**CHAPTER 1**

EXCERSISE 1.1

1. Programs
2. Arithmetic and logic unit, Processing unit, CPU, Memory unit, Output unit and Input unit.
3. Assembly language, High level language, Machine language.
4. Compilers
5. Android
6. Release candidate
7. Accelerometer

EXCERSISE 1.2

1. Javav
2. Javac
3. .Java
4. .class
5. Bytecodes

EXCERSISE 1.3

1. Information hiding
2. Classes
3. Object-oriented analysis and design (OOAD)
4. Inheritance
5. The unified modeling language (UML)
6. Attributes

EXCERSISE 1.4

1. Input unit
2. Programming
3. Assembly language
4. The output unit
5. Memory unit and secondary memory unit
6. Arithmetic logic unit
7. Arithmetic logic unit
8. High level languages
9. Machine language
10. Control unit

EXCERSISE 1.5

1. Java
2. C
3. The transmission control protocol (TCP)
4. C++

EXCERSISE 1.6

1. Write, compile and run
2. Integrated Development environment (IDE)
3. Java virtual machine
4. Virtual machine
5. Class loader
6. Bytecode verifies

EXCERSISE 1.7

Java compilation stages are split into the compilation stage and the execution stage.

Compilation stage: - The compiler javac will convert the source code to bytecode.

Execution stage: - Here the JVM will interpreter o compile bytecode into machine code.

EXCERSISE 1.8

1. **Object**: A wristwatch is an object in the real world, and in object-oriented programming, it would be represented as an instance of a class. It has both data (attributes) and functionality (behavior).
2. **Attributes**: These are the properties of the watch, e.g., color, brand, material, shape, water resistance, weight, and strap type.
3. **Behaviors**: These are actions the watch can perform or functions it has, e.g., displaying time, setting the alarm, starting/stopping a stopwatch, or showing the date.
4. **Class**: A class is a blueprint for objects. The WristWatch class would define the general structure for any watch, including its attributes (e.g., time, brand) and methods (e.g., showTime(), setAlarm()).
5. **Inheritance**: An alarm clock could be a subclass of the Watch class, inheriting its basic time-keeping features while adding alarm-specific behaviors like RingAlarm(). Similarly, a smartwatch might inherit from WristWatch and add methods like trackHeartRate() or connectBluetooth().
6. **Modeling**: Modeling is the process of creating a virtual representation of the watch in software, using classes and objects to simulate its structure and behavior.
7. **Messages**: In OOP, objects communicate by sending messages. For example, a program might send a message to the watch object like watch.setTime(12, 30) to change its time.
8. **Encapsulation**: Encapsulation means bundling the data (attributes) and methods (behaviors) together, restricting direct access to the object's data. For instance, the time attribute may be private and only modifiable through methods like setTime().
9. **Interface**: The interface would define how users or other objects interact with the watch object, e.g., a method signature like setAlarm(int hours, int minutes) without exposing the internal logic.
10. **Information Hiding**: This is related to encapsulation. The internal details of how the watch keeps track of time (e.g., how tick() increments time) are hidden from other objects or users; they only see public methods like getTime() or setAlarm().

EXCERSISE 1.9

* I visited the TerraPass and Carbon Footprint calculators.
* Both calculators generally ask for:
  + **Home energy usage** (electricity, gas, etc.)
  + **Travel habits** (miles driven, flights taken)
  + **Waste and recycling habits**
  + **Dietary choices** (meat consumption, etc.)

To prepare for programming a carbon footprint calculator, research reveals that:

* Carbon emissions from **electricity** = kWh used × emission factor (kg CO₂/kWh).
* Emissions from **car travel** = miles driven × car’s emission factor (kg CO₂/mile).
* Emissions from **flights** = distance flown × emission factor (kg CO₂/km).

These formulas vary depending on local electricity sources and vehicle types.

EXCERSISE 1.10

* Using the U.S. Department of Health BMI calculator:
  + **BMI Formula** = weight (kg) / height (m²) or weight (lbs) × 703 / height (in)².

The BMI categories are generally:

* Underweight: BMI < 18.5
* Normal weight: 18.5 ≤ BMI < 25
* Overweight: 25 ≤ BMI < 30
* Obese: BMI ≥ 30

This will help when writing a BMI calculator later.

Studied models: Toyota Prius, Honda Accord Hybrid, Ford Escape Hybrid, Hyundai Ioniq.

EXCERSISE 1.11

Common hybrid-related attributes:

* **City MPG**: 44–58 mpg
* **Highway MPG**: 38–57 mpg
* **Battery Type**: Lithium-ion or Nickel-Metal Hydride (NiMH)
* **Battery Weight**: ~50–150 kg depending on the model
* **Electric Motor Power**: Varies (e.g., 53–94 kW)
* **CO₂ Emissions**: ~80–120 g/km
* **Fuel tank size**: ~11–14 gallons

EXCERSISE 1.12

**Procedure (Algorithm):**

1. Input: A paragraph of text.
2. Read the paragraph word by word.
3. For each word:
   * Check if the word exists in the gender-specific dictionary (e.g., { "wife": "spouse", "husband": "spouse" }).
   * If found, replace it with the corresponding neutral word.
4. Output: The modified paragraph.

**Why might you get terms like “woperchild”?**

* If the program doesn't account for partial words, e.g., replacing "woman" with "person" without verifying word boundaries, "woman" inside a larger word like "womanchild" might become "woperchild."

**Solution:**

* Implement boundary checking (e.g., using regex or tokenizing sentences into words) to ensure replacements occur only on whole words.