
CSL 356: Analysis and Design of Algorithms

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1. (NP-complete problems) Solve the following problems from Chapter 8 of the Tardos-Kleinberg book. ¹

- Problem 27.
- Problem 29.
- Problem 31.

2. (*MAKESPAN problem*) Consider the following problem:

3-MAKESPAN: Given n jobs with integer durations d_1, \dots, d_n and an integer D , determine if these jobs can be scheduled on 3 machines such that the maximum finishing time of any job is $\leq D$.

- Show that 3-MAKESPAN is **NP**-complete.

Now consider the optimization version of the problem.

MIN-3-MAKESPAN: Given n jobs with duration d_1, \dots, d_n , determine a schedule of these n jobs on 3 machines that minimizes the maximum finishing time of any job.

The optimization version of a problem is usually harder than the decision version. The next question asks you to show this formally.

- Show that MIN-3-MAKESPAN is **NP**-hard.

¹These are just arbitrary subset of problems that I liked. You should try all problems in the book.