

Coalescent practice problems*Note: some of these will be part of Lab 7*

1. Let μ be the per base, per generation mutation rate. Given that the expected time to coalescence for two lineages is $2N$ generations, how many differences do we expect between two sequences?

2. The expected value of T_i (time when there are i lineages) is:

$$E[T_i] = \frac{1}{\binom{i}{2}} = \frac{2}{i(i-1)}.$$

Let T_{total} be the total branch length of the coalescent genealogy (sum of all branch lengths). Making use of $E[T_i]$, what is $E[T_{\text{total}}]$ (your result can include a summation)?

3. Using $E[T_i]$ again, what is the expected value of T_{MRCA} , the time to most recent common ancestor of the entire sample? Let the sample size be n . Simplify your result so it does not include a summation.