

1. Let X = time between successive mosquito bites = time until the next mosquito bite.

The mosquito bites occur according to a Bernoulli process with parameter $p = 0.5 \cdot 0.2 = 0.1$. X is a geometric random variable, so $\mathbf{E}[X] = \frac{1}{p} = \frac{1}{0.1} = 10$.

2. $\text{var}(X) = \frac{1-p}{p^2} = \frac{1-0.1}{0.1^2} = 90$.
3. Mosquito bites occur according to a Bernoulli process with parameter $p = 0.1$. Tick bites occur according to another independent Bernoulli process with parameter $q = 0.1 \cdot 0.7 = 0.07$. Bug bites (mosquito or tick) occur according to a merged Bernoulli process from the mosquito and tick processes. Therefore, the probability of success at any time point for the merged Bernoulli process is $r = p + q - pq = 0.1 + 0.07 - 0.1 \cdot 0.07 = 0.163$. Let Y be the time between successive bug bites. As before, Y is a geometric random variable, so $\mathbf{E}[Y] = \frac{1}{r} = \frac{1}{0.163} \approx 6.135$.

4. $\text{var}(Y) = \frac{1-r}{r^2} = \frac{1-0.163}{0.163^2} \approx 31.503$.