AP Computer Science

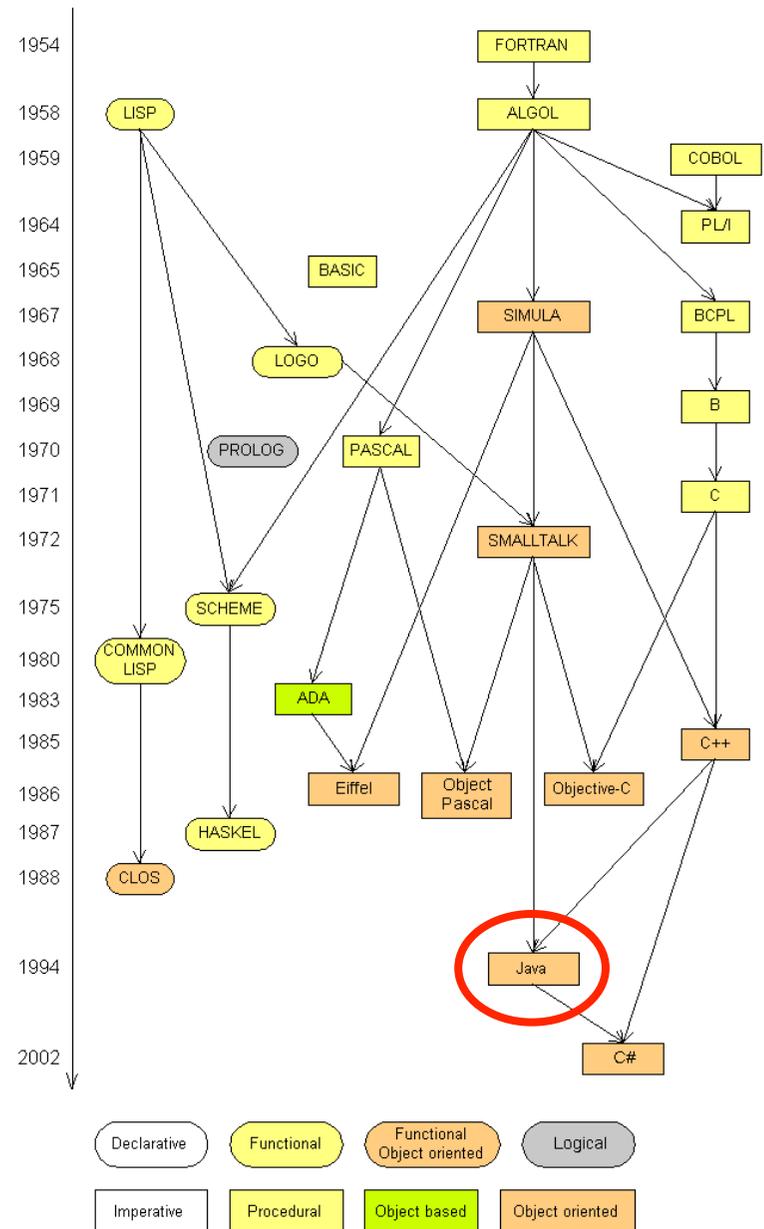## Programming, Java

What is Programming?

- **program**: A set of instructions to be carried out by a computer.

- **program execution**: The act of carrying out the instructions contained in a program.

- **programming language**: A systematic set of rules used to describe computations in a format that is editable by humans.

```
sub leap {
    my $yr = $_[0];
    if ($yr % 100 == 0) {
        return ($yr % 400 == 0);
    }
    return ($yr % 4 == 0);
}
(Finding leap years in Perl!)
```

Programming languages

- Formal expressions

- Run on real machines

- Come in lots of flavors

- See rosettacode.org for comparison code

Programming Languages

Python

Java

C

Automatic Transmission Car

Manual Transmission Car

Motorcycle

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Photo by Petar Milošević
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Photo by Zero Motorcycles

Why Java?

- Relatively simple

- Object-oriented (modern!!)

- Lots of Existing libraries

- Platform independent (Windows, Mac, & Linux) & free!
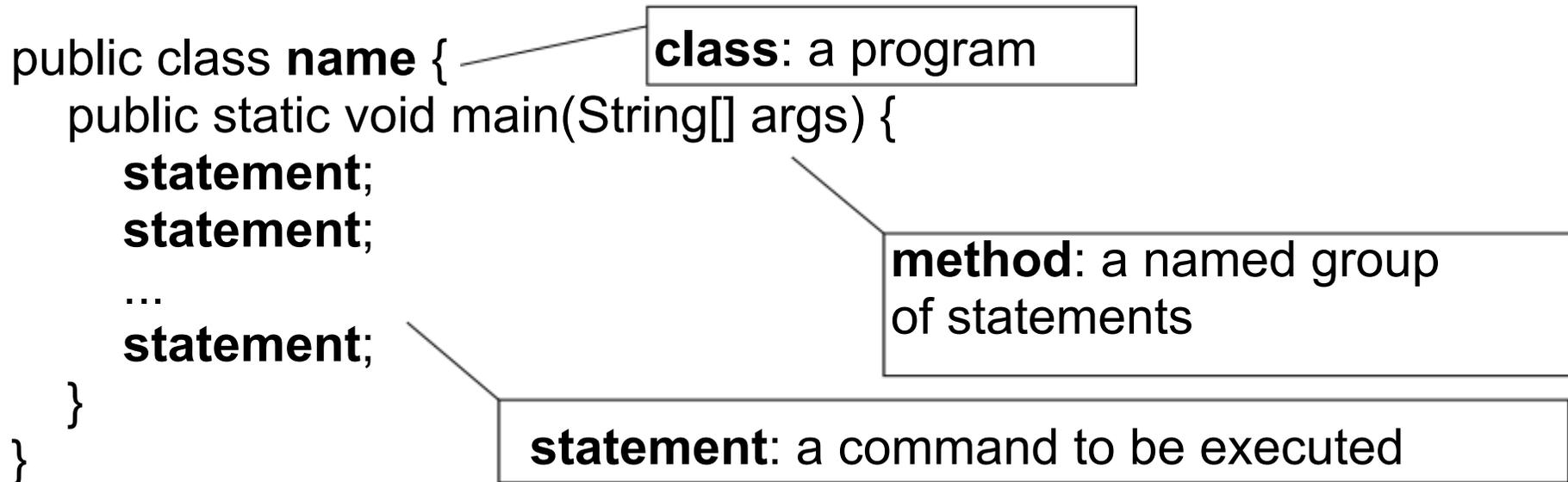
- Widely used
  - #1 in popularity in many rankings:
    http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

Goals

- Basics of procedural, object-oriented design

- Interesting application domains

- Beautiful code, NOT hacks

- Learn Java syntax

Dive in... in style!
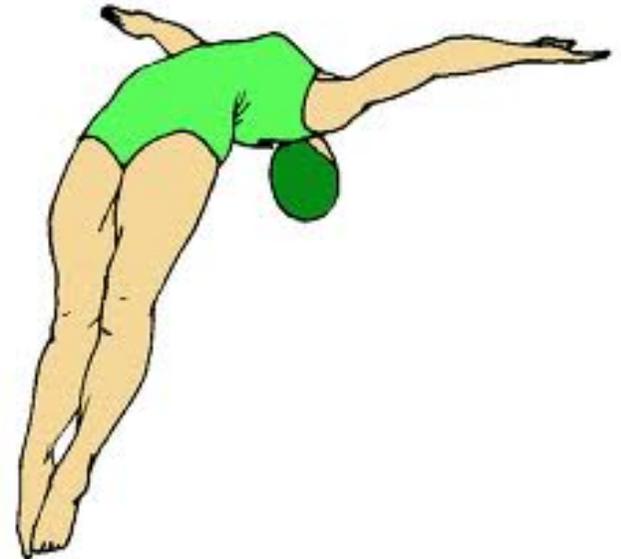
Structure of a Java program

```
public class name {
    public static void main(String[] args) {
        statement;
        statement;
        ...
        statement;
    }
}
```

class: a program

method: a named group of statements

statement: a command to be executed

- Every executable Java program consists of a **class**,
  - that contains a **method** named main,
    - that contains the **statements** (commands) to be executed.

Your first Java program!

```java
public class Hello {
  public static void main(String[] args) {
    System.out.println("Hello, world!");
  }
}
```

- File must be named `Hello.java`

- What does this code *output* (print to the user) when you *run* (execute) it?
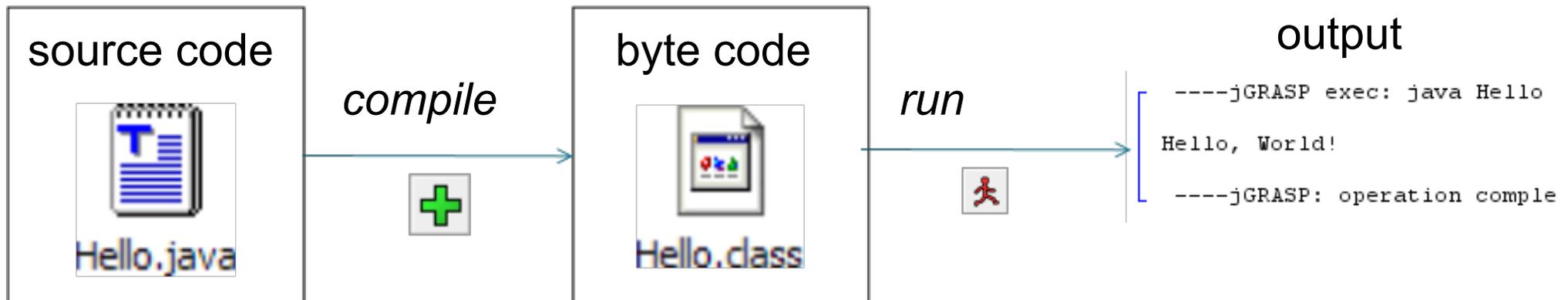
Compiling/running programs

1. *Write* it.
   - **code** or **source code**: The set of instructions in a program.

2. *Compile* it.
   - **compile**: Translate a program from one language to another.
   - **byte code**: The Java compiler converts your code into a format named *byte code* that runs on many computer types.

3. *Run* (execute) it.
   - **output**: The messages printed to the user by a program.

source code

compile

byte code

run

output

```
    ----jGRASP exec: java Hello

Hello, World!

    ----jGRASP: operation comple
```

Hello.java

Hello.class
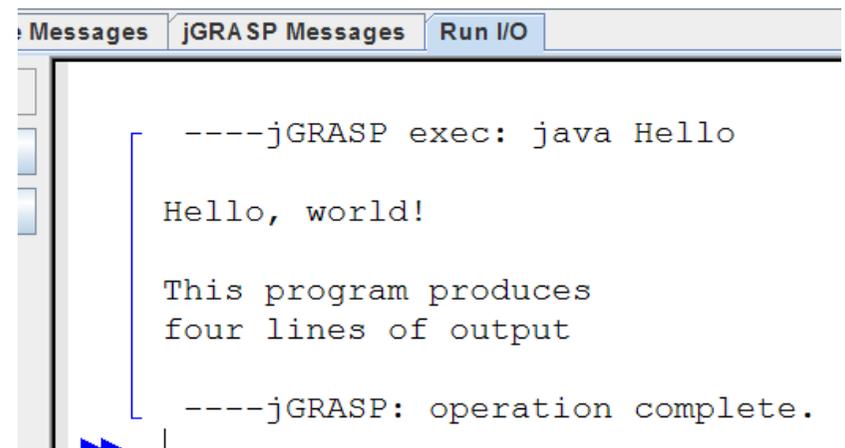
Bigger Java program!

```java
public class Hello {
    public static void main(String[] args) {
        System.out.println("Hello, world!");
        System.out.println();
        System.out.println("This program produces");
        System.out.println("four lines of output");
    }
}
```

- Its output:

```
Hello, world!

This program produces
four lines of output
```


- **console**: Text box into which the program's output is printed.