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CS110T: Programming Language1

IQ ACADEMY

Lab 4: Java basics II Cont.

Lab Objectives:

In this lab, the student will practice:

- ✓ Defining variables of different data types ✓
- ✓ Using format specifiers in printing output ✓
- ✓ Compiling and executing Java applications. ✓
- ✓ Writing and evaluating mathematical expressions
- ✓ Reading data values from the user.

Lab Exercise 1: Program Output

Problem Description: What is the output of the following code?

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

      int a = 10;
int b = 20;       int
c = 5;

a += b;
b -= c;
c *= 2;

      System.out.println("a > b: " + (a > b));
      System.out.println("c < a: " + (c < a));
      System.out.println("b == c: " + (b == c));
        System.out.println("(a > b) && (b > c): " + ((a > b) && (b > c)));
     System.out.println("(a < b) || (c > b): " + ((a < b) || (c > b)));
      System.out.println("!(b == 10): " + (!(b == 10)));
    }
}
```

Output:

```
a > b: true
c < a: true
b == c: false
(a > b) && (b > c): true
(a < b) || (c > b): false
!(b == 10): true
```

Lab Exercise 2: Program Debugging

Problem Description: Identify and categorize errors in the code to (Syntax, Logical, or Runtime errors) then Correct the identified errors.

Hint: To calculate the area of a circle Use the formula pi * radius * radius.

```
public class DebuggingExercise
    public static void main(String[] args) {
int x = 10;          int y = "20";

        double pi = 3.14

        System.out.println("The square of 5 = ");
        System.out.println(5 * 3);

        double radius = 5;
        double area = radius * radius;

        int z = 0;
        int divisionResult = x / z;

        System.out.printl("End of debugging exercise.");
    }
}
```

```
public class DebuggingExercise {  // Syntax: Missing opening brace {
  public static void main(String[] args) {
    int x = 10;
    // int y = "20";  // Syntax: Cannot assign String to int
    int y = 20;

    double pi = 3.14;  // Syntax: Missing semicolon

    System.out.println("The square of 5 = " + (5 * 5));  // Logical: Wrong calculation
    System.out.println(5 * 5);  // Logical: Should be 5*5, not 5*3

    double radius = 5;
    double area = pi * radius * radius;  // Logical: Missing pi in formula

    int z = 0;
    // int divisionResult = x / z;  // Runtime: Division by zero
```

```
        System.out.println("End of debugging exercise.");  // Syntax: Typo in println
    }
}
```

Lab Exercise 3: Java statements (code writing 1)

Problem Description: for the following problem do the arithmetic operations by hand then write the Java statements in Netbeans to double check your answers.
The problem should accomplish the following:

a. Declare six variables a, b, c, d, e, g as an integer number.
b. Initialize them as: **(a=2 , b= 3, c= 6, d=4 , e=7, g=10)**
c. Update their values as:
(c +=7 , d -=2, e *=3, g /=2, a %=2)
d. Perform these operations: a = c + g * d g = a – a%e b = (g +c) * ++d
e. Print the value of all these variables using the format specifier.

```
public class ArithmeticOperations {
  public static void main(String[] args) {
    // Declare and initialize variables
    int a = 2, b = 3, c = 6, d = 4, e = 7, g = 10;

    // Update values
    c += 7;  // c = 6 + 7 = 13
    d -= 2;  // d = 4 - 2 = 2
    e *= 3;  // e = 7 * 3 = 21
    g /= 2;  // g = 10 / 2 = 5
    a %= 2;  // a = 2 % 2 = 0

    // Perform operations
    a = c + g * d;      // a = 13 + 5 * 2 = 13 + 10 = 23
    g = a - a % e;      // g = 23 - 23 % 21 = 23 - 2 = 21
    b = (g + c) * ++d;  // b = (21 + 13) * 3 = 34 * 3 = 102

    // Print results with format specifiers
    System.out.printf("a = %d%n", a);
    System.out.printf("b = %d%n", b);
    System.out.printf("c = %d%n", c);
    System.out.printf("d = %d%n", d);
    System.out.printf("e = %d%n", e);
    System.out.printf("g = %d%n", g);
  }
}
```

Lab Exercise 4: Code writing (2)

Problem Description: Consider a program that reads the length and width of a rectangle and then computes area and perimeter.

The Java program should

1. Use the Scanner class to read input.
2. Ask the user to enter length and width (double).
3. Compute area = length * width and perimeter = 2 * (length + width).
4. Display length, width, area, and perimeter using the formatted printing. It should look like this output:

Output:

```
Enter length: 11.2
Enter width: 5.6
Area = 62.72
Perimeter = 33.60
```

```
import java.util.Scanner;

public class RectangleCalculator {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter length: ");
        double length = input.nextDouble();

        System.out.print("Enter width: ");
        double width = input.nextDouble();

        double area = length * width;
        double perimeter = 2 * (length + width);

        System.out.printf("Area = %.2f%n", area);
        System.out.printf("Perimeter = %.2f%n", perimeter);

        input.close();
    }
}
```

Lab Exercise 5: Code writing (3)

a. **Sum of the Digits of a Two-Digit Number** Write a Java program that calculates the sum of the digits for a two-digit number. The program will prompt the user to enter a two-digit number, then extract the tens digit and the units digit. Finally, it will display the result.

1. Write a Java statement that imports the Scanner class.
2. Declare an input as a Scanner object for inputting data.
3. Ask the user to input a two-digit number.
4. Calculate the **tens digit** using division.
5. Calculate the **units digit** using the modulus operator.
6. Print the sum of both digits.

Hint: Use the **% (modulus)** and **/ (division)** operators to separate the digits.

Output Sample:

```
Enter your Two-digit number: 56   Sum of all digits is 11
```

```
import java.util.Scanner;

public class DigitSum {
   public static void main(String[] args) {
      Scanner input = new Scanner(System.in);

      System.out.print("Enter your Two-digit number: ");
      int number = input.nextInt();

      int tensDigit = number / 10;
      int unitsDigit = number % 10;
      int sum = tensDigit + unitsDigit;

      System.out.println("Sum of all digits is " + sum);

      input.close();
   }
}
```

b. **Calculating Acceleration** Write a Java program that calculates acceleration. The program prompts the user to enter the initial velocity, final velocity, and time in seconds. Then, it displays the acceleration

1. **Write** a Java statement that **imports** the `Scanner` class**.**
2. **Declare** ***`input`*** as a `Scanner` object for inputting data.
3. Ask the user to **input** the *`initial velocity`*.
4. Ask the user to **input** the *`final velocity`*.
5. Ask the user to **input** the *`time in sec`*.
6. **Calculate** the `acceleration`.

7. display the result.

Hint: `acceleration = (Vf-Vi)/time`

Output Sample

```
Enter initial velocity
0
Enter Final velocity
20
Enter Time in seconds
4
The acceleration is 5.000
```

```
import java.util.Scanner;

public class AccelerationCalculator {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.println("Enter initial velocity");
        double initialVelocity = input.nextDouble();

        System.out.println("Enter Final velocity");
        double finalVelocity = input.nextDouble();

        System.out.println("Enter Time in seconds");
        double time = input.nextDouble();

        double acceleration = (finalVelocity - initialVelocity) / time;

        System.out.printf("The acceleration is %.3f%n", acceleration);

        input.close();
    }
}
```

c. **Heart maximum rate** Write a Java program that calculates the maximum heart rate. The program should prompt the user for their age, calculate the heart rate, and display it

1. **Write** a Java statement that **imports** the `Scanner` class**.**
2. **Declare** ***`input`*** as a **`Scanner`** object for inputting data.
3. Ask the user to **input** the *`age as integer`*.
4. **Calculate** the `Heart maximum rate.`

$$\text{Heart rate maximum} = 192 - (0.007 \times \text{age}^2)$$

5. **Print** to display the result.

Output Sample:

```
Enter your age   30    Your maximum Heart rate is 185
```

```
import java.util.Scanner;

public class HeartRateCalculator {
   public static void main(String[] args) {
      Scanner input = new Scanner(System.in);

      System.out.println("Enter your age");
      int age = input.nextInt();

      double heartRate = 192 - (0.007 * age * age);

      System.out.println("Your maximum Heart rate is " + (int)heartRate);

      input.close();
   }
}
```

LAB4 Assignment Problems

Problem Description1: As a programmer you have a client who owns a moving service company called "WorldMovers". This client needs a program to calculate the amount of workers that are needed for any moving job. We know that one worker can move a maximum of 10 boxes and that one worker's service fee is 50$. The program should ask the client's consumers about how many boxes they have to move in order to calculate the service fee.

A simple Output

```
Welcome to WorldMovers How
many boxes you have?
25
You need 3 workers to do the job
This will cost you 150$
```

```
import java.util.Scanner;

public class WorldMovers {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.println("Welcome to WorldMovers");
        System.out.println("How many boxes you have?");
        int boxes = input.nextInt();

        int workers = (int) Math.ceil(boxes / 10.0);
        int cost = workers * 50;

        System.out.println("You need " + workers + " workers to do the job");
        System.out.println("This will cost you " + cost + "$");

        input.close();
    }
}
```

Problem Description2: Write a program that asks the user to type the price without tax of one kilogram of tomatoes, the number of kilograms you want to buy. The program must calculate the total price including taxes.

Note: taxes are 5% of product price.

Hint : total price with tax = Price + (price*tax as a decimal)

A simple Output

```
Please enter the price without tax of one kilogram of tomatoes: 10
Please enter the number of kilograms: 5
Total price: 52.5 S.R.
```

```
import java.util.Scanner;


public class TomatoCalculator {

   public static void main(String[] args) {

      Scanner input = new Scanner(System.in);


      System.out.print("Please enter the price without tax of one kilogram of tomatoes: ");

      double pricePerKg = input.nextDouble();


      System.out.print("Please enter the number of kilograms: ");

      double kg = input.nextDouble();


      double totalPrice = (pricePerKg * kg) * 1.05; // 5% tax


      System.out.printf("Total price: %.1f S.R.%n", totalPrice);


      input.close();

   }

}
```

Problem Description3: Complete the following code and write the output of code:

```
// Lab Exercise 1: Math.java
// Computing and displaying the result of different
expressions
public class Math
{
   // main method begins execution of Java application
public static void main( String args[] )
   {
      myNum = 9;
      myFloatNum = 8.99f;
      myLetter = 'A';
      myBool = false;
      myText = "Hello World";
System.out.println(myText);
      System.out.println("4.0+9="+4.0+myNum);
       System.out.print("((2-2) × 1×3) - 3/1.0= ");
      System.out.println(((2-2)*1*3)-3/1.0);
      System.out.println("(1+2)*3*4/5 ="+(1+2)*3*4/5);
}
}
```

```
public class Math {
   public static void main(String[] args) {
       int myNum = 9;
       float myFloatNum = 8.99f;
       char myLetter = 'A';
       boolean myBool = false;
       String myText = "Hello World";

       System.out.println(myText);
       System.out.println("4.0+9=" + (4.0 + myNum));  // Added
parentheses
       System.out.print("((2-2) × 1×3) - 3/1.0= ");
       System.out.println(((2-2)*1*3)-3/1.0);
       System.out.println("(1+2)*3*4/5 =" + ((1+2)*3*4/5));
   }
}
```

output

Hello World
4.0+9=13.0
((2-2) × 1×3) - 3/1.0= -3.0
(1+2)*3*4/5 =7

Problem Description4: Write a program that takes as input any change expressed in Halalah coins. It should then compute the number of one riyals, half-riyal coins, quarter-riyal coins, 10-hallalah coins, 5- Halalah coins, and one Halalah coin to be returned, using as many one riyal coins as possible, then halfs coins, quarters, 10's, 5's, and 1 Halalah, in that order. For example, 483 coins would be returned as 4 (riyal coins), 1 (half-riyal coins), 1 (quarterriyal coins), 1 (5- Halalah coins), and 3 (one Halalah coin).

Input: Change in cents
Output: Equivalent change

Hint: you need to use divide (/) and remainder (%) operations.

```
import java.util.Scanner;


public class ChangeCalculator {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter change in Halalah: ");
        int change = input.nextInt();

        int riyalCoins = change / 100;
        int remaining = change % 100;

        int halfRiyalCoins = remaining / 50;
        remaining %= 50;

        int quarterRiyalCoins = remaining / 25;
        remaining %= 25;

        int tenHalalahCoins = remaining / 10;
        remaining %= 10;

        int fiveHalalahCoins = remaining / 5;
        int oneHalalahCoins = remaining % 5;

        System.out.println("Riyal coins: " + riyalCoins);
        System.out.println("Half-riyal coins: " + halfRiyalCoins);
        System.out.println("Quarter-riyal coins: " + quarterRiyalCoins);
```

```
        System.out.println("10-Halalah coins: " + tenHalalahCoins);
        System.out.println("5-Halalah coins: " + fiveHalalahCoins);
        System.out.println("1-Halalah coins: " + oneHalalahCoins);

        input.close();
    }
}
```

Problem Description5: A milk carton can hold 3.78 liters of milk. Each morning, a dairy farm ships cartons of milk to local grocery stores. The cost of producing one liter of milk is $0.38, and the profit per carton is $0.27. – Refer to Lab 1, Exercise 3.

Write a Java program that:

1. Uses the Scanner class to get input from the user.
2. Asks the user for the total amount of milk produced in the morning (in liters).
3. Calculates and displays:
   - The number of milk cartons needed.
   - The cost of producing the milk.
   - The profit from producing the milk.
4. Display all results using formatted printing.

```
import java.util.Scanner;

public class MilkProduction {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter total milk produced (liters): ");
        double milkProduced = input.nextDouble();

        double cartonsNeeded = Math.ceil(milkProduced / 3.78);
        double productionCost = milkProduced * 0.38;
        double profit = cartonsNeeded * 0.27;

        System.out.printf("Number of cartons needed: %.0f%n", cartonsNeeded);
        System.out.printf("Production cost: $%.2f%n", productionCost);
        System.out.printf("Profit: $%.2f%n", profit);

        }
    }
```


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