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CSCI 330-54

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Homework 1

Q1's From Common Lisp Textbook:

Question 2.2: Well-formed Lists

Lists with appropriately balanced parenthesis are considered well-formed. The following are well-structured lists derived from the examples given:

- 2nd ((A) (B))
- 5th (A (B (C)))
- 6th (((A) (B)) (C))

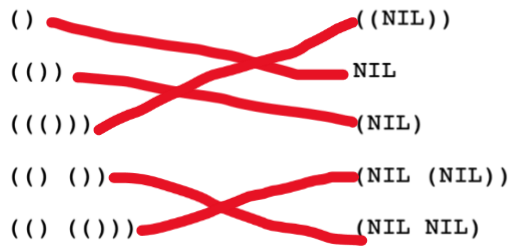
The parentheses in other examples are not balanced.

Question 2.4: Parenthesis Notation for Cons Cell Structure

For the given cons cell structure, the parenthesis notation is: ((BOWS ARROWS) (FLOWERS CHOCOLATES)).

Question 2.6: Match Lists with Corresponding Forms

2.6. Match each list on the left with a corresponding list on the right by substituting NIL for () wherever possible. Pay careful attention to levels of parenthesization.



Question 2.13: Accessing Words in (((FUN)) (IN THE) (SUN))

FUN is the CAAAR; IN is the CAADR; THE is the CADADR; SUN is the CAADDR.

The table for accessing words in the list:

Step	Result
1. start	(((FUN)) (IN THE) (SUN))
C..AR	((FUN))
C.AAR	(FUN)
CAAAR	FUN
2. start	(((FUN) (IN THE) (SUN))
C..DR	((IN THE) (SUN))
C.ADR	(IN THE)
CAADR	IN
3. start	(((FUN) (IN THE) (SUN))
C…DR	((IN THE) (SUN))
C..ADR	(IN THE)
C.DADR	(THE)
CADADR	THE
4. start	(((FUN) (IN THE) (SUN))
C…DR	((IN THE) (SUN))
C..DDR	((SUN))
C.ADDR	(SUN)
CAADDR	SUN

Question 2.15: Results for Functions on ((A B) (C D) (E F))

Function	Result
CAR	(A B)
CDDR	((E F))
CADR	(C D)
CDAR	(B)
CADAR	B
CDDAR	NIL
CAAR	A
CDADDR	(F)
CADADDR	F

Question 2.16: Result of CAAR on (FRED NIL)

The CAAR function first takes the CAR of (FRED NIL), which is FRED. The CAR of FRED results in an error because FRED is not a list.

Q2's From Sebesta's Textbook (Questions 6–16, 20–25, and 29):

6. In what language is most of UNIX written?
C is used to write the majority of UNIX.

7. What is the disadvantage of having too many features in a language?
Too many features can lead to confusion and misuse, as programmers may not be familiar with all of them, making the language harder to learn and less uniform.

8. How can user-defined operator overloading harm the readability of a program?
User-defined operator overloading can lead to confusion if operators are used in unexpected ways, making it hard for readers to understand their intended meaning.

9. What is one example of a lack of orthogonality in the design of C?
An example is that arrays cannot be returned from functions, while records (structs) can.

10. What language used orthogonality as a primary design criterion?
ALGOL 68 was designed with orthogonality as a primary goal.

11. What primitive control statement is used to build more complicated control statements in languages that lack them?
The goto statement is often used.

12. What does it mean for a program to be reliable?
A program is reliable if it performs to its specifications under all conditions.

13. Why is type-checking the parameters of a subprogram important?
Type checking prevents type mismatches, reducing errors at runtime.

14. What is aliasing?
Aliasing occurs when two or more references point to the same memory location, potentially causing unintended side effects.

15. What is exception handling?
Exception handling is the process of responding to runtime errors by transferring control to a predefined error-handling code block.

16. Why is readability important to writability?
Readable code is easier to write because it simplifies understanding and modifying existing code, reducing development time.

20. What two programming language deficiencies were discovered as a result of the research in software development in the 1970s?

Lack of modularity and type checking.

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

Abstract data types, inheritance, and dynamic binding of methods.

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?

Readability and writability often conflict; for example, features that simplify writing code can make it harder to read.

24. What are the three general methods of implementing a programming language?

Compilation, pure interpretation, and hybrid implementation.

25. Which produces faster program execution, a compiler or a pure interpreter?

A compiler produces faster execution than a pure interpreter.

26. What are the advantages in implementing a language with a pure interpreter?

Pure interpreters allow for easy debugging and detailed error messages at the source level.

<u>Other Questions from LISP</u>

3.

a) CDR, CDR, CAR: (car (cdr (cdr '(a b x d))))

b) CDR, CAR, CDR, CAR, CAR: (car (car (cdr (car (cdr '(a (b (x d))))))))

c) CAR, CAR, CDR, CAR, CDR, CAR, CAR: (car (car (cdr (car (cdr (car (car '(((a (b (x) d))))))))))))

4.

a) (cons 'a (cons 'b (cons 'x (cons 'd '()))))

b) (cons 'a (cons (cons 'b (cons (cons 'x (cons 'd '())) '())) '()))

c) (cons (cons (cons 'a (cons (cons 'b (cons (cons 'x '()) (cons 'd '()))) '())) '()) '())