Answer on Question #65110 - Math - Statistics and Probability| Fix 2

Question: If %10 of the rivets produced by a machine are defective, find the probability that out of 5 randomly chosen rivets:

i) one or more will be defective,
ii) at most two will be defective.

Solution: Probability for a randomly chosen rivet to be defective is $p = 0{,}1$**.** Number of rivets $n = 5$. It is a binomial experiment with $n = 5$ and $p = 0{,}1$. (For binomial experiment see for example https://www.probabilitycourse.com/chapter2/2_1_3_unordered_without_replacement.php or http://www.dartmouth.edu/~chance/teaching_aids/books_articles/probability_book/amsbook.mac.pdf , P. 96-98).

i) If by A we denote the event "one or more rivets out of 5 are defective", then it is easier to calculate probability for the complementary event $P(A^c) = P(0) = \binom{5}{0}\ 0.1^0(1 - 0.1)^5 = 0.9^5 = 0.59049$. Then, $P(A) = 1 - \ P(A^c) = 1 - 0.59049 = 0.40951$;

ii) Let by B we denote the event "at most two rivets out of 5 are defective". So, $P(B) = P(0) + P(1) + P(2) = \binom{5}{0}\ 0.1^0(1 - 0.1)^5 + \binom{5}{1}\ 0.1^1(1 - 0.1)^4 + \binom{5}{2}\ 0.1^2(1 - 0.1)^3 = 0.9^5 + 5{\times}0.1{\times}0.9^4 + 10{\times}0.1^2{\times}0.9^3 = 0.59049 + 0.32805 + 0.0729 = 0.99144.$

Answer: i) 0.40951; ii) 0.99144.