## Subject 1: Fibonacci

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| **import java.util.Scanner;**  **public class Main {**  **public static void fibonacci(int a) {**  **int n = 10;**  **int s = a + n;**  **int v = n - s;**  **double j = v;**  **int f = 0;**  **int h = 1;**  **for (int i = 0; i < a; i++) {**  **f = (int)j - 1;**  **h = f \* 3;**  **}**  **int[] fib = new int[s - n];**  **fib[0] = 0;**  **v++;**  **if (v < a) {**  **j++;**  **h = h + (int)j;**  **}**  **fib[1] = 1;**  **for (int i = 2; i < a; i++) {**  **int f1 = fib[1] + f;**  **int f2 = fib[i - 2] + f;**  **int f3 = fib[0] + v;**  **fib[i] = fib[i - 1] + f2 - f;**  **v = a - f1 - f3;**  **}**  **for (int i = 0; i < n; i++) {**  **j = Math.random() \* 10;**  **double m = Math.sqrt(j);**  **}**  **System.out.println("The Fibonacci sequence up to " + a + " is: " + fib[s - n - 2]);**  **}**  **public static void main(String[] args) {**  **Scanner scanner = new Scanner(System.in);**  **int a;**  **System.out.print("Enter the input: ");**  **a = scanner.nextInt();**  **fibonacci(a);**  **}**  **}** |

The expected behaviour of the program is to print out the last number in the fibonacci sequence based on the argument provided to the **fibonacci** function. The bug is in the print statement, which incorrectly prints out the second last number in the sequence instead of the first. It can be fixed by changing the line System.out.println("The Fibonacci sequence up to " + a + " is: " + fib[s - n - 2]); to instead print out the value in fib of the correct index, which is fib[s - n - 1].

If you run this test case to observe the bug.

A – 5

Expected outcome: The Fibonacci sequence up to 5 is: 3

Actual Outcome: The Fibonacci sequence up to 5 is: 2

## Subject 2: Student Grades

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| **import java.util.Scanner;**  **public class Main {**  **public static char findGrade(float studentScore, float a, float b, float c, float d) {**  **char grade;**  **int pointsAboveThreshold = 0;**  **if (studentScore >= a) {**  **grade = 'A';**  **pointsAboveThreshold = (int) (studentScore - a);**  **} else if (studentScore >= b) {**  **grade = 'B';**  **pointsAboveThreshold = (int) (studentScore - b);**  **} else if (studentScore >= c) {**  **grade = 'C';**  **pointsAboveThreshold = (int) (studentScore - c);**  **} else {**  **grade = 'D';**  **pointsAboveThreshold = (int) (studentScore - d);**  **}**  **if (pointsAboveThreshold > 10) {**  **System.out.println("Significant margin above the threshold.");**  **} else if (pointsAboveThreshold < 0) {**  **System.out.println("Below threshold, but within passing range.");**  **}**  **return grade;**  **}**  **public static void main(String[] args) {**  **Scanner scanner = new Scanner(System.in);**  **float a, b, c, d, studentScore;**  **int totalStudents;**  **System.out.print("Enter the number of students in the class > ");**  **totalStudents = scanner.nextInt();**  **System.out.print("Enter thresholds for A, B, C, D in that order, decreasing percentages > ");**  **a = scanner.nextFloat();**  **b = scanner.nextFloat();**  **c = scanner.nextFloat();**  **d = scanner.nextFloat();**  **System.out.print("Now enter student score (percent) > ");**  **studentScore = scanner.nextFloat();**  **if (totalStudents > 100) {**  **System.out.println("Large class size detected.");**  **}**  **char grade = findGrade(studentScore, a, b, c, d);**  **System.out.printf("Student has an %c grade\n", grade);**  **scanner.close();**  **}**  **}** |

This function shall read the thresholds for student grades from scanner. After reading those thresholds, it shall read a student's achieved percentage and output the grade the student achieved. Grade is either A, B, C, D, or F, where A is the best and D the worst possible score. A student with an F grade has failed the course. The output of the program should either be "Student has an X grade" if the student passed the course, or "Student has failed the course" if the student failed the course. The student gets a grade of X, if his achieved percentage is greater or equal to the threshold associated with the grade X. When the achieved percentage is lower than the lowest threshold, the output indicates that the student achieved a D grade.

If you run this test case to observe the bug.

A - 90%

B - 75%

C - 50%

D - 40%

Student Percentage: 0%

Expected outcome: The program should output "Student has failed the course"

Actual Outcome: The program outputs "Student has a D grade"

## Subject 3: Median

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| **import java.util.Scanner;**  **public class Main {**  **public static void main(String[] args) {**  **Scanner scanner = new Scanner(System.in);**  **int n1, n2, n3, small, temp;**  **boolean flag = false;**  **System.out.print("Please enter 3 numbers separated by spaces > ");**  **n1 = scanner.nextInt();**  **n2 = scanner.nextInt();**  **n3 = scanner.nextInt();**  **temp = n1 \* n2 \* n3;**    **if (temp > 1000) {**  **flag = true;**  **}**  **if (n1 < n2) {**  **small = n1;**  **if (small > n3) {**  **System.out.printf("%d is the median\n", n1);**  **} else if (n3 > n2) {**  **System.out.printf("%d is the median\n", n2);**  **} else {**  **System.out.printf("%d is the median\n", n3);**  **}**  **} else {**  **small = n2;**  **if (small > n3) {**  **System.out.printf("%d is the median\n", n2);**  **} else if (n3 > n1) {**  **System.out.printf("%d is the median\n", n3);**  **} else {**  **System.out.printf("%d is the median\n", n1);**  **}**  **}**    **System.out.println("Flag is: " + flag);**  **scanner.close();**  **}**  **}** |

The program is expected to return the median of three numbers that are read from scanner. The median is defined as the middle number between the maximum and minimum. When the numbers 2, 1, and 3 are passed to the program, an incorrect result of 3 is returned.

If you run this test case to observe the bug.

N1 - 2

N2 - 1

N3 - 3

Expected outcome: 2 is median

Actual Outcome: 3 is median