Week 1.1

3. What programming language has dominated scientific computing over the past 60 years?

Page 5, Chapter 1, Section 1.2.1: Scientific Applications. The book states, for some scientific applications where efficiency is the primary concern, such as those that were common in the 1950s and 1960s, no subsequent language is significantly better than Fortran.

Introduced in the late 1950s, Fortran was designed by IBM for numerical and scientific computation, offering efficient handling of floating-point arithmetic and support for array processing. It quickly became the language of choice for applications in physics, engineering, and computational sciences.

### 4. What programming language has dominated business applications over the past 60 years?

**COBOL** (Common Business-Oriented Language) has been the dominant language for business applications. Designed in 1959 under the guidance of Grace Hopper, COBOL was tailored for data processing and generating structured reports. It remains widely used in legacy systems for banking, insurance, and government applications.

Page 6, Chapter 1, Section 1.2.2: Business Applications. The text highlights that COBOL was "designed to provide facilities for producing elaborate reports, precise ways of describing and storing decimal numbers, and the ability to specify decimal arithmetic operations."

5. What programming language has dominated artificial intelligence over the past 60 years?

For much of its history, **Lisp** has been the dominant language for artificial intelligence (AI) applications. Lisp, created in 1958 by John McCarthy, introduced symbolic computation, a critical feature for AI, enabling manipulation of symbols and linked lists. Later, **Prolog** (Programming in Logic), introduced in the 1970s, became popular for logic programming, particularly in expert systems and natural language processing.

Page 6, Chapter 1, Section 1.2.3: Artificial Intelligence. The book notes, "The first widely used programming language developed for AI applications was the functional language Lisp," while "logic programming using the Prolog language" is also mentioned as an alternative.

6. In what language is most of UNIX written?

Most of UNIX is written in the **C programming language**. Initially developed in assembly language, UNIX was rewritten in C during the early 1970s by Dennis Ritchie and Ken Thompson at Bell Labs. This shift made UNIX portable, allowing it to run on various hardware platforms.

Page 17, Chapter 1, Section 1.4.1: Computer Architecture. The book states, "Most of the popular languages of the past 60 years have been designed around the prevalent computer architecture," noting UNIX's rewriting in C as a key example.

14. What is aliasing?

Page 15, Chapter 1, Section 1.3.3.3: Aliasing. The book describes aliasing as "having two or more distinct names in a program that can be used to access the same memory cell."

Aliasing occurs when two or more distinct identifiers refer to the same memory location. This can lead to unintended interactions when changes to one alias affect all other aliases.

21. What are the three fundamental features of an object-oriented programming language?

The three fundamental features of an object-oriented programming language are **encapsulation**, **inheritance**, and **polymorphism**.

Encapsulation: Combines data and the methods that operate on it into objects, ensuring data hiding and controlled access through interfaces.

Inheritance: Enables new classes to derive properties and behaviors from existing classes, promoting code reuse and hierarchical organization.

Polymorphism: Allows objects of different classes to be treated as instances of a common superclass, enabling dynamic method binding and flexible code.