CS 211 Object Oriented Programming **Homework 1**
Instructors: Dr. Djuraev Sirojiddin Term: Fall 2023

Topic: Types, Basic Input/Output and Operators, Methods, Control flow, Values, Variables, Types, Primitive types. Single Dimension Arrays, Multidimensional Arrays.

Due Date: 27 October 2023 23:59

Instructions: Submit all the assignments on Gradescope.

Problem 1

If today is Thursday, what will be the day in 98 days?

Problem 2

Write a statement to display the result of $2^{3.5}$

Problem 3
(Sum the digits in an integer)
Write a program that reads an integer between 0 and 1000 and adds all the digits in the integer. For example, if an integer is 932, the sum of all its digits is 14.
Hint: Use the % operator to extract digits, and use the / operator to remove the extracted digit. For instance, 932 % 10 = 2 and 932 / 10 = 93.

Example:

Input: 923
Output: 14

Input: 552
Output: 12

Problem 4

(Algebra: solve quadratic equations) The two roots of a quadratic equation

$$ax^2 + bx + c = 0$$

can be obtained using the following formula:

$$r1 = \frac{(-b + \sqrt{b^2 - 4ac}}{2a} r2 = \frac{(-b - \sqrt{b^2 - 4ac}}{2a}$$

$b^2 - 4ac$ is called the discriminant of the quadratic equation. If it is positive, the equation has two real roots. If it is zero, the equation has one root. If it is negative, the equation has no real roots.
Write a program that prompts the user to enter values for a, b, and c and displays the result based on the discriminant. If the discriminant is positive, display two roots. If the discriminant is 0, display one root. Otherwise, display "The equation has no real roots." Note you can use $Math.pow(x, 0.5)$to compute $\sqrt{x}$. Here are some sample runs: *Example:*

Input: 1 3 1
Output: 0.381966 and 2.61803

Input: 1 -4 -5
Output: -1 and -5

Problem 5
(Find the character of an ASCII code) Write a program that receives an ASCII code (an integer between 0 and 127) and displays its character. Here is a sample run:
Example:

Input: Enter an ASCII code: 69
Output: Character for ASCII code 69 is E

Input: Enter an ASCII code: 69
Output: Character for ASCII code 75 is K

Problem 6

(Financial application: payroll) Write a program that reads the following information and prints a payroll statement:
Employee's name (e.g., Smith)
Number of hours worked in a week (e.g., 10)
Hourly pay rate (e.g., 9.75)
Federal tax withholding rate (e.g., 20%)
State tax withholding rate (e.g., 9%) A sample run is as follows: *Example:*

Input: Employee Name: Smith
Hours Worked: 10.0
Pay Rate: $9.75
Gross Pay: $97.50

Output: Deductions:
Federal Withholding (20.0%): $19.50
State Withholding (9.0%): $8.77
Total Deduction: $28.27
Net Pay: $69.22

Input:

Output:

Problem 7

Write a program that displays all the numbers from 100 to 200 (10 per line) that are divisible by 5 or 6, but not both. Numbers are separated by exactly one space.

Problem 8

(Sum the digits in an integer)
Write a method that computes the sum of the digits in an integer. Use the following method header:

```
public static int sumDigits(long n)
```

For example, sumDigits(234) returns 9 (= 2 + 3 + 4).
(Hint: Use the % operator to extract digits and the / operator to remove the extracted digit. For instance, to extract 4 from 234, use 234 % 10 (= 4). To remove 4 from 234, use 234 / 10 (= 23). Use a loop to repeatedly extract and remove the digit until all the digits are extracted. Write a test program that prompts the user to enter an integer then displays the sum of all its digits.

Problem 9

(Check password) Some Websites impose certain rules for passwords. Write a method that checks whether a string is a valid password. Suppose the password rules are as follows:
A password must have at least eight characters.
A password must contain only letters and digits.
A password must contain at least two digits.
Write a program that prompts the user to enter a password and displays Valid Password if the rules are followed, or Invalid Password otherwise.

Problem 10

(Occurrences of a specified character) Write a method that finds the number of occurrences of a specified character in a string using the following header:

```
public static int count(String str, char a)
```

For example, count("Welcome", 'e') returns 2. Write a test program that prompts the user to enter a string followed by a character then displays the number of occurrences of the character in the string.

Problem 11

(Find the smallest element) Write a method that finds the smallest element in an array of double values using the following header:

```
public static double min(double[] array)
```

Write a test program that prompts the user to enter 10 numbers, invokes this method to return the minimum value, and displays the minimum value. Here is a sample run of the program:
Example:

Input: Enter 10 numbers: 1.9 2.5 3.7 2 1.5 6 3 4 5 2

Output: The minimum number is 1.5

Input: Enter 10 numbers: 0 5 -1 6 7 2 3.2 36 1 11

Output: The minimum number is -1

Problem 12

(Identical arrays) The two-dimensional arrays m1 and m2 are identical if they have the same contents. Write a method that returns true if m1 and m2 are identical, using the following header:

```
public static boolean equals(int[][] m1, int[][] m2)
```

Write a test program that prompts the user to enter two 3 * 3 arrays of integers and displays whether the two are identical. Here are the sample runs: *Example:*

Input: Enter list1: 51 25 22 6 1 4 24 54 6
Enter list2: 51 22 25 6 1 4 24 54 6

Output: The two arrays are identical

Input: Enter list1: 51 5 22 6 1 4 24 54 6
Enter list2: 51 22 25 6 1 4 24 54 6

Output: The two arrays are not identical

Problem 13

(Sort two-dimensional array) Write a method to sort a two-dimensional array using the following header:

```
public static void sort(int m[][])
```

The method performs a primary sort on rows, and a secondary sort on columns.
For example, the following array
{{4, 2},{1, 7},{4, 5},{1, 2},{1, 1},{4, 1}}
will be sorted to
{{1, 1},{1, 2},{1, 7},{4, 1},{4, 2},{4, 5}}.

Problem 14

(Geometry: area of a triangle) Write a method that returns the area of a triangle using the following header:

```
public static double getTriangleArea(double[][] points)
```

The points are stored in a 3-by-2 two-dimensional array points with points [0][0] and points[0][1] for (x1, y1). The triangle area can be computed using the formula below:

$$s = (side1 + side2 + side3)/2$$

$$area = \sqrt{s(s - side1)(s - side2)(s - side3)}$$

The method returns 0 if the three points are on the same line. Write a program that prompts the user to enter three points of a triangle and displays the triangle's area. Here are the sample runs:

Problem 15
Replace the "ADD CODE HERE" below with the code to declare and initialize a two-dimensional String array called students with the names "Brice, Marvin, Anna" in the first row and "Kamal, Maria, Elissa" in the second. The finished code will print all the names in the array starting with all in the first row followed by all in the second row.

```
public class Test1
{
    public static void main(String[] args)
    {
        // ADD CODE HERE //

        // Should print the values in students in order
        for (int row = 0; row <= students.length; row++)
        {
            for (int col = 0; col <= students.length; col++)
            {
                System.out.print(students[row][col] + " ");
            }
        }
    }
}
```