Answer on Question #44201 – Math - Statistics and Probability

A medical test has a false positive rate of 0.2. If 9 tests are conducted, what is the chance of getting exactly 2 false positive results?

Solution

The random variable $X = "the\ number\ of\ false\ positive\ results"$ is a binomial random variable,

$n = 9$ is a fixed number of trials, $p = 0.2$ is the probability of false positive result in each trial.

X can take any value of 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Assume that all trials are independent.

The probability of getting exactly 2 false positive results is calculated by

$$P(X = 2) = P(X = k) = \binom{n}{k} p^k (1 - p)^{n-k} = \frac{n!}{k!\,(n - k)!} p^k (1 - p)^{n-k} = \frac{9!}{2!\,7!} 0.2^2 (1 - 0.2)^7 =$$
$$= \frac{9 \times 8}{2} \times 0.2^2 0.8^7 \approx 0.302$$

Answer: $\frac{9 \times 8}{2} \times 0.2^2 0.8^7 \approx 0.302$