

**Practice:** Use the Neighbor Joining Algorithm to build the tree for the following distance matrix:

$n=4$

	A	B	C	D	$\frac{u}{2}$
A	0	3	4	3	10
B	3	0	4	5	12
C	4	4	0	1	9
D	3	5	1	0	9

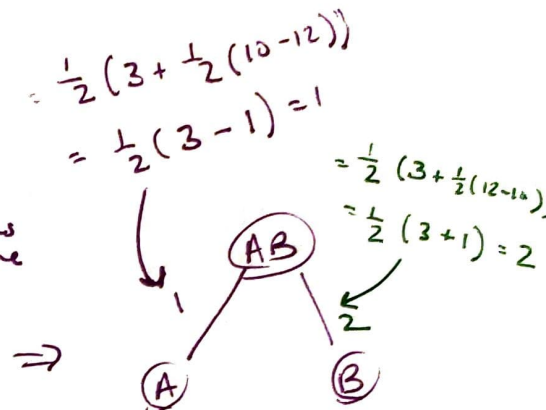
$S_D(A,B) = 2 * 3 - 10 - 12 = -16$  \* pick this as smallest one

$S_D(A,C) = 2 * 4 - 10 - 9 = -11$

$S_D(A,D) = 2 * 3 - 10 - 9 = -13$

$S_D(B,C) = 2 * 4 - 12 - 9 = -13$

$S_D(B,D) = 2 * 5 - 12 - 9 = -11$

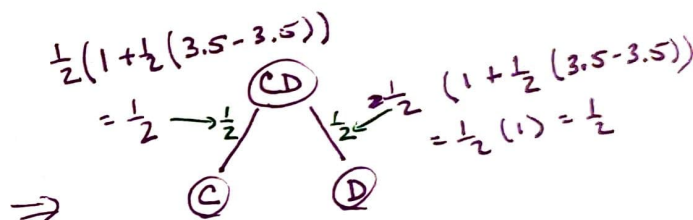


Merge A+B

New entries for smaller table

$D(AB, C) = \frac{1}{2}(4 + 4 - 3) = 2.5$

$D(AB, D) = \frac{1}{2}(3 + 5 - 3) = 2.5$



↓

$n=3$

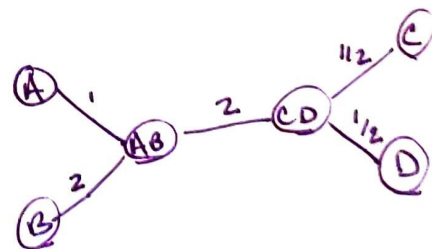
	AB	C	D	$\frac{u}{2}$
AB	0	2.5	2.5	5
C	2.5	0	1	3.5
D	2.5	1	0	3.5

$S_D(AB,C) = 1 * 2.5 - 5 - 3.5 = -6$

$S_D(AB,D) = 1 * 2.5 - 5 - 3.5 = -6$

$S_D(C,D) = 1 * 1 - 3.5 - 3.5 = -6$  \* pick this as smallest

Final Tree



Merge C+D  
new entries for smaller table

$D(AB, CD) = \frac{1}{2}(2.5 + 2.5 - 1) = 2$

⇒

	AB	CD
AB	0	2
CD	2	0

table is 2x2, so, stop.