Exercise for April 11, 2009

**November 2000 Course 1 Examination, Problem No. 19, also P Sample Exam Questions, Problem No. 81**

Claims filed under auto insurance policies follow a normal distribution with mean 19,400 and standard deviation 5,000. What is the probability that the average of 25 randomly selected claims exceeds 20,000?

A. 0.01  B. 0.15  C. 0.27  D. 0.33  E. 0.45

Solution.

Let \( X_1, \ldots, X_{25} \) denote the 25 collision claims, and let

\[
\bar{X} = \frac{1}{25} \left( X_1 + \ldots + X_{25} \right).
\]

We are given that each \( X_i \), \( i = 1, \ldots, 25 \) follows a normal distribution with mean 19400 and standard deviation 5000. As a result \( \bar{X} \) also follows a normal distribution with mean 19400 and standard deviation \( \frac{5000}{\sqrt{25}} = 1000 \). We conclude that (\( \Phi \) is the CDF of the standard normal distribution)

\[
\Pr(\bar{X} > 20,000) = \Pr \left( \frac{\bar{X} - 19,400}{1000} > \frac{20,000 - 19,400}{1000} \right) = \\
= \Pr \left( \frac{\bar{X} - 19,400}{1000} > 0.6 \right) = 1 - \Phi(0.6) = 1 - 0.7257 = 0.2743.
\]

Answer C.

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