Chernoff

$$P(X \geq (1+\delta)\mu) \leq \left(\frac{e^{\delta}}{(1+\delta)^{1+\delta}}\right)^{\mu}$$

$\mu = 25, \ \delta = 1$

$$P(X \geq 50) \leq \left(\frac{e}{4}\right)^{25}$$

$$\leq 6.3957 \times 10^{-5} \quad //$$

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<u>Markov</u> : $P(X \geq a) = \frac{E(X)}{a}$

$E(x) = np$ for a binomial distribution

$= 100 \times \frac{1}{4}$ ($P = 1/4$ $\because$ there are 4 options

$= 25$

$P(X \geq 50) = \frac{25}{50}$

$= \frac{1}{2}$ //

<u>Chebyshev</u>:

$P(|X - \mu| \geq a) \leq \frac{Var(X)}{a^2}$

$P(|X - \mu| \geq 25) \leq \frac{100 \times 1/4 \times 3/4}{25 \times 25}$

$\leq \frac{3}{100}$

However this includes $P(X \geq 50)$ and $P(X \leq 0)$

$\therefore P(X \geq 50) \leq \frac{3}{100} - P(X \leq 0)$

$\leq \frac{3}{100} - \left(\frac{3}{4}\right)^{100}$ //