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### Running Times of Loops

Nested for loops:

•If the <u>exact</u> number of iterations of each loop is known, multiply the numbers of iterations of the loops.

•If the exact number of iterations of some loop is not known, "open" the loops and count the total number of iterations (as in Assignment 1).

# **Running Time of Recursive Methods**

- · Could be just a hidden "for" or "while" loop.
  - See "Tail Recursion" slide.
  - $\,\cdot\,$  "Unravel" the hidden loop to count the number of iterations.
- Logarithmic
  - Examples: binary search, exponentiation, GCD
- Solving a recurrence
  - Example: merge sort, quick sort









# Arrays and Linked Lists

#### Arrays

- Extendable arrays
- Strategies for extending arrays:
  - doubling the size
  - increment by *k* cells

#### Linked lists

- Singly linked
- Doubly linked
- Implementation
- Running times for insertion and deletion at the two ends.

9

								10
Running Operation	Time ns	es of A	Array	and	Link	ed Lis	t	
Operation	Array unsorted		Array sorted		DL list unsorted		DL list sorted	
search	О(	)	O(	)	O(	)	O(	)
insert	О(	)	O(	)	O(	)	O(	)
delete	О(	)	О(	)	O(	)	O(	)







