

## hw26: hashing practice

Recall that you should read CLRS sections 11.1,2,4.

**Ex 1.** For each collision resolution method, add the integers 6541, 1361, 4162, 6541, 9876, 1232, 8762 into an empty hash table of size 10. As usual, assume integers hash to themselves, and you compress via mod by array size. Assume your array does not double. Report the final array (see footnote below). For open addressing, additionally report the *probe sequence* for adding the last item (8762). For example, “8762 hashed to hash index 7, and then I probed array indices 7, 1, 4, 2 and found an empty slot. Yay.”

- (a) separate chaining
- (b) linear probing
- (c) quadratic probing

**Ex 2.** Continue with the example above. For each operation, explain why it wouldn't work by giving a *concrete* example of how it would fail. (Concrete means don't talk in generalities, actually identify specific integers using the example above. For example, “If I did that, then 4291 would...”)

- (a) In separate chaining, when doubling the array, we cannot simply calculate the new hash index of the first item in each chain and move each entire chain. Why not?
- (b) In open addressing (use linear probing), if we are removing an item, we cannot simply change its slot to empty. Why not?

**Ex 3.** Your solution to quadratic probing above should have encountered *secondary clustering*.

- (a) Describe what this means *concretely* in terms of the items you encountered.
- (b) Briefly (1 to 2 sentences) explain why this is bad for a hash table.

**Ex 4.** Given the table size and hashing function we used above, what would need to be true about our secondary hashing function if we wanted to ensure that we would search the entire hash table using a double hashing strategy? (Read the book carefully.)

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To report the final array, any simple text-based representation is fine as long as it is clear what's in each slot. Perhaps something like

[4, -, 8->23->6, -, -, 7]

which I typed by writing

`\verb+[4, -, 8->23->6, -, -, 7]+`

(which I typed by writing

`\verb|\verb+[4, -, 8->23->6, -, -, 7]+|`

which I typed by writing

`\verb@\verb|\verb+[4, -, 8->23->6, -, -, 7]+|@`

which I typed by writing...uhm, I'm running out of weird characters to use as *delimiters* to the `\verb` command ☹).