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Lab - 7

Task-1

PROGRAM INSPECTION

Code:

https://github.com/godotengine/godot/blob/master/main/main.cpp

Checklist

Category A: Data Reference Errors
1. True - Check if referenced variable has an unset/uninitialized value.
2. True - Ensure array subscripts are within bounds.
3. True - Array subscripts should have an integer value.
4. True - Pointer/reference variables should reference allocated memory.
5. True - Memory areas with alias names should have correct attributes.
6. True - Variables should have expected types/attributes.
7. True - Ensure no addressing issues arise from memory allocation differences.
8. True - Pointer/reference memory locations should meet compiler expectations.
9. True - Data structures should be identically defined across procedures.
10. True - Ensure no off-by-one errors in array/string indexing.
11. True - All inheritance requirements should be met in object-oriented languages.

Category B: Data-Declaration Errors
1. True - All variables should be explicitly declared.
2. True - Default attributes must be understood if not stated.
3. True - Variables initialized in declarative statements should be correctly initialized.
4. True - Correct length and data type for variables must be ensured.
5. True - Initialization should align with memory type.
6. True - Variables with similar names should be carefully reviewed to avoid confusion.

Category C: Computation Errors
1. True - Check for computations with inconsistent data types.
2. True - Mixed-mode computations need careful examination.
3. True - Ensure computations use same data types and lengths.
4. True - Ensure target variables can accommodate assigned values.
5. True - Watch out for overflow or underflow in expressions.
6. True - Divisors should not be zero.
7. True - Be cautious with base-2 inaccuracies in machine calculations.
8. True - Values of variables should not go outside their meaningful ranges.
9. True - Operator precedence and evaluation order must be correct.
10. True - Avoid invalid use of integer arithmetic.

Category D: Comparison Errors
1. True - No comparisons should be made between variables of different types.

2. True - Mixed-mode comparisons should follow proper conversion rules.
3. True - Ensure comparison operators are used correctly.
4. True - Boolean expressions must clearly state intended logic.
5. True - Boolean operator operands must be valid.
6. True - Avoid base-2 issues with floating-point comparisons.
7. True - Ensure correct order of evaluation for Boolean expressions.
8. True - Compiler-specific Boolean expression evaluations should be considered.

Category E: Control-Flow Errors

1. True - Ensure index variables do not exceed branch possibilities.
2. True - Loops should eventually terminate.
3. True - Subroutines must eventually terminate.
4. True - Loops should be designed to avoid skipping execution.
5. True - Avoid fall-through conditions in loops.
6. True - No off-by-one errors in loop iterations.
7. True - Ensure correct correspondence between loops and their blocks.
8. True - All decision points should cover all possible input values.

Category F: Interface Errors

1. True - Parameters received by modules should match those sent.
2. True - Parameter attributes should match their corresponding arguments.
3. True - Units of parameters and arguments must match.
4. True - Number of arguments sent should match the number expected.
5. True - Attributes of transmitted arguments should match the expected parameters.
6. True - Units of transmitted arguments should match the expected parameters.
7. True - Ensure correct usage of built-in functions with arguments.
8. True - Subroutines should not alter input-only parameters.
9. True - Global variables must have consistent definitions across modules.

Category G: Input / Output Errors

1. True - Ensure correct attributes for declared files.
2. True - Attributes in file's OPEN statement should be correct.
3. True - Ensure enough memory is available for reading files.
4. True - Files should be opened before use.
5. True - Files should be closed after use.
6. True - Handle end-of-file conditions correctly.
7. True - Handle I/O errors appropriately.
8. True - Ensure no spelling/grammatical errors in output.

Category H: Other Checks

1. True - Check for unused or under-referenced variables.
2. True - Review variable attributes for unexpected defaults.
3. True - Address all compiler warnings and informational messages.
4. True - Programs should check inputs for validity.
5. True - Ensure all necessary functions are present in the program.

Task – 2

1. Armstrong Number:

```
//Armstrong Number
class Armstrong{
    public static void main(String args[]){
        int num = Integer.parseInt(args[0]);
        int n = num; //use to check at last time
        int check=0,remainder;
        while(num > 0){
            remainder = num / 10;
            check = check + (int)Math.pow(remainder,3);
            num = num % 10;
        }
        if(check == n)
            System.out.println(n+" is an Armstrong Number");
        else
            System.out.println(n+" is not a Armstrong Number");
    }

Input: 153
Output: 153 is an armstrong Number.
```

I.Errors in the code:

1: remainder = num / 10;

- This line is supposed to extract the last digit of the number, but it’s performing integer division (/), which gives the quotient instead of the remainder. The correct operation should be **num % 10** to get the remainder (the last digit of the number).

2: num = num % 10;

- This line is intended to remove the last digit, but it is incorrectly using the modulus operator. It should use integer division (/) instead of modulus (%). The correct operation is **num = num / 10;** to remove the last digit.
- At last, there should be a closing bracket.

II.Breakpoints needed to fix the errors:

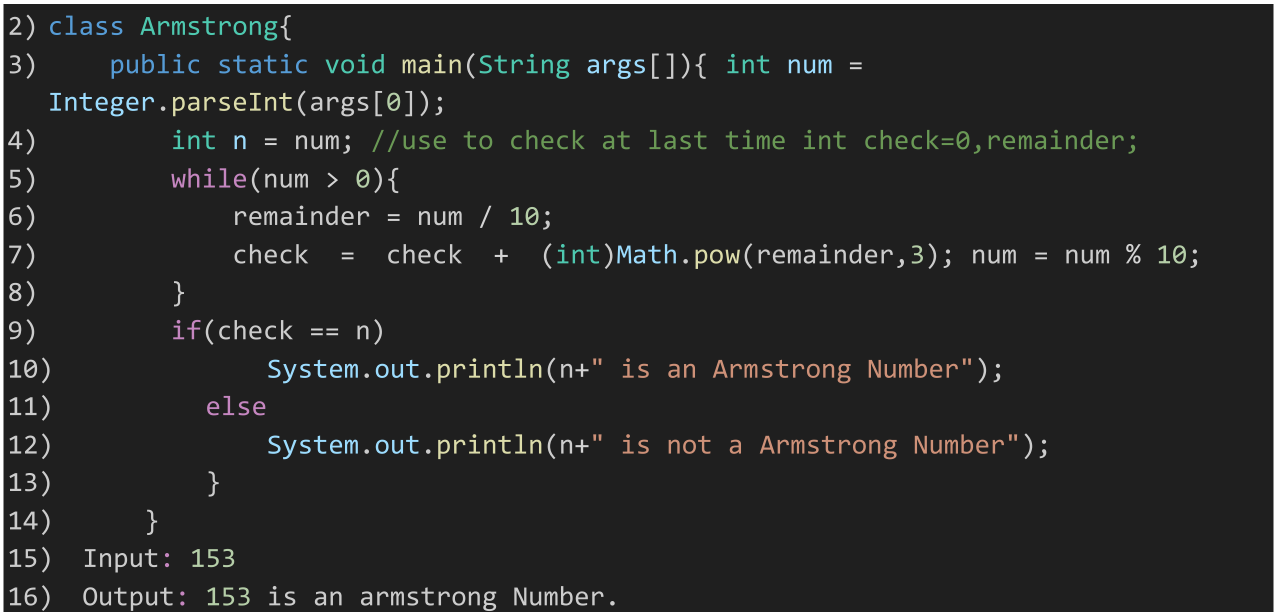
- Check the initial values of num, check, and remainder.
- Check the value of remainder after the division.
- Check how the value of num changes after updating.

III.Steps to fix the errors:

Step 1: Fix the incorrect operations.

- Change line 10 to remainder = num % 10;
- Change line 12 to num = num / 10;

IV. FIXED CODE:



```
2) class Armstrong{
3)     public static void main(String args[]){ int num =
   Integer.parseInt(args[0]);
4)         int n = num; //use to check at last time int check=0,remainder;
5)         while(num > 0){
6)             remainder = num / 10;
7)             check  =  check  +  (int)Math.pow(remainder,3); num = num % 10;
8)         }
9)         if(check == n)
10)             System.out.println(n+" is an Armstrong Number");
11)          else
12)             System.out.println(n+" is not a Armstrong Number");
13)          }
14)      }
15)  Input: 153
16)  Output: 153 is an armstrong Number.
```

2. GCD LCM:

```
public class GCD_LCM
{
    static int gcd(int x, int y)
    {
        int r=0, a, b;
        a = (x > y) ? y : x; // a is greater number
        b = (x < y) ? x : y; // b is smaller number

        r = b;
        while(a % b == 0) //Error replace it with while(a % b != 0)
        {
            r = a % b;
            a = b;
            b = r;
        }
        return r;
    }

    static int lcm(int x, int y)
    {
        int a;
        a = (x > y) ? x : y; // a is greater number
        while(true)
        {
            if(a % x != 0 && a % y != 0)
                return a;
            ++a;
        }
    }

    public static void main(String args[])
    {
        Scanner input = new Scanner(System.in);
        System.out.println("Enter the two numbers: ");
        int x = input.nextInt();
        int y = input.nextInt();

        System.out.println("The GCD of two numbers is: " + gcd(x, y));
        System.out.println("The LCM of two numbers is: " + lcm(x, y));
        input.close();
    }
}

Input:4 5
Output: The GCD of two numbers is 1
        The GCD of two numbers is 20
```

I. Errors in the code:

- **GCD Calculation (Line 13)**:
  - The condition while(a % b == 0) is incorrect. This will cause an infinite loop when a % b == 0, as r will not change inside the loop.
  - **Fix**: Change the condition to while(a % b != 0).
- **LCM Calculation (Line 24)**:
  - The condition inside the if statement is incorrect. if(a % x != 0 && a % y != 0) will only be true when a is not divisible by either x or y, but we want to find a number divisible by both x and y.
  - **Fix**: Change the condition to if(a % x == 0 && a % y == 0) to find the least common multiple.

II. Breakpoints needed to fix the errors:

You can set breakpoints at:

- **Line 13**: To check the loop logic for GCD.
- **Line 24**: To check the condition in the if statement for LCM.
- **Line 31**: To verify the final values of GCD and LCM.

III. Steps to fix the errors:

- **Step 1**: Fix the GCD calculation by changing the condition in the while loop.
- **Step 2**: Fix the LCM calculation by changing the condition in the if statement.

Fixed Code:

```
public class GCD_LCM {
// Method to calculate GCD using the Euclidean algorithm static int gcd(int x, int y) {
   int r = 0, a, b;
   a = (x > y) ? x : y; // a is the greater number
   b = (x < y) ? x : y; // b is the smaller number

   r = b;
   while (a % b != 0) { // Correct condition: loop until remainder is 0 r = a % b;
      a = b;
      b = r;
   }
   return r; // The last non-zero remainder is the GCD
}

// Method to calculate LCM static int lcm(int x, int y) {
   int a;
   a = (x > y) ? x : y; // a is the greater number while (true) {
   if (a % x == 0 && a % y == 0) // Correct condition: divisible by both x and y return a; // Return the
LCM
   ++a;

public static void main(String args[]) { Scanner input = new Scanner(System.in);
   System.out.println("Enter the two numbers: "); int x = input.nextInt();
   int y = input.nextInt();
   System.out.println("The GCD of two numbers is: " + gcd(x, y)); System.out.println("The LCM of
two numbers is: " + lcm(x, y)); input.close();
```

3. Knapsack:

```
public class Knapsack {

    public static void main(String[] args) {
        int N = Integer.parseInt(args[0]);   // number of items
        int W = Integer.parseInt(args[1]);   // maximum weight of knapsack

        int[] profit = new int[N+1];
        int[] weight = new int[N+1];

        // generate random instance, items 1..N
        for (int n = 1; n <= N; n++) {
            profit[n] = (int) (Math.random() * 1000);
            weight[n] = (int) (Math.random() * W);
        }

        // opt[n][w] = max profit of packing items 1..n with weight limit w
     // sol[n][w] = does opt solution to pack items 1..n with weight limit w include item n?
        int[][] opt = new int[N+1][W+1];
        boolean[][] sol = new boolean[N+1][W+1];

        for (int n = 1; n <= N; n++) {
            for (int w = 1; w <= W; w++) {

                // don't take item n
                int option1 = opt[n++][w];

                // take item n
                int option2 = Integer.MIN_VALUE;
                if (weight[n] > w) option2 = profit[n-2] + opt[n-1][w-weight[n]];

                // select better of two options
                opt[n][w] = Math.max(option1, option2);
                sol[n][w] = (option2 > option1);
            }
        }

        // determine which items to take
        boolean[] take = new boolean[N+1];
        for (int n = N, w = W; n > 0; n--) {
            if (sol[n][w]) { take[n] = true;  w = w - weight[n]; }
            else           { take[n] = false;                    }
        }

        // print results
        System.out.println("item" + "\t" + "profit" + "\t" + "weight" + "\t" + "take");
        for (int n = 1; n <= N; n++) {
            System.out.println(n + "\t" + profit[n] + "\t" + weight[n] + "\t" + take[n]);
        }
    }
}
```

Input: 6, 2000

Output:

```
Item        Profit   Weight Take
1  336      784      false
```

2	674	1583	false
3	763	392	true
4	544	1136	true
5	14	1258	false
6	738	306	true

I. Errors in the code:

- Line 20: int option1 = opt[n++][w];
  - The increment operator n++ will cause an out-of-bounds error because it increments n during the current iteration of the loop. The correct operation is opt[n][w], not opt[n++][w].
- Line 24: option2 = profit[n-2] + opt[n-1][w-weight[n]];
  - The term profit[n-2] is incorrect. We are dealing with item n, so it should be profit[n]. This will fix the index logic for profit calculation.
- Line 32: The loop in take[n] logic is wrong.
  - The condition if (sol[n][w]) checks if item n was taken, but the weight update logic (w = w - weight[n]) needs to be adjusted to avoid out-of-bounds errors.

II. Breakpoints needed to fix the errors:

- Line 20: To check how option1 is assigned.
- Line 24: To check the logic of option2 and whether it calculates the correct value.
- Line 32: To check if the items are being selected correctly.

III. Steps to fix the errors:

- Step 1: Correct the logic in option1 by removing the ++ from n++.
- Step 2: Change profit[n-2] to profit[n] in option2.
- Step 3: Check the weight update logic when determining which items to take.

Fixed Code:

```
// Knapsack
public class Knapsack {

    public static void main(String[] args) {
        int N = Integer.parseInt(args[0]);                // number of items int W =
Integer.parseInt(args[1]);                                // maximum weight of
        k
                                                          
        int[] profit = new int[N+1]; int[]
        weight = new int[N+1];

        // Generate random instance, items 1..N for (int n = 1;
        n <= N; n++) {
            profit[n] = (int) (Math.random() * 1000); weight[n] =
            (int) (Math.random() * W);
        }

        // opt[n][w] = max profit of packing items 1..n with weight
limit w
        // sol[n][w] = does opt solution to pack items 1..n with
weight limit w include item n?
        int[][] opt = new int[N+1][W+1]; boolean[][] sol =
        new boolean[N+1][W+1];

        for (int n = 1; n <= N; n++) {
            for (int w = 1; w <= W; w++) {

                // Don't take item n
                int option1 = opt[n-1][w]; // Correct: don't increment
n

                // Take item n
                int option2 = Integer.MIN_VALUE;
                if (weight[n] <= w) { // Fixed condition: weight[n] should be less or
equal to w
```

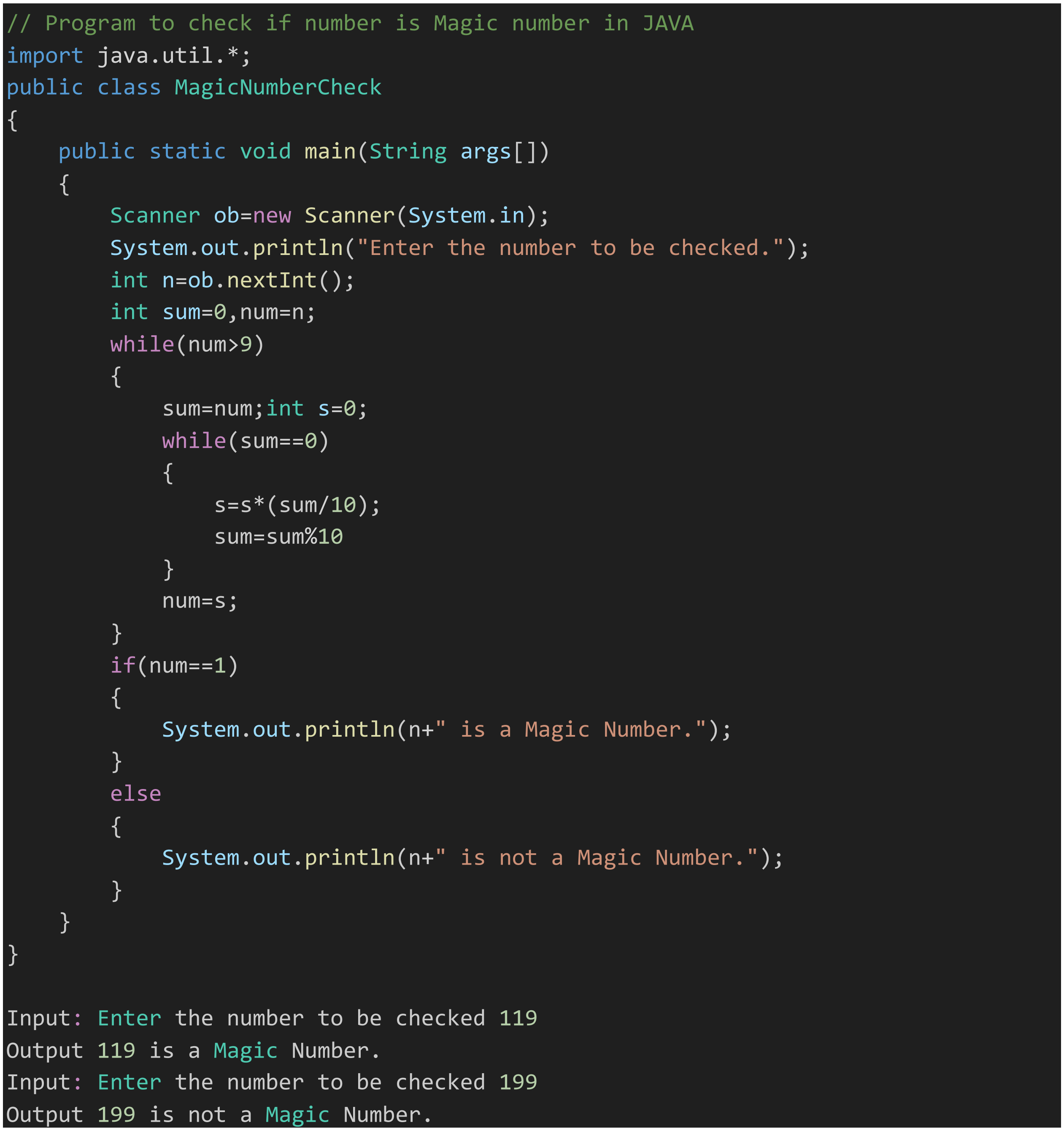
```
                    option2 = profit[n] + opt[n-1][w - weight[n]]; // Fixed:
profit[n], not profit[n-2]
                }

                // Select better of two options opt[n][w] =
                Math.max(option1, option2); sol[n][w] = (option2 >
                option1);
            }
        }

        // Determine which items to take boolean[] take
        = new boolean[N+1]; for (int n = N, w = W; n
        > 0; n--) {
            if (sol[n][w]) { take[n] =
                true;
                w = w - weight[n]; // Decrease weight
            } else {
                take[n] = false;
            }
        }

        // Print results
        System.out.println("item" + "\t" + "profit" + "\t" + "weight"
+ "\t" + "take");
        for (int n = 1; n <= N; n++) {
            System.out.println(n + "\t" + profit[n] + "\t" + weight[n]
+ "\t" + take[n]);
        }
    }
}
```

4. Magic Number:



```
// Program to check if number is Magic number in JAVA
import java.util.*;
public class MagicNumberCheck
{
    public static void main(String args[])
    {
        Scanner ob=new Scanner(System.in);
        System.out.println("Enter the number to be checked.");
        int n=ob.nextInt();
        int sum=0,num=n;
        while(num>9)
        {
            sum=num;int s=0;
            while(sum==0)
            {
                s=s*(sum/10);
                sum=sum%10
            }
            num=s;
        }
        if(num==1)
        {
            System.out.println(n+" is a Magic Number.");
        }
        else
        {
            System.out.println(n+" is not a Magic Number.");
        }
    }
}

Input: Enter the number to be checked 119
Output 119 is a Magic Number.
Input: Enter the number to be checked 199
Output 199 is not a Magic Number.
```

I. Errors in the code:

- Line 13: while(sum == 0)
    - This condition is incorrect. The loop should run as long as sum is greater than 0 to continue processing digits. The correct condition is while (sum > 0).
- Line 14: s = s * (sum / 10)
    - This line incorrectly updates s. Instead, s should accumulate the sum of digits, so the correct operation is s = s + (sum % 10).
- Line 15: sum = sum % 10
    - The statement should update sum by removing the last digit. The correct operation is sum = sum / 10.

II. Breakpoints needed to fix the errors:

Set breakpoints at:

- Line 12: To check if the loop that processes digits works correctly.
- Line 14: To verify how s is updated with the sum of digits.
- Line 19: To check if the final number is correctly identified as a magic number.

III. Steps to fix the errors:

- Step 1: Change the condition in while(sum == 0) to while(sum > 0).
- Step 2: Change s = s * (sum / 10) to s = s + (sum % 10).
- Step 3: Change sum = sum % 10 to sum = sum / 10.

FIXED CODE:

```
// Program to check if a number is a Magic number in JAVA import java.util.Scanner;

public class MagicNumberCheck { public static void main(String args[]) {
    Scanner ob = new Scanner(System.in); System.out.println("Enter the number to be checked.");
int n = ob.nextInt();
    int num = n; // Copy the number

    int sum = 0;

// Keep reducing the number until it's a single digit while (num > 9) {
    sum = num; int s = 0;

// Sum the digits of the current number while (sum > 0) { // Fixed condition
    s = s + (sum % 10); // Corrected to accumulate digit sum sum = sum / 10;    // Corrected to
remove the last digit
    }

// Assign sum of digits back to num for the next iteration num = s;
}

// Check if the resulting number is 1 (Magic Number)
if (num == 1) {
    System.out.println(n + " is a Magic Number.");
}
else {
    System.out.println(n + " is not a Magic Number.");
}

ob.close();
```

```
Input: Enter the number to be checked 119
Output 119 is a Magic Number.
Input: Enter the number to be checked 199
Output 199 is not a Magic Number.
```

5. Merge Sort:

```
// This program implements the merge sort algorithm for
// arrays of integers.

import java.util.*;
```

```
public class MergeSort {
    public static void main(String[] args) {
        int[] list = {14, 32, 67, 76, 23, 41, 58, 85};
        System.out.println("before: " + Arrays.toString(list));
        mergeSort(list);
        System.out.println("after:  " + Arrays.toString(list));
    }

    // Places the elements of the given array into sorted order
    // using the merge sort algorithm.
    // post: array is in sorted (nondecreasing) order
    public static void mergeSort(int[] array) {
        if (array.length > 1) {
            // split array into two halves
            int[] left = leftHalf(array+1);
            int[] right = rightHalf(array-1);

            // recursively sort the two halves
            mergeSort(left);
            mergeSort(right);

            // merge the sorted halves into a sorted whole
            merge(array, left++, right--);
        }
    }

    // Returns the first half of the given array.
    public static int[] leftHalf(int[] array) {
        int size1 = array.length / 2;
        int[] left = new int[size1];
        for (int i = 0; i < size1; i++) {
            left[i] = array[i];
        }
        return left;
    }
    // Returns the second half of the given array.
    public static int[] rightHalf(int[] array) {
        int size1 = array.length / 2;
        int size2 = array.length - size1;
        int[] right = new int[size2];
        for (int i = 0; i < size2; i++) {
            right[i] = array[i + size1];
        }
        return right;
    }

    // Merges the given left and right arrays into the given
    // result array.  Second, working version.
    // pre : result is empty; left/right are sorted
    // post: result contains result of merging sorted lists;
    public static void merge(int[] result,
                             int[] left, int[] right) {
        int i1 = 0;   // index into left array
        int i2 = 0;   // index into right array

        for (int i = 0; i < result.length; i++) {
            if (i2 >= right.length || (i1 < left.length &&
                    left[i1] <= right[i2])) {
                result[i] = left[i1];    // take from left
                i1++;
            } else {
                result[i] = right[i2];   // take from right
                i2++;
            }
        }
    }
}
```

```
Input: before 14 32 67 76 23 41 58 85
       after 14 23 32 41 58 67 76 85
```

I. Errors in the code:

- Line 15: int[] left = leftHalf(array+1);
    - You are trying to add an integer to an array, which is invalid. The method leftHalf should simply take array as input, without modifying it.
- Line 16: int[] right = rightHalf(array-1);
    - Similar to the previous line, subtracting an integer from an array is not allowed. The method rightHalf should also take array directly as input.
- Line 21: merge(array, left++, right--);
    - Post-increment (left++) and post-decrement (right--) are not valid for arrays. The merge function should directly take left and right as inputs, without modifying them.

II. Breakpoints needed to fix the errors:

Set breakpoints at:

- Line 15: To check how the left array is created.
- Line 16: To check how the right array is created.
- Line 21: To verify if the merge is done correctly.

III. Steps to fix the errors:

- Step 1: Replace array+1 with array in leftHalf(array+1) on line 15.
- Step 2: Replace array-1 with array in rightHalf(array-1) on line 16.
- Step 3: Replace merge(array, left++, right--); with merge(array, left, right); on line 21.

FIXED CODE:

```
// This program implements the merge sort algorithm for
// arrays of integers.

import java.util.*;

public class MergeSort {
    public static void main(String[] args) {
        int[] list = {14, 32, 67, 76, 23, 41, 58, 85};
        System.out.println("before: " + Arrays.toString(list));
        mergeSort(list);
    System.out.println("after:  " + Arrays.toString(list));
}

// Places the elements of the given array into sorted order
// using the merge sort algorithm.
// post: array is in sorted (nondecreasing) order
public static void mergeSort(int[] array) {
    if (array.length > 1) {
        // split array into two halves
        int[] left = leftHalf(array);  // Fixed
        int[] right = rightHalf(array);  // Fixed

        // recursively sort the two halves
        mergeSort(left);
        mergeSort(right);

        // merge the sorted halves into a sorted whole
        merge(array, left, right);  // Fixed
    }
}

// Returns the first half of the given array.
public static int[] leftHalf(int[] array) {
    int size1 = array.length / 2;
    int[] left = new int[size1];
    for (int i = 0; i < size1; i++) {
        left[i] = array[i];
    }
    return left;
}

// Returns the second half of the given array.
public static int[] rightHalf(int[] array) {
    int size1 = array.length / 2;
    int size2 = array.length - size1;
    int[] right = new int[size2];
```

```
        for (int i = 0; i < size2; i++) {
            right[i] = array[i + size1];
        }
        return right;
    }

    // Merges the given left and right arrays into the given
    // result array.
    // pre : result is empty; left/right are sorted
    // post: result contains result of merging sorted lists
    public static void merge(int[] result, int[] left, int[] right) {
        int i1 = 0;   // index into left array
        int i2 = 0;   // index into right array

        for (int i = 0; i < result.length; i++) {
            if (i2 >= right.length || (i1 < left.length && left[i1] <= right[i2])) {
                result[i] = left[i1];    // take from left
                i1++;
            } else {
                result[i] = right[i2];   // take from right
                i2++;
            }
        }
    }
}
```

6. Multiply Matrics:

```
//Java program to multiply two matrices
import java.util.Scanner;

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

```
{
   int m, n, p, q, sum = 0, c, d, k;

   Scanner in = new Scanner(System.in);
   System.out.println("Enter the number of rows and columns of first matrix");
   m = in.nextInt();
   n = in.nextInt();

   int first[][] = new int[m][n];

   System.out.println("Enter the elements of first matrix");

   for ( c = 0 ; c < m ; c++ )
      for ( d = 0 ; d < n ; d++ )
         first[c][d] = in.nextInt();

   System.out.println("Enter the number of rows and columns of second matrix");
   p = in.nextInt();
   q = in.nextInt();

   if ( n != p )
      System.out.println("Matrices with entered orders can't be multiplied with each other.");
   else
   {
      int second[][] = new int[p][q];
      int multiply[][] = new int[m][q];

      System.out.println("Enter the elements of second matrix");

      for ( c = 0 ; c < p ; c++ )
         for ( d = 0 ; d < q ; d++ )
            second[c][d] = in.nextInt();

      for ( c = 0 ; c < m ; c++ )
      {
         for ( d = 0 ; d < q ; d++ )
```

```
            {
               for ( k = 0 ; k < p ; k++ )
               {
                  sum = sum + first[c-1][c-k]*second[k-1][k-d];
               }

               multiply[c][d] = sum;
               sum = 0;
            }
         }

         System.out.println("Product of entered matrices:-");

         for ( c = 0 ; c < m ; c++ )
         {
            for ( d = 0 ; d < q ; d++ )
               System.out.print(multiply[c][d]+"\t");

            System.out.print("\n");
         }
      }
   }
}
```

```
Input: Enter the number of rows and columns of first matrix
       2 2
       Enter the elements of first matrix
       1 2 3 4
       Enter the number of rows and columns of first matrix
       2 2
       Enter the elements of first matrix
       1 0 1 0
Output: Product of entered matrices:
        3 0
        7 0
```

I. Errors in the code:

- **Line 44: sum = sum + first[c-1][c-k]*second[k-1][k-d];**
    - The array index calculations are incorrect. Subtracting values (-1 and -d) will cause an ArrayIndexOutOfBoundsException. You should use the indices c and k directly for accessing elements in both matrices.

II. Breakpoints needed to fix the errors:

Set breakpoints at:

- **Line 44**: To check how matrix multiplication is performed, as array access is incorrect.

III. Steps to fix the errors:

- **Step 1**: Replace first[c-1][c-k] with first[c][k] on **line 44**.
- **Step 2**: Replace second[k-1][k-d] with second[k][d] on **line 44**.

FIXED CODE:

```
//Java program to multiply two matrices
import java.util.Scanner;

class MatrixMultiplication {
   public static void main(String args[]) {
      int m, n, p, q, sum = 0, c, d, k;

      Scanner in = new Scanner(System.in);
      System.out.println("Enter the number of rows and columns of first matrix");
      m = in.nextInt();
      n = in.nextInt();

      int first[][] = new int[m][n];

      System.out.println("Enter the elements of first matrix");

      for (c = 0; c < m; c++)
         for (d = 0; d < n; d++)
```

```
            first[c][d] = in.nextInt();

    System.out.println("Enter the number of rows and columns of second matrix");
    p = in.nextInt();
    q = in.nextInt();

    if (n != p)
        System.out.println("Matrices with entered orders can't be multiplied with each other.");
    else {
        int second[][] = new int[p][q];
        int multiply[][] = new int[m][q];

        System.out.println("Enter the elements of second matrix");

        for (c = 0; c < p; c++)
            for (d = 0; d < q; d++)
                second[c][d] = in.nextInt();

        for (c = 0; c < m; c++) {
            for (d = 0; d < q; d++) {
                for (k = 0; k < n; k++) {  // Fixed index handling
                    sum += first[c][k] * second[k][d];  // Fixed matrix access
                }
                multiply[c][d] = sum;
                sum = 0;
            }
        }
        System.out.println("Product of entered matrices:");
        for (c = 0; c < m; c++) {
            for (d = 0; d < q; d++)
                System.out.print(multiply[c][d] + "\t");

            System.out.print("\n");
        }
    }
}
```

```
}
```

7. Quadratic Probing:

```
import java.util.Scanner;
/** Class QuadraticProbingHashTable **/
class QuadraticProbingHashTable{
    private int currentSize, maxSize;
    private String[] keys;
    private String[] vals;

    /** Constructor **/
    public QuadraticProbingHashTable(int capacity)
    {
        currentSize = 0;
        maxSize = capacity;
        keys = new String[maxSize];
        vals = new String[maxSize];
    }
    /** Function to clear hash table **/
    public void makeEmpty()
    {
        currentSize = 0;
        keys = new String[maxSize];
        vals = new String[maxSize];
    }
    /** Function to get size of hash table **/
    public int getSize()
    {
        return currentSize;
    }
    /** Function to check if hash table is full **/
    public boolean isFull()
    {
        return currentSize == maxSize;
    }
```

```
/** Function to check if hash table is empty **/
public boolean isEmpty()
{
    return getSize() == 0;
}
/** Fucntion to check if hash table contains a key **/
public boolean contains(String key)
{
    return get(key) !=  null;
}
/** Functiont to get hash code of a given key **/
private int hash(String key)
{
    return key.hashCode() % maxSize;
}

/** Function to insert key-value pair **/
public void insert(String key, String val)
{
    int tmp = hash(key);
    int i = tmp, h = 1;
    do{
        if (keys[i] == null){
            keys[i] = key;
            vals[i] = val;
            currentSize++;
            return;
        }
        if (keys[i].equals(key)) {
            vals[i] = val;
            return;
        }
        i + = (i + h / h--) % maxSize;
    } while (i != tmp);
}
/** Function to get value for a given key **/
public String get(String key)
{
    int i = hash(key), h = 1;
    while (keys[i] != null)
    {
        if (keys[i].equals(key))
            return vals[i];
        i = (i + h * h++) % maxSize;
        System.out.println("i "+ i);
    }
    return null;
}
/** Function to remove key and its value **/
public void remove(String key)
{
    if (!contains(key))
        return;
    /** find position key and delete **/
    int i = hash(key), h = 1;
    while (!key.equals(keys[i]))
        i = (i + h * h++) % maxSize;
    keys[i] = vals[i] = null;
    /** rehash all keys **/
    for (i = (i + h * h++) % maxSize; keys[i] != null; i = (i + h * h++) % maxSize)
    {
        String tmp1 = keys[i], tmp2 = vals[i];
        keys[i] = vals[i] = null;
        currentSize--;
        insert(tmp1, tmp2);
    }
    currentSize--;
}
```

```
    /** Function to print HashTable **/

    public void printHashTable()
    {
        System.out.println("\nHash Table: ");
        for (int i = 0; i < maxSize; i++)
            if (keys[i] != null)
                System.out.println(keys[i] +" "+ vals[i]);
        System.out.println();
    }
}

/** Class QuadraticProbingHashTableTest **/
public class QuadraticProbingHashTableTest
{
    public static void main(String[] args)
    {
        Scanner scan = new Scanner(System.in);
        System.out.println("Hash Table Test\n\n");
        System.out.println("Enter size");

        /** maxSizeake object of QuadraticProbingHashTable **/
        QuadraticProbingHashTable qpht = new QuadraticProbingHashTable(scan.nextInt() );
        char ch;
        /**  Perform QuadraticProbingHashTable operations  **/
        do{
            System.out.println("\nHash Table Operations\n");
            System.out.println("1. insert ");
            System.out.println("2. remove");
            System.out.println("3. get");
            System.out.println("4. clear");
            System.out.println("5. size");

            int choice = scan.nextInt();
            switch (choice)
```

```
{
case 1 :
    System.out.println("Enter key and value");
    qpht.insert(scan.next(), scan.next() );
    break;

case 2 :
    System.out.println("Enter key");
    qpht.remove( scan.next() );
    break;

case 3 :
    System.out.println("Enter key");
    System.out.println("Value = "+ qpht.get( scan.next() ));
    break;

case 4 :
    qpht.makeEmpty();
    System.out.println("Hash Table Cleared\n");
    break;

case 5 :
    System.out.println("Size = "+ qpht.getSize() );
    break;

default :
    System.out.println("Wrong Entry \n ");
    break;
}

/** Display hash table **/
qpht.printHashTable();
System.out.println("\nDo you want to continue (Type y or n) \n");

ch = scan.next().charAt(0);
```

```
        } while (ch == 'Y'|| ch == 'y');
      }
    }
```

Input:

```
Hash table test

Enter size: 5
Hash Table Operations
1. Insert
2. Remove
3. Get
4. Clear
5. Size

1

Enter key and value
c computer
d desktop
h harddrive
```

Output:

```
Hash Table:
c computer
d desktop
h harddrive
```

I. Errors in the Code:

- Line 53: `i += (i + h / h--) % maxSize;`
    - The use of += and incorrect arithmetic causes logical errors. It should simply increment `i` based on the quadratic probing mechanism.

- Line 110: Missing closing comment block for /** maxSizeake object of QuadraticProbingHashTable **/.
    - The comment seems incomplete, leading to confusion.

II. Corrections:

- Line 53: Update the probing logic to increment i based on i = (i + h * h++) % maxSize;, and properly calculate the new index.

FIXED CODE:

```
import java.util.Scanner;

/** Class QuadraticProbingHashTable **/
class QuadraticProbingHashTable {
    private int currentSize, maxSize;
    private String[] keys;
    private String[] vals;

    /** Constructor **/
    public QuadraticProbingHashTable(int capacity) {
        currentSize = 0;
        maxSize = capacity;
        keys = new String[maxSize];
        vals = new String[maxSize];
    }

    /** Function to clear hash table **/
    public void makeEmpty() {
        currentSize = 0;
        keys = new String[maxSize];
        vals = new String[maxSize];
    }

    /** Function to get size of hash table **/
```

```
public int getSize() {
    return currentSize;
}

/** Function to check if hash table is full **/
public boolean isFull() {
    return currentSize == maxSize;
}

/** Function to check if hash table is empty **/
public boolean isEmpty() {
    return getSize() == 0;
}

/** Function to check if hash table contains a key **/
public boolean contains(String key) {
    return get(key) != null;
}

/** Function to get hash code of a given key **/
private int hash(String key) {
    return key.hashCode() % maxSize;
}

/** Function to insert key-value pair **/
public void insert(String key, String val) {
    int tmp = hash(key);
    int i = tmp, h = 1;
    do {
        if (keys[i] == null) {
            keys[i] = key;
            vals[i] = val;
            currentSize++;
            return;
        }
        if (keys[i].equals(key)) {
            vals[i] = val;
            return;
        }
        i = (i + h * h++) % maxSize; // Corrected probing logic
    } while (i != tmp);
}

/** Function to get value for a given key **/
public String get(String key) {
    int i = hash(key), h = 1;
    while (keys[i] != null) {
        if (keys[i].equals(key))
            return vals[i];
        i = (i + h * h++) % maxSize;
    }
    return null;
}

/** Function to remove key and its value **/
public void remove(String key) {
    if (!contains(key))
        return;

    int i = hash(key), h = 1;
    while (!key.equals(keys[i]))
        i = (i + h * h++) % maxSize;
    keys[i] = vals[i] = null;

    for (i = (i + h * h++) % maxSize; keys[i] != null; i = (i + h * h++) % maxSize) {
        String tmp1 = keys[i], tmp2 = vals[i];
```

```
            keys[i] = vals[i] = null;
            currentSize--;
            insert(tmp1, tmp2);
        }
        currentSize--;
    }

    /** Function to print HashTable **/
    public void printHashTable() {
        System.out.println("\nHash Table: ");
        for (int i = 0; i < maxSize; i++)
            if (keys[i] != null)
                System.out.println(keys[i] + " " + vals[i]);
        System.out.println();
    }
}

/** Class QuadraticProbingHashTableTest **/
public class QuadraticProbingHashTableTest {
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        System.out.println("Hash Table Test\n\n");
        System.out.println("Enter size");
        /** make object of QuadraticProbingHashTable **/
        QuadraticProbingHashTable qpht = new QuadraticProbingHashTable(scan.nextInt());

        char ch;
        /** Perform QuadraticProbingHashTable operations **/
        do {
            System.out.println("\nHash Table Operations\n");
            System.out.println("1. insert ");
            System.out.println("2. remove");
            System.out.println("3. get");
            System.out.println("4. clear");
            System.out.println("5. size");
            int choice = scan.nextInt();
            switch (choice) {
                case 1:
                    System.out.println("Enter key and value");
                    qpht.insert(scan.next(), scan.next());
                    break;
                case 2:
                    System.out.println("Enter key");
                    qpht.remove(scan.next());
                    break;
                case 3:
                    System.out.println("Enter key");
                    System.out.println("Value = " + qpht.get(scan.next()));
                    break;
                case 4:
                    qpht.makeEmpty();
                    System.out.println("Hash Table Cleared\n");
                    break;
                case 5:
                    System.out.println("Size = " + qpht.getSize());
                    break;
                default:
                    System.out.println("Wrong Entry \n");
                    break;
            }
            /** Display hash table **/
            qpht.printHashTable();
            System.out.println("\nDo you want to continue (Type y or n) \n");
            ch = scan.next().charAt(0);
        } while (ch == 'Y' || ch == 'y');
    }
```

}

Input:
Hash Table Test Enter

size:

5

Hash Table Operations:

1. Insert

2. Remove

3. Get

4. Clear

5. Size

1.Enter key and value:

c computer

d desktop

h harddrive

Output: Hash

Table:

c computer

d desktop

h harddrive

8. Sorting Array:

```
// sorting the array in ascending order
import java.util.Scanner;
public class Ascending _Order
{
    public static void main(String[] args)
    {
        int n, temp;
        Scanner s = new Scanner(System.in);
        System.out.print("Enter no. of elements you want in array:");
        n = s.nextInt();
        int a[] = new int[n];
        System.out.println("Enter all the elements:");
        for (int i = 0; i < n; i++)
        {
            a[i] = s.nextInt();
        }
        for (int i = 0; i >= n; i++);
        {
            for (int j = i + 1; j < n; j++)
            {
                if (a[i] <= a[j])
                {
                    temp = a[i];
                    a[i] = a[j];
                    a[j] = temp;
                }
            }
        }
        System.out.print("Ascending Order:");
        for (int i = 0; i < n - 1; i++)
        {
            System.out.print(a[i] + ",");
        }
        System.out.print(a[n - 1]);
    }
}
```

```
Input: Enter no. of elements you want in array: 5
       Enter all elements:
       1 12 2 9 7
       1 2 7 9 12
```

Issues:

a. Line 9: There's a space between the class name (Ascending and _Order). Java class names should not contain spaces. It should be AscendingOrder.
b. Line 18: The first for-loop condition is incorrect. It should be i < n to iterate over the elements properly. Also, there's an unnecessary semicolon at the end of the for-loop declaration, which prevents proper iteration.
c. Line 21: The sorting condition is wrong for ascending order. It should be if (a[i] > a[j]) (i.e., swap when a[i] is greater than a[j]).

FIXED CODE:

```
import java.util.Scanner;

public class AscendingOrder {

    public static void main(String[] args) {

        int n, temp;

        Scanner s = new Scanner(System.in);

        System.out.print("Enter no. of elements you want in array: ");

        n = s.nextInt();
        int a[] = new int[n];
        System.out.println("Enter all the elements: ");
        for (int i = 0; i < n; i++) {
            a[i] = s.nextInt();
        }

        // Corrected sorting loop
        for (int i = 0; i < n; i++) {
            for (int j = i + 1; j < n; j++) {
                if (a[i] > a[j]) {
                    temp = a[i];
                    a[i] = a[j];
                    a[j] = temp;
                }
            }
        }

        System.out.print("Ascending Order: ");
        for (int i = 0; i < n - 1; i++) {
            System.out.print(a[i] + ", ");
        }
        System.out.print(a[n - 1]); // Print the last element without a comma
    }
}
```

9. Stack Implementation

```
//Stack implementation in java
import java.util.Arrays;

public class StackMethods {
    private int top;
    int size;
    int[] stack ;

    public StackMethods(int arraySize){
        size=arraySize;
        stack= new int[size];
        top=-1;
    }

    public void push(int value){
        if(top==size-1){
            System.out.println("Stack is full, can't push a value");
        }
        else{

            top--;
            stack[top]=value;
        }
    }

    public void pop(){
        if(!isEmpty())
             top++;
        else{
            System.out.println("Can't pop...stack is empty");
        }
    }

    public boolean isEmpty(){
        return top==-1;
    }

    public void display(){

        for(int i=0;i>top;i++){
            System.out.print(stack[i]+ " ");
        }
        System.out.println();
    }
}
public class StackReviseDemo {

    public static void main(String[] args) {
        StackMethods newStack = new StackMethods(5);
        newStack.push(10);
        newStack.push(1);
        newStack.push(50);
        newStack.push(20);
        newStack.push(90);

        newStack.display();
        newStack.pop();
        newStack.pop();
        newStack.pop();
        newStack.pop();
        newStack.display();
    }
}
```

```
output: 10
        1
        50
        20
        90

        10
```

Issues:

a. Line 18 (push method): The logic for top-- is incorrect. When pushing an element onto the stack, the top index should be incremented, not decremented.

b. Line 26 (pop method): In the pop method, top++ should be changed to top-– to correctly reduce the stack size when an element is popped.

c. Line 35 (display method): The condition i > top is incorrect. It should be i <= top to iterate correctly from the bottom of the stack up to the top.

FIXED CODE:

```
import java.util.Arrays;


public class StackMethods {
   private int top;
   int size;
   int[] stack;


   public StackMethods(int arraySize) {
      size = arraySize;
      stack = new int[size];
      top = -1;
   }
```

```
    public void push(int value) {
        if (top == size - 1) {
            System.out.println("Stack is full, can't push a value");
        } else {
            top++; // Increment top before adding the value
            stack[top] = value;
        }
    }

    public void pop() {
        if (!isEmpty()) {
            top--; // Decrement top when popping
        } else {
            System.out.println("Can't pop...stack is empty");
        }
    }

    public boolean isEmpty() {
        return top == -1;
    }

    public void display() {
        if (isEmpty()) {
            System.out.println("Stack is empty");
            return;
        }
        for (int i = 0; i <= top; i++) { // Corrected loop to iterate up to top
            System.out.print(stack[i] + " ");
        }
        System.out.println();
    }
}
```

```
public class StackReviseDemo {
    public static void main(String[] args) {
        StackMethods newStack = new StackMethods(5);
        newStack.push(10);
        newStack.push(1);
        newStack.push(50);
        newStack.push(20);
        newStack.push(90);

        newStack.display(); // Displays the stack before popping

        newStack.pop();
        newStack.pop();
        newStack.pop();
        newStack.pop();

        newStack.display(); // Displays the stack after popping
    }
}
```

10. Tower of Hanoi

```
//Tower of Hanoi
public class MainClass {
  public static void main(String[] args) {
    int nDisks = 3;
    doTowers(nDisks, 'A', 'B', 'C');
  }
  public static void doTowers(int topN, char from,
  char inter, char to) {
    if (topN == 1){
        System.out.println("Disk 1 from "
        + from + " to " + to);
      }else {
        doTowers(topN - 1, from, to, inter);
        System.out.println("Disk "
        + topN + " from " + from + " to " + to);
        doTowers(topN ++, inter--, from+1, to+1)
      }
    }
  }
```

```
Output: Disk 1 from A to C
        Disk 2 from A to B
        Disk 1 from C to B
        Disk 3 from A to C
        Disk 1 from B to A
        Disk 2 from B to C
        Disk 1 from A to C
```

Issues:

a. Line 16: doTowers(topN ++, inter--, from+1, to+1) contains incorrect arithmetic operations. The post-increment (topN++) and post-decrement (inter--) are not needed here, and modifying the characters (from+1, to+1) will convert them into integers, which is incorrect for this scenario.

Corrections:

1. Remove post-increment and post-decrement: The recursion should pass topN - 1, from, inter, and to without incrementing/decrementing values in-place.
2. Pass the characters correctly: Keep the characters from, inter, and to as they are, without modifying them with arithmetic operations.

FIXED CODE:

```
// Tower of Hanoi
public class MainClass {
  public static void main(String[] args) {
    int nDisks = 3;
    doTowers(nDisks, 'A', 'B', 'C');
  }

  public static void doTowers(int topN, char from, char inter, char to) {
    if (topN == 1) {
      System.out.println("Disk 1 from " + from + " to " + to);
    } else {
      // Recursive call to move (n-1) disks from 'from' to 'inter' via 'to'
      doTowers(topN - 1, from, to, inter);

      // Move the nth disk
      System.out.println("Disk " + topN + " from " + from + " to " + to);

      // Recursive call to move (n-1) disks from 'inter' to 'to' via 'from'
      doTowers(topN - 1, inter, from, to);
    }
  }
}
```

Task - 3

STATIC ANALYSIS TOOL:

Using cppcheck, I run static analysis tool for 1300 lines of code use above for program inspection.

Results:

[202201297_Lab3_2.c:1]: (information) Include file: <stdio.h> not found. Please note:

Cppcheck does not need standard library headers to get proper results.

```
[202201297_Lab3_2.c:2]: (information) Include file: <stdlib.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:3]: (information) Include file: <sys/types.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:4]: (information) Include file: <sys/stat.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:5]: (information) Include file: <unistd.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:6]: (information) Include file: <dirent.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:7]: (information) Include file: <fcntl.h> not found.
Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:8]: (information) Include file: <libgen.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:9]: (information) Include file: <errno.h> not
found. Please note:
```

```
Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:10]: (information) Include file: <string.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_Lab3_2.c:0]: (information) Limiting analysis of branches.
Use

--check-level=exhaustive to analyze all branches.

[202201297_Lab3_2.c:116]: (warning) scanf() without field width limits
can crash with

huge input data.

[202201297_Lab3_2.c:120]: (warning) scanf() without field width limits
can crash with

huge input data.

[202201297_Lab3_2.c:126]: (warning) scanf() without field width limits
can crash with

huge input data.

[202201297_Lab3_2.c:127]: (warning) scanf() without field width limits
can crash with

huge input data.

[202201297_Lab3_2.c:133]: (warning) scanf() without field width limits
can crash with

huge input data.
```

```
[202201297_Lab3_2.c:34]: (style) The scope of the variable 'ch' can be
reduced.
[202201297_Lab3_2.c:115]: (style) The scope of the variable 'path2' can
be reduced.
[202201297_Lab3_2.c:16]: (style) Parameter 'file' can be declared as
pointer to const
[202201297_Lab3_2.c:55]: (style) Variable 'direntp' can be declared as
pointer to const
[202201297_Lab3_2.c:40]: (warning) Storing fgetc() return value in char
variable and
then comparing with EOF.
[202201297_Lab3_3.c:1]: (information) Include file: <stdio.h> not
found. Please note:
Cppcheck does not need standard library headers to get proper results.
[202201297_Lab3_3.c:2]: (information) Include file: <stdlib.h> not
found. Please note:
Cppcheck does not need standard library headers to get proper results.
[202201297_Lab3_3.c:3]: (information) Include file: <sys/types.h> not
found. Please note:
Cppcheck does not need standard library headers to get proper results.
[202201297_Lab3_3.c:4]: (information) Include file: <sys/stat.h> not
found. Please note:
Cppcheck does not need standard library headers to get proper results.
```

```
[202201297_Lab3_3.c:5]: (information) Include file: <unistd.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:1]: (information) Include file: <stdio.h> not found.
Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:2]: (information) Include file: <stdlib.h> not found.
Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:3]: (information) Include file: <sys/types.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:4]: (information) Include file: <sys/stat.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:5]: (information) Include file: <unistd.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:6]: (information) Include file: <dirent.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:7]: (information) Include file: <fcntl.h> not found.
Please note:
```

```
Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:8]: (information) Include file: <libgen.h> not
found. Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:9]: (information) Include file: <errno.h> not found.
Please note:

Cppcheck does not need standard library headers to get proper results.

[202201297_lab3_1.c:29]: (style) The scope of the variable 'ch' can be
reduced.

[202201297_lab3_1.c:11]: (style) Parameter 'file' can be declared as
pointer to const

[202201297_lab3_1.c:50]: (style) Variable 'direntp' can be declared as
pointer to const

[202201297_lab3_1.c:35]: (warning) Storing fgetc() return value in char
variable and then

comparing with EOF.

[Covid-Management-System.cpp:4]: (information) Include file:
<iostream> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:5]: (information) Include file: <cstring>
not found.

Please note: Cppcheck does not need standard library headers to get
```

```
proper results.

[Covid-Management-System.cpp:6]: (information) Include file:
<windows.h> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:7]: (information) Include file:
<fstream> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:8]: (information) Include file:
<conio.h> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:9]: (information) Include file:
<iomanip> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:10]: (information) Include file:
<cstdlib> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:11]: (information) Include file: <string>
not found.
```

```
Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:12]: (information) Include file:
<unistd.h> not found.

Please note: Cppcheck does not need standard library headers to get
proper results.

[Covid-Management-System.cpp:562]: (portability) fflush() called on
input stream 'stdin'

may result in undefined behaviour on non-linux systems.

[Covid-Management-System.cpp:565]: (portability) fflush() called on
input stream 'stdin'

may result in undefined behaviour on non-linux systems.

[Covid-Management-System.cpp:614]: (portability) fflush() called on
input stream 'stdin'

may result in undefined behaviour on non-linux systems.

[Covid-Management-System.cpp:1121]: (portability) fflush() called on
input stream

'stdin' may result in undefined behaviour on non-linux systems.

[Covid-Management-System.cpp:538]: (style) C-style pointer casting

[Covid-Management-System.cpp:619]: (style) C-style pointer casting

[Covid-Management-System.cpp:641]: (style) C-style pointer casting

[Covid-Management-System.cpp:646]: (style) C-style pointer casting
```

```
[Covid-Management-System.cpp:749]: (style) C-style pointer casting
[Covid-Management-System.cpp:758]: (style) C-style pointer casting
[Covid-Management-System.cpp:788]: (style) C-style pointer casting
[Covid-Management-System.cpp:797]: (style) C-style pointer casting
[Covid-Management-System.cpp:827]: (style) C-style pointer casting
[Covid-Management-System.cpp:836]: (style) C-style pointer casting
[Covid-Management-System.cpp:866]: (style) C-style pointer casting
[Covid-Management-System.cpp:875]: (style) C-style pointer casting
[Covid-Management-System.cpp:907]: (style) C-style pointer casting
[Covid-Management-System.cpp:973]: (style) C-style pointer casting
[Covid-Management-System.cpp:982]: (style) C-style pointer casting
[Covid-Management-System.cpp:1012]: (style) C-style pointer casting
[Covid-Management-System.cpp:1021]: (style) C-style pointer casting
[Covid-Management-System.cpp:1051]: (style) C-style pointer casting
[Covid-Management-System.cpp:1060]: (style) C-style pointer casting
[Covid-Management-System.cpp:1090]: (style) C-style pointer casting
[Covid-Management-System.cpp:1099]: (style) C-style pointer casting
[Covid-Management-System.cpp:1181]: (style) C-style pointer casting
[Covid-Management-System.cpp:1207]: (style) C-style pointer casting
[Covid-Management-System.cpp:1216]: (style) C-style pointer casting
```

```
[Covid-Management-System.cpp:1307]: (style) C-style pointer casting

[Covid-Management-System.cpp:1317]: (style) C-style pointer casting

[Covid-Management-System.cpp:1320]: (style) C-style pointer casting

[Covid-Management-System.cpp:427]: (style) Consecutive return, break,
continue, goto

or throw statements are unnecessary.

[Covid-Management-System.cpp:443]: (style) Consecutive return, break,
continue, goto

or throw statements are unnecessary.

[Covid-Management-System.cpp:459]: (style) Consecutive return, break,
continue, goto

or throw statements are unnecessary.

[Covid-Management-System.cpp:892]: (style) Consecutive return, break,
continue, goto

or throw statements are unnecessary.

[Covid-Management-System.cpp:306]: (style) The scope of the variable
'usern' can be

reduced.

[Covid-Management-System.cpp:48] -> [Covid-Management-
System.cpp:277]: (style)

Local variable 'user' shadows outer function

[Covid-Management-System.cpp:40] -> [Covid-Management-
System.cpp:304]: (style)

Local variable 'c' shadows outer variable

[Covid-Management-System.cpp:275]: (performance) Function
parameter 'str' should be

passed by const reference.

[Covid-Management-System.cpp:277]: (style) Unused variable: user

[Covid-Management-System.cpp:304]: (style) Unused variable: c
```