

CS/20 - Lists (recap) + Sorting

Note Title

10/31/2011

Announcements

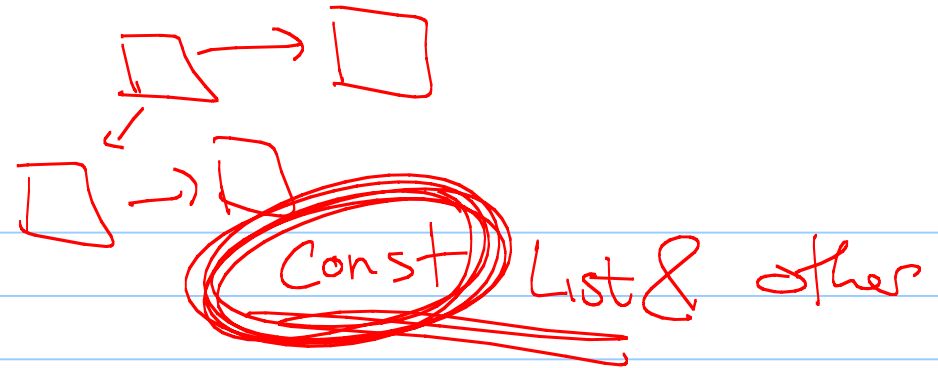
- Program 3 graded
- Program 5 checkpoint tomorrow
- Will have 1 more HW before the next midterms

Explanation of P.4 issues

Error was constructor

Order of initialization is important →

Lists - recap



Code I added:

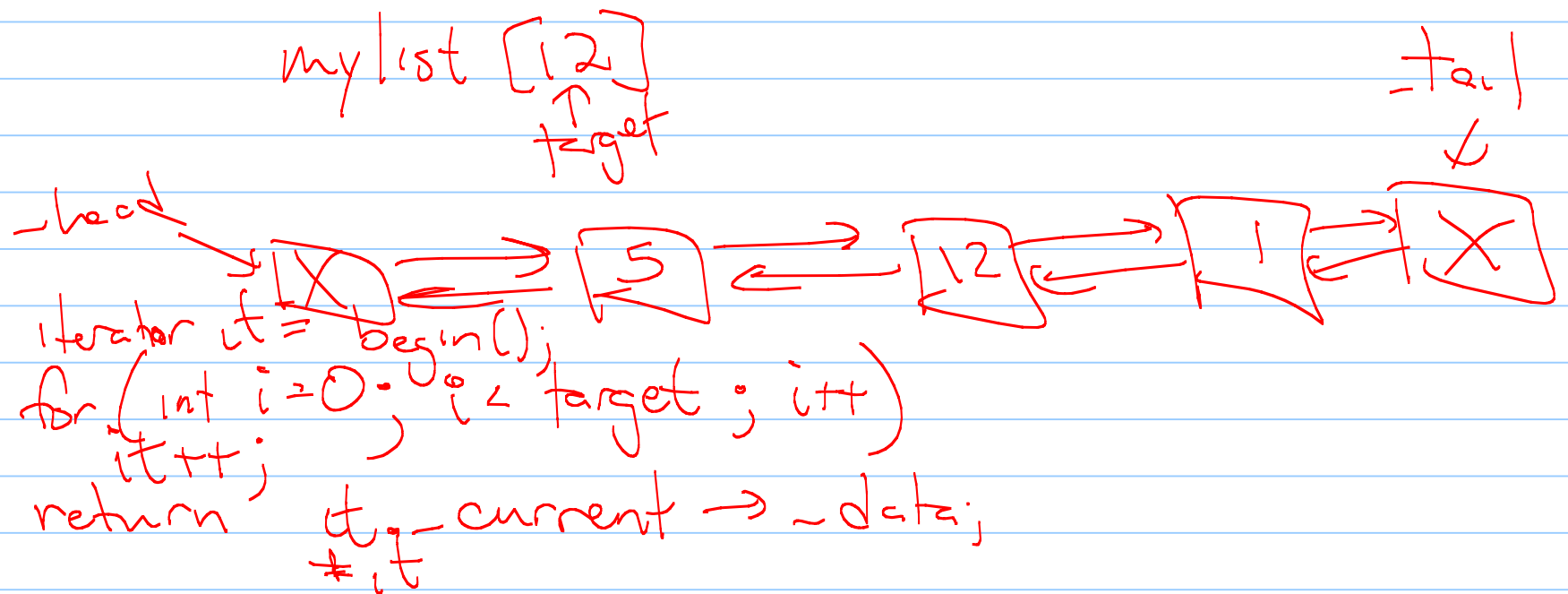
- copy constructor
- destructor
- operator =

Plus:

const_iterator class
why?

Vectors versus lists

Q: What would operator `[]` look like
in a list? $\leftarrow O(n)$



Vectors versus lists (cont)

Running times:

	<u>Vectors</u>	<u>Lists</u>
operator []	$O(1)$	$O(n)$ (if we code it)
find (or in)	$O(n)$	$O(n)$
insert	$O(n)$	$O(1)$
erase/remove	$O(n)$	$O(1)$
	all $O(\lg n)$	

Searching

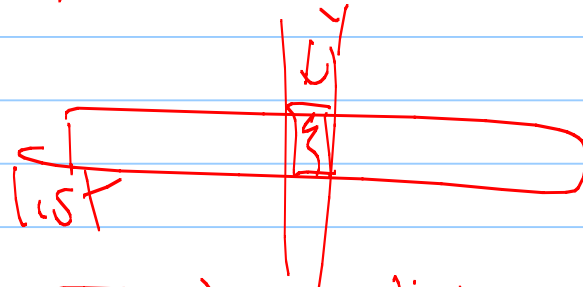
What is linear search?

exactly same as our find
best possible is list is unsorted

Binary search?

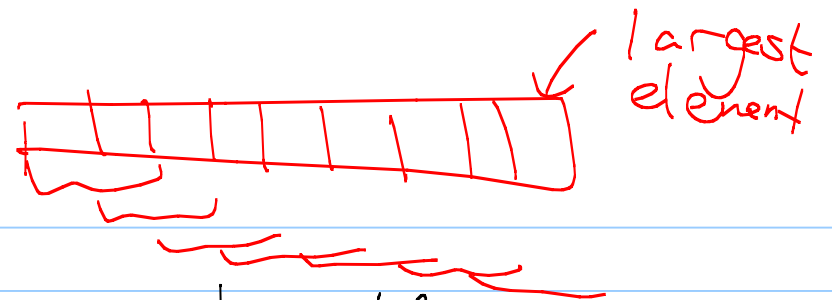
assume sorted. \times

with $O(1)$ work,
eliminate half the list



$$T(n) = 1 + T\left(\frac{n}{2}\right) = 1 + 1 + T\left(\frac{n}{4}\right) = \dots + 1 + T\left(\frac{n}{8}\right)$$
$$\rightarrow T(n) = O(\log_2 n)$$

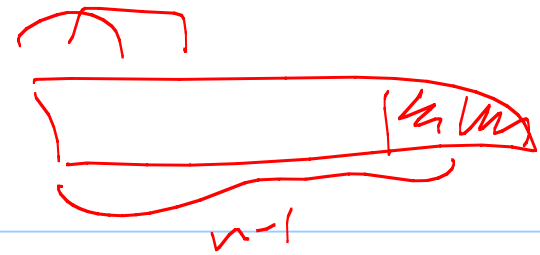
Sorting



Name some sorting algorithms.

- Bubble sort \downarrow it: $n-1$ comparisons
 - Selection sort
 - Insertion sort
 - Quick sort
 - Merge sort
- } look these up

Bubble



n-1

to get largest

n-2

to get 2nd largest

n-3

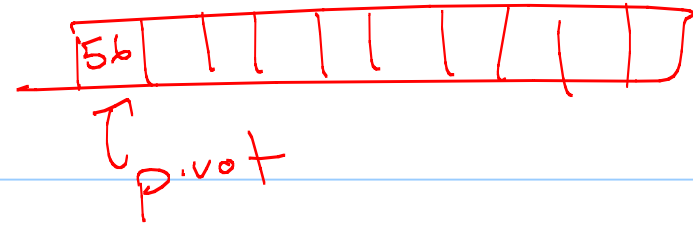
n-4

⋮
1

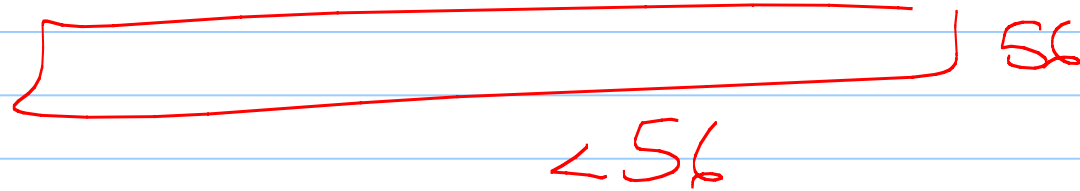
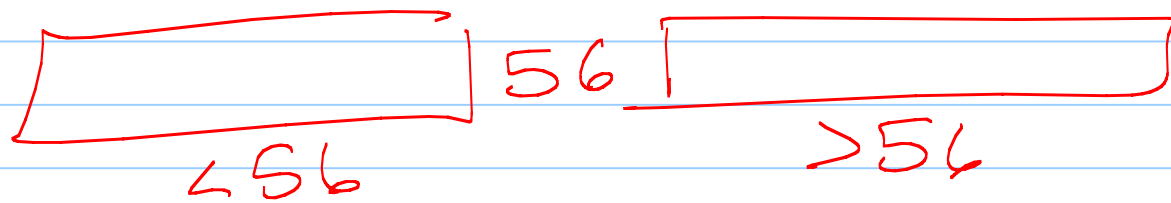
for
for

$$\sum_{i=1}^{n-1} i = \frac{n(n-1)}{2} = O(n^2)$$

Quick sort



- select a "random" pivot



worst case: $O(n^2)$

$$T(n) = n-1 +$$

$$T\left(\frac{n}{2}\right) + T\left(\frac{n}{2}\right)$$

$$= n-1 + 2T\left(\frac{n}{2}\right)$$

$$= O(n \log n)$$