Answer on Question #52980 – Math – Statistics and Probability

Kellogg's marketing department conducts an experiment to find out whether consumers can distinguish between its various brands of breakfast cereal. Five very small bowls of different brands of cereal were placed in front of each of eight persons participating in the experiment. The bowls were labeled A, B, C, D and E. Each person was informed that only one bowl contained his or her favorite cereal. Suppose that none of the eight persons in the experiment was able to identify his or her favorite cereal and just guessed which bowl it was in. What is the probability that no more than two of the eight participants guessed correctly?

Solution

We have binomial distribution with $p = \frac{1}{5}$ and n=8.

The probability that no more than two of the eight participants guessed correctly is

$$P(X \leq 2) = P(X = 0) + P(X = 1) + P(X = 2)$$
$$= \frac{8!}{0!\,(8-0)!}\left(\frac{1}{5}\right)^0\left(\frac{4}{5}\right)^{8-0} + \frac{8!}{1!\,(8-1)!}\left(\frac{1}{5}\right)^1\left(\frac{4}{5}\right)^{8-1} + \frac{8!}{2!\,(8-2)!}\left(\frac{1}{5}\right)^2\left(\frac{4}{5}\right)^{8-2}$$
$$= \left(\frac{4}{5}\right)^8 + 8\frac{4^7}{5^8} + 28\frac{4^6}{5^8} = 0.7969.$$

Answer: 0.7969.