

Exercise A3, 1/28/05

Part 1: Computational Problem Solving

As we glanced at the main components of the Theory of Computation, we will be ready to discuss the components more in detail. The standard interface between your practical problems and the theoretical analysis is the set representation of your (corresponding) computational problem.

Task 1 (Program Verification): One of the software industry's biggest concern is how to check whether their products are really correct with respect to the specification that the developer and the user both agreed. According to a variety of sources, inability to do so will cost us an incredible amount of money in the future (well, this must be already happening). As you know, *generality* is a prime concern in Computer Science. So, why don't we write a single program that could verify whether the program correctly solves a problem with respect to a given specification? **Give** the set representation of the computational problem involved here. **Speculate** the basic Theory properties (i.e., possibility to solve computationally, the simplest mechanism, practicality with large data), referring to the set (a concise, informal description suffices). Can you think of such a program?

Task 2 (Map Coloring): It has been shown that with four distinct colors, we can color any map so that the neighboring countries (or whatever political boundaries) do not share the same color. With three colors, we may or may not be able to do the same thing. **Give** the set representation of the computational problem involved here. **Speculate** the basic Theory properties, referring to the set.

Part 2: Review "Theory of Computation"

Without going into the details of the Theory of Computation, we discussed the properties associated with the three traditional subareas of the Theory. While it must be difficult to point out exactly how these would apply to your problems, you should still be able to *speculate* how these property would apply (intuition is important!).

Task: Suppose that your own problem (Ex 00) has been transformed into a computational problem (set). Concisely analyze the problem with respect to the basic Theory properties. If you have difficulty, explain where you have the difficulty. You are also encouraged to discuss with other students and/or the instructor.

Part 3: Evaluation Form and Supporting Notes

Module A evaluation will come in a week or so. You must be continuing to fill in the evaluation form and writing up your supporting notes as much as you can. You are also encouraged (but not required; i.e., not required to submit anything for this part) to attach a copy of your supporting notes to this exercise so that the instructor can comment on them.

Survey: Time spent between classes: _____

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