Java Basics

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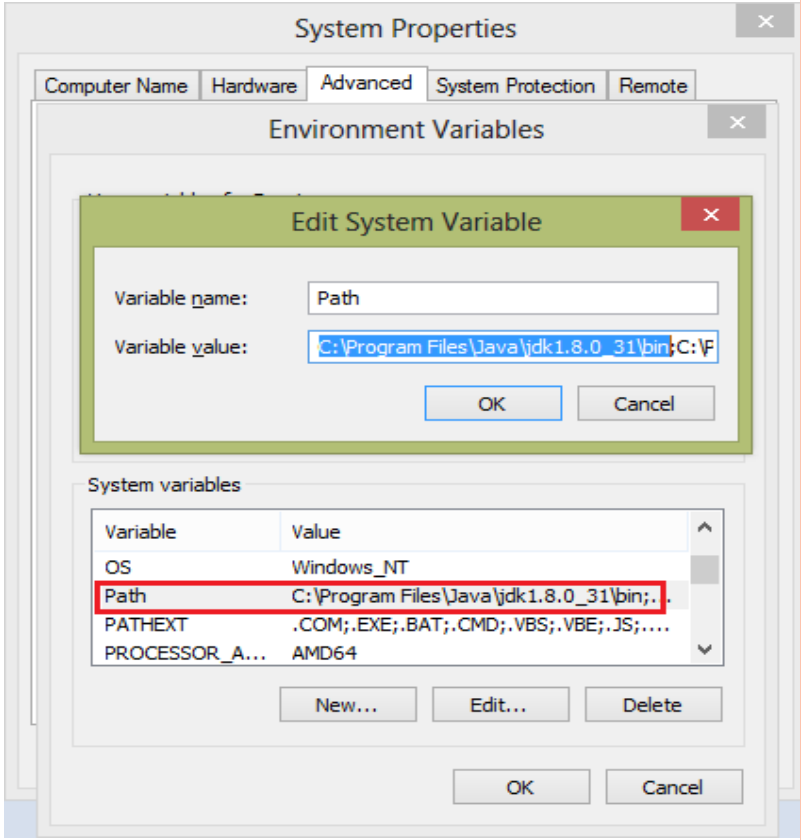
Tools/Set-Up

Step1: Install Java and Path Set-up

- Need to install Java(JDK and JRE). Get the latest version from Java Standard Edition(SE) from http://www.oracle.com/technetwork/java/javase/downloads/index.html
  - After installing Java you need to set-up the "**Path**" environment variable which is available from **My Computer** under **Advanced Properties** tab.
  - **Note**: Do not delete anything in "Path" variable. Just add your path "C:\Program Files\Java\jdk1.8.0_31\bin;" (Depending on your version the path will change) at the beginning of the existing value.



Step 2: Install IDE

- Need an IDE: Eclipse or NetBeans or IntelliJ IDEA.

  Or

- A Text Editor e.g. TextPad
- ***You can install***
  - eclipse from : Eclipse IDE for Java Developers | Eclipse Packages
  - NetBeans: Apache NetBeans Releases
  - IntelliJ IDEA: Download IntelliJ IDEA – The Leading Java and Kotlin IDE (jetbrains.com)

Compile & Run Java Application

Without IDE

- Using JDK you can compile and run java program from command line.
  - c:> javac HelloWorld. Java
    - compiling here and
    - it will produce HelloWorld.class i.e. bytecode.
  - c:>java HelloWorld
    - It runs java byte code on native machine

With JAVA IDE

- Creating, Compiling, Debugging and Execution for these four steps JDK is not user friendly. IDE is provided for that. A list of IDEs are:
  - Eclipse
  - Netbeans.
  - IntelliJ IDEA

Data Types

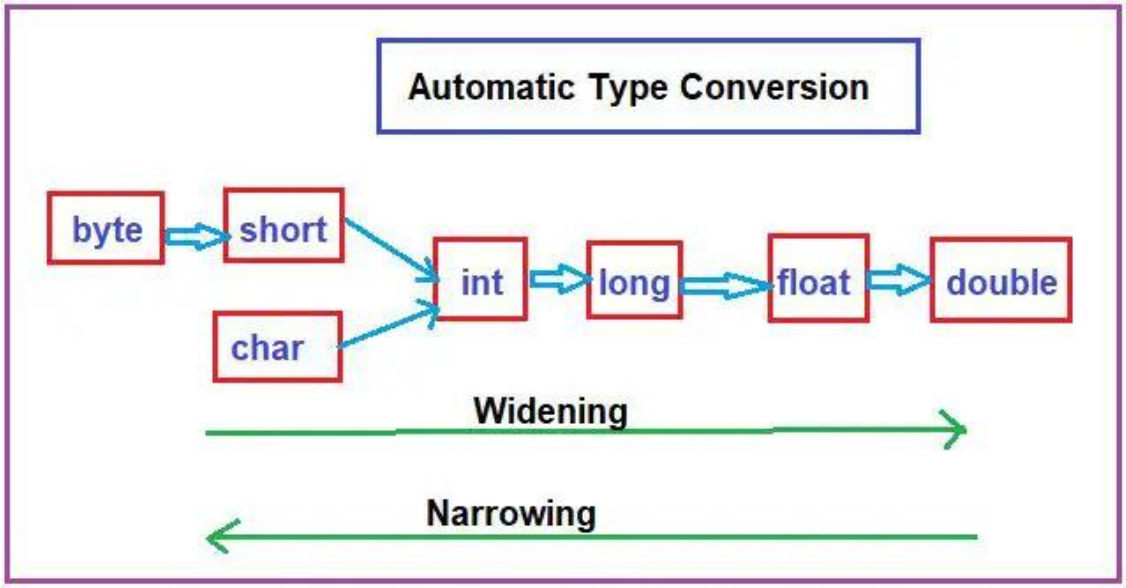
- Divided into two broad categories:
  - primitive types
  - class/reference types.

- Primitive data : eight types
  - Logical: boolean (true or false)
    - doesn't hold integer (unlike C)
  - Textual: char (16 bits)
    - use the Unicode(International: 0-255) not ASCII(1 byte: 0-127)
  - Integral: byte (8 bits), short (16 bits), int (32 bits), and long (64 bits)
  - Floating point: float (32 bits) and double (64 bits)

- Class or reference data: two types
  - Textual: String
  - All classes that declare by yourself

Casting

- **Converting** from **one data type to another.**
- e.g. assigning an int value to a long variable



Casting

- **Converting** from **one data type to another.**
- e.g. assigning an int value to a long variable

- Example

```
public class TestCast {
    public static void main(String[] args) {
        byte b= 5;
        int a = b;
        byte c = a;
        c = (byte)a; //Casting

        float f = 1.2f;
        a= f;
        a = (int)f; //Explicit Cast
        f = a;
    }
}
```

Casting

- **Converting** from **one data type to another.**
- e.g. assigning an int value to a long variable

- Example

```
public class TestCast {
    public static void main(String[] args) {
        byte b= 5;
        int a = b;  //OK. Auto Casting
        byte c = a; //Compiler error. Need Casting
        c = (byte)a; //Casting

        float f = 1.2f;
        a= f;  //Compiler error. Need Cast
        a = (int)f; //Explicit Cast
        f = a;
    }
}
```

Operator

- Assignment =
- Arithmetic + - * /%
- Equality == !=
- Relational < <= > >=
- Logical &&, | |
- increment/decrement ++ --
- Shift << >>

Arrays

- An **array** is a **collection** of data items, all of the **same type**, accessed using a **common name.**
- The data type can be either a **primitive** data type or a **reference** type.

- Major differences with C/C++ arrays:
  - Java arrays are references
  - Java arrays know their size (length property)
  - Java multidimensional arrays need not be rectangular
  - Java array elements are initialized

Array Declaration & Initialization

- Declaration

```
int[] sampleArray;
sampleArray = new int[10];
Or
int[] sampleArray = new int[10];
```

- Initialization
  - During declaration

```
int[] sampleArray = {1,2,3,4,5};
```

  - After declaration

```
int[] sampleArray;
sampleArray = new int[]{1,2,3,4,5};
sampleArray = {1,2,3,4,5}; //compiler error
```

Array Size & Accessing a specific index

- Getting size of array

```
int[] sampleArray = new int[10];
int size = sampleArray.length; //this will return the size of the array, here 10
```

- Accessing a specific item
  - Assigning a value

```
sampleArray[0] = 5;
sampleArray[1] = 2;
sampleArray[2] = 3;
```

  - Getting/Reading a value

```
int value = sampleArray[2];
```

Arrays – Example Code

```
public class ArrayExample
{
    public static void main( String args[] )
    {
        //space to store Reference is allocated, no array space allocated
        double[] sampleArray;

        //allocate array locations on heap
        sampleArray = new double[ 10 ];

        //Indexing starts at 0 like C/C++
        sampleArray[ 0 ] = 5.5;

        //Reference refers to new array.
        //Old array available for garbage collection
        sampleArray = new double[ 2 ];
    }
}
```

Multi-Dimensional Array

- *multidimensional arrays* are actually arrays of arrays.

```
int twoD[][] = new int[4][5];
```

- Do not need to be rectangular
- During creation it's required to specify the size for the first/leftmost dimension. You can allocate the remaining dimensions separately.

```
int twoD[][] = new int[4][];
```

Multi-Dimensional Array

	Rectangular	Irregular Array

Declarion & Array Creation	int twoD[][] = new int[4][5];
	or
	int twoD[][] = new int[4][];
	twoD[0] = new int[5];
	twoD[1] = new int[5];
	twoD[2] = new int[5];
	twoD[3] = new int[5];
		int twoD[][] = new int[4][];
		twoD[0] = new int[1];
		twoD[1] = new int[2];
		twoD[2] = new int[3];
		twoD[3] = new int[4];

Example of Array	0 1 2 3 4 5 6 7 8 9 1 1 1 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Multi-Dimensional Array

Irregular Array

```
int twoD[][] = new int[4][];
twoD[0] = new int[]{0};
twoD[1] = new int[]{1,2};
twoD[2] = new int[3]{3,4,5};  //error
twoD[3] = new int[]{6,7,8,9};
```

```
0
1 2
3 4 5
6 7 8 9
```

Control Statement

- if –else
- switch
- Loop
  - for
  - while
  - do-while

Control Statement

- "Enhance for" or "for-each"
  - automatically cycles through an array in sequence from the lowest index to the highest.
  - Syntax : for(*type itr-var : collection) statement-block*
  - *Example:*

```
int nums[] = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 };
int sum = 0;
for(int x: nums)
  sum += x;
```

  - Advantage: Avoid boundary error

Printing Multi-Dimensional Array

```
public static void main( String args[] ) {
   int twoD[][]={{1,2,3},{5,6}};
   for(int[] oneD : twoD){
      for(int element : oneD){
         System.out.print(element+" ");
      }
      System.out.println();
   }
}
```

Jump Statement

- **break**
  - Exits out of a loop or switch statement
  - Unlabeled break exits out of the innermost loop or switch
  - Use labeled break to exit out of nested loops or switch or block.
  - In case of labeled break program exits from that particular labeled block

JUMP STATEMENT

```
public class BreakExample {
   public static void main( String args[] ) {
      for ( int row = 0; row < 5; row++ ) {
        System.out.println("Outer loop: " +  row);
        for (int column = 0; column < 4 ; column++) {
         System.out.print(column   +" ");
          if ( ((row + column) % 2 ) == 0 ) {
            System.out.println("Break " );
            break;
          }
        }
      }
   }
}
```

Output:

Outer loop: 0
0 Break
Outer loop: 1
0 1 Break
Outer loop: 2
0 Break
Outer loop: 3
0 1 Break
Outer loop: 4
0 Break

Jump Statement – Labeled Jump

```
public class BreakExample {
    public static void main( String args[] ) {
        Outer:
        for ( int row = 0; row < 5; row++ ) {
            System.out.println("Outer loop: " + row);
            for(int column = 0; column < 4;column++){
                System.out.println(column + "\t");
                 if ( ((row + column) % 2 ) == 0 )
                {
                    System.out.println("Break ");
                    break Outer;
                }
            }
        }
    }
}
```

Output:

Outer loop: 0

0 Break

Program will exit from the labelled block of Outer which contains a nested loop

```
public static void main(String[] args) {
        Outer:{
            System.out.println("hello");
            for (int i = 1; i < 4; i++) {
                for (int j = 1; j <= i; j++) {
                    System.out.println(i + " " + j);
                    if (i == j) {
                        System.out.println("break ");
                        break Outer;
                    }
                }
            }
            int x = 10;
            System.out.println(x);
        }
        System.out.println("out");
}
```

Output:

```
Hello
1 1
break
out
```

Jump Statement

- **continue**
  - A continue statement skips to the end of the current loop's body.
  - The loop's boolean expression is then evaluated.

Code	Output

public class TestContinue {
  public static void main(String args[]) {
  for(int i=0; i<10; i++) {
  System.out.print(i + " ");
  if (i%2 == 0) continue;
  System.out.println("");
  }
  }
}
	0 1
	2 3
	4 5
	6 7
	8 9

Thank You