

Homework #5

- Assume the **JC69 model** and that **all edges have length 0.38311922** expected substitutions per site.
- **Compute the transition probabilities probsame and probdiff and write the values in the spaces provided** (probsame is the transition probability when the same base is observed at both ends of an edge, probdiff is the transition probability when different bases are observed across an edge).
- **Compute the likelihood for each of the 16 combinations and write it on the appropriate tree** in the next slide (use **7 decimal places**). **Place tick marks on edges** in which a change occurs (the number of tick marks will equal `ndiff` below).
- Finally, **sum these 16 values** to obtain the overall site likelihood and write that in the space provided (again, use 7 decimal places).
- Note that I'm asking for likelihood, **not** $\log(\text{likelihood})$
- Below is a Python template for calculating one of the 16 values:

```
from math import log,exp,pow
nsame = 3.
ndiff = 2.
probsame = # replace with number or formula
probdiff = # replace this number or formula
loglike = log(0.25) + nsame*log(probsame) + ndiff*log(probdiff)
like = exp(loglike)
print(like)
```

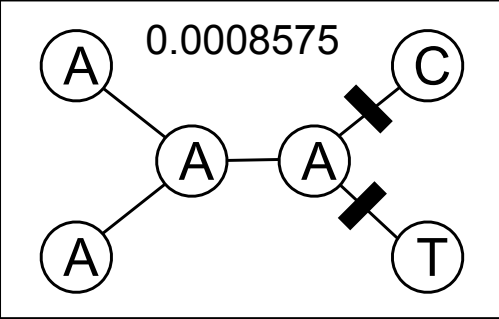
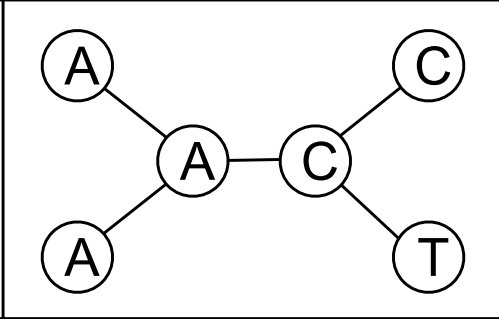
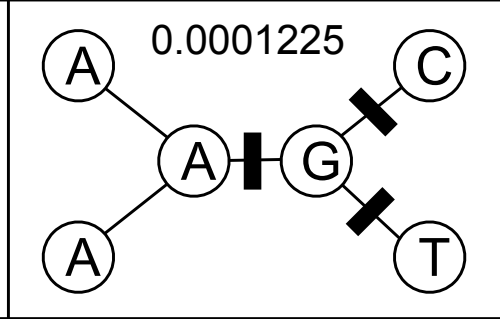
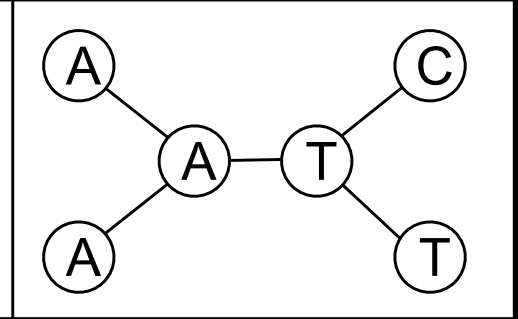
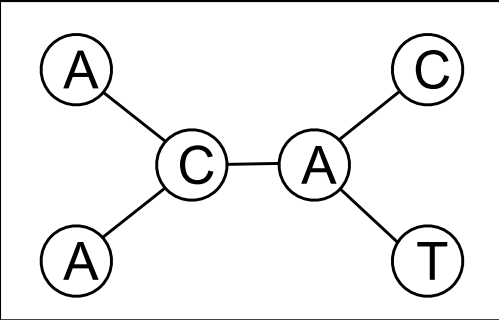
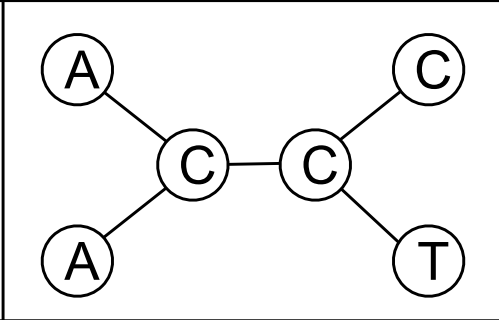
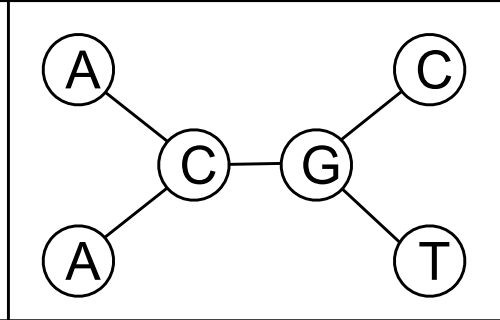
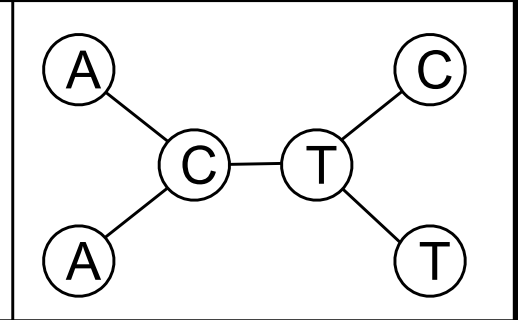
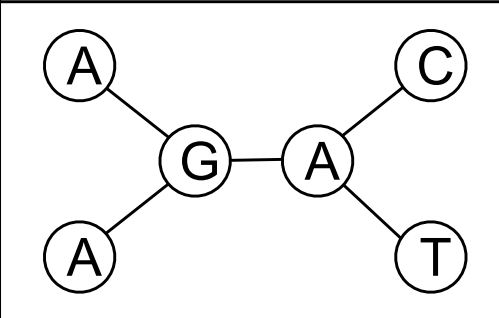
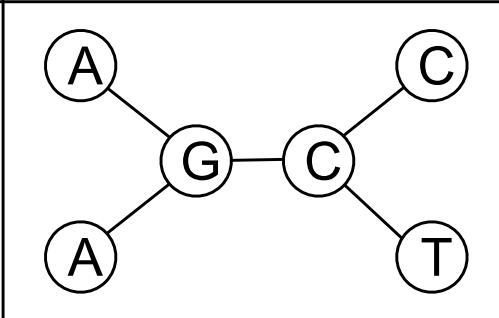
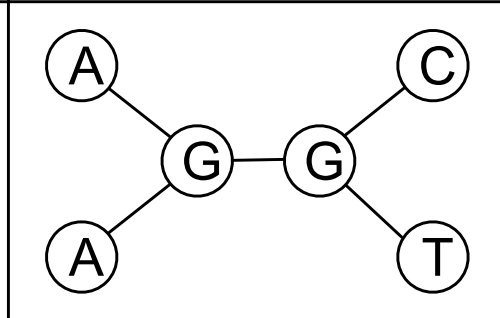
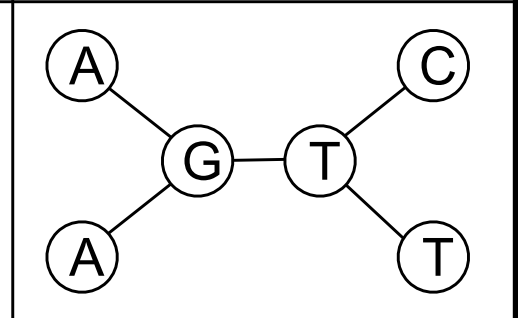
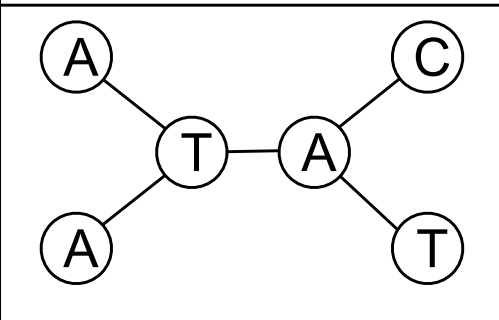
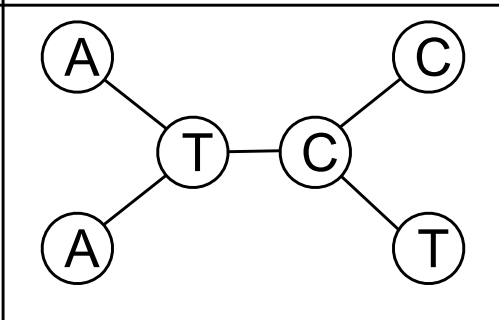
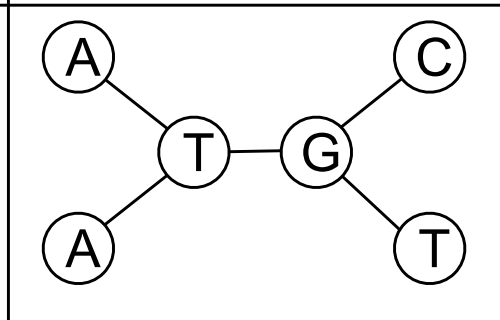
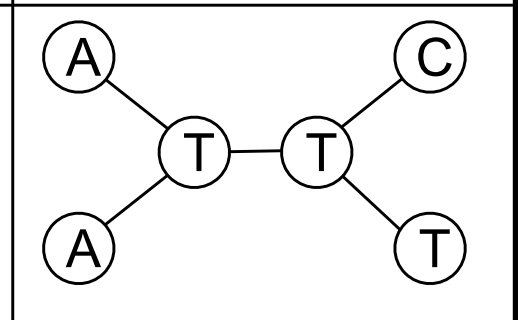
I've done the 1st and 3rd of the 16 ancestral state combinations, so use those results to make sure your program works correctly. After that, you only need to change `nsame` and `ndiff` to do the others. Note that you really only have to calculate 4 values because many ancestral state combinations have the same `nsame` and `ndiff`.

Homework #5 worksheet

Overall likelihood: _____

probsame: _____

probdiff: _____

| | | | |
|---|--|--|---|
|  <p>0.0008575</p> |  |  <p>0.0001225</p> |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |