E*.  Please solve the following problems; display the computations, and upload the resulting pdf document on the appropriate Canvas assignment link:

i. A person is randomly selected from a population and tested for COVID-19 infection. A positive test result is labeled a "success" and coded as 1; a negative test result is labeled a "failure" and coded as 0. If the first person selected is infected, then the experiment is completed. If the first person is not infected than the experiment continues with the same population. This process is repeated until an infected person is selected. As of May 26, 2020, one seemingly credible estimate is 30% of the people worldwide are infected; use that figure for this problem. Compute the probability that exactly 4 trials are executed before an infected person is identified.

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Sample computation:

This is a geometric experiment so we compute the probability in question as follows with $k = 4$, and $p(1) = 0.30$ :

$$p(X = k) = (1 - p(1))^{k-1} p(1) \Rightarrow p(X = 4) = (0.70^3)(0.30) = 0.1029$$

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ii. Five cards are randomly selected from a standard 52-card poker deck and this is done *without replacement*. Determine the probability that exactly two of the selected cards are red.

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Sample computation:

This is a hypergeometric experiment so we compute the probability in question as follows with $N = 52$, $k = 26$, $n = 5$, and $x = 2$ :

$$p(X = x) = \frac{\binom{k}{x}\binom{N-k}{n-x}}{\binom{N}{n}} \Rightarrow p(X = 2) = \frac{\binom{26}{2}\binom{52-26}{5-2}}{\binom{52}{5}} \Rightarrow$$

$$p(X = 2) = \frac{(325)(2600)}{2598690} \approx 3252$$

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