

Answer on Question #45482 – Math - Statistics and Probability

Previous results indicate that 1 in 1000 transistors are defective on average. Without using table,

- a) determine the largest number, N , of transistors that can be put in a box so that the probability of acceptable transistors is at least 0.5.

Solution

We can use Poisson approximation to Binomial distribution.

$$\lambda = Np = \frac{N}{1000};$$

The probability of acceptable transistors is

$$P(X = 0) = \frac{\lambda^0 e^{-\lambda}}{0!} = e^{-\lambda} = e^{-\frac{N}{1000}}.$$

$$e^{-\frac{N}{1000}} = 0.5 \rightarrow -\frac{N}{1000} = \ln 0.5 \rightarrow N = 1000 \ln 2 = 693.147.$$

Choose $N = 693$ or less.

The largest number, N , of transistors that can be put in a box so that the probability of acceptable transistors is at least 0.5 is

$$N = 693.$$

Answer: 693.