

Answer on Question #78394 – Math – Statistics and Probability Question

A pharmaceutical company receives large shipments of aspirin tablets. The acceptance sampling plan is to randomly select and test 19 tablets, then accept the whole batch if there is only one or none that doesn't meet the required specifications. If a particular shipment of thousands of aspirin tablets actually has a 4% rate of defects, what is the probability that this whole shipment will be accepted?

Solution

Let X be the number of successes in the n trials that is the number of tablets from the sample of 19 that don't meet specifications. The shipment is accepted if $X = 0$ or $X = 1$.

It follows Binomial distribution with $n = 19$ and $p = 0.04$

$$P(X = k) = \binom{n}{k} p^k (1 - p)^{n-k}, k = 0, 1, 2, \dots, 19$$

So the probability is

$$\begin{aligned} P(X \leq 1) &= P(X = 0) + P(X = 1) = \\ &= \binom{19}{0} 0.04^0 (1 - 0.04)^{19-0} + \binom{19}{1} 0.04^1 (1 - 0.04)^{19-1} = \\ &= 0.96^{18} (0.96 + 19(0.04)) = 0.8249 \end{aligned}$$

Answer: 0.8249.