LAB ASSIGNMENT # 02

Branching

CSE110 | Programming Language I

	LAB TASKS	HOME TASKS
CODING	05	06
TRACING	01	02

NOTE: You need to submit only the Home Tasks. Submit all the Flowchart or Tracing tasks hand drawn or handwritten respectively to your Lab Instructors before the next lab. Submit all the Homework Coding Tasks in the Google Form shared on buX.

POLICY FORM: LINK
Kindly fill up the form before the class is started

LAB TASKS
[NO NEED TO SUBMIT]

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

Sample Input	Sample Output
Enter Three Numbers: 100 23 -4	Largest Number: 100
Enter Three Numbers: -7 -36 -5	Largest Number: -5

Question: 2
You are developing a student grading system for a university portal. One of the features of this system is to automatically determine a student's letter grade based on their numerical score, which is entered by the user. The grading policy is defined as follows:

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

Sample Input	Output
45	Your grade is F
87	Your grade is A-

Question: 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

Question: 4

The Registrar's Office at a University is preparing the academic calendar for upcoming sessions. Before finalizing the schedule, they need to determine whether a given year will have February 29 because leap years affect semester dates, holidays, and exam schedules.

To automate this, they've asked you to write a simple Java program that checks whether a year is a leap year or not, following the standard rules:

- A year is a leap year if it is divisible by 4.
- However, if the year is a century (divisible by 100), it must also be divisible by 400 to be a leap year.

Sample Input	Output
2020	2020 is a leap year
2001	2001 is not a leap year
1900	1900 is not a leap year
2000	2000 is a leap year

Question: 5
It's 11:59 PM, and Harun is desperately trying to finish a math assignment before the deadline. The final question involves a strange piecewise function, and Harun needs to write a program to verify the answers before submitting.

The function is defined as follows:

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

Your task is to help Harun by writing a Java program that takes the value of x as input from the user and displays the corresponding value of f(x) according to the formula.

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

Question: 6

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         }
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) {
```

Output

```
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  }
```

HOME TASKS

Question: 1

Write a Java code of a program that takes an integer number as user input and then determines if that number is divisible by either 5 or 7 but not both; otherwise display "No". For example, numbers like 35, 70, 105, 140, 175, 210, 245, 280 etc. can be divisible by both 5 and 7. These numbers are invalid.

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

Question: 2

A new Smart Electric Car Charging Station has been set up in your city.
The station automatically calculates the total cost for charging based on the amount of electricity consumed (in kWh) and the type of user.
To make the billing fair and environmentally conscious, the station follows these rules:
Base rate: 15 Taka per kWh.

- Discounts and surcharges:
    - Students (under 18 years old) get a 20% discount on the total bill.
    - Regular users (18 to 60 years old) pay the normal rate.
    - Senior citizens (above 60 years old) get a 10% discount.
- High usage surcharge:
    - If total energy consumption exceeds 100 kWh, a 5% surcharge is added after applying any discount.

Sample Input	Output
Age: 16 Electricity Consumed: 50	Final Bill: 600.0 Taka
Age: 65 Electricity Consumed: 120	Final Bill: 1701.0 Taka

Question: 3

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 -0.02 Minimum number is -26.45

Question: 4

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

Question: 5

Suppose you are hired by a supershop named Bastob. 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. The 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.

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	Please pay 30 taka more.

Enter the amount, customer gave(Taka) 520	

Question: 6

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

Question: 7

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  }
```

Question: 8

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

```
1   public class Tracing3 {
2       public static void main(String[] args) {
3           int p = 5;
4           int q = 6;
5           int r = 9;
6           int sum = 0;
7           if (p < 12) {
8                   System.out.println(r + 2);
9           }
10          else {
11                  System.out.println(r + p);
12          }
13          if (q > 20){
14              System.out.println(r + 19);
15          }
16          else if (q <= 6) {
17                  System.out.println(q + 3);
18          }
19          else{
20                  System.out.println(p + q + r);
21          }
22          if (r > 15) {
23                  System.out.println(r);
24          }
25          else if (r == 0) {
26                  System.out.println(p + q);
27          }
28          else {
29                  System.out.println(p);
30          }
31          if (sum != 0) {
32                  System.out.println(3);
33          }
34          else {
35                  System.out.println(sum + 32);
36          }
37          if(p > 0 && r < 10){
```

```
38                      System.out.println(p + r);
39              }
40              else {
41                      System.out.println(p - r);
42              }
43      }
44  }
```