

Module A Comprehensive Exercises, 9/12/03

Due at the beginning of the class meeting on 9/16/03

General note: Try to do all the problems. You will evaluate each of the problems yourself with the help of another (or two) student(s). Your evaluation should be based on how well you achieve the relevant part of the course Performance Goals, *not* on how correctly you answer the problem. Therefore, instead of worrying about obtaining a correct answer (some problems may not have a *correct* answer, like many real-world problems), apply your critical thinking and analytical skills.

1. Orchestra

Note: You do not need to be a musician. If you do not know much about orchestra, do a quick search, say, on the internet. Since this is not a problem in music, the accuracy of your work is not the focus. So, as long as it is clear that you are representing some kind of orchestra (symphony, chamber, jazz, rock, mariachi, etc.), you can simplify the information to a level appropriate for this exercise.

Consider an orchestra (of the kind you choose) and respond to the following questions/instructions:

- A. Identify a scenario/story you might need to model an orchestra (as object/phenomenon).
- B. Informally define a mathematical structure that would represent this object/phenomenon, and precisely describe *each* structure component (in plain English). Try to include as few structure components as possible for your scenario.
- C. Classify each structure component as set, relation, or function, and justify your classification. If there are multiple ways to classify a component, discuss their advantages/disadvantages.
- D. Compare your structure with at least two other structures discussed in class/exercises and argue for their similarities/differences.
- E. Discuss the advantages/disadvantages of *informally* representing objects/phenomena, cf. the use of mathematical symbols.

2. *Gone with the Wind*

At the end of Part 1 in a classic movie film “Gone with the Wind,” Scarlett O’Hara shouts, “I shall never be hungry again!” Let us analyze this sentence step by step. Note that we have not (and will not) discuss precise meaning of the words “shall,” “never,” and “again” in this course. Apply your common-sense understanding of these words when needed.

- A. First, consider a simplified version: “Scarlett O’Hara is never hungry.” Is this sentence true? If you can answer this question, explain. If not, explain what other information you need.
- B. Apply the syntax-semantics distinction in the analysis of the sentence in Question A.
- C. Next, analyze another simplified version: “Scarlett O’Hara shall never be hungry.”
- D. Then, analyze the original: “I shall never be hungry again.”

3. Java Comment

In introductory programming courses, you will most certainly be required to comment your program appropriately. The most common way of commenting multiple lines in Java and C++ is to use the pattern `/* ... */` (called “traditional comment”). According to *Java Language Reference* (2nd edition of 1997 from O’Reilly by Mark Grand), this type of comment is specified as follows:

A standard C-style comment, where all of the characters between `/*` and `*/` are ignored.

Respond to the following questions/instructions:

- A. Give several good and bad examples of Java traditional comments, *based on the above specification*.
- B. Test all of the above examples with real Java or C compiler and report the results. Note: In case you have no programming experience, contact the instructor.
- C. Does the specification correctly cover *all* and *only* the good Java traditional comment? If yes, explain. If no, give a correct specification.
- D. Analyze what you did in Questions A through C using the logic-structure connection diagram
- E. Let us consider a way to specify Java traditional comments as a set. For example, a first attempt might define the set as a collection including `/**/`, `/* */`, `/*a*/`, `/*b*/`, etc. If we can tell how to fill in the “etc.” part precisely and accurately, the set is indeed capable of specifying Java traditional comments. Discuss whether it is possible.
- F. Suppose that a student answered to Question E is “yes.” What can you tell from this, with respect to the course Performance Goals 5 (see the syllabus or the self-evaluation form)?

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