Object Declaration

❖ Every object used must be declared
❖ Syntax:

<class name> <object name>;

- <class name>: the name of the class to which the object belongs
- <object name>: the name of the object (any valid identifier)

❖ Identifier: any sequence of letters, digits, underscores, and dollar signs with the following limitations:

- Must begin with a letter
- Cannot contain any spaces or other "white space"
- Cannot be a Java "reserved" word (aka "keyword")

❖ Java Convention on Identifiers:
- First letter lowercase
- First letter of subsequent words uppercase

❖ Reserved Word: an Identifier that is used for a specific purpose and cannot be used for any other purpose.

- Example of some of Java's Reserved Words:

public	private	protected
import	class	new
static	void	byte
short	int	long
float	double	boolean
final	return	while
if	do	for

Object Creation

❖ No objects are actually created by a declaration (with declaration, only an Identifier used to refer to an object is created)

❖ Use the 'new' command. Syntax:

<object name> = new <class name> (<arguments>)

- <object name>: the name of the declared object
- <class name>: the name of the class to which the object belongs
- <arguments>: sequence of values passed to the method

Examples of Object Declaration:

```
Student dave;

Noisemaker clapper;

Ship battleship;
```

Examples of Object Creation:

```
dave = new Student (4.0, 1234);

clapper = new Noisemaker ();

battleship = new Battleship (numPegs, xPos, yPos, dir);
```

Message Sending

❖ Once an object has been created, messages can be sent to it

❖ Syntax:

<object name>.<method name> (<arguments>);

- <object name>: name of a declared object
- '.' : the "dot notation" gives relation to the items on either side of the dot
- <method name>: name of a method of the object
- <arguments>: sequence of values passed to the method

Examples of Message Sending:

```
dave.setGPA (2.5);

clapper.makeNoise (decibelLevel);

battleship.insertHit ();
```

Program Components

Three (3) main parts:

1. **Comments**
2. Import statements
3. Class declarations

Comments

❖ Uses:

1. State the purpose of the program
2. Explain the meaning of code
3. Give other explanations to help programmers understand the program

❖ Syntax:

/* ANY text between slash-asterisk and asterisk-slash */

OR

// ANY text following two slashes to the end of the line

❖ All programs should contain a Header Comment containing the following information:

1. Program Title
2. Author
3. Course (including section number)
4. Date Written (or Due Date)
5. Description of Program

❖ Comments are NOT required to run a program. However, they are indispensable in writing easy to understand code. (You will lose points if your programs do NOT contain adequate comments.)

❖ Excessive comments can hurt more than help in understanding code.

Program Components

Three (3) main parts:

1. Comments
2. **Import statements**
3. Class declarations

Import Statements

❖ Classes are grouped into "Packages"

❖ To use a class from a Package, the class must be "imported" into the program. Syntax:

```
import <package name>.<class name>;
```

- import: a reserved word indicating a class is to be imported
- <package name>: the name of the package to which the class belongs
- <class name>: the name of the class to be imported

❖ With subclasses, use multiple dot notations

For example: `import java.awt.image.ColorModel;`

❖ To import more than one class from a package, use the asterisk notation. Syntax:

```
import <package name>.*;
```

❖ When the asterisk notation is used, ALL of the classes (or subclasses) of a particular package (or super class) will be imported.

❖ Java Convention: all package names are lowercase.

Program Components

Three (3) main parts:

1. Comments
2. Import statements
3. **Class declarations**

Class Declaration

❖ Syntax:

```
class <class name>
{
        <class member declarations>
}
```

- class: a reserved word indication the declaration of a class
- <class name>: the name of a class (any valid identifier)

  Java convention: class names start with a capital letter and each subsequent word in the class name also has a capital letter

- <class member declarations>: a sequence of class member declarations

  class member: a data value or a method

❖ A program can (and usually does) have more than one class, but only one class will be designated the "main" class.

❖ Typically, the application and the main class have the same name

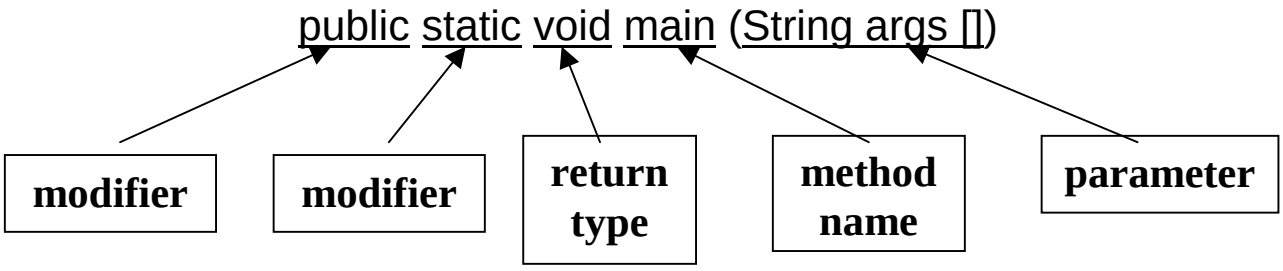
❖ The main class must define a method called main. This method is executed FIRST when the Java application is executed.

Method Declaration

❖ Syntax:

```
<modifiers> <return type> <method name> (<arguments>)
{
        <method body>
}
```

- <modifiers>: sequence of terms designating different kinds of methods
- <return type>: type of data value returned by a method
- <method name>: name of the method (any valid identifier)
- <arguments>: sequence of values passed to a method
- <method body>: sequence of instructions



Edit-Compile-Run Cycle

Three (3) steps:

1. **Step 1: Type in the program using an editor and save it**
2. Step 2: Compile the source file
3. Step 3: Execute the bytecode file using an Interpreter

Step 1: Type in the program using an editor and save it

❖ Examples of editors:

- Code Warrior
- JavaWorks
- vi
- emacs

❖ Save the entered code with the following filename syntax:

<name of main class>.java

❖ The resultant is a source file written in a "high level language" (HLL)

❖ Examples of high level languages;

- Java
- C
- C++
- Pascal
- BASIC
- Fortran

❖ Machines (i.e., computers) can only understand machine language (written in binary). Machine language is a "low level language" (LLL).

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Step 2: Compile the source file

❖ A compiler translates the HLL into a LLL called bytecode (Code Warrior contains a compiler)

❖ The bytecode file that is generated is titled as follows:

<name of source file>.class

❖ The whole source file is compiled at once

❖ Compilers can detect Compilation Errors (aka "Syntax Errors")

- Compilation Errors: errors resulting from the source code containing text that does not obey the rules of the language

- Examples of Compilation Errors:
  - Mismatched parantheses (( )))
  - Missing punctuation (e.g., no semi-colon at the end of statements)
  - Misspelled reserved words

❖ The compiler will NOT generate a bytecode file if compilation errors exist in the source file.

❖ Most good compilers give detailed error messages when identifying the compilation errors

Edit-Compile-Run Cycle

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Step 3: Execute the bytecode file using an Interpreter

❖ The interpreter executes instructions one line at a time

❖ The interpreter can detect Execution Errors (aka "Run-Time Errors")

- Execution Errors: errors occurring during the execution of the instructions

- Examples of Execution Errors:
  - Dividing by zero
  - Using undeclared objects/data values
  - Null pointers