

Probability (Linearity of Expectation)

- QuickSort / Selection Sort

- Random variable is # of comparisons over alg
integer that depends on choice of pivot at each step

$$\begin{array}{ccc}
 - X = \sum X_{i,j} & \rightarrow & \mathbb{E}[X] = \sum \mathbb{E}[X_{i,j}] \\
 \uparrow & \uparrow & \uparrow \\
 \text{total} & \# \text{ times } X_{i,j} \text{ compared} & X_{i,j} \text{ is indicator} \\
 & & \mathbb{E}[X_{i,j}] = \Pr[\text{event occurs}]
 \end{array}$$

- Random Search

- Random variable is # of rounds
integer that depends on choice of query at each step

- Break into stages

$$\begin{array}{ccc}
 X = \sum X_i & \rightarrow & \mathbb{E}[X] = \sum \mathbb{E}[X_i] \\
 \uparrow & \uparrow & \\
 \text{total} & \# \text{ of steps in } i^{\text{th}} \text{ stage} &
 \end{array}$$

- Break each stage into indicator random variables for each round