

204700

Data Structure and Programming Languages

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From: <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/index.htm>

Outline

- Types, Variables, Operators
- More Types, Methods, Conditions
- Loops, Arrays
- Classes and Objects
- Data structures

Course Description

- Abstract data types
- Linear data structure
- Non-linear data structure
- Searching and sorting techniques
- Programming language paradigms

Installing Java and Eclipse

In order to write Java programs, you need

– The Java Development Kit(JDK)

- Contains the tools needed to compile and run Java programs

– A source code editor

- Lets you write programs and has feature to make this easier

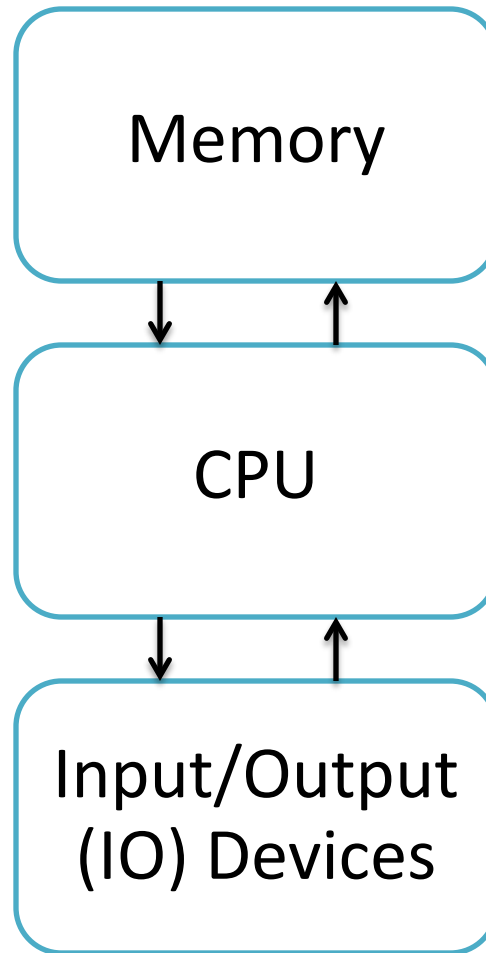
Installing Java and Eclipse: Editors

In order to write programs needs a piece of software called an editor

- Source code editor
 - Notepad, SciTE, UltraEdit, Textmate
- Integrated Development Environments (IDEs)
 - Eclipse, Netbeans

1.TYPES, VARIABLES, OPERATORS

The Computer



CPU Instructions

$z = x + y$

Read location x

Read location y

Add

Write to location z

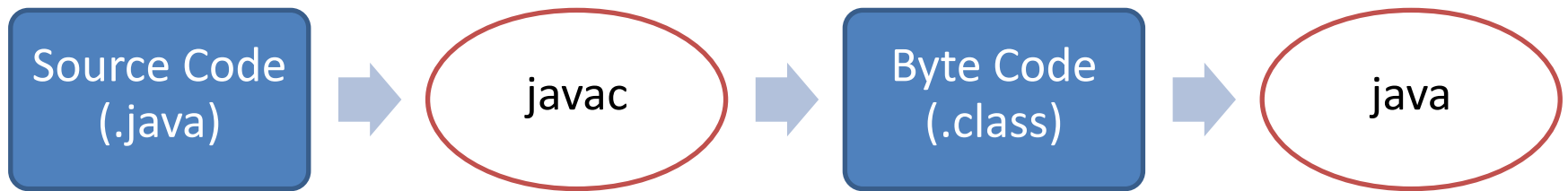
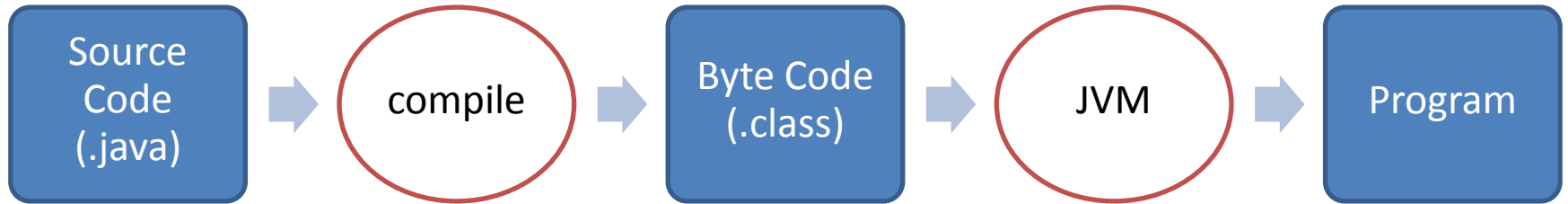
Programming Languages

- Easier to understand than CPU instructions
- Needs to be translated for the CPU to understand it

Java

- “Most popular” language
- Runs on a “virtual machine” (JVM)
- More complex than some (eg. Python)
- Simpler than others (eg. C++)

Compiling Java



Compile: `javac filename.java → filename.class`
Run: `java filename`

Example:
`javac hello.java → hello.class`
`java hello`

- Open Eclipse!!

First Program

```
class Hello{  
    public static void main(String[] arguments){  
        //Program execution begins here  
        System.out.println("Hello world.");  
    }  
}
```

Program Structure

```
class CLASSNAME{  
    public static void main(String[] arguments){  
        STATEMENTS  
        .....  
    }  
}
```

Output

`System.out.println(some String)` outputs to the console

Example:

```
System.out.println("output");
```

Second Program

```
class Hello2{  
    public static void main(String[] arguments){  
        System.out.println("Hello world.");  
        System.out.println("Line number 2");  
    }  
}
```


Types

Kind of values that can be stored and manipulated.

byte,short,int,long,float,double,char,String,boolean

- **boolean**: Truth value (**true** or **false**).
- **int**: Integer (0, 1 -50)
- **double**: Real number (3.14, 1.0, -756.015)
- **String**: Text (“Hello world.”, “example”).

Variables

Named location that stores a value of one particular type.

Form:

```
TYPE NAME;
```

Example:

```
String foo;
```

Assignment

Use = to give variables a value.

Example:

```
String foo;
```

```
foo = "Java programming";
```

Assignment

Can be combined with a variable declaration.

Example:

```
double badPi = 3.14;
```

```
boolean isJanuary = true;
```

```
class Hello3{
    public static void main(String[] arguments){
        String foo = "Java Programming";
        System.out.println(foo);
        foo = "204700";
        System.out.println(foo);
    }
}
```

Operators

Symbols that perform simple computations

Assignment: =

Addition: +

Subtraction: -

Multiplication: *

Division: /

Order of Operations

Follows standard math rules:

1. Parentheses $()$
2. Multiplication and division $* /$
3. Addition and subtraction $+ -$

```
Class DoMath{  
    public static void main(String[] arguments){  
        double score = 1.0 + 2.0 * 3.0;  
        System.out.println(score);  
        score = score / 2.0;  
        System.out.println(score);  
    }  
}
```


Class DoMath2{

public static void main(String[] arguments){

double score = 1.0 + 2.0 * 3.0;

System.out.println(score);

double copy = score;

copy = copy / 2.0;

System.out.println(copy);

System.out.println(score);

}

}

String Concatenation (+)

```
String text = "hello" + "world";
```

```
Text = text + " number "+5;
```

```
//text = "hello world number 5"
```

Assignment: C2F Calculator

Convert Celsius degree to Fahrenheit degree:

$$\frac{c}{5} = \frac{f - 32}{9}$$