

Answer on Question #44832 – Math – Statistics and Probability

Question. A random variable X has a mean 10 and variance 4. Find

a) $P(|X - 10| \geq 3)$

b) $P(5 < X < 15)$ using Chebyshev theorem.

Solution. We shall use the Chebyshev's inequality: $P(|X - E(X)| \geq \varepsilon) \leq \frac{\text{Var}(X)}{\varepsilon^2} \Leftrightarrow P(|X - E(X)| < \varepsilon) > 1 - \frac{\text{Var}(X)}{\varepsilon^2}$. In our case $E(X) = 10, \text{Var}(X) = 4$.

a) $P(|X - 10| \geq 3) \leq \frac{4}{9}$.

b) $P(5 < X < 15) = P(-5 < X - 10 < 5) = P(|X - 10| < 5) > 1 - \frac{4}{25} = \frac{21}{25}$.

Answer.

a) $P(|X - 10| \geq 3) \leq \frac{4}{9}$.

b) $P(5 < X < 15) > \frac{21}{25}$.