

Question #88**Key: B**

First restate the table to be CAC's cost, after the 10% payment by the auto owner:

Towing Cost, x	$p(x)$
72	50%
90	40%
144	10%

$$\text{Then } E(X) = 0.5 * 72 + 0.4 * 90 + 0.1 * 144 = 86.4$$

$$E(X^2) = 0.5 * 72^2 + 0.4 * 90^2 + 0.1 * 144^2 = 7905.6$$

$$\text{Var}(X) = 7905.6 - 86.4^2 = 440.64$$

$$\text{Because Poisson, } E(N) = \text{Var}(N) = 1000$$

$$E(S) = E(X)E(N) = 86.4 * 1000 = 86,400$$

$$\text{Var}(S) = E(N)\text{Var}(X) + E(X)^2\text{Var}(N) = 1000 * 440.64 + 86.4^2 * 1000 = 7,905,600$$

$$\Pr(S > 90,000) + \Pr\left(\frac{S - E(S)}{\sqrt{\text{Var}(S)}} > \frac{90,000 - 86,400}{\sqrt{7,905,600}}\right) = \Pr(Z > 1.28) = 1 - \Phi(1.28) = 0.10$$

Since the frequency is Poisson, you could also have used

$$\text{Var}(S) = \lambda E(X^2) = (1000)(7905.6) = 7,905,600$$

That way, you would not need to have calculated $\text{Var}(X)$.