

# Probability Assignment

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**Question:** It is known that 10% of certain articles manufactured 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
$X$	$1 \leq X \leq 12$	Number of defective in 12 articles

$X$  has a binomial distribution with parameters

$$n = 12 \quad p = \frac{10}{100} = \frac{1}{10} \quad (1)$$

Pmf of  $X$  is

$$p_X(k) = {}^nC_k p^k (1-p)^{n-k} \quad (2)$$

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

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

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

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

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