The formula that we commonly used for determining the distribution of binomial types is more generally known also as the formula for “Bernoulli trials” (when n = 1).

Let us assume that in an experiment done, ‘n’ is representing the number of trials attempted, and that ‘k’ is the count of successes that is to be attained in those ‘n’ trials. This implies that number of failures clearly will be ‘n - k’.

Assuming, ‘s’ to be the probability of succeeding in a trial, we get that the probability of failure is ‘1 - s’.

Then the formula for calculating the achievement of ‘k’ successes in ‘n’ trials is given below:

P (‘k’ successes in ‘n’ trials) = C(n,k)s raised to k\*(1−s)(n−k)

Hence, C (n, k) is evaluated as below:

C (n, k) = n!(k!(n−k)!)

With n! = n \* (n - 1) \* … \* 2 \* 1

If k > n/2 then the following is applicable,

f (k, n, s) = f (n - k, n, 1 - s)

This holds true for every k > n/2.

Problem Statement:

A test is conducted which is consisting of 20 MCQs (multiple choices questions) with every MCQ having its four options out of which only one is correct. Determine the probability that a person undertaking that test has answered exactly 5 questions wrong.

Solution:

Here, n = 20, n - k = 5, k = 20 - 5 = 15

Here the probability of success = probability of giving a right answer = s = 1/4

Hence, the probability of failure = probability of giving a wrong answer = 1 - s

= 1 - 14 = 3/4

When we substitute these values in the formula for Binomial distribution we get,

So, P (exactly 5 out of 20 answers incorrect) = C (20, 5) \* (1/4) raised to 15 \* (3/4) raised to 5

→ P (5 out of 20) = (20∗19∗18∗17∗16)/(5∗4∗3∗2∗1) \* (1/4) 15 \* (3/4) 5

= 0.0000034 (approximately)

Thus the required probability is 0.0000034 approximately.