Warm-up: A binomial experiment is characterized by what four properties?

1. Consists of n "trials," with n fixed in advance.
2. Each trial results in "success" or "failure."
3. Trials are independent.
4. Probability of success p is constant for all trials.

Problem: Let $X \sim \text{Bin}(20, 0.6)$. What is the probability that X is within 1.5 standard deviations of its mean?

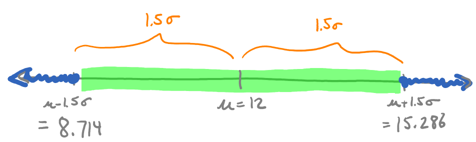
Chebyshev's Inequality: $P(|X-\mu| \geq k\sigma) \leq \frac{1}{k^2}$

$\mu = 20(0.6) = 12$, $\sigma = \sqrt{20(0.6)(0.4)} = 2.19$, $k = 1.5$ so $1.5\sigma = 3.286$

Let $k = 1.5$: $P(|X-12| \geq 3.286) \leq \frac{1}{(\frac{3}{2})^2} = \frac{4}{9}$

$P(X \leq 8.714 \text{ or } X \geq 15.286) \leq \frac{4}{9}$

$P(8.714 < X < 15.286) \geq \frac{5}{9}$



This is the best answer from Chebyshev's inequality

Exact Probability: $P(8.714 < X < 15.286) = P(X = 9, \text{ or } 10, 11, 12, 13, 14, \text{ or } 15)$

$$= \sum_{x=9}^{15} \binom{20}{x} (0.6)^x (0.4)^{20-x}$$

$$= B(15; 20, 0.6) - B(8; 20, 0.6) = \boxed{0.8925}$$