CPS 210 — Lab 9

PROBLEMS - Call all methods where applicable, and display your result

More Method Practice (no arrays needed):

1. (Convert feet into meters) Write a program that reads a number in feet, then write a method that converts it to meters. Then display the result. One foot is 0.305 meter. Here is a sample run:

   Enter a value for feet: 16.5 ↵Enter
   16.5 feet is 5.0325 meters

2. (Financial application: calculate tips) Write a program that reads the subtotal and the gratuity rate, then write a method that computes and **displays** the gratuity and total. For example, if the user enters 10 for subtotal and 15% for gratuity rate, the program displays $1.5 as gratuity and $11.5 as total. Here is a sample run:

   Enter the subtotal and a gratuity rate: 10 15 ↵Enter
   The gratuity is $1.5 and total is $11.5

3. (Science: calculating energy) Write a method that calculates the energy needed to heat water from an initial temperature to a final temperature. Your program should prompt the user to enter the amount of water in kilograms and the initial and final temperatures of the water. The formula to compute the energy is

$$Q = M * (finalTemperature – initialTemperature) * 4184$$

where M is the weight of water in kilograms, temperatures are in degrees Celsius, and energy Q is measured in joules. Here is a sample run:

```
Enter the amount of water in kilograms: 55.5  ↵Enter
Enter the initial temperature: 3.5  ↵Enter
Enter the final temperature: 10.5  ↵Enter
The energy needed is 1625484.0
```

4. (Algebra: solve quadratic equations) The two roots of a quadratic equation $ax^2 + bx + c = 0$ can be obtained using the following formula:

$$r_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{and} \quad r_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

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. Then write a method that displays the result based on the discriminant. If the discriminant is positive, display two roots. If the discriminant is 0, display one root (display either equation since it will produce the same number). Otherwise, display "The equation has no real roots".

Below are some sample runs:

```
Enter a, b, c: 1.0 3 1  ↵ Enter
The equation has two roots -0.381966 and -2.61803
```

```
Enter a, b, c: 1 2.0 1  ↵ Enter
The equation has one root -1
```

```
Enter a, b, c: 1 2 3  ↵ Enter
The equation has no real roots
```

5. (Find the number of days in a month) Write a program that prompts the user to enter the month and year. Then write a method that returns the number of days in the month. Then display the days. For example, if the user entered month 2 and year 2012, your program should display 29 days. If the user entered month 3 and year 2015, your program should display 31 days. A year is a leap year if it is divisible by 4 but not by 100, **or** if it is divisible by 400. Below is a sample run:

```
Enter a month and year: 2 1992
There are/were 29 days
```

Practice with Arrays:

6. Create a char array with 26 values. Assign each slot a letter of the alphabet. Print the array forwards and backwards in the main method. HINT: Instead of manually entering a, b, c …etc. you can use a for loop to add the values a through z.

    a. Next, create a method that prints out arrays of type char forwards. Name this method, **printArray**. Call your method for your character array.

7. In the same program as Q6, Declare and initialize an int array with numbers 1 through 10.

   a. Next, create a method that prints out arrays of type int. Name this method, **printArray**. This is method overloading since the name of the array is the same as the one used above, but the parameters are different.

   b. In the main method, increase each value in your array by 1. You must use a for loop for this.

   c. Try to place what you did for part b in a method. Call the method and print your result using the printArray method again.

8. In the same program as Q6 and Q7, declare an array of type int with a size of 5. Use Scanner to ask the user to fill the array with whatever integers they want. Use a for loop for this.

   a. Use your **printArray** method you created in question 7 to display the array. Below is a sample run:

```
Enter 5 values to place in array: 2 8 15 0 43
2 8 15 0 43
```