Q1.

- 2.2
  - ((A) (B))
  - (A (B (C)))
  - (((A) (B)) (C))
- 2.4
  - ((BOWS ARROWS) (FLOWERS CHOCLATES))
- 2.6
  - NIL
  - (NIL)
  - (NIL NIL)
  - (NIL (NIL))
- 2.13
  - STEP Result
  - CAADDR SUN
  - CADADR THE
  - CAADR IN
  - CAAAR FUN
- 2.15
  - ((E F))
  - (C D)
  - (B)
  - CADAR
  - B
  - CAAR
  - (F)
  - CADADDR
- 2.16
  - NIL

Q2. 54

- 6. In what language is most of UNIX written?
  - C programming language
- 7. What is the disadvantage of having too many features in a language?
  - Reliability, cost of execution and design trade-offs
- 8. How can user-defined operator overloading harm the readability of a program?
  - If user-defined operator overloading is done thoughtlessly it could harm readability. For example, if the "+" operator is overloaded to add the mean of two arrays can cause confusion for not only the author but the program's reader due to the unorthodox usage of it.
- 9. What is one example of a lack of orthogonality in the design of C?

    - C has two structured data types, arrays and structs. Structs can be returned from functions while arrays cannot. These special cases force the programmer to be aware of the differences and special cases that they are used.
- 10. What language used orthogonality as a primary design criterion?
    - ALGOL 68
- 11. What primitive control statement is used to build more complicated control statements in languages that lack them?
    - Goto statements
- 12. In your opinion, what major features would a perfect programming language include
    - Conditional statements, Loops (while/for), Common data types (floats, ints, char, strings, etc), Functions, Objects, extensive community supported libraries.
- 13. Was the first high-level programming language you learned implemented with a pure interpreter, a hybrid implementation system, or a compiler? (You may have to research this.)
    - I first learned java which is a hybrid implementation system. I believe this is due to JIT.
- 14. Describe the advantages and disadvantages of some programming environment you have used.
    - VS Code has the most advantages in my opinion, such as accurate syntax highlighting and error linter. Extensive community supported extensions to make programming easier. The only disadvantage I can think of is it is not easy to use languages such as C++ and Java. This can be solved using WSL or other methods, but it still requires extra steps to get to work. I haven't used any other IDE since I have no reason to.
- 15. How do type declaration statements for simple variables affect the readability of a language, considering that some languages do not require them?
    - In a language, such as python and JavaScript, we need to be careful not to do operations on variables that are not the correct type. An example is using the "==" in JavaScript, strange behavior can happen if a == is used. The way around this is to use "===", a band aid solution.
- 16. Write an evaluation of some programming language you know, using the criteria described in this chapter.
    - Readability for C++ is okay in my opinion. For example, header file make following the flow of objects and inheritance complicated in big programs.
- 20. What two programming language deficiencies were discovered as a result of the research in software development in the 1970s?
    - Top-down design and stepwise refinement
- 21. What are the three fundamental features of an object-oriented programming language?
    - Abstraction
    - Inheritance
    - Dynamic method binding
- 22. What language was the first to support the three fundamental features of object-oriented programming?
    - Smalltalk

- 23. What is an example of two language design criteria that are in direct conflict with each other?
    - Reliability and cost of execution
- 24. What are the three general methods of implementing a programming language?
    - Compilation, Pure interpretation and hybrid
- 25. Which produces faster program execution, a compiler or a pure interpreter?
    - Compiler
- 29. What are the advantages in implementing a language with a pure interpreter?
    - Allowing easy implementation of many source-level debugging operations