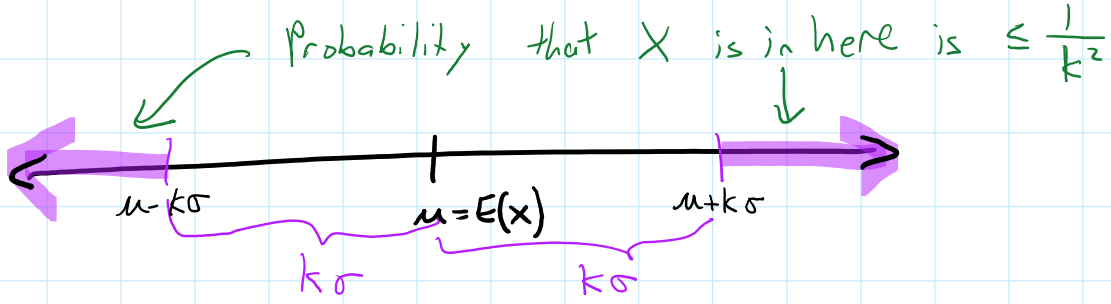
Chebyshev's Inequality: Let X be a discrete random variable with mean μ and standard deviation σ. For any $k \geq 1$,

$P(|X - \mu| \geq k\sigma) \leq \frac{1}{k^2}$.

In words, the probability that X is at least k standard deviations away from its mean is at most $\frac{1}{k^2}$.

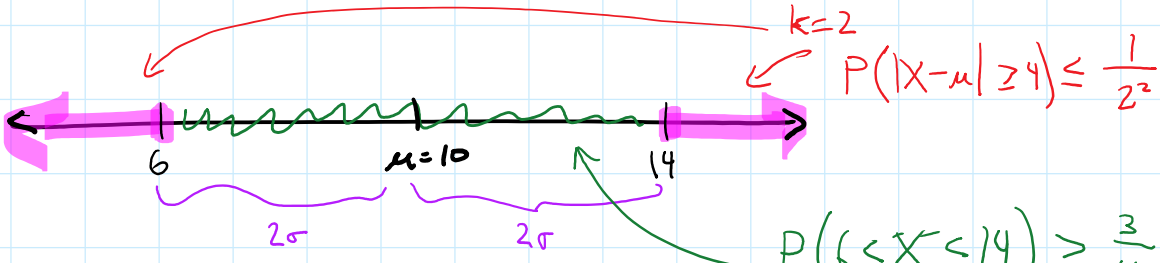
$k \geq 1$



Example: Waiting time X for a bus has mean $\mu = 10$ min and st. dev. 2 min.

Find $P(6 < X < 14) \geq \frac{3}{4}$

$= P(10-4 < X < 10+4) = P(X \text{ is within } 2\sigma \text{ of } \mu)$



$P(|X-\mu| \geq 4) \leq \frac{1}{2^2} = \frac{1}{4}$

$P(6 < X < 14) \geq \frac{3}{4}$

BINOMIAL DISTRIBUTION

1. Experiment consists of n "trials" (n fixed)
2. Each trial results in "success" or "failure"
3. Trials are independent.
4. Constant probability of success p for all trials.

The number of successes X has a binomial distribution

$$X \sim Bin(n, p)$$