## Please write Your name:

You may leave your answer in terms of sums, products, factorials or binomial coefficients, and fractions. There is NO need to simplify. NO calculators are needed.

In questions on this page, we discuss a rare not inherited genetic mutation which can occur in an individual with probability $p=10^{-6}=0.000001$, which is one in a million.
(1) Find the probability that a state of 4 million people have nobody with this particular mutation.
(2) Find the probability that a city of half a million people have at least two people with this particular mutation.
(3) Find the mean and the standard deviation of the number of mutations in the United States (current population 328 million).
(4) Patients are coming to a clinic one by one, and each randomly may have a flu with probability $25 \%$, independently one of another. Let $X$ be the number of patients until the first flu case. Find the mean and the standard deviation of $X$. You do not have to simplify your answer.
(5) In the same situation, find the probability that $X \geqslant 3$. You do not have to simplify your answer.
(6) Find the mean and the variance of a random variable which is uniformly distributed from 1 to 4 .

