\*\*\*\*\* Document about Java Primitive Data types\*\*\*\*

Data stored in memory is a string of bits i.e. combination of 0’s and 1’s.

If we simply give 1000010 to the computer to perform some operation, What does 1000010 mean?

**Question:** How the computer interprets the string of bits depends on the context.

**Answer:** We must make the context explicit by specifying the type of the data i.e. specifying the data type of the data we are using.

In Java, there are two types of data types :

* Primitive Data type
* Non-primitive or Reference Data type

In Non-primitive data type we have

* Class
* Arrays
* Interface
* Strings

In Primitive data type we have

1. Integer

* byte
* short
* int
* long

1. Floating point

* float
* double

1. Character

* char

1. Boolean

* boolean

In this document primitive data types are explained in depth.

Java determines the size of the each data type. These sizes do not change from one operating system to another. This is one of the key features of the language that makes Java so portable.

1. **Integer**

* **byte :**

The smallest integer type is byte.

byte data type occupies memory size of 1 byte.

The default value of byte data type is -0.

The range of any data type is calculated using below formula:

−(2n−1) to +(2n−1)−1

where n is no of bits.

Here 1 byte = 8 bits so n=8.

Therefore, the range of byte is -128 to +127.

Note: When you try to assign values to the variable(in our example byte variable) that are not in valid range, the java compiler encounters an error.

Ex: byte b = -129 (or)

byte b= 128

/MyClass.java:4: error: incompatible types: possible lossy conversion from int to byte

byte b=-129;

^

1 error

* **short:**

short data type occupies memory size of 2 bytes.

The range of short is -32768 to +32767.

The default value of short is -0.

* **int:**

int data type occupies memory size of 4 bytes.

The range of int is -2,147,483,648 to +2,147,483,647.

The default value of int is -0.

* **long:**

long data type occupies memory size of 8 bytes.

The range of long is -9,223,372,036,854,775,808 to +9,223,372,036,854,775,808 .

The default value of long is -0.

1. **Floating point**

* **float:**

float data type occupies memory size of 4 bytes.

The range of float is 3.4e-038 to 3.4e+038.

The default value of float is 0.0f.

In java, floating point literals are default double type.

Ex: float f=5.6;

The java compiler treats 5.6 as double and raises an error.

To overcome this, specify ‘f’ or ‘F’ to the value as follows:

float f=5.6f (or) float f=5.6F;

By mentioning 5.6f/5.6F, the compiler treats 5.6 as float.

After a decimal point, float gives precision value upto 7 digits.

* **double:**

double data type occupies memory size of 8 bytes.

The range of double is 1.7e-038 to 1.7e+038.

The default value of double is 0.0.

After a decimal point, float gives precision value upto 17 digits.

1. **Character**

* **char:**

char data type occupies a memory size of 2 bytes.

The range of char is ‘\u0000’ or 0 to ‘\uffff’ or 65,537.

The default value of char is ‘\u0000’ which is nothing but a blank space.

A char variable can hold one character at a time and should be quoted in single inverted commas.

Note: ‘\u’ infront of the hex codes represents that the character is Unicode.

1. **Boolean**

* **boolean:**

This is used as a result of conditional statements.

boolean data type holds two states:

1. true
2. false

The memory size of boolean is JVM dependent i.e. the memory size allocated to boolean varies from platform to platform.

The default value of boolean is false.

**Importance of Understanding limitations of data types:**

A very good example to sight the importance is the catastrophic failure of the Ariane 5 space shuttle. Ariane 5 shuttle is designed to fly higher altitudes than earlier shuttles. But the team has used the old software package which uses a variable like say short. But the shuttle is capable of flying higher heights which the variable cannot hold.

When the shuttle took off and with in seconds when it reached to certain height, the variable failed to hold the higher values and on board computer generated fatal errors and the shuttle blasted off in the air. So one should be careful with data types when working on critical projects.

**Summary:** Data types in java are designed to support all form of numbers and is capable of representing multiple languages which has very good support for Internationalization.

**References:**

<http://java9s.com/core-java/data-types-in-java>

<https://www.w3resource.com/java-tutorial/java-premitive-data-type.php>