NAME → TUSHAR BAJAJ
ROLL NO → 190103111
GROUP → 10

MA 212M

- Indian Army Problem ⇒ [Question 4 of Assignment -2]

Question 4)

a) Since the sample of soldiers is very large, $n = 500$ and the probability of the disease for every soldier is relatively low, $p = 10^{-3}$

we can use Poisson ~~Ratio~~ approximation, with n,

Hence if we mark X as the random variable that marks the number of diseased soldiers, we have that X has approximately $\text{Pois}(np) = \text{Pois}(0.5)$, Thus,

$$P(X \geq 1) = 1 - P(X = 0) = 1 - e^{-0.5} \approx 0.393$$

So, probability that at least one soldier will be tested positive is 0.393.

b) Now, we are given the information that test is positive i.e., $X \geq 1$.

Now we have to probability of $X \geq 1$ given that information. We have that

$$P(X > 1 \mid X \geq 1) = \frac{P(X > 1, X \geq 1)}{P(X \geq 1)}$$

$$= \frac{P(X \geq 2)}{P(X \geq 1)}$$

$$= \frac{1 - e^{-0.5} - 0.5e^{-0.5}}{1 - e^{-0.5}}$$

$$= 0.229$$