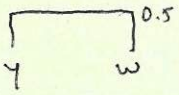
Tyler Bradley | ECES T-590 HW 2 | 2/23/19

(1) a) X: TACCC6AT
Y: TAAACGAT
Z: AAAACGCG
W: AAAACGAT

Hamming Distance Matrix

	X	Y	Z	W
X	0	2	5	3
Y		0	3	1
Z			0	2
W				0



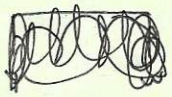
	X	Z	YW
X	0	5	2.5
Z		0	2.5
YW			0

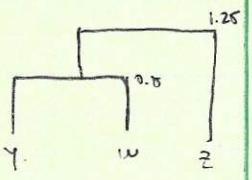
$d(yw,x) = \frac{d(y,x) + d(w,x)}{2} = \frac{2+3}{2}$

$= 2.5$

$d(yw,z) = \frac{d(y,z) + d(w,z)}{2} = \frac{3+2}{2}$

$= 2.5$

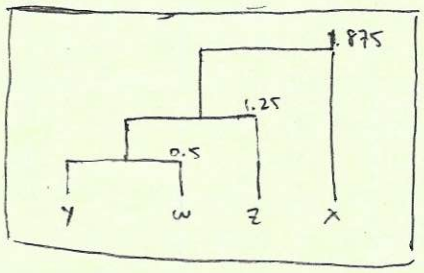




	X	ZYW
X	0	3.75
ZYW		0

$d(zyw,x) = \frac{d(z,x) + d(yw,x)}{2} = \frac{5+2.5}{2}$

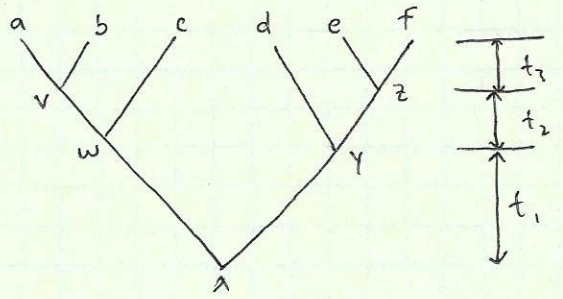
$= 3.75$



This tree is not ultrametric

* See part b) on bootstrapping in the attached matlab code

(2) Show the expression for obtaining $Pr(a,b,c,d,e,f \mid T, m)$



$P_{xy}(t_1)$ ~ prob of going from x to y in time, t_1

$$Pr(a,b,c,d,e,f \mid T, m) = \sum_x \sum_y \sum_z \sum_w \sum_v pr(x)\left[P_{xy}(t_1) \cdot P_{yd}(t_2+t_3) \cdot P_{yz}(t_2) \cdot P_{ze}(t_3) \cdot P_{zf}(t_3) \cdot P_{xw}(t_1) \cdot P_{wc}(t_2+t_3) \cdot P_{wv}(t_2) \cdot P_{vb}(t_3) \cdot P_{va}(t_3)\right]$$