Answer on Question #45532, Engineering, SolidWorks — CosmoWorks — Ansys

A company manufactures 4000 cars in a year with a probability that a part will be defective is 0.002. Find the probability that company produces a) 4 cars with defective b) at least 4 cars c) at most 4 cars with defective.

Solution

Here we are dealing with binomial distribution and hence we will use formula for probability mass function:

$$f(k; n, p) = \Pr(X = k) = \binom{n}{k} p^k (1 - p)^{n-k}$$

where n=4000 is number of randomly selected cars, k=4 is number of defective cars and p=0.002 is probability. a) So, the probability to find 4 defective cars among 4000 is

$$Pr(X = 4) = \binom{4000}{4} \cdot 0.002^4 \cdot (1 - 0.002)^3 996 = 0.0571663$$

c) Here we have to add probabilities that 0 or 1 or 2 or 3 or 4 cars are defective

$$P = Pr(X = 0) + Pr(X = 1) + Pr(X = 2) + Pr(X = 3) + Pr(X = 4) =$$

$$= 0.0003328 + 0.0026676 + 0.010689 + 0.028547 + 0.0571663 = 0.099403$$

b) To find that at least cars are defective is the same that to find sum of probabilities that 4 or 5 or ... 3999 or 4000 cars are defective. Or, to find 1 - (0 or 1 or 2 or 3 cars are defective). Hence

$$P = 1 - Pr(X = 0) - Pr(X = 1) - Pr(X = 2) - Pr(X = 3) =$$

$$= 1 - 0.0003328 - 0.0026676 - 0.010689 - 0.028547 \approx 0.95776$$