

Answer on Question #75038, Math / Statistics and Probability

If  $X$  is a random variable with  $E(X) = 3$  and  $E(X^2) = 16$ , find a lower bound for the probability  $P(-2 < X < 8)$ .

Solution

Use the Chebyshev's inequality to determine a lower bound for the probability.

Note that  $\sigma^2 = E(X^2) - (E(X))^2 = 16 - (3)^2 = 7$ . Then

$$\begin{aligned} -2 < X < 8 \\ -5 < X - 3 < 5 \\ |X - 3| < 5 \end{aligned}$$

$$P(-2 < X < 8) = 1 - P(|X - 3| > 5) \geq 1 - \frac{\sigma^2}{5^2} = 1 - \frac{7}{25} = \frac{18}{25}$$

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