Lab 2

Master the concepts of variables, math operations, and user-input

In this Lab, you learn more about variables, variable declaration, using variables in input and output statements, as well as using variables to create expressions using arithmetic operators.

In-Lab Activities

Guided Inquiry *questions are shown in the* ***blue chat bubbles*** *– answer all of these in your* ***notebook*** *before beginning that particular activity. It is also encouraged to use the* ***notebook*** *for more than just these questions, as writing down our thoughts before coding a program is beneficial, and can actually make the coding process itself a little bit easier.*

Warm-Ups

Go to the Google Forms link on the board and complete your Warm-Up Questions. You have 10 minutes to complete this. If you finish early, feel free to begin the Lab Activities, but make sure your partner is ready as well.

Pair Programming Swap

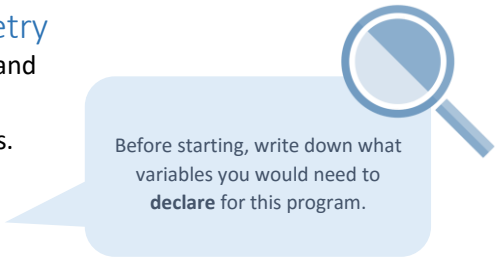
Don't forget to swap partner roles every time you see the icon! One person should be coding while the other is helping. Make sure that you share copies of the code once finished. Discuss activity concepts in depth.

Activity 1: Displaying the Current Time

You were required to watch the video in the Revel Textbook section 2.12 called "Using Operators / and %". Now go back to this section in the textbook and **code along** with the video. You may also scroll down to view the code in the rest of the text on the page. Write **comments** under each block of code to describe what it is doing in your own words. We will check this at the end of Lab.

Activity 2: Declaring Variables to help Children learn Geometry

You are asked to write a program for elementary school children to play with and learn about geometry. The program will teach them about shapes, areas and perimeters. As the start, we want you to just write a program about rectangles.



1. Start with your **block comment**!
2. You need to inform the children about this game (What do you suggest? Maybe at least a nice message?)
3. Don't forget **inline comments** as you continue to write code.
4. Allow the user to enter the rectangle's length and height. (What variables you needed to **declare** before being able to do that?
5. The program will then calculate and display both the area and perimeter of the rectangle based on the user-inputted values. (What **mathematical expression** will you need here to perform the calculation?)
6. Don't forget to include some encouraging message and show how the calculation was done.

Activity 3: Mod Operators

In this activity, you will need to use **mod operators** here as well as **integer division**. Write a program that asks user to enter two integers, then calculates and displays the result of both the division *and* mod operation.

1. Like before, make sure to remember your **commenting**!
2. Allow the user to enter two integers – don't forget your **variable declarations**. Also, what **message** should you show so that the user has proper instructions?
3. Write the correct **expressions** to fulfil the requirements mentioned in the Activity description. (What else must you do with this expression so that the answers are saved for later use?)
4. Display the answers. Also, like the previous activity, show how the calculation was done.

When testing the program for yourself, try these pairs of numbers as input: 5 4, 4 5, 9 3, 3 9, 0 7, 7 0

Did you experience anything unusual? What was that? Why did it happen? How do we fix it?

CHECKPOINT

35 MINUTES

Activity 4: Juggling Values

Write a program that takes in two user-inputted values and assigns them to variables. Next, swap the values in the variables.

Hint: use a temporary variable to do so. Each variable can only hold one value at a time, so what happens when you set one variable equal to the other variable's value? You lose the value of the first variable. *Forever*. With the help of an additional temporary variable, you can save that value before it is lost.

Try coding this yourself using similar processes as the previous activities – commenting, deciding what variables to declare, and writing any required expressions and display messages.

Activity 5: Calculating Test Grade

Bill Gates is going to get his driver's license, but must first take the written test. In order to pass, he must get at least 85% of the questions correct. Write a program that shows him his test percentage:

How many variables do you need to **declare** at the beginning? Are any of them **instantiated**? What are their **data types**?

1. Never forget to comment – both **block** and **inline**!
2. Allow the user to input the total number of questions correct, as well as the total number of questions on the test.
3. Calculate and display the percentage of questions correct.
4. Don't forget to include proper messages throughout the program so that the user knows what's going on.

CHECKPOINT

25 MINUTES

Activity 6: Gas Mileage

Before buying a car, Billy wants to go on many, many test drives to calculate gas mileage of each car and make sure the salesman isn't lying to him. Write a program that allows him to quickly determine gas mileage - take in the total miles driven, as well as the amount of gas consumed, as user-input. Next, calculate out the mileage of the vehicle and display that, so Billy can make a good buying choice.

Use similar processes as what you have been doing in the past activities. Think about the required **variable declarations**, what **messages** you will need to display to the user, and any arithmetic **expressions** you may need.
Don't forget **commenting** either!

Activity 7: Tips and Vacations

Part 1: Martha is working as a waitress to save money for college tuition. Write a small program that calculates her tip. The program will ask for user-input regarding the customer's total bill. Next, it will automatically add a 15% tip to the total. Have the program display both the tip amount, as well as the customer's total bill (including the tip).

Which variables need to be **instantiated** at the beginning? Which variable can be **declared** as a **constant**? What is the **keyword** used for declaring a **constant**?

Part 2: Unfortunately, Martha has tired herself out by working so hard for tips; now she needs a vacation to recuperate. Write a program that allows the user (Martha) to enter how many days' vacation she took. The program will print how many weeks and days (less than 7) this is. For example, if user enters "10", then the program should print "That is 1 week and 3 days". Is this requiring any particular operator other than subtraction? How about **mod operator**? How does it work?

CHECKPOINT

35 MINUTES

Activity 8: Debugging

Not only is it good to learn how to code from scratch, but you will also need to know how to find and solve errors that may occur within your program.

Copy the following code into your IDE:

```
public class Activity8 {
	public static void main(String[] args){
		int numPets1;
		double numPets2;
		int total

		Scanner scan = new Scanner(System.in);

		System.out.println("How many pets do you own?");
		numPets1 = scan.nextInt();

		System.out.print("How many pets does your partner own?");
		numPets2 = scan.nextInt();

		total = numPets 1 + numPets2;
```

```
            System.out.println("Together, you both have" + total + " pets");

      }
}
```

There will be many syntax errors, shown by a red squiggly line. Find these errors and write a comment beside each one, explaining what you think the problem is. After you are done, try to fix the errors.

Once complete, try looking for some small errors that aren't necessarily syntax-related. If you find any, put a comment beside it and fix it.

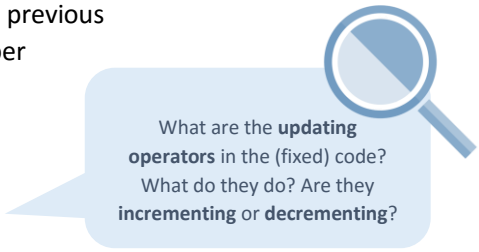
CHECKPOINT

15 MINUTES

Activity 9: Debugging

Copy the following code into your IDE and go through the same process as the previous Lab Activity. Instead of writing a comment per error however, count the number of errors and write it at the top (in a comment).

Good luck reading through all the lines of text. 😊 Also, there are points when the line runs off to the next line because of the document – these still belong on the previous line.



Pay attention to what is on the **left hand side** and **right hand side** of expressions.

```
import java.util.Scanner;

public class Activity9 {
      public static void main(String[] args){
            int total = 0;
            int tempNum;

            Scanner scan = new Scanner(System.in());

            System.out.println("Personality Quiz: What Animal Are You?");
            System.outprintln("Taken from a random YouTube video.");
            system.out.println("Type in the number associated for each answer.")

            System.out.println();
            System.out.println("How would you describe yourself?");
            System.out.println("Fun and loud (30), Cute and lazy (10), Calm and
Serious (20),\n"
                        + "Smart and bossy (50), Mean and mysterious (60), or \n"
                         "Loyal and adventurous (40)");
            tempNum = scan.nextInt();
            total + tempNum;

            System.out.println();
            System.out.println("If you could travel through time where would you
go?");
```

```
            System.out.println("In the future, I love technology (30)");
            System.out.println("My favorite time period (60)");
            System.out.println("In my dreams (10)");
            System.out.println("When Julius Caesar was alive (50)");
            System.out.println("Just before humans conquered the Earth (20)");
            System.out.println("When werewolves will rule the world (40)");
            tempNum = scan.nextInt();
            total += tempNum

            System.out.println();
            System.out.println("Your best friend has told your enemy one of"
                        + " your secrets. What now?");
            System.out.Println("What friend? (20)");
            System.out.println("Whatever, who cares? (10)");
            System.out.println("Why? I don't know but they will be sorry! (40)");
            System.out.println("Yell at them and get a new best friend (30)");
            System.out.println("Well, that's it. They are no longer my friend.
(50)");
            System.out.println("I will tear them apart! (so violent) (60)");
            tempNum = scan.next();
            tempNum + total = total;

            System.out.println();
            System.out.println("Your points are: " total);
            System.out.println("If you got between...");
            System.out.println("30-59: Koala");
            System.out.println("60-89: Bear");
            System.out.println("90-119: Monkey");
            system.out.println("120-149: Lion");
            System.out.println("150-180: Tiger");
      }
}
```

CHECKPOINT

20 MINUTES

Don’t forget to upload JAVA files to your Google Drive folders.

Reflection

Go to the Google Forms link given by your TA to work on your Reflection for Lab 2. This counts as a part of your participation grade, and it is important that you put as much detail as possible.