Variables

Variables are used to store values in a computer program. The following are characteristics of variables:

- **Variables must have names:** Names defined in Java are case sensitive, which means a variable whose name begins with an uppercase letter and a variable whose name begins with a lowercase letter are two separate variables. All variable names must be unique and descriptive. Someone reading a program should be able to tell how the variable is used simply by its name.

- **Variables must be declared or defined before they can be used:** When a variable is declared, it is given a name and a data type. The data type describes the type and size of the information that will be stored in the variable.

- **Variables may or may not be initialized:** Initializing a variable gives the variable a starting value. It is a best practice to initialize all variables at the time they are declared.

- **Variables may have their value changed many times throughout the course of a program:** Each variable can hold only one value at a time; however, the value can change during the execution of the program.

The following is example of a variable named `age`. The data type is integer; the variable will only hold whole numbers:

```java
int age; //variable of type integer
```

In the following example, the variable is named `salary`. The data type is double. This variable is used for a large decimal number:

```java
float salary; //variable of type floating-point decimal
```

In the following example, the variable is `numberOfPets`. The type is integer, or a whole number. The variable is initialized, and the number 2 is assigned to the variable:

```java
int numberOfPets = 2; //variable of type integer and initialized to 2
```
Constants

Constants are also used to store values in a computer program. Unlike variables whose value can change throughout the running of a program, the value of a constant cannot be changed by the program. The following examples demonstrate how constants are defined in Java.

The following are two examples of the declaration of a constant. Each has a data type of double or decimal. Notice the addition of the word final in front of the declaration. This is what identifies it as a constant rather than as a variable. Final means the value cannot be changed after it has been set. It is also best practice to name the constant using all uppercase letters.

```java
final double PI = 3.14159; // a constant declaration
final double PAYRATE = 6.75; // PayRate represents the value of 6.75 in the program and cannot be changed during the execution of the program.
```

Data Types

The data type of a variable or constant has the vital role of telling the compiler how much memory to set aside to hold the value that is stored at the memory location labeled with that identifier. All programming languages have some built-in data types. These are sometimes referred to as primitive types. All languages contain the facilities for the programmer to devise his or her own data types from combinations of the primitive data types. Because a data type is a memory size specifier, it also limits the value range that can be stored in memory.

The following are the four primitive data types that are commonly used in Java for storing numbers:

- Integer
- Long (for large integers)
- Float (or decimal)
- Double (for large decimal numbers)

Characters and alphanumeric data are stored in the following primitive data types:
• **Char**: This stores one character at a time.
• **String**: This stores one or more words.

The final primitive data type in Java is logical or true/false:

• **Boolean**

Data types tell the compiler how much memory to reserve in a program. For example, an integer is assigned four bytes of memory. A decimal, or floating point variable, is also assigned four bytes of memory. A double is assigned eight bytes of memory.