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David Luo
Exercise 1.14

We can rewrite the recurrence as

$$A_N = 1 + \frac{2}{N}\sum_{j=0}^{N-1} A_j$$

And multiply both sides by *N* to get

$$NA_N = N + 2\sum_{j=0}^{N-1} A_j$$

To get rid of the summation, we subtract by the *N - 1* version of the equation:

$$NA_N - (N-1)A_{N-1} = N - (N-1) + 2A_{N-1}$$

$$NA_N = (N+1)A_{N-1} + 1$$

$$A_N = \frac{N+1}{N}A_{N-1} + \frac{1}{N}$$

Why is this linear? Unclear based on the form you've written it in.

With the initial condition, this ends up being a linear relationship.

N	0	1	2	3
A_N	0	1	2	3

The equality holds with probability $\frac{1}{N}$ per call on quicksort, so roughly once.

We're interested in the total number of times a subarray of length 1 is called throughout the entire recursion. You should be able to set up a recursion similar to the one in the first part.