Activity 1: Variables and Operators

Today, you will work in teams of 3–4 students to learn new concepts. We’ll take a first look at how to store data in Java programs.

## Content Learning Objectives

*After completing this activity, students should be able to:*

• Write Java code to declare int and double variables.

• Explain what it means to assign a value to a variable.

## Process Skill Goals

*During the activity, students should make progress toward:*

* Leveraging prior knowledge and experience of other students. (Teamwork)

# Model 1 Variables

Most programs store and manipulate data values, and we use *variables* to give them meaningful names. The following code *declares* and *assigns* three variables. Each variable is stored in the computer’s memory, represented by the boxes on the right.

|  |  |
| --- | --- |
| **Java code**  int dollars;  int cents;  double grams;  dollars = 1;  cents = 90;  grams = 3.5; | **Computer memory**  dollars = 1  cents = 90  grams = 3.5 |

## Questions

1. Identify the Java *keyword* used in a variable declaration to indicate
2. an integer:
3. a real number:
4. Consider numbers of dollar bills, cents, and grams. Which of these units only makes sense as an integer, and why?
5. What would you expect the following statements to printout?

a) System.out.println(dollars);

b) System.out.println(cents);

c) System.out.println(grams);

1. In the previous question, how does the third printed line(c) differ from the first two?
2. What do you think is the purpose of a variable declaration?
3. What is output by the following code, and why?

double one;

one = 1;

System.out.println(one);

# Model 2 Variables (assignment)

Declaring a variable instructs the computer to reserve space for it in memory.

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| --- | --- |
| **Java code**  1 int dollars;  2 int cents; | **Computer memory**  dollars =  cents = |

Variables cannot be used until they are *initialized* (assigned for the first time).

|  |  |
| --- | --- |
| **Java code**  3 dollars = 2;  4 System.out.println(dollars); //OK  5 System.out.println(cents); //error | **Computer memory**  dollars = 2  cents = |

Each time you assign a variable, you are *updating* its value stored in memory.

|  |  |
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| **Java code**  6 dollars = 3;  7 dollars = 4;  8 cents = 49; | **Computer memory**  dollars = 4  cents = 49 |

## Questions

1. How many times is each variable in Model2 assigned?
2. What is the error in the second System.out.println statement? (Don’t just repeat the text in Model 2; explain in your own words what the problem is.)
3. What is the value of dollars right before it’s assigned for the last time? What is the value of cents before it’s assigned for the last time?
4. Consider the statement: cents = dollars;
5. Compare this code to lines 6–8 in Model 2. What value do you think cents and dollars will have after running this statement?
6. Which side of the equals sign (left or right) was assigned a new value?
7. In Java, the + and - symbols are used to perform addition and subtraction. For example, the statement dollars = dollars + 1; adds one to the current value of dollars.
   1. What is the value of dollars (in memory) after running this statement?
   2. Do you consider the equals sign in Java an operation to be performed? (like +). If so, explain the operation. If not, explain why not.
   3. Do you consider the equals sign in mathematics an operation to be performed? If so, explain the operation. If not, explain why not.
8. In your own words, explain how you should read the = sign in Java. For example, the Java statement x = a + b; should be read as “x \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a plus b.”