Probability Assignment

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Question: It is known that 10% of certain articles manufactered are defective. What is probability that a random sample space of 12 such articles,9 are defective?

Solution: Let X be random variable defined as

Random Variable	Values	Description
X	$1 \le X \le 12$	Number of defective in 12 articles

X has a binomial distribution with parameters

$$n = 12 \qquad p = \frac{10}{100} = \frac{1}{10} \tag{1}$$

Pmf of X for $1 \le k \le 12$ is

$$p_X(k) = {}^{n}C_k p^k (1-p)^{n-k} \tag{2}$$

Probability that a random sample space of 12 such articles,9 are defective is

$$p_X(9) = {}^{12}C_9 \left(\frac{1}{10}\right)^9 \left(1 - \frac{1}{10}\right)^{12-9} \tag{3}$$

$$= \frac{12!}{9!3!} \left(\frac{1}{10}\right)^9 \left(\frac{9}{10}\right)^3 \tag{4}$$

$$= 220 \left(\frac{1}{10^9}\right)\left(\frac{9^3}{10^3}\right) \tag{5}$$

$$= 22 \left(\frac{9^3}{10^{11}}\right) \tag{6}$$