(The following material may be helpful to you during the quiz.)

Markov's Inequality. Let Y be a discrete random variable taking non-negative values. Then for any $a > 0$,

$$\Pr[Y \geq a] \leq \frac{\mathbb{E}[Y]}{a}.$$

Chebyshev's Inequality. Let X be a random variable with expected value μ and strictly positive variance σ^2. Then for all real $k > 0$,

$$\Pr[|X - \mu| \geq k] \leq \frac{\sigma^2}{k^2}.$$

Chernoff Bounds. Suppose $X_1, \ldots, X_n$ are independent random 0-1 variables. Let X denote their sum and let $\mu = \mathbb{E}[X]$ denote the sum's expected value. Then for any $\beta > 0$,

(a) $\Pr[X > (1+\beta)\mu] < e^{-\beta^2\mu/3}$, for $0 < \beta < 1$;

(b) $\Pr[X > (1+\beta)\mu] < e^{-\beta\mu/3}$, for $1 < \beta$;

(c) $\Pr[X < (1-\beta)\mu] < e^{-\beta^2\mu/2}$, for $0 < \beta < 1$.

Union Bound. Consider events $A_1, \ldots, A_n \subseteq \Omega$, where Ω is a sample space. Then we have that

$$\Pr\left[\bigcup_{i=1}^{n} A_i\right] \leq \sum_{i=1}^{n} \Pr\left[A_i\right].$$

Bernoulli Trials. Let X be a Bernoulli random variable that is equal to 1 with probability p and is equal to 0 with probability $1-p$. The expected number of independent trials until this variable X will be equal to 1 is exactly:

$$\sum_{t=1}^{\infty} (1-p)^{t-1} \cdot p \cdot t = \frac{1}{p}.$$