Java Data Types and Variables

Java has eight primitive data types. A *primitive* data type is a data type that cannot be broken down into simpler data types. They are also pre-defined by the Java language, and not as part of a built-in library. These data types are always all lowercase.

- Integer data types
  - **`byte`**: holds integers from -128 to 127 (inclusive)
  - **`short`**: holds integers from -32,768 to 32,767 (inclusive)
  - **`int`**: holds integers from -2,147,483,648 to 2,147,483,647 (inclusive)
  - **`long`**: holds integers from -2^{63} to $2^{63}-1$ (inclusive) [integers with up to 18 digits]

  - These strange limits come from the number of bytes reserved for variables of each data type in the Java language: 1 byte, 2 bytes, 4 bytes, and 8 bytes, respectively.

  - Most people recommend using `int` as your default integer data type, and `long` where you think you might need the extra space. `byte` and `short` are rarely used in practice, except to save memory in large arrays.

- Floating-point data types
  - **`float`**: holds roughly any decimal number with roughly 6-7 significant figures. [4 bytes]
  - **`double`**: holds roughly any decimal number with roughly 14-15 significant figures. [8 bytes]

  - Most people recommend using `double` as your default floating-point data type. `float` is often used when allocating large arrays when saving memory is important.

- Boolean data type: **`boolean`**. Can only be assigned `true` or `false` as values.

- Character data type: **`char`**. Can represent any single character. Character literals must be enclosed in single quotes, like `'a'` or `'*'` or even `' '` (a space character).

- Note that strings are *not* primitive data types in Java; they are reference data types. You can remember this because the **`String`** data type is capitalized.

Java, being a statically-typed language, requires that variables be *declared* before they can be used. A variable is declared by stating the type and the name of the variable:

```
int numDogs;
```

A variable may optionally also be initialized when it is declared:

```
int numDogs = 2;
```

If a variable is *not* initialized when it is declared, it is assigned a default value. The default for numeric types is 0, `false` for Booleans, and the "empty character" for `char`.

After a variable is declared, it can be assigned to (and therefore changed) similarly to how it is done in Python:

```
numDogs = 5;        // Note that when simply assigning to a variable, the type is not used.
```

Aside from declaring a variable's type before it can be used, variables work similarly to how they do in Python.

Java's naming convention is slightly different than Python's; you will usually see variables in camelCase rather than using underscores to separate words.