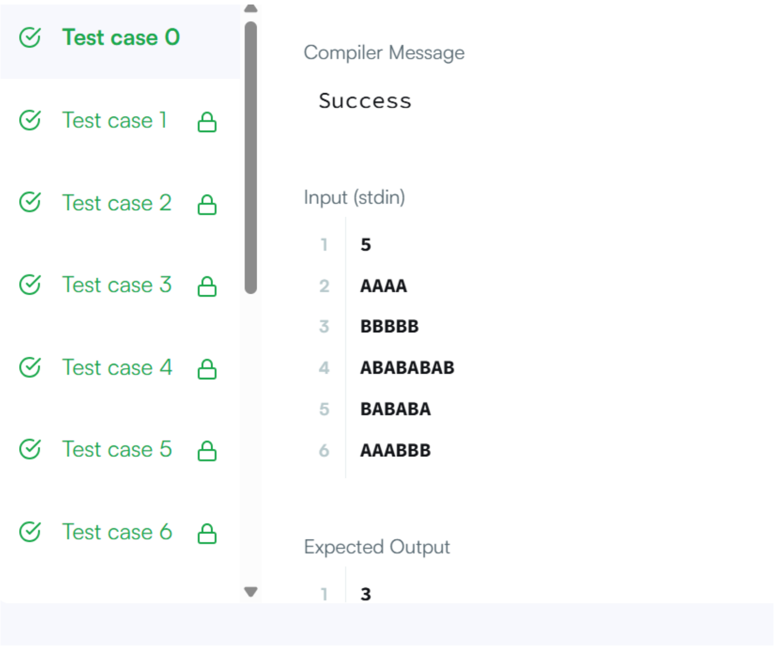
PROCEDURE

1. Input string.
2. Traverse string and count duplicates.
3. Print deletions.

PROGRAM (Java)

```
static int alternatingCharacters(String s) {
    int count = 0;
    for(int i = 1; i < s.length(); i++) {
        if(s.charAt(i) == s.charAt(i - 1)) count++;
    }
    return count;
}
```

OUTPUT



Compiler Message

```
Success
```

Input (stdin)

```
5
AAAA
BBBBB
ABABABAB
BABABA
AAABBB
```

Expected Output

```
3
```

RESULT

The program outputs required deletions.

TASK 7: Longest Substring Without Repeating Characters

AIM

To find length of longest substring without repeated characters.

ALGORITHM

1. Use sliding window with HashSet.
2. Move right pointer and remove duplicates from left.

PROCEDURE

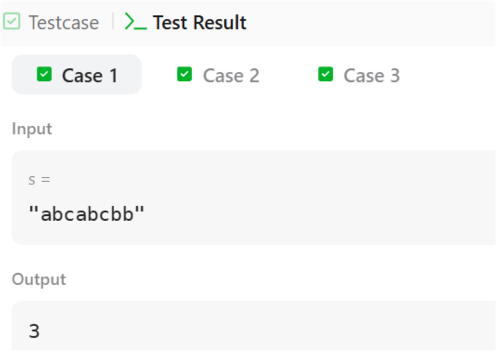
1. Input string.
2. Apply sliding window technique.
3. Print maximum length.

PROGRAM (Java)

```
class Solution {
    public int lengthOfLongestSubstring(String s) {
        Set<Character> set = new HashSet<>();
        int l = 0, max = 0;

        for(int r = 0; r < s.length(); r++) {
            while(set.contains(s.charAt(r))) {
                set.remove(s.charAt(l++));
            }
            set.add(s.charAt(r));
            max = Math.max(max, r - l + 1);
        }
        return max;
    }
}
```

OUTPUT



Input

s =
"abcabcbb"

Output

3

RESULT

The program prints the longest substring length.

TASK 8: Find and Replace Pattern

AIM

To find words matching a pattern using bijection mapping.

ALGORITHM

1. For each word, map characters to pattern characters.
2. Ensure one-to-one mapping.
3. Store matching words.

PROCEDURE

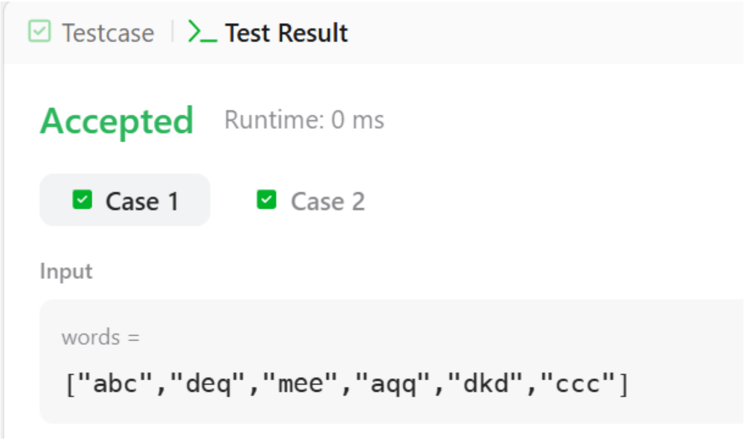
1. Input words array and pattern.
2. Check mapping using HashMap.
3. Return matching words.

PROGRAM (Java)

```
class Solution {
  public List<String> findAndReplacePattern(String[] words, String pattern) {
    List<String> res = new ArrayList<>();
    for(String w : words) {
      if(match(w, pattern)) res.add(w);
    }
    return res;
  }

  private boolean match(String w, String p) {
    Map<Character, Character> m1 = new HashMap<>();
    Map<Character, Character> m2 = new HashMap<>();
    for(int i = 0; i < w.length(); i++) {
      char c1 = w.charAt(i), c2 = p.charAt(i);
      if(m1.containsKey(c1) && m1.get(c1) != c2) return false;
      if(m2.containsKey(c2) && m2.get(c2) != c1) return false;
      m1.put(c1, c2);
      m2.put(c2, c1);
    }
    return true;
  }
}
```

OUTPUT



☑ Testcase | >_ Test Result

Accepted Runtime: 0 ms

☑ Case 1 ☑ Case 2

Input

words =

```
["abc","deq","mee","aqq","dkd","ccc"]
```

RESULT

The program outputs all words matching the pattern.

TASK 9: String Matching in an Array

AIM

To find all strings that are substrings of other strings.

ALGORITHM

1. Compare each string with others.
2. If one string is found inside another, add to result.

PROCEDURE

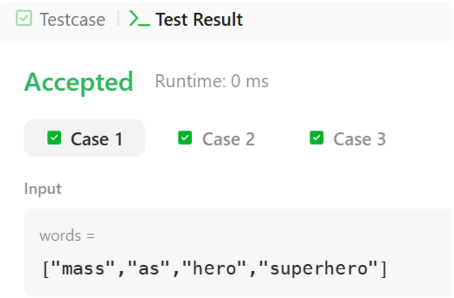
1. Input array of strings.

2. Use nested loops to check substring.
3. Print result list.

PROGRAM (Java)

```
class Solution {
    public List<String> stringMatching(String[] words) {
        List<String> res = new ArrayList<>();
        for(int i = 0; i < words.length; i++) {
            for(int j = 0; j < words.length; j++) {
                if(i != j && words[j].contains(words[i])) {
                    res.add(words[i]);
                    break;
                }
            }
        }
        return res;
    }
}
```

OUTPUT



Accepted Runtime: 0 ms

Input

```
words =
["mass","as","hero","superhero"]
```

RESULT

The program returns all matching substrings.

TASK 10: Naive Pattern Search

AIM

To find occurrences of a pattern in a text using naive approach.

ALGORITHM

1. Slide pattern over text one by one.
2. Compare characters.
3. If all match, print index.

PROCEDURE

1. Input text and pattern.
2. Use two loops to compare.
3. Print all starting indices.

PROGRAM (Java)

```
class Solution {
   static void search(String pat, String txt) {
      int m = pat.length();
      int n = txt.length();

      for(int i = 0; i <= n - m; i++) {
         int j;
         for(j = 0; j < m; j++) {
            if(txt.charAt(i + j) != pat.charAt(j)) break;
         }
         if(j == m) System.out.print(i + " ");
      }
   }
}
```

RESULT

The program prints all pattern occurrence positions.