**SELF REVIEW EXERCISES**

**1.1 Fill in the blanks**

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 (ALU)**, **central processing unit (CPU)**, 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) **Stable** 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 Fill in the blanks**

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 Fill in the blanks**

a) Objects enable the design practice of **encapsulation**—although they may know how to communicate with one another across well-defined interfaces, they normally are not allowed to know how other objects are implemented.

b) Java programmers concentrate on creating **classes**, which contain fields and the set of methods that manipulate those fields and provide services to clients.

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**—the new class (called the subclass) starts with the characteristics of an existing class (called the superclass), possibly customizing them and adding unique characteristics of its own.

e) **Unified Modeling Language (UML)** is a graphical language that allows people who design software systems to use an industry-standard notation to represent them.

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

**1.4 Fill in the blanks**

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

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

c) **Assembly language** is a type of computer language that uses English-like abbreviations for machine-language instructions.

d) **Output unit** is a logical unit that sends information which has already been processed by the computer to various devices so that it may be used outside the computer.

e) **Primary storage (RAM)** and **secondary storage (hard disk, SSD)** are logical units of the computer that retain information.

f) **Arithmetic and logic unit (ALU)** is a logical unit of the computer that performs calculations.

g) **Control unit** is a logical unit of the computer that makes logical decisions.

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

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

j) **Control unit** is a logical unit of the computer that coordinates the activities of all the other logical units.

**1.5 Fill in the blanks**

a) The **Java** programming language is now used to develop large-scale enterprise applications, to enhance the functionality of web servers, to provide applications for consumer devices, and for many other purposes.

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

c) The **Transmission Control Protocol (TCP)** ensures that messages, consisting of sequentially numbered pieces called bytes, were properly routed from sender to receiver, arrived intact, and were assembled in the correct order.

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

**1.6 Fill in the blanks**

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

b) A(n) **integrated development environment (IDE)** provides many tools that support the software development process, such as editors for writing and editing programs, debuggers for locating logic errors in programs, and many other features.

c) The command java invokes the **Java Virtual Machine (JVM)**, which executes Java programs.

d) A(n) **virtual machine** is a software application that simulates a computer but hides the underlying operating system and hardware from the programs that interact with it.

e) The **class loader** takes the .class files containing the program’s bytecodes and transfers them to primary memory.

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

**1.7 Two Compilation Phases in Java**

**Compilation Phase:** The Java compiler (javac) translates the source code (.java file) into bytecode (.class file).

**Execution Phase:** The Java Virtual Machine (java command) loads and executes the bytecode.

1.8 Object-Oriented Concepts Applied to a Watch

**Object:** A watch is an object.

**Attributes:** Size, color, weight, brand, battery life, etc.

**Behaviors:** Showing time, setting an alarm, stopwatch function.

**Class:** "Watch" is a class, and different brands/models are objects of this class.

**Inheritance:** An alarm clock inherits features from a basic watch and adds an alarm function.

**Modeling:** A watch can be modeled in a software system with appropriate attributes and behaviors.

**Messages:** A watch receives a message when the user presses a button to adjust time.

**Encapsulation:** The internal mechanism of timekeeping is hidden from the user.

**Interface:** Buttons and screen allow interaction with the user.

**Information Hiding:** The user doesn't need to know how the watch's quartz oscillator works, only how to read the time.

**Making a Difference**

**1.9 Carbon Footprint Calculator**

Research online resources like TerraPass to learn about carbon footprint formulas.

This knowledge will be used to create a Java program that calculates carbon footprints based on energy consumption and travel habits.

**1.10 BMI Calculator**

Use the Body Mass Index (BMI) formula:

𝐵

𝑀

𝐼

=

weight (kg)

height (m)

2

BMI=

height (m)

2

weight (kg)

​

A future Java program will use this formula to calculate BMI based on user input.

**1.11 Attributes of Hybrid Vehicles**

**Examples:** Tesla Model 3, Ford Fusion Hybrid, Honda Insight, Toyota Prius.

**Attributes:** Battery type, fuel efficiency (mpg), capacity, charging time, electric range.

**1.12 Gender Neutrality**

**The program would:**

Read text input.

Identify gendered words using a dictionary mapping (e.g., "husband" → "spouse").

Replace them with gender-neutral terms.

**Edge case:** Words may partially overlap (e.g., "man" in "woman"), causing unintended changes.

**Solution:** Use regex or dictionary-based word replacement.