Answer on Question #48328 - Math - Statistics and Probability

Chebyshev's inequality

Solution:

Chebyschev's inequality formula is able to prove (with little information given) the probability of outliers existing at a certain interval.

Let X be a random variable with mean μ and variance σ^2, then for any $k > 0$ we have:

$$Pr(|X-\mu| \geq k\sigma) \leq 1/k^{2,}$$

It could be read as follows: the absolute value of the difference of X minus μ is greater than or equal to the k times σ has the probability less than or equal to one divided by k squared.

Sample use:

TASK: Computers from a particular company are found to last on average for three years without any hardware malfunction, with standard deviation of two months. At least what percent of the computers last between 31 months and 41 months?

SOLUTION: The mean lifetime of three years corresponds to 36 months. The times of 31 months to 41 months are each 5/2 = 2.5 standard deviations from the mean. By Chebyshev's inequality, at least $1 - 1/(2.5)6^2$ = 84% of the computers last from 31 months to 41 months.