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# Lab Assignment 02

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## Branching and Introduction to Loops



### CSE110: Programming Language I

No of Tasks	Points to Score
17	170

***[Submit all the Coding Tasks (Task 1 to 15) in the Google Form shared on buX. Submit the Tracing Tasks (Task 16 & 17) 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 **given** numbers.

Given Numbers	Output
100 23 -4	largest number: 100
5 17 -5	largest number: 17

2. Write a Java program that prints the corresponding letter grade according to the following grading system based on a **given** score.

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

Given Score	Output
9	Your grade is F
82	Your grade is B

3. Write a Java code of a program that determines if the given 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.

Given Number	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 prints whether a given 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.

Given Year	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 checks a given integer number to print any of the following outputs:

- If the number is negative, then print “Number is negative”
- If the number is zero, then print “Number is zero”
- If the number is positive and even, then print “Number is positive and even”
- And if the number is positive and odd, then print “Number is positive and odd”

Given Number	Output
5	Number is positive and odd
-2	Number is negative
0	Number is zero

6. Let's consider the following piecewise function:

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

Assuming x is an integer number; design a Java code of a program that displays the output based on the given piecewise function.

Given Number	Output
-3	output: -6
1	output: 2
4	output: 15
10	output: 302

7. Given a BRACU Student ID, write a Java Program that prints out the year and the session the student enrolled in.

Hints:

- The first two digits denote the year the student got enrolled
- The 3rd digit denotes the session Student joined(Spring→1,Summer→3,Fall→2)

Given Student ID	Output
16101307	Student Joined BRAC in Spring 16
19301307	Student Joined BRAC in Summer 19
20201307	Student Joined BRAC in Fall 20

8. 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: Assign values to payment and age variables according to your choice; then calculate tax and print it.

Given Values	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

9. Write a Java program that prints the maximum and minimum number from 3 given double numbers.

Given Number	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

10. A triangle has 3 sides. Based on the 3 sides, write a Java program that displays 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

Given Sides	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
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11. Suppose you are hired by a grocery store called “Bastob”. Now, your task is to create a Java program that will help the cashier calculate the change to be returned.

The program has two variables. First value is an integer number which is the amount of money to be paid in taka and the second integer value 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.

Given Values	Output
<p>The customer need to pay(Taka)</p> <p>35</p> <p>Customer gave (Taka)</p> <p>53</p>	<p>The returned amount is 18 taka.</p> <p>100 taka note: 0</p> <p>50 taka note: 0</p> <p>20 taka note: 0</p> <p>10 taka note: 1</p> <p>5 taka coin: 1</p> <p>2 taka coin: 1</p> <p>1 taka coin: 1</p>
<p>The customer need to pay(Taka)</p> <p>60</p> <p>Customer gave (Taka)</p> <p>500</p>	<p>The returned amount is 440 taka.</p> <p>100 taka note: 4</p> <p>50 taka note: 0</p> <p>20 taka note: 2</p> <p>10 taka note: 0</p> <p>5 taka coin: 0</p> <p>2 taka coin: 0</p> <p>1 taka coin: 0</p>
<p>The amount the customer need to pay(Taka)</p> <p>50</p>	<p>The returned amount is 0 taka.</p>

Customer gave (Taka) 50	
The amount the customer need to pay(Taka) 550	Please pay 30 taka more.
Customer gave (Taka) 520	

12. Based on three given integer numbers, write a Java program that 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 or different" otherwise.

Given Numbers	Output
2345 2452 4532	All numbers are different
230 230 112	Neither all are equal or different

13. Write a Java code that would print the following sequences **using while/for loop**:  
24, 18, 12, 6, 0, -6
14. Write a Java code that would print the following sequences **using while/for loop**:  
-10, -5, 0, 5, 10, 15, 20
15. Write a Java program that finds the sum and average of numbers from 1 to 200 **using a while/for loop**.

## Tracing Tasks

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

1	<code>public class Tracing1 {</code>	<b>Output</b>
2	<code>    public static void main(String[] args) {</code>	
3	<code>        int num1 = 10;</code>	
4	<code>        int num2 = -3;</code>	
5	<code>        int num3 = -1;</code>	
6	<code>        int sum = num1 + num2 + num3;</code>	
7	<code>        if (num3 &lt; 0) {</code>	
8	<code>            System.out.println(num3 * (-2));</code>	
9	<code>        }</code>	
10	<code>        else {</code>	
11	<code>            System.out.println(sum);</code>	
12	<code>        }</code>	
13	<code>        if (num1 &lt; 5) {</code>	
14	<code>            System.out.println(num1 + 10);</code>	
15	<code>        }</code>	
16	<code>        else if (num2 == -3) {</code>	
17	<code>            num2 = num1;</code>	
18	<code>            System.out.println(num2);</code>	
19	<code>        }</code>	
20	<code>        else {</code>	
21	<code>            System.out.println(num1 + num2 + num3);</code>	
22	<code>        }</code>	



23	<code>if (num1 &gt; 15) {</code>
24	<code>    System.out.println(num1);</code>
25	<code>}</code>
26	<code>if (num2 == 0) {</code>
27	<code>    System.out.println(num2 + num3);</code>
28	<code>}</code>
29	<code>else {</code>
30	<code>    System.out.println(num3);</code>
31	<code>}</code>
32	<code>if (sum != 0) {</code>
33	<code>    System.out.println(100);</code>
34	<code>}</code>
35	<code>else {</code>
36	<code>    System.out.println(sum + 100);</code>
37	<code>}</code>
38	<code>if (num1 &gt; 0 &amp;&amp; num2 &lt; 0) {</code>
39	<code>    System.out.println(num1 == num2);</code>
40	<code>}</code>
41	<code>else {</code>
42	<code>    System.out.println("End");</code>
43	<code>}</code>
44	<code>}</code>
45	<code>}</code>

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

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

24	<code>result10 = !(var1 &amp;&amp; true);</code>
25	<code>System.out.println(result1 + " " + result2);</code>
26	<code>System.out.println(result3 + " " + result4);</code>
27	<code>System.out.println(result5 + " " + result6);</code>
28	<code>System.out.println(result7 + " " + result8);</code>
29	<code>System.out.println(result9 + " " + result10);</code>
30	<code>}</code>
31	<code>}</code>

**Output:**
