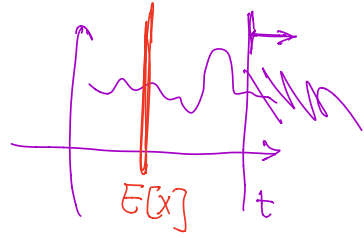Markov inequality: Consider any Prob. distribution with expected
value $E[X]$

$$P(X \geq t) \leq \frac{E[X]}{t}$$

$E[X]$ t

Proof:

$$f(x) = \begin{cases} 1 & \text{if } x \geq t \text{; i.e. } x/t \geq 1 \\ 0 & \text{otherwise} \end{cases}$$

$$P(X \geq t) = P(f(x) = 1) = E[f(x)]$$

$x/t \geq f(t)$

$$\leq E[x/t]$$

$$= \frac{E[X]}{t}$$

Example: R-Q-Sort:

what is the prob. of runtime $\geq \frac{n^2}{C}$

Using Markov ineq. ?