This document illustrates how the meta-NJ algorithm works for some very small examples. To follow these notes you will need to refer to the details of the algorithm defined in the Appendix. Consider the following tree topologies for five taxa A,B,C,D,E:

Topology 1:	((A,B),(C,D),E)
Topology 2:	((A,B),(D,E),C)
Topology 3:	((A,C),(B,D),E)
Topology 4:	((A,C),(B,E),D)
Topology 5:	((A,C),(D,E),B)

Topologies 1–4 are shown in Figure 1 together with the corresponding meta-tree, while topology 5 is additional. It is useful to decompose each topology as a set of (non-trivial) splits:

	AB|CDE	AC|BDE	DE|BCD	CD|ABE	BD|ACE	BE|ACD
T_1	✓			✓		
T_2	✓		✓			
T_3		✓			✓	
T_4		✓				✓
T_5		✓	✓			

First consider the construction of the meta-tree for topologies 1–4. Initially the meta-tree has the star topology, and the tree topology associated to the interior vertex is the majority consensus of topologies 1–4, i.e. the fully unresolved tree on A,B,C,D,E. The final meta-tree is constructed with a single agglomeration. The table below lists the possible agglomerations, which conditions hold for each split under each agglomeration, and the resultant meta-tree. Note that the algorithm for determining the trees T_X and T_Z ensures that a split must occur in strictly more than one of the original set of trees to appear in an interior vertex on a meta-tree. Thus it is only necessary to consider splits AB|CDE and AC|BDE.

Agglomeration:	T_1&T_2	T_1&T_3	T_1&T_4
AB|CDE	$C2$	$C1$&$C4$	$C1$&$C4$
AC|BDE	$C3$	$C1$&$C4$	$C1$&$C4$
T_X	{AB|CDE}	∅	∅
T_Z	{AC|BDE}	∅	∅
Meta-tree topology	$((1,2),(3,4))$	$(1,2,3,4)$	$(1,2,3,4)$
Meta-tree score	6	8	8

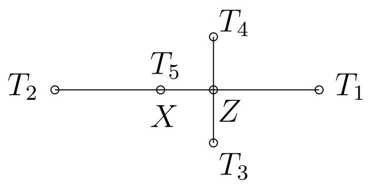
The agglomeration of T_1 and T_2 produces the meta-tree with the lowest score, as shown in figure 1. The other two possible agglomerations result in the branch length XZ being zero, and so are excluded from consideration. (In any case, they leave the meta-tree unchanged.)

Now consider building a meta-tree for all five topologies T_1-T_5. The initial meta-tree has the star topology and the tree topology associated to the internal vertex contains the single (non-trivial) split AC|BDE. This configuration has score 9: T_1 and T_2

differ by 3 splits from the internal vertex, while each of T_3, T_4, T_5 differ by just one split. There are 10 possible agglomerations. The table below lists four of these, chosen so as to be representative, and specifies their affect on the meta-tree. As before, it is only necessary to consider splits that are contained in at least two of the original topologies, since otherwise the split cannot appear at an internal meta-vertex.

Aggomeration:	T_1&T_2	T_1&T_3	T_3&T_4	T_2&T_5
AB|CDE	$C2$	$C4$	$C4$	$C4$
AC|BDE	$C3$	$C1$&$C4$	$C2$	$C1$&$C4$
DE|BCE	$C4$	$C4$	$C4$	$C2$
T_X	{AB|CDE}	{AC|BDE}	{AC|BDE}	{AC|BDE, DE|ABC}
T_Z	{AC|BDE}	{AC|BDE}	$\varnothing$	{AC|BDE}
Meta-tree topology	$((1,2),(3,4,5))$	$(1,2,3,4,5)$	$((3,4),(1,2,5))$	See below
Meta-tree score	7	9	9	7

The agglomeration represented by the second column results in XZ having zero length, and so is not accepted as being valid. The agglomeration between $A = T_2$ and $B = T_5$, shown in the fourth column, produces a meta-tree for which BX has zero branch length:



Although it has the same score as the agglomeration between T_2 and T_5, the agglomeration between T_1 and T_2 is preferred since the corresponding meta-tree has no zero-length branches. It is accepted as the minimum-score agglomeration. Further steps of the algorithm do not lead to any further refinements, so column 1 of the table above corresponds to the final meta-tree.