Level 2 Practice Programs

1. Write a program to take user input for the age of all 10 students in a class and check whether the student can vote depending on his/her age is greater or equal to 18.

```java
import java.util.Scanner;
import java.util.Arrays;
public class Bonus{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        //Declaring arrays
        final int emp = 10;
        double[] salary = new double[emp];
        double[] years = new double[emp];
        double[] new_sal = new double[emp];
        double[] bonus_am = new double[emp];

        //Declaring arrays with starting value = 0
        double total_bonus = 0;
        double total_oldSalary = 0;
        double total_newSalary = 0;

        //Using for loop and while loop
        for(int i = 0; i < emp; i++){
            while(true){
                System.out.print("Enter salary of employee " +(i+1)+ " : ");
                salary[i] = input.nextDouble();
                System.out.print("Enter the year of service of employee " +(i+1)+ " : ");
                years[i] = input.nextDouble();

                if(salary[i] < 0 && years[i] <= 0){
                    System.out.println("Invalid input");
                }else{
                    break;
                }
            }
        }
        for(int i = 0; i < emp; i++){
            bonus_am[i] = (years[i] > 5) ? salary[i]*0.05 : salary[i]*0.02;
            new_sal[i] = salary[i] + bonus_am[i];

            //Assigning
            total_bonus += bonus_am[i];
            total_oldSalary += salary[i];
            total_newSalary += new_sal[i];
        }

        //Printing output
        System.out.println("Old Salary : " +total_oldSalary);
        System.out.println("Bonus amount : " +total_bonus);
        System.out.println("New Salary : " +total_newSalary);
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac Bonus.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java Bonus
Enter salary of employee 1 : 50000
Enter the year of service of employee 1 : 6
Enter salary of employee 2 : 45000
Enter the year of service of employee 2 : 7
Enter salary of employee 3 : 36000
Enter the year of service of employee 3 : 5
Enter salary of employee 4 : 85300
Enter the year of service of employee 4 : 4
Enter salary of employee 5 : 84000
Enter the year of service of employee 5 : 6
Enter salary of employee 6 : 55000
Enter the year of service of employee 6 : 3
Enter salary of employee 7 : 75000
Enter the year of service of employee 7 : 4
Enter salary of employee 8 : 65000
Enter the year of service of employee 8 : 6
Enter salary of employee 9 : 30000
Enter the year of service of employee 9 : 5
Enter salary of employee 10 : 49300
Enter the year of service of employee 10 : 9
Old Salary : 574600.0
Bonus amount : 20291.0
New Salary : 594891.0
```

2. Create a program to find the youngest friends among 3 Amar, Akbar, and Anthony based on their ages and the tallest among the friends based on their heights.

```java
import java.util.Arrays;
public class Young{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        //Delcaring an array
        String[] friends = {"Amar","Akbar","Anthony"};
        int[] height = new int[3];
        int[] age = new int[3];
        int sum = 0;

        //Taking user input and using for loop
        for(int i = 0; i < 3; i++){
            System.out.print("Enter age of " +friends[i]+ " : ");
            age[i] = input.nextInt();
            System.out.print("Enter height of " +friends[i]+ " : ");
            height[i] = input.nextInt();
        }

        //Youngest
        int min_Age = age[0];
        String youngest = friends[0];
        for(int i = 1; i < 3; i++){
            if(age[i] < min_Age){
                min_Age = age[i];
                youngest = friends[i];
            }
        }

        //Tallest
        int max_Height = height[0];
        String tallest = friends[0];
        for(int i = 1; i < 3; i++){
            if(height[i] > max_Height){
                max_Height = height[i];
                tallest = friends[i];
            }
        }

        //Output
        System.out.println("The youngest friend is : " +youngest+ " with age : " +min_Age);
        System.out.println("The tallest friend is : " +tallest+ " with height : " +max_Height+ " cm.");
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac Young.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java Young
Enter age of Amar : 18
Enter height of Amar : 157
Enter age of Akbar : 25
Enter height of Akbar : 162
Enter age of Anthony : 14
Enter height of Anthony : 161
The youngest friend is : Anthony with age : 14
The tallest friend is : Akbar with height : 162 cm.
```

3. **Create a program to store the digits of the number in an array and find the largest and second largest element of the array.**

```java
import java.util.Scanner;
import java.util.Arrays;
public class LargestElement{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a number : ");
        int n = input.nextInt();

         int maxDigit = 10;
        int[] digits = new int[maxDigit];
        int index = 0;

        //Using while Loop
        while (n != 0 && index < maxDigit) {
            digits[index] = n % 10;
            n /= 10;
            index++;
        }

        int largest = -1, secondLargest = -1;

        //Using for Loop
        for (int i = 0; i < index; i++) {
            if (digits[i] > largest) {
                secondLargest = largest;
                largest = digits[i];
            } else if (digits[i] > secondLargest && digits[i] != largest) {
                secondLargest = digits[i];
            }
        }

        //Display Output
        System.out.println("Largest digit: " + largest);
        if (secondLargest != -1) {
            System.out.println("Second largest digit: " + secondLargest);
        } else {
            System.out.println("No second largest digit found.");
        }
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac LargestElement.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java LargestElement
Enter a number : 48
Largest digit: 8
Second largest digit: 4
```

4. **Rework the program 2, especially the Hint f where if index equals maxDigit, we break from the loop. Here we want to modify to Increase the size of the array i,e maxDigit by 10 if the index is equal to maxDigit. This is done to consider all digits to find the largest and second-largest number.**

```java
import java.util.Scanner;
import java.util.Arrays;
public class LargestElement2{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a number : ");
        int n = input.nextInt();

        int maxDigit = 10;
        int[] digits = new int[maxDigit];
        int index = 0;

        //Using while loop
        while (n != 0) {
            if (index == maxDigit) {
                maxDigit += 10;
                int[] temp = new int[maxDigit];
                System.arraycopy(digits, 0, temp, 0, digits.length);
                digits = temp;
            }
            digits[index] = n % 10;
            n /= 10;
            index++;
        }

        int largest = -1, secondLargest = -1;

        //Using for loop
        for (int i = 0; i < index; i++) {
            if (digits[i] > largest) {
                secondLargest = largest;
                largest = digits[i];
            } else if (digits[i] > secondLargest && digits[i] != largest) {
                secondLargest = digits[i];
            }
        }

        //Display output
        System.out.println("Largest digit: " + largest);
        if (secondLargest != -1) {
            System.out.println("Second largest digit: " + secondLargest);
        } else {
            System.out.println("No second largest digit found.");
        }
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac LargestElement2.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java LargestElement2
Enter a number : 658
Largest digit: 8
Second largest digit: 6
```

5. **Create a program to take a number as input and reverse the number. To do this, store the digits of the number in an array and display the array in reverse order.**

```java
import java.util.Scanner;
import java.util.Arrays;
public class Reverse{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a number : ");
        int n = input.nextInt();

        int temp = n, count = 0;
        while (temp != 0) {
            temp /= 10;
            count++;
        }

        //Using for loop
        int[] digits = new int[count];
        temp = n;
        for (int i = 0; i < count; i++) {
            digits[i] = temp % 10;
            temp /= 10;
        }

        //Display result
        System.out.print("Reversed number: ");
        for (int i = 0; i < count; i++) {
            System.out.print(digits[i]);
        }
        System.out.println();
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac Reverse.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java Reverse
Enter a number : 95585
Reversed number: 58559
```

6. **An organization took up an exercise to find the Body Mass Index (BMI) of all the persons in the team. For this create a program to find the BMI and display the height, weight, BMI and status of each individual.**

```java
import java.util.Scanner;
import java.util.Arrays;
public class BMI{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        System.out.print("Enter the number of persons: ");
        int n = input.nextInt();
        double[] bmi = new double[n];
        String[] status = new String[n];

        //Using for Loop
        for (int i = 0; i < n; i++) {
            System.out.print("Enter weight (kg) and height (m) for person " + (i + 1) + ": ");
            double weight = input.nextDouble();
            double height = input.nextDouble();

            //Calculation
            bmi[i] = weight / (height * height);

            //Conditional Statements
            if (bmi[i] <= 18.4){
                status[i] = "Underweight";
            }
            else if (bmi[i] <= 24.9) {
                status[i] = "Normal";
            }
            else if (bmi[i] <= 39.9) {
                status[i] = "Overweight";
            }
            else{
                status[i] = "Obese";
            }
        }

        //Display results
        System.out.println("\nBMI Results:");
        for (int i = 0; i < n; i++) {
            System.out.printf("Person %d: BMI = %.2f, Status = %s\n", (i + 1), bmi[i], status[i]);
        }
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac BMI.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java BMI
Enter the number of persons: 3
Enter weight (kg) and height (m) for person 1: 61 1.6
Enter weight (kg) and height (m) for person 2: 55 1.3
Enter weight (kg) and height (m) for person 3: 72 1.9

BMI Results:
Person 1: BMI = 23.83, Status = Normal
Person 2: BMI = 32.54, Status = Overweight
Person 3: BMI = 19.94, Status = Normal
```

7. **Rewrite the above program using multi-dimensional array to store height, weight, and BMI in 2D array for all the persons.**

```java
import java.util.Scanner;
import java.util.Arrays;
public class BMI2{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        //User input
        System.out.print("Enter number of persons: ");
        int n = input.nextInt();
        double[][] data = new double[n][3];
        String[] status = new String[n];

        //Using for loop
        for (int i = 0; i < n; i++) {
            System.out.print("Enter weight (kg) and height (m) for person " + (i + 1) + ": ");
            data[i][0] = input.nextDouble();
            data[i][1] = input.nextDouble();
            data[i][2] = data[i][0] / (data[i][1] * data[i][1]);
            status[i] = data[i][2] <= 18.4 ? "Underweight" : data[i][2] <= 24.9 ? "Normal" : data[i][2] <= 39.9 ? "Overweight" : "Obese";
        }

        //Printing results
        System.out.println("\nBMI Results:");
        System.out.println("Weight(kg)  Height(m)  BMI       Status");
        for (int i = 0; i < n; i++){
            System.out.printf("%-10.2f %-10.2f %-10.2f %s\n", data[i][0], data[i][1], data[i][2], status[i]);
        }
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac BMI2.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java BMI2
Enter number of persons: 3
Enter weight (kg) and height (m) for person 1: 61 1.6
Enter weight (kg) and height (m) for person 2: 55 1.3
Enter weight (kg) and height (m) for person 3: 72 1.9

BMI Results:
Weight(kg)  Height(m)  BMI       Status
61.00       1.60       23.83     Normal
55.00       1.30       32.54     Overweight
72.00       1.90       19.94     Normal
```

8. Create a program to take input marks of students in 3 subjects physics, chemistry, and maths. Compute the percentage and then calculate the grade as per the following guidelines.

```java
import java.util.Scanner;
public class Grade2 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        // Taking user input
        System.out.print("Enter the number of students: ");
        int n = input.nextInt();

        double[] physics = new double[n];
        double[] chemistry = new double[n];
        double[] maths = new double[n];
        double[] percentages = new double[n];
        String[] grades = new String[n];

        //Using for loop and while loop
        for (int i = 0; i < n; i++) {
            System.out.println("Enter marks for Student " + (i + 1) + ":");

            physics[i] = getValidMarks(input, "Physics");
            chemistry[i] = getValidMarks(input, "Chemistry");
            maths[i] = getValidMarks(input, "Maths");

            percentages[i] = (physics[i] + chemistry[i] + maths[i]) / 3.0;
            grades[i] = (percentages[i] >= 80) ? "A" :
                        (percentages[i] >= 70) ? "B" :
                        (percentages[i] >= 60) ? "C" :
                        (percentages[i] >= 50) ? "D" :
                        (percentages[i] >= 40) ? "E" : "R";
        }

        // Printing output
        System.out.println("\nStudent Results:");
        System.out.println("Student  Physics  Chemistry  Maths  Percentage  Grade");
        for (int i = 0; i < n; i++) {
            System.out.printf("%d        %.2f     %.2f       %.2f   %.2f%%       %s\n",
                (i + 1), physics[i], chemistry[i], maths[i], percentages[i], grades[i]);
        }

        input.close();
    }

    //Function to validate and get positive marks
    private static double getValidMarks(Scanner input, String subject) {
        double marks;
        do {
            System.out.print(subject + " marks: ");
            marks = input.nextDouble();
            if (marks < 0) {
                System.out.println("Invalid! Enter a positive value.");
            }
        } while (marks < 0);
        return marks;
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac Grade2.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java Grade2
Enter the number of students: 3
Enter marks for Student 1:
Physics marks: 65
Chemistry marks: 78
Maths marks: 61
Enter marks for Student 2:
Physics marks: 95
Chemistry marks: 45
Maths marks: 99
Enter marks for Student 3:
Physics marks: 87
Chemistry marks: 86
Maths marks: 95

Student Results:
Student  Physics  Chemistry  Maths  Percentage  Grade
1         65.00     78.00     61.00    68.00%      C
2         95.00     45.00     99.00    79.67%      B
3         87.00     86.00     95.00    89.33%      A
```

9. **Rewrite the above program to store the marks of the students in physics, chemistry, and maths in a 2D array and then compute the percentage and grade.**

```java
import java.util.Scanner;
import java.util.Arrays;
public class Grade{
    public static void main(String[] args){
        Scanner input = new Scanner(System.in);

        //Taking user input
        System.out.print("Enter the number of students: ");
        int n = input.nextInt();
        double[][] marks = new double[n][3];
        double[] percentages = new double[n];
        String[] grades = new String[n];

        //Using for loop
        for (int i = 0; i < n; i++) {
            System.out.println("Enter marks for Student " + (i + 1) + " (Physics, Chemistry, Maths):");
            for (int j = 0; j < 3; j++) {
                double mark;
                do {
                    mark = input.nextDouble();
                    if (mark < 0) {
                        System.out.println("Invalid! Enter a positive value: ");
                    }
                } while (mark < 0);
                marks[i][j] = mark;
            }

            percentages[i] = (marks[i][0] + marks[i][1] + marks[i][2]) / 3.0;
            grades[i] = (percentages[i] >= 80) ? "A" :
                        (percentages[i] >= 70) ? "B" :
                        (percentages[i] >= 60) ? "C" :
                        (percentages[i] >= 50) ? "D" :
                        (percentages[i] >= 40) ? "E" : "R";
        }

        //Printing output
        System.out.println("\nStudent Results:");
        System.out.println("Student   Physics  Chemistry  Maths   Percentage  Grade");
        for (int i = 0; i < n; i++) {
            System.out.printf("%d        %.2f     %.2f      %.2f     %.2f%%        %s\n",
                (i + 1), marks[i][0], marks[i][1], marks[i][2], percentages[i], grades[i]);
        }
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac Grade.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java Grade
Enter the number of students: 3
Enter marks for Student 1 (Physics, Chemistry, Maths):
95
89
99
Enter marks for Student 2 (Physics, Chemistry, Maths):
84
86
92
Enter marks for Student 3 (Physics, Chemistry, Maths):
96
99
85

Student Results:
Student    Physics  Chemistry  Maths  Percentage  Grade
1           95.00     89.00     99.00    94.33%      A
2           84.00     86.00     92.00    87.33%      A
3           96.00     99.00     85.00    93.33%      A
```

10. **Create a program to take a number as input find the frequency of each digit in the number using an array and display the frequency of each digit.**

```java
import java.util.Scanner;
public class Frequency {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        // Taking user input
        System.out.print("Enter a number: ");
        int number = input.nextInt();
        input.close();
        int[] frequency = new int[10];

        //Using while Loop
        while (number > 0) {
            int digit = number % 10; // Extract last digit
            frequency[digit]++; // Increase count
            number /= 10; // Remove last digit
        }

        //Printing output
        System.out.println("Digit Frequency:");
        for (int i = 0; i < 10; i++) {
            if (frequency[i] > 0) {
                System.out.println("Digit " + i + " appears " + frequency[i] + " times");
            }
        }
    }
}
```

```
C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>javac Frequency.java

C:\Users\Shounak Roy\Desktop\JAVA\Topic 3- Arrays\Level 2>java Frequency
Enter a number: 95585
Digit Frequency:
Digit 5 appears 3 times
Digit 8 appears 1 times
Digit 9 appears 1 times
```