**Chapter 1 - Answers**

**Self-Review Exercises 1.1**

a) Computers process data under the control of sets of instructions called **programs**.

b) The key logical units of the computer are the **input unit, output unit, memory unit, arithmetic and logic unit, central processing unit, and secondary storage unit**.

c) The three types of languages are **machine language, assembly language, and high-level language**.

d) The programs that translate high-level language programs into machine language are called **compilers**.

e) **Android** is an operating system for mobile devices based on the Linux kernel and Java.

f) **Beta** software is generally feature complete, (supposedly) bug-free, and ready for use by the community.

g) The Wii Remote, as well as many smartphones, use a(n) **accelerometer**, which allows the device to respond to motion.

**1.2 Java Environment**

a) The **java** command from the JDK executes a Java application.

b) The **javac** command from the JDK compiles a Java program.

c) A Java source code file must end with the **.java** file extension.

d) When a Java program is compiled, the file produced by the compiler ends with the **.class** file extension.

e) The file produced by the Java compiler contains **bytecodes** that are executed by the Java Virtual Machine.

**1.3 Object-Oriented Concepts**

a) Objects enable the design practice of **encapsulation**.

b) Java programmers concentrate on creating **classes**, which contain fields and methods.

c) The process of analyzing and designing a system from an object-oriented point of view is called **object-oriented analysis and design (OOAD)**.

d) A new class of objects can be created conveniently by **inheritance**.

e) **UML (Unified Modeling Language)** is a graphical language for designing software systems.

f) The size, shape, color, and weight of an object are considered **attributes** of the object’s class.

**1.4 Computer System Components**

a) The logical unit that receives information from outside the computer is the **input unit**.

b) The process of instructing the computer to solve a problem is called **programming**.

c) **Assembly language** uses English-like abbreviations for machine-language instructions.

d) **Output unit** sends processed information to various devices for external use.

e) **Memory unit** and **secondary storage unit** are logical units that retain information.

f) **Arithmetic and logic unit (ALU)** performs calculations.

g) **Central processing unit (CPU)** makes logical decisions.

h) **High-level languages** are most convenient for writing programs quickly and easily.

i) The only language a computer can directly understand is **machine language**.

j) **Control unit** coordinates the activities of all other logical units.

**1.5 History and Impact of Programming Languages**

a) The **Java** programming language is used for large-scale applications, web servers, and more.

b) **C** initially became widely known as the development language of UNIX.

c) The **Transmission Control Protocol (TCP)** ensures proper message routing.

d) The **C++** programming language was developed by Bjarne Stroustrup in the early 1980s.

**1.6 Java Program Execution**

a) Java programs normally go through five phases— **edit, compile, load, verify, and execute**.

b) A(n) **integrated development environment (IDE)** provides many tools for development.

c) The command **java** invokes the **Java Virtual Machine (JVM)**.

d) A(n) **virtual machine** is a software application that simulates a computer.

e) The **class loader** loads bytecodes into memory.

f) The **bytecode verifier** examines bytecodes to ensure they’re valid.

**1.7 Java Compilation Phases** Java programs undergo two compilation phases:

1. **Compilation Phase**: The Java compiler translates the source code into bytecodes.
2. **Execution Phase**: The JVM interprets or compiles the bytecodes into machine code for execution.

**1.8 Applying Object-Oriented Concepts to a Wristwatch**

* **Object**: The wristwatch is an object.
* **Attributes**: Color, size, brand, material.
* **Behaviors**: Display time, set alarm, measure stopwatch.
* **Class**: The general blueprint of all watches.
* **Inheritance**: Alarm clocks inherit features from regular watches.
* **Modeling**: Designing a digital or analog watch using software.
* **Messages**: Interaction between components.
* **Encapsulation**: Internal mechanisms are hidden from users.
* **Interface**: User interface for setting time.
* **Information Hiding**: Internal workings remain private.

**1.9 Carbon Footprint Calculator** Test carbon footprint calculators at:

* [TerraPass](http://www.terrapass.com/carbon-footprint-calculator/)
* [Carbon Footprint](http://www.carbonfootprint.com/calculator.aspx)

**1.10 BMI Calculator** Check BMI at:

* [BMI Calculator](http://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm)

**1.11 Hybrid Vehicles Attributes** Hybrid attributes include:

* Fuel efficiency (city/highway MPG)
* Battery type and weight
* Emissions rating
* Regenerative braking
* Hybrid engine type

**1.12 Gender Neutrality in Programming** To replace gender-specific words with neutral ones:

1. Scan text for gendered words.
2. Replace them with predefined neutral terms.
3. Ensure contextual meaning is retained.

Example issue: “woman” → “person” might create awkward terms like “woperchild” if replacements are not done carefully.