

### Answer on Question #43322-Math-Statistics and Probability

A pharmaceutical company receives large shipments of aspirin tablets. The acceptance sampling plan is to randomly select and test 13 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 5% rate of defects, what is the probability that this whole shipment will be accepted?

#### Solution

This is a binomial distribution problem or sometimes called repeated independent trials. You have a very large shipment of tablets and you are to randomly select  $n = 13$ . In the conventional language of binomial problems we are going to say that success is selecting a tablet that does not meet specifications. Thus if we randomly select one tablet then the probability of success is  $p = 0.05$ . Let  $X$  be the number of successes in the  $n$  trials that is the number of tablets from the sample of 13 that don't meet specifications. The shipment is accepted if  $X = 0$  or  $X = 1$ . Thus the question is to find

$$P(X = 0 \text{ or } X = 1) = P(X = 0) + P(X = 1),$$

where

$$P(X = k) = \frac{n!}{(n - k)! k!} p^k (1 - p)^{n - k}.$$

So

$$P(X = 0) = \frac{13!}{(13 - 0)! 0!} 0.05^0 (1 - 0.05)^{13 - 0} = 0.513,$$

$$P(X = 1) = \frac{13!}{(13 - 1)! 1!} 0.05^1 (1 - 0.05)^{13 - 1} = 0.351.$$

$$P(X = 0 \text{ or } X = 1) = 0.513 + 0.351 = 0.864.$$

**Answer: 0.864.**