Analysis of Algorithms

Homework 1: due 11 April 2005

You are to write a program that implements randomized and deterministic selection algorithms.

```
rdselect  i  file
```

where `i` is an integer and `file` is a file name. The file contains a list of integers, ten in each line. Your program finds the i-th smallest element in the file by the following two algorithms.

- Randomized-select: `Randomized-Select` in CLRS
- Deterministic-select: the worst-case linear-time algorithm in CLRS

Your program should proceed as follows.

(1) Read all input data into memory.
(2) Run the randomized-select algorithm for the given input, and measure the time. Print the i-th smallest number and the time.
(3) Check the correctness of your randomized-select implementation by a checker program. Print the result of checking. The checker program gets the input (`i` and `file`) and the output (the i-th smallest number) as its input and checks whether the output is correct or not. The checker program for selection should run in linear time.
(4) Run the deterministic-select algorithm for the given input, and measure the time. Print the i-th smallest number and the time.
(5) Check the correctness of your deterministic-select implementation. Print the result of checking.

– Hand in your programs and an example running (with at least three input files) in hardcopy. Also hand in your programs and executable files (email to TA).
– Comment on the time complexities and actual time usage of the two algorithms in your report. Explain how your checker program works in your report.
– Write down the environment you run your program.
– Write comments appropriately in your program.