s_i = strings $|s_i| = x$

want to concat all strings.

s = " "

for s' in $[s_i]$:

     s = s + s'

return s

$O|s| + O|s'|$ time

$= O[s] + O(x)$

$0 + x \ + \ (x + x) \ + \ (2x + x) \ + \ (3x + x)$

$\cdots \ + \ ((n-1)x + x)$

$= \ x(1 + 2 + \cdots n) = O(n^2 x)$

n = # of strings

Better way: s = [ ]

     append each s_i to s   O(n)
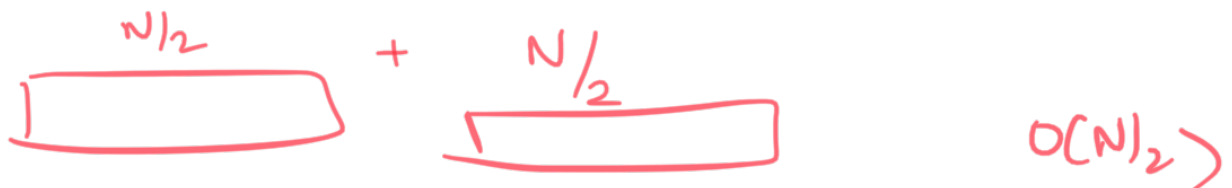
     then join   ←   O(nx)

       = O(nx)

Resizable arrays   (Java

when array full,
double it in size

...

each resizing $O(n)$ time, but happens rarely

but amortized insertion time is still $O(1)$

N size array at end

$N/2$ + $N/2$

$O(N/2)$

$N/4$ + $N/4$

$O(N/4)$

$\vdots$

$O(N/2) + \cdot O(N/4) + \ldots + 1$

$= \left(1 + \frac{1}{2} + \frac{1}{4} + \ldots + \right) N = N$

so $O(N)$ / N inserts

        $O(1)$ / 1 insert ....