CO 225: Software Construction

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Computer Programs/Software

- What is a Computer program?

  Computer program is a collection of instructions, that solves a defined problem.

- Programming Paradigms:

1. Procedural Programming (eg:- C, Pascal, FORTRAN, COBOL):

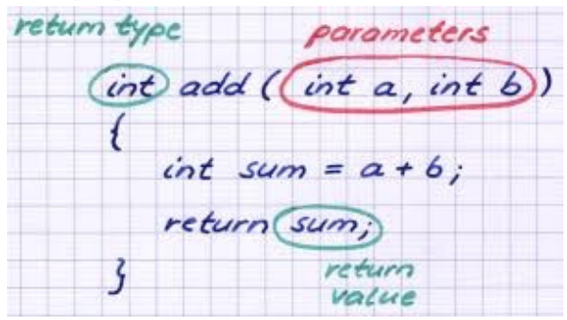
   break down the main problem into data structures (lists, stack) and sub routines (functions, procedures).

2. Object Oriented Programming (OOP) (eg:-Small Talk, Java, C++):

   break down the main problem into objects (entity that defines state and behavior of a real world item).

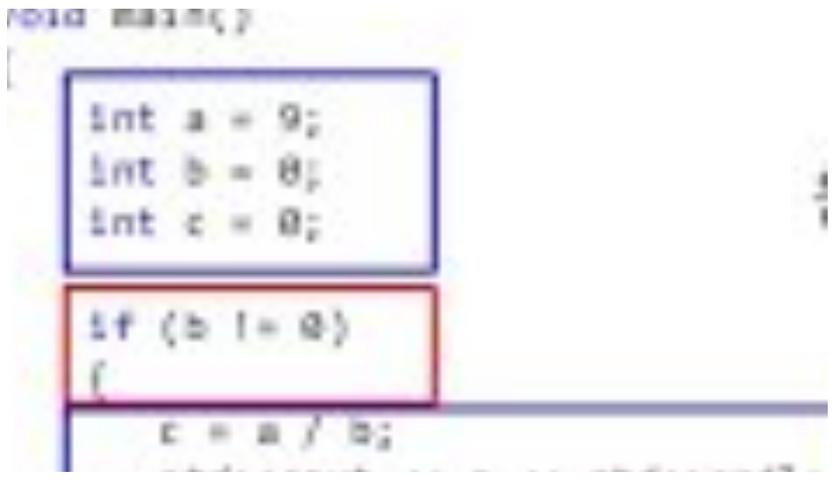
In Procedural Programming…

- functions: a set of instructions with a return type



- procedures: a set of instructions without a return type

- variables: a storage location



The Sort Procedure in C

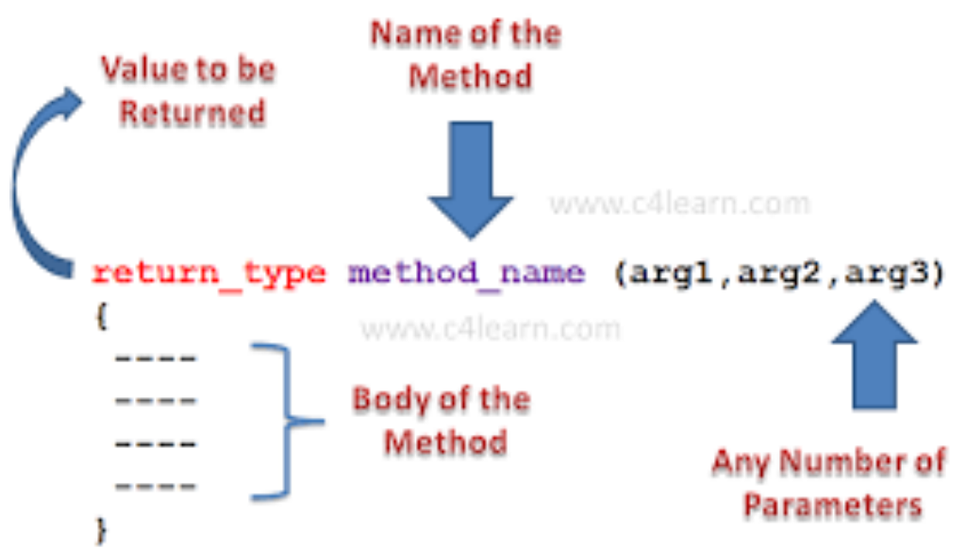
- Non-leaf (calls swap)

```
void sort (int v[], int n)
{
  int i, j;
  for (i = 0; i < n; i += 1) {
    for (j = i - 1;
         j >= 0 && v[j] > v[j + 1];
         j -= 1) {
      swap(v,j);
    }
  }
}
```

- v in $a0, n in $a1, i in $s0, j in $s1

In OOP…

- objects: an entity that defines state and behavior of a real world item



- methods: a set of instructions (behavior of an object)

- attributes: defines state of an object, they are variables

Making Executables

- Interpreted prog languages: executes the code line-by-line (BASIC, VB).

- Compile prog languages: compiles the entire code at once and creates the executable file (C, Java).

- What if there is an error in the code?

A Simple Java Program

```
import java.lang.*;
class HelloWorld{
  public static void main (String args []){
    System.out.println (“Hello World”);
    }
}
```

- Now I explain the above Java program

- **class:** Java is OOP language, so everything must be placed inside a class. class is a keyword. HelloWorld is the identifier that specifies the name of the class.

- **public static void main (String args []):** defined the method named main. This is the starting point to the program and each Java program must include a main method. Java program may contain any number of classes but only one of them must include a main method in order to run the program.

- **public:** this is a keyword and an access modifier, that declares the main method as unprotected and make it accessible to all the other classes.

- **static:** this is a keyword that declares a method as one that belongs to the entire class and not a part of any object. The main method must be a static method because the interpreter uses this method before any object is created.

- **void:** the main method does not return any value.

How to create a Java Program

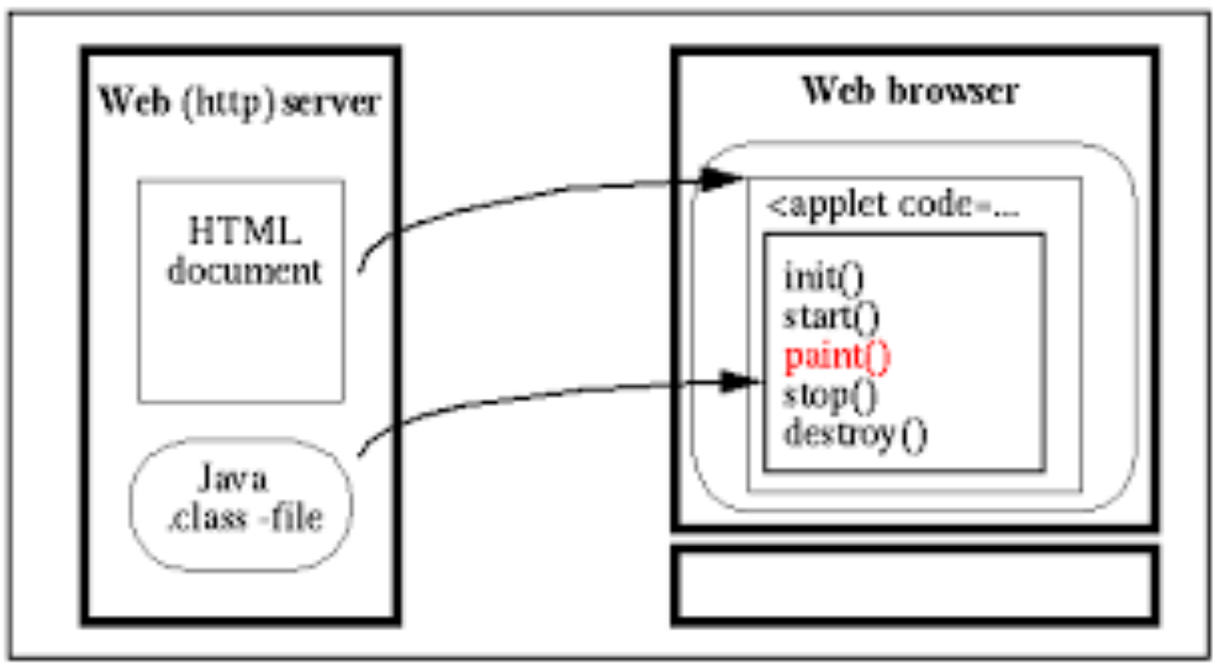
- Create the source file using any text editor that support ASCII
- Compile the source file and generate the class file
- Run your java program by using the java interpreter

Generic Java Program Structure

- Documentation Section
- Package Statements
- Import Statements
- Interface Statement
- Class Definitions
- Main Class
    - Now I explain them one-by-one

Types of Java Programs

- Applications
  - stand-alone
  - must include mail class
- Applets
  - runs on web
  - no main method



Java Tokens

- Smallest individual unit in a program
- There are five types of Tokens:
  - Reserved key words (eg:- class, public)
  - Identifiers (eg:- Total, Hello)
  - Literals (eg:- “ ‘)
  - Operators (eg:- +,-)
  - Separators (eg:- ; , })
    - Now I explain them one-by-one

Java Statements

- Statement is the smallest unit that is a complete instruction
- This is a combination of tokens
- must end with semi-colon (;)