Lab Assignment 02

Branching

CSE110: Programming Language I

No of Tasks	Points to Score
13	*130*

[Submit all the Coding Tasks (Task 1 to 11) in the Google Form shared on buX. Submit the Tracing Tasks (Task 12 & 13) handwritten to your Lab Instructors before the next lab.]

Coding Tasks

1. Write the Java code of a program to find the largest among three numbers entered by the user.

Sample Input	Output
100 23 -4	largest number: 100
5 17 -5	largest number: 17

2. Write a Java program that takes a student's numerical score as input as an integer and prints their corresponding letter grade according to the following grading system:

Scores	90-100	85-89	70-84	57-69	50-56	<50
Grades	A	A-	B	C	D	F

Sample Input	Output
9	Your grade is F
82	Your grade is B

3. Write a Java code of a program that takes an integer number as user input and then determines if that number is divisible by both 5 and 7; otherwise display "No". For example, numbers like 35, 70, 105, 140, 175, 210, 245, 280 etc. can be divisible by both 5 and 7.

Sample Input	Output
15	Invalid: Divisible by 5 Only
28	Invalid: Divisible by 7 Only
105	Divisible by Both
36	No

4. Write a Java program that will take a year as input and print whether that year is a leap year or not.

   ● A year **may be** a leap year if it is evenly divisible by 4.
   ● Years that are divisible by 100 (century years such as 1900 or 2100) cannot be leap years unless they are also divisible by 400.

Sample Input	Output
2020	2020 is a leap year
2001	2001 is not a leap year
1900	1900 is not a leap year

5. Write a program which asks the user to enter an integer. Then you have to check the input and based on that you have to print the following outputs.

   ● If the input is negative, then print "Number is negative"
   ● If the input is zero, then print "Number is zero"
   ● If the input is positive and even, then print "Number is positive and even"
   ● And if the input is positive and odd, then print "Number is positive and odd"

Sample Input	Output
5	Number is positive and odd

-2	Number is negative
0	Number is zero

6. Let's consider the following piecewise function:

$$f(x) = \begin{cases} 2x, & x < 0 \\ x + 1, & 0 \le x < 2 \\ x^2 - 1, & 2 \le x < 5 \\ 3x^2 + 2, & x \ge 5 \end{cases}$$

Design a Java code of a program that takes the value of x as user input and then displays the output based on the given piecewise function.

Sample Input	Output
-3	output: -6
1	output: 2
4	output: 15
10	output: 302

7. Write the Java code of a program that calculates the tax and prints it as follows:
   a) No tax if you get paid less than 10,000
   b) 5% tax if you get paid between 10,000 and 20,000 (both inclusive)
   c) 10% tax if you get paid more than 20,000
   d) NO TAX IF YOU ARE LESS THAN 18 YEARS OLD.
   Hint: Take payment and age as user as inputs; then calculate tax and print it.

Sample Input	Output
9000 23	Your tax amounts in 0 Tk
15000 17	Your tax amounts in 0 Tk
15000 18	Your tax amounts in 750 Tk

30000 25	Your tax amounts in 3000 Tk

8. Write a Java program that takes 3 float numbers as input from the user and prints the maximum and minimum number from the inputs.

Sample Input	Output
18.83 -4.02 83.12	Maximum number is 83.12 Minimum number is -4.02
26.45 0.02 13.56	Maximum number is 26.45 Minimum number is 0.02

9. A triangle has 3 sides. Write a program which asks the users for input. Based on the input, your program should output whether it is an Equilateral, Isosceles or Scalene.

   ● Equilateral triangle has three sides with equal length
   ● Isosceles triangle has two sides with equal length and another side is different
   ● Scalene triangle has different lengths in each side

Sample Input	Output
5 2 4	This is a Scalene triangle
5 5 3	This is a Isosceles triangle
3 3 3	This is a Equilateral triangle

10. Suppose you are hired by Swapno. Now, your task is to create a Java program that will help the cashier calculate the change to be returned.

The program takes two inputs. First input is an integer number which is the amount of money to be paid in taka and the second integer is the amount of money the customer gave to the cashier. Your program should print the following:

- If the customer gave more money than the actual amount, print change the cashier should return in notes and coins.
- If the customer gave less money than the amount to be paid, then print the amount the customer needs to pay.

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Consider the following denomination for notes and coins in taka:
Notes: 100, 50, 20, 10.
Coins: 5, 2, 1.

Sample Input	Output
Enter the amount the customer need to pay(Taka) 35 Enter the amount, customer gave(Taka) 53	The returned amount is 18 taka. 100 taka note: 0 50 taka note: 0 20 taka note: 0 10 taka note: 1 5 taka coin: 1 2 taka coin: 1 1 taka coin: 1
Enter the amount the customer need to pay(Taka) 60 Enter the amount, customer gave(Taka) 500	The returned amount is 440 taka. 100 taka note: 4 50 taka note: 0 20 taka note: 2 10 taka note: 0 5 taka coin: 0 2 taka coin: 0 1 taka coin: 0
Enter the amount the customer need to pay(Taka) 50 Enter the amount, customer gave(Taka) 50	The returned amount is 0 taka.
Enter the amount the customer need to pay(Taka) 550 Enter the amount, customer gave(Taka) 520	Please pay 30 taka more.

11. Write a Java program that reads three numbers and prints "All numbers are equal" if all three numbers are equal, "All numbers are different" if all three numbers are different and "Neither all are equal nor different" otherwise.

User Input	Output
Input the 1st number: 2345 Input the 2nd number: 2452 Input the 3rd number: 4532	All numbers are different
Input the 1st number: 230 Input the 2nd number: 230 Input the 3rd number: 112	Neither all are equal or different

Tracing Tasks

12. What will be the output of the following program? Show the workings.

1	`public class Tracing1 {`
2	`    public static void main(String[] args) {`
3	`        int num1 = 10;`
4	`        int num2 = -3;`
5	`        int num3 = -1;`
6	`        int sum = num1 + num2 + num3;`
7	`        if (num3 < 0) {`
8	`            System.out.println(num3 * (-2));`
9	`        }`
10	`        else {`
11	`            System.out.println(sum);`
12	`        }`
13	`        if (num1 < 5) {`
14	`            System.out.println(num1 + 10);`
15	`        }`

Output


```java
16        else if (num2 == -3) {
17            num2 = num1;
18            System.out.println(num2);
19        }
20        else {
21            System.out.println(num1 + num2 + num3);
22        }
23     if (num1 > 15) {
24         System.out.println(num1);
25     }
26     if (num2 == 0) {
27         System.out.println(num2 + num3);
28     }
29     else {
30         System.out.println(num3);
31     }
32     if (sum != 0) {
33         System.out.println(100);
34     }
35     else {
36         System.out.println(sum + 100);
37     }
38     if (num1 > 0 && num2 < 0) {
39         System.out.println(num1 == num2);
40     }
```

41	else {
42	System.out.println("End");
43	}
44	}
45	}

13. What will be the output of the following program? Your answer will not be accepted without the workings.

1	`public class Tracing2 {`
2	`public static void main(String[] args) {`
3	`boolean var1, var2, var3, var4, var5, var6;`
4	`boolean result1, result2, result3, result4, result5;`
5	`boolean result6, result7, result8, result9, result10;`
6	`var1 = var2 = var3 = var4 = var5 = var6 = false;`
7	`result1 = result2 = result3 = result4 = result5 = false;`
8	`result6 = result7 = result8 = result9 = result10 = false;`
9	`var1 = (!false || false) && true;`
10	`var2 = var1 && true;`
11	`var3 = false && !true;`
12	`var4 = true;`
13	`var5 = false;`
14	`var6 = var3 && true;`
15	`result1 = (var1 && var2) && (40 % 3 > 45) || (var5 && var6);`
16	`result2 = (var1 || var2) || (result1 && false);`

17	`        result3 = (var1 && result1) || result2 || var5;`
18	`        result4 = (var1 || var2) || ((var3 && var1) && false);`
19	`        result5 = (var1 && var2) && (result3 || var1);`
20	`        result6 = ((var3 || !var2) && result5) || true;`
21	`        result7 = (var4 && result1) && ((result1 && false) || true);`
22	`        result8 = ((var1 && result3) && (!var5 || var6)) && true;`
23	`        result9 = ((result2 && var2) || (!result7 && var1)) && !false;`
24	`        result10 = !(var1 && true);`
25	`        System.out.println(result1 + " " + result2);`
26	`        System.out.println(result3 + " " + result4);`
27	`        System.out.println(result5 + " " + result6);`
28	`        System.out.println(result7 + " " + result8);`
29	`        System.out.println(result9 + " " + result10);`
30	`    }`
31	`}`

Output: