BSM 261: Object Oriented Programming
LAB 1: Primitive Types
Getting Comfortable with DrJava

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1 Getting Started

Before you perform the lab please check the following information:

- Make sure that the lab computer you are using has DrJava downloaded into the desktop. Here is the jar file to check:

  drjava-beta-20190813-220051.jar

- If you can not locate DrJava, please download the DrJava from the following link and place it to your desktop.

  https://sourceforge.net/projects/drjava/files/latest/download

- If you have the DrJava jar file in your desktop, you are ready to perform your lab. In order to use jar files in linux, you need to run it from terminal. Open your terminal and use the following commend to start DrJava

  java -jar /Desktop/drjava-beta-20190813-220051.jar

2 Objective and Rules

The purpose of this lab is to get you used to using DrJava, to start experimenting with Java expressions, and to understand some of the issues involved in representing and manipulating data with a computer.
Here are the lab rules:

- The teaching assistant will make a short recap of the week. Then you will perform the lab in the recitation hour.
- Your grade will be determined by your participation and finishing the assigned work during the recitation. When you get stuck on a question, please ask for help.
- Once you finish all of the tasks, show your work to the TA to receive full credit.
- **If you did not join the lab, or joined more than 10 minutes late or did not show your work to the Teaching Assistant, you will receive 0.**

3 Starting DrJava

DrJava is what is known as an integrated development environment (or IDE for short) for Java. An IDE is an application that assists programmers in writing computer programs. There are a large number of IDEs available for many different languages, and we will be using DrJava for writing Java in our class because DrJava is particularly good for new programmers. You are allowed to use a different IDE if both you want to, but these labs exercises are designed for DrJava. If you are a coding novice, then you should use DrJava.

3.1 Testing DrJava

All programming languages have their own quirks with how they manipulate numbers and other data. In this lab, you will begin exploring the syntactic form of Java expressions as well as their semantic meaning.

In this lab, you will be entering code fragments in the Interactions Pane of DrJava. At the bottom of the DrJava window, you should see several tabs. Click on the one that is labeled Interactions. You should see
Welcome to DrJava.
>

You will enter the code fragments at the > prompt.
Try it now. Type: **true** at the > prompt and press the Enter key. The interactions pane should respond with **true**

The Interactions Pane is the reason DrJava is a very nice IDE for beginning programmers. You can enter pieces of Java code into the Interactions Pane in order to test the code and see what happens. This way, you can get started working in Java without having to write an entire Java program.

4 Lab Instructions and Questions

You will be writing a lab report in this lab. Follow the following procedure through the lab.

- Look over the lines you are asked to type into the interactions pane. Try to guess what you think the results should be.
- Type the expressions one at a time into the Interactions Pane of DrJava and see what happens. (If you try to copy and paste all of them at once, you will get a Java error.)
- Read the questions that follow and see if you can answer them. If you are unsure, you can enter more test cases into the interactions pane.
- Write your answers or explanations to the following questions in the lab report document.

At the end of lab, your report to the TA to receive full credit. The questions below cover some features of numbers in Java. Don't worry about trying to remember all the syntax. We will be covering this in more detail later. Right now, just focus on the behavior of the different Java expressions below.

Question 1: What is the result of each of the following expressions when you type them in the interactions pane?
5 * 2
2 + 20 * 10
(2 - 20) * 10

Answer the following questions. You may enter more test cases, if you need, to determine the correct answers. Write up your answers on your lab report.
A) What is the meaning of +, -, and *?
B) If your have a mixture of +, *, and - operators in an expression, what is the rule Java uses to evaluate the expression?

Question 2: What is the result of each of the following expressions when you type them in the interactions pane?
5 - 2
5 - 2.0
6.0 - 5
6.0 - 5.0

Answer the following questions. You may enter more test cases, if you need, to determine the correct answers. Write up your answers on your lab report.
A) What is the type of each of the resulting values?
B) What is the rule Java uses to determine what type the resulting value is?

Question 3: What is the result of each of the following expressions when you type them in the interactions pane?
11 / 5
11.0 / 5.0
11 % 5
12 % 5
4.0 / 5 * 10
4 / 5 * 10.0

Answer the following questions. You may enter more test cases, if you need, to determine the correct answers. Write up your answers on your lab report.
A) What is the meaning of the / and % operators?
B) What is the rule for / if the operands have decimal points (double) and if they do not (int)?
C) What is the order of operations if you have more than one operator in an expression?

Note: Because of the possible different results when mixing int and double values, we try to avoid doing so when we write programs.

Question 4: What is the result of the following expressions when you type them in the interactions pane?
4 < 5
4 > 5
5.01 > 5.00
6 > 5 > 4
2 == 2
2 == 3

Answer the following questions. You may enter more test cases, if you need, to determine the correct answers. Write up your answers on your lab report.
A) What do < and > do?
B) What does == do?
C) Why did one of the above expressions give an error message? (Hint: the answer has to do with a data type.)

Note: true and false are also values of a primitive type. They are the only two values of the

type boolean.

Question 5: What is the result of the following expressions when you type them in the interactions pane?
(int)5.3
(int)5.9
(double)4
(int)2.5 + 2.5
(int)2.5 + (int)2.5
(int)(2.5 + 2.5)
(double)(1 / 2)

Answer the following questions. You may enter more test cases, if you need, to determine the correct answers. Write up your answers on your lab report.
A) What is the difference between int and double?
B) What does placing (int) to the left of a value do to the value?
C) What does placing (double) to the left of a value do to the value?
D) Explain as precisely as you can why the 4th through 6th lines above each gave different answers.

Note: int and double are called types and (int) and (double) are called typecasts.

Question 6: What is the result of the following expressions when you type them in the interactions pane? (Note that the symbol used is the single-quote, also known as the apostrophe.)
'a' + 1
(char)('a' + 1)
'a' < 'b'
'b' - 'a'
'B' - 'A'
'C' - 'A'
'a' - 'A'
'3' == 3
3 == 3

Answer the following questions. You many enter more test cases, if you need, to determine the correct answers. Write up your answers in your lab report.
A) What does the single-quote do?
B) Why did 'a' + 1 return the value it did?
C) What was the behavior of the (char) typecast?
D) How are letter values represented?
E) Describe, as best you can, what '3' and 3 represent in Java.

Note: char is also a type of Java, similar to int and double.

Question 7: What is the result of the following expressions when you type them in the interactions pane?
int x
int y
x = 10
y = x * 2
x
y
x = x + 1
x

```
y
x = 2.0
x = (int)2.0
x
```

Answer the following questions. You may enter more test cases, if you need, to determine the correct answers. Write up your answers on your lab report.

A) What does the = operator do?

B) In your own words, explain the behavior of the line x = x + 1.

C) Why, after the line x = x + 1 did the value of x change but not the value of y?

D) Why did the third to last line cause an error?

Important: remember the difference between = and ==.