

Question #173

Key: E

For claim severity,

$$\mu_S = 1(0.4) + 10(0.4) + 100(0.2) = 24.4,$$

$$\sigma_S^2 = 1^2(0.4) + 10^2(0.4) + 100^2(0.2) - 24.4^2 = 1,445.04.$$

For claim frequency,

$$\mu_F = r\beta = 3r, \quad \sigma_F^2 = r\beta(1 + \beta) = 12r.$$

For aggregate losses,

$$\mu = \mu_S \mu_F = 24.4(3r) = 73.2r,$$

$$\sigma^2 = \mu_S^2 \sigma_F^2 + \sigma_S^2 \mu_F = 24.4^2(12r) + 1,445.04(3r) = 11,479.44r.$$

For the given probability and tolerance, $\lambda_0 = (1.96/0.1)^2 = 384.16$.

The number of observations needed is

$$\lambda_0 \sigma^2 / \mu^2 = 384.16(11,479.44r) / (73.2r)^2 = 823.02 / r.$$

The average observation produces $3r$ claims and so the required number of claims is $(823.02 / r)(3r) = 2,469$.