

If the # of elements is unknown,

how do you select a random
one without using $O(n)$ space?

we want $P(\text{select } a_i)$
 $= \frac{1}{n}$

$a_1 a_2 a_3 \dots a_i \dots a_n$

what we have seen now

$$P(\text{select } a_i) = \frac{1}{i} \times \left(\frac{i}{i+1} \times \frac{i+1}{i+2} \times \dots \times \frac{n-1}{n} \right)$$
$$= \frac{1}{n}$$