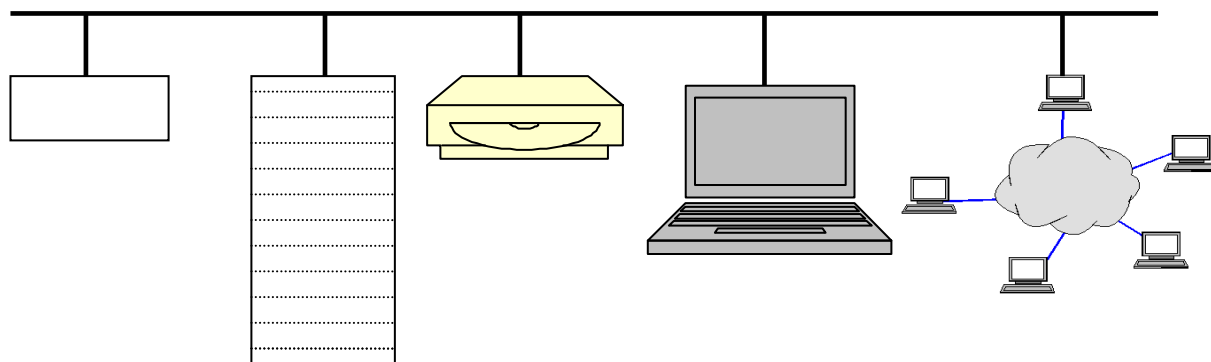## Introduction

Computer Science is the science of _____ _____ where the solutions

happen to use a computer.

A computer program is a set of _____ to a computer to allow it to _____

some data. These programs are generically known as _____.

Hardware Basics

Memory

Memory is where actively running _____ reside. Access to this area is very fast and is

referred to as _____ or _____ _____ _____. Any

information stored in this area is _____ when the computer is turned _____.

Each memory location is 8 _____ or 1 _____ long. Each bit is either a _____ or _____. Data that cannot

fit in one byte can use consecutive locations. Each memory location has a unique address represented by a

hexadecimal number. The memory address is like the address of your home. With the address, the software can

locate the information it needs.

0109			:	
010A			5851	
010B			5851	
010C			5853	
010D			5854	
:			:	

Number Systems

Binary (base 2) 0 or 1									Decimal (base 10)
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0		
128	64	32	16	8	4	2	1		
0	1	1	0	0	1	0	1	=	
								= 123	

Octal (base 8) 0,1,2,3,4,5,6,7					Decimal (base 10)
8^3	8^2	8^1	8^0		
512	64	8	1		
0	0	2	7	=	
				= 257	

Hexadecimal (base 16) 0,1,2,3,4,5,6,7, 8,9,A,B,C,D,E,F					Decimal (base 10)
16^3	16^2	16^1	16^0		
4096	256	16	1		
4	0	F	B	=	
				= 321	

Solve and express answer as a decimal:

1. 12(octal) + 42 (decimal) =

2. 1E(hex) + 17 (octal) + 2 (decimal) =

Algorithms

Algorithms are a _____ for _____ a problem. These _____ solutions will be the core of the programs you write. At first the algorithms will be simple and come right to mind. As you move through the course, they will become more complex and will require more thought and planning. Write an algorithm to print the minimum of two numbers, x & y:

Programming Process

There are two steps to the programming process:

1. Develop or choose an existing algorithm. This is called _____ _____.
2. Express the algorithm as a computer program in a programming language. This is called _____.
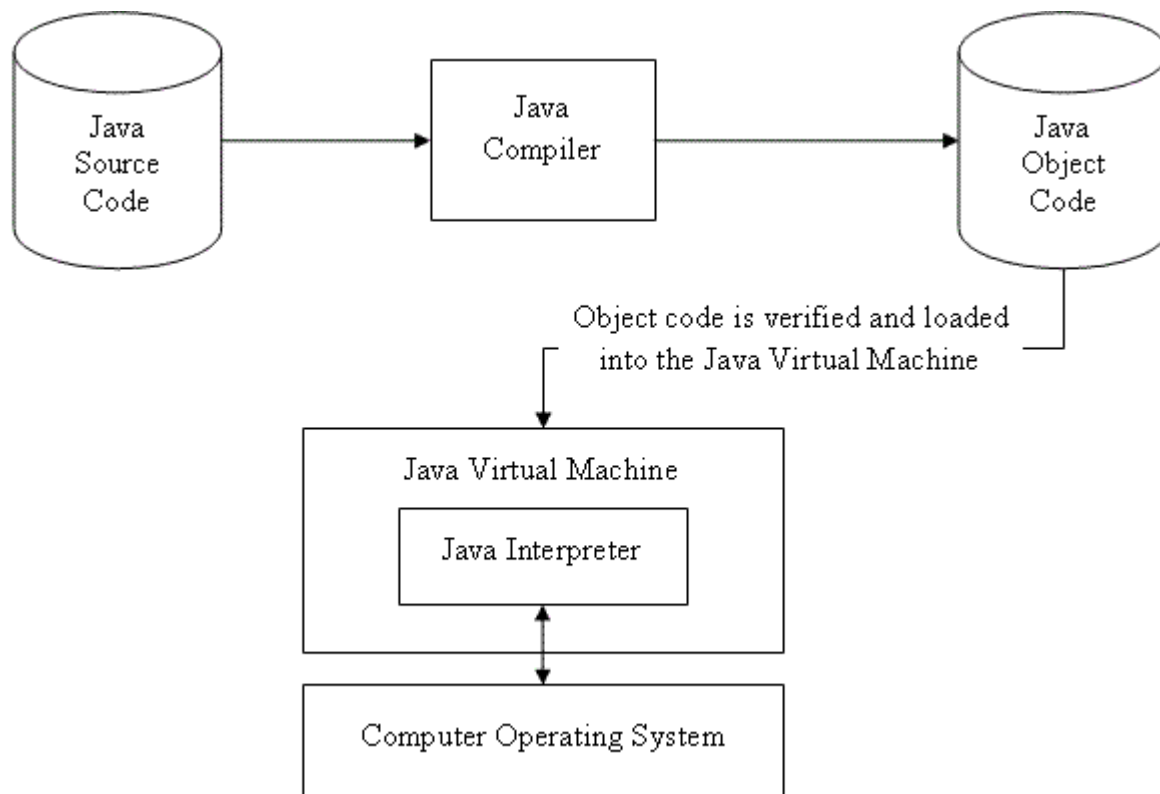

At first, coding will seem to be the most difficult part of programming. You are learning a new language whose _____ and _____ are unfamiliar.   DO NOT GIVE UP!! Please be reassured that coding will become easier as you learn more about the programming process.

Computer programs can be written in several different programming languages. In this class you will learn _____ to illustrate the more general concepts of programming and computer science. Java is called an _____ _____ programming language. Other languages include: Objective-C (iPhone), C++, Pascal, Fortran, C#.

Java was written by James Gosling at Sun Microsystems (now Oracle) in 1975.

"Write once, run anywhere" is a slogan created by Sun Microsystems to illustrate the _____ benefits of the Java language. Ideally, this means Java can be developed on any device, compiled into a standard _____ and be expected to run on any device equipped with a _____ _____ _____ (JVM). The installation of a JVM or Java interpreter on chips, devices or software packages has become an industry standard practice.

This is intended to save software developers the effort of writing a different version of their software for each _____ or _____ _____ they intend to deploy on.

```
┌─────────────┐        ┌─────────────┐        ┌─────────────┐
│    Java     │        │    Java     │        │    Java     │
│   Source    │───────▶│  Compiler   │───────▶│   Object    │
│    Code     │        │             │        │    Code     │
└─────────────┘        └─────────────┘        └─────────────┘
```

                    Object code is verified and loaded
                      into the Java Virtual Machine

```
        ┌─────────────────────────────────────┐
        │       Java Virtual Machine          │
        │     ┌───────────────────────┐       │
        │     │    Java Interpreter   │       │
        │     └───────────────────────┘       │
        └─────────────────────────────────────┘
                          ▲
                          ▼
        ┌─────────────────────────────────────┐
        │      Computer Operating System      │
        └─────────────────────────────────────┘
```

Programming languages are made up of English words which have meaning to the computer. There are

_____ when writing the words into a program. The rules (_____ _____) let the

compiler change the words into instructions (_____ _____ or

_____) the computer can understand.

When you compile a program, the compiler first checks to see whether your program is

_____ correct. If you have violated the syntactic rules, the compiler displays an error

message. These errors are called _____ _____. These errors can be frustrating,

but your biggest source of frustration will occur when your program compiles but fails to operate correctly. This

type of mistake is called a _____ and the process of finding and fixing such mistakes is called

_____. All programmers make logic errors. You will make logic errors and it is your

job as a programmer to find and fix the bugs!

Some of the English words (called _____) have special meaning in Java, these are called

_____ words. Some examples are `public`, `static`, and `class`. Below are the Java

reserved words:

```
abstract      else
assert        enum          interface     super
boolean       extends       long          switch
break         false         native        synchronized
byte          final         new           this
case          finally       null          throw
catch         float         package       throws
char          for           private       transient
class         goto          protected     true
const         if            public        try
continue      implements    return        void
default       import        short         volatile
do            instanceof    static        while
double        int           strictfp
```

Other identifiers are made up by other programmers or yourself and can represent _____,
_____ or _____. Identifiers can be made up of letter, digits, underscore and
dollar sign characters, are case sensitive and cannot begin with a digit.

Which of the following identifiers are legal in Java?

|		
ILoveAPCS	2_names	$myNum
iloveapcs!	my$num	MY$NUM
I_love_apcs	Account_2	account^num

Every Java program is made up of _____. Classes are usually small and are created for a specific
function. Classes are like blueprints, they define what something is going to look like (called _____
_____) and how it will behave (called _____).

Imagine a blueprint for a house. You know what the house will look like and how it will function by looking at
the blueprint, but the house doesn't exist yet. You cannot live in a blueprint. You have to create the house
(_____) from the blueprint (_____). This creation is called _____.
The house object is _____ from the house blueprint (class). In other words, the house is
an _____ of the house blueprint. Many houses can be built (instantiated) from one
blueprint.
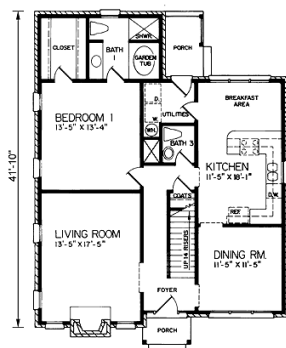
Class Creation

Each class is written in a separate class file with a file extension _____. The convention is to start class names with a _____ letter. Class names and the `.java` file name are identical. Each class is defined with a class heading using this syntax (rules for declaring a class):

Classes contain information specific to the class, called _____ _____. Instance variables must be defined with a _____ and variable _____. Types can be one of Java's primitive types (`int` _____, `boolean` _____or `double` _____) or an object type (class name). The convention is to start variable names with a _____ letter.

Classes also contain behavior called _____. Each method has a set of instructions that perform a function. The set of instructions is the _____ for the method. Each _____ in the method is a specific instruction. Statements end with a _____. Method declarations follow this syntax:

Each program you write will contain a class with a method named _____. The JVM will look for this method when you run your program. This method will also create _____ from the other classes in your program, but will not become an object itself.

Write a class named `MyMessage` **that will print the message** `I love computer science!`:

Java API

The Java API contains all of the class information for the many classes that come with Java. You will need to become familiar with the Java API.

Open the Java API up (https://docs.oracle.com/javase/7/docs/api/) and look at the instance variables and methods for the following classes that you will be required to know for the AP Exam and answer the questions in the space provided.

`Integer`   What are the `MAX_VALUE` and `MIN_VALUE` for this object?

`Double`   Look under the "Method Summary" section. What does the method `longBitsToDouble()` do?

`String`   Look under the "Method Summary" section. What does the method `length()` d**o?**

`Math`   Look under the "Method Summary" section. What does the method
              `max(double a, double b)` do?

`ArrayList`   Look under the "Method Detail" section. What does the method `isEmpty()` return?

`System`   Look under the "Field Detail" section. What does it say under the field `in`?

Comments

Comments are a very important part of your program. They are written for _____ _____

not the _____. The compiler ignores comments. The three types of comments in Java are:


1.    ```
      /*
      * File: MyMessage.java
      * This program prints out a simple message to the console
      */
      ```


2.    ```
      // Use this type for short, one-line comments.
      ```


3.    ```
      /**
      * File: CallOfDuty.java
      * @author Mrs. Allen
      * This program simulates war time fighting.
      */
      ```


A few words on BlueJ and Eclipse Photon

BlueJ and Eclipse Photon are examples of an IDE (_____

_____ _____) which allows programmers to _____,

_____ and _____ Java programs.

- **write** – Using the Java commands and syntax, create class files and save with the .java file extension.
- **compile** – Invoke the Java compiler to read the class files and if there are no syntax errors, convert the Java language into bytecode or machine code (.class file) which can be read only by computers.
- **execute** – Invoke the JVM (Java Virtual Machine) to read the .class bytecode file and carry out the instructions of the program.

You can set up your file structure in many different ways. To help organize your programs, you will need to create an \APCSA folder in your student director. Each chapter will have a .zip file to download from GitHub, containing the chapter lab manual and any lab files. Keep each chapter separate by using the folders created during the unzip. They will be named \Chapter 1, \Chapter 2, etc.

For NOW we will use **BlueJ** to create our programs. Later on you might want to use Eclipse Photon.

Links to download each are:

BlueJ: https://www.bluej.org/download/release-notes.html
        Click on the "download" link on the left
        Select the version that is correct for your computer.

Eclipse: http://www.eclipse.org/downloads/packages/release/photon/r/eclipse-ide-java-developers
        Under "Download Links", click on the version that is correct for your computer.