

## CSE 2010, HW5

Due Tue Apr 1 at the start of your lab section; Canvas = hw5

Due Tue Apr 1 at the end of your lab section; Canvas = hw5a

To help track down a hacker who has compromised multiple user accounts, we would like to display (potentially suspicious) activities during a certain period of time. How would you design an efficient tool for the task?

The goal of HW5 is to manage the activities and allow the user to specify a time range to display the corresponding activities. Also, we would like the user to be able to add and remove activities (e.g. from different sources such as log files from applications, the network, the operating system). To improve efficiency, your implementation uses a Skip List that includes the following operations:

- `get(key)` // if `key` exists, return value associated with `key`; otherwise, return null (Code Fragment 10.14)
- `put(key, value)` // if `key` doesn't exist, add entry and return true; otherwise, return false (Code Fragment 10.15)
- `remove(key)` // if `key` exists, remove entry and return its value; otherwise, return null
- `ceilingEntry(key)` // return the entry with the smallest `key` greater than or equal to `key`; return null if no such entry exists
- `floorEntry(key)` // return the entry with the largest `key` less than or equal to `key`; return null if no such entry exists
- `subMap(key1, key2)` // return all entries with `key` such that  $key1 \leq key \leq key2$ ; return null if none exists

Use `getRandHeight()` in `FakeRandomHeight.java` for `put(key, value)` (to facilitate easier debugging and testing). You may rewrite/modify `DoublyLinkedList.java`. Program files are on the course website. We will be evaluating your submission on `code01.fit.edu`; we strongly recommend you to ensure that your submission runs on `code01.fit.edu`.

**Input:** Input is from the command-line arguments for `HW5.java`:

- filename of actions, each line has one of the following actions:
  - `DisplayActivity time`
  - `AddActivity time activity`
  - `DeleteActivity time`
  - `DisplayActivitiesBetweenTimes startTime endTime`
  - `DisplayActivitiesFromStartTime startTime`
  - `DisplayActivitiesToEndTime endTime`
  - `DisplayAllActivities`
  - `PrintSkipList`

For simplicity, times are in HHMM format (HH is 00-23 and MM is 00-59) [leading zeros are optional]. You may assume the times are unique. Sample input is on the course website.

**Output:** Output goes to the standard output (screen), each line has a result for the corresponding action:

- `DisplayActivity time activity/none`
- `AddActivity time activity [existingTimeError]`
- `DeleteActivity time activity/noTimeError`
- `DisplayActivitiesBetweenTimes startTime endTime time1:activity1 ... or none`
- `DisplayActivitiesFromStartTime startTime time1:activity1 ... or none`
- `DisplayActivitiesToEndTime endTime time1:activity1 ... or none`
- `DisplayAllActivities time1:activity1 ... or none`
- `PrintSkipList`  
(Sh) empty  
...  
(S1) `time1:activity1 ...`  
(S0) `time1:activity1 ...`

Sample output is on the course website.

**Submission:** Submit `HW5.java` that has the main method and other program files. Submissions for Individual and GroupHelp have the same guidelines as HW1.

Note the late penalty on the syllabus if you submit after the due date and time as specified at the top of the assignment.