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Exercise for August 13, 2005

The claim amount on a certain insurance contract has a normal distribution with mean \$1,000 and standard deviation \$250. Given 10 independent claims, what is the probability that the number of claims less than \$1,050 is less than or equal to 2?

- A. 0.9026 B. 0.6025 C. 0.5793 D. 0.3356 E. 0.0174

Solution.

Let X be the random individual claim amount, and Z denote the standard normal random variable. Then

$$\Pr(X \leq 1050) = \Pr\left(\frac{X - 1000}{250} \leq \frac{1050 - 1000}{250}\right) = \Pr(Z \leq 0.2) = 0.5793.$$

If we have 10 claims, we can treat each claim comparison to the 1050 threshold as a Bernoulli Trial, with being below 1050 treated as a success and being above 1050 treated as failure. Then the total number of claims among 10 less than \$1050 follows the binomial distribution with $p = 0.5793$ and $n = 10$, so that the probability that the number of claims less than \$1,050 is less than or equal to 2 equals

$$\binom{10}{0} \cdot 0.5793^0 \cdot 0.4207^{10} + \binom{10}{1} \cdot 0.5793^1 \cdot 0.4207^9 + \binom{10}{2} \cdot 0.5793^2 \cdot 0.4207^8 \approx 0.0174.$$

Answer E.

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