

# CSC120 2024S Lab No.2

## Using Variable and Receiving Inputs

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This lab aims to learn how to use `Scanner` to write programs that receive inputs from the user. This assignment consists of two parts.

### Part 1: Solving a System of Linear Equations with Two Unknowns

For this part of the assignment, you must write a program, `LinEq`, to solve a system of linear equations with two unknowns. Suppose we have two linear equations with two unknowns,  $x$  and  $y$ , as follows:

$$\begin{cases} ax + by = p \\ cx + dy = q \end{cases}$$

Let  $det$  denote the determinant  $ad - bc$ . The solutions for these equations can be obtained using Cramer's Rule as follows:

$$\begin{cases} x = (d * p - b * q) / det \\ y = (a * q - c * p) / det \end{cases}$$

Write a program `LinEq.java` that receives three coefficients  $a$ ,  $b$ , and  $p$ , from the user and then another three  $d$ ,  $e$ , and  $q$ , from the user, then solves the equations using the formulas. To receive input, use the `nextDouble()` method.

Here is a sample execution of the code:

```
This program solves systems of linear equations
ax + by = p, cx + dy = q
Enter a, b, and p: 2 4 5
Enter c, d, and q: 3 3 2
The equations are:
2.0 x + 4.0 y = 5.0 and 3.0 x + 3.0 y = 2.0
The solution is (-1.1666666666666667, 1.8333333333333333)
```

The user of the program inputs appear in the third and the fourth lines after the colon. The fifth and sixth lines are for reporting the inputs the user gave. The result of the calculation appears in the seventh line.

Note that because of the choice to use `nextDouble()`, the program read the coefficients as real numbers, although the user entered whole numbers.

With the user input and the part depending on the user input replaced with ###, the program execution will look as follows:

```
This program solves systems of linear equations
ax + by = p, cx + dy = q
Enter a, b, and p: ### ### ###
Enter c, d, and q: ### ### ###
The equations are:
### x + ### y = ### and ### x + ### y = ###
The solution is (###, ###)
```

## Part 2: Shopping at a Cafe

This part of the assignment aims to write a class, `Cafe`, that mimics shopping at a bakery, *Caroline's Cafe*.

Caroline's Cafe sells four items: pastries, coffees, special drinks, and sandwiches. Their prices are \$5.0, \$3.0, \$6.0, and \$6.5. The program receives the number of items the user purchases for each type and computes and reports the running subtotal. After receiving the four quantities, the program computes the tax (with a tax rate of 7.0%) and total. The program then reports the tax and total and greets off,

Here is an example of executing the program.

```
Welcome to Caroline's!
Here is our menu:
-- Pastries are 5.5 dollars each.
-- Coffees are 3.0 dollars each.
-- Special Drinks are 6.0 dollars each.
-- Sandwiches are 6.5 dollars each.
How many pastries? 4
Subtotal: 22.0 dollars.
How many coffees? 3
Subtotal: 31.0 dollars.
How many special drinks? 4
Subtotal: 55.0 dollars.
How many sandwiches? 2
Subtotal: 68.0 dollars.
Tax: 4.76 dollars.
Total: 72.76 dollars.
Thank you for stopping by. Take care!
```

You can write the code using the following variables in the program: `int` variables `pastries`, `coffees`, `special_drinks`, and `sandwiches` for storing the numbers of orders for pastries, coffees, special drinks, and sandwiches, respectively. In addition, the program uses `double` variables in the program: `subtotal`, `tax`, and `total` for the subtotal, the tax, and the total of the purchase, respectively. In computing the tax, we can use the following formula and assignment:

```
tax = (int)( subtotal * 0.07 * 100 ) / 100.0;
```

The formula inside the parenthesis computes the tax in cents, uses the `(int)` to round it down, and then runs the amount in dollars.