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$3^m - 2^{n+1} = X \to Y$

we have D Items. who choose k of the items to form the left hand side of the rule. there is $\binom{D}{K}$ posibilities. after selecting the left hand side ther are $\binom{D-k}{i}$ ways to form the right hand side this is how we get this

$\sum_{K=1}^{D} \binom{D}{K} \sum_{i=1}^{D-k} \binom{D-K}{i}$

$\sum_{K=1}^{D} \binom{D}{K} (2^{D-K} - 1)$ we use the formula and subtract two. then we multiple the sume across the result

$\sum_{K=1}^{D} \binom{D}{K} 2^{D-K} - \sum_{K=1}^{D}$ we use the formula again.

$\sum_{K=1}^{D} \binom{D}{K} 2^{D-K} - (2^D + 1)$

for all the sets we subtract 2 for the empty sets. so $\sum_{i=1}^{D} \binom{D}{i} = 2^n - 1$

we have $(1 + X)^D = \sum_{i=1}^{D} 2^{D-i}$ we replace $x = 2$ we get $(1 + 2)^D$ that's how we get

$3^D - 2^D - [2^D + 1] = 3^D + 2^{D+1} + 1]$

3. Single linkage

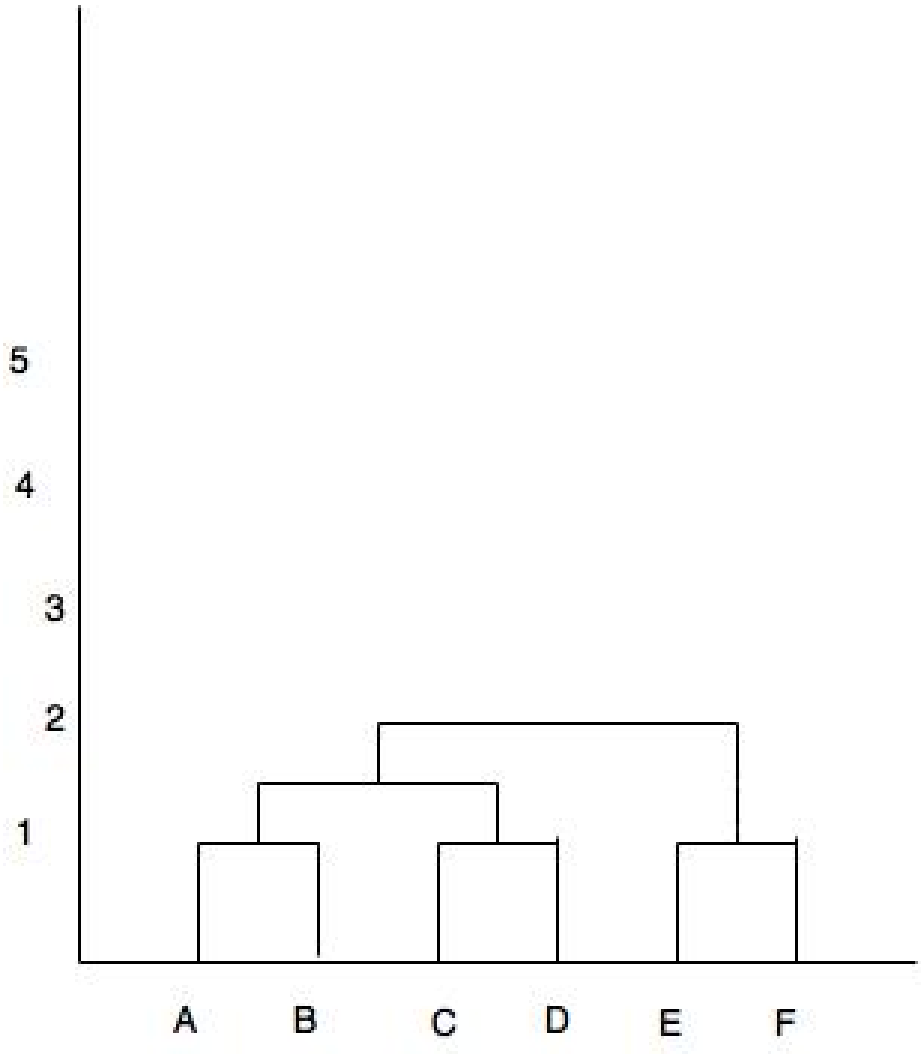
	A	B	C	D	E	F
A						
B	1					
C	$\sqrt{5}$	$\sqrt{2}$				
D	$\sqrt{10}$	$\sqrt{5}$	1			
E	$\sqrt{13}$	$\sqrt{10}$	2	$\sqrt{5}$		
F	$\sqrt{20}$	$\sqrt{17}$	3	$\sqrt{10}$	1	

	C	D	E	F	AB
C					
D	1				
E	2	$\sqrt{5}$			
F	3	$\sqrt{10}$	1		
AB	$\sqrt{2}$	$\sqrt{5}$	$\sqrt{10}$	$\sqrt{17}$	

	E	F	AB	CD
E				
F	1			
AB	$\sqrt{10}$	$\sqrt{17}$		
CD	2	$\sqrt{2}$	1	

	AB	CD	EF
AB			
CD	$\sqrt{2}$		
EF	$\sqrt{10}$	2	

	EF	CDAB
EF		
CDAB	2	



complete linkage

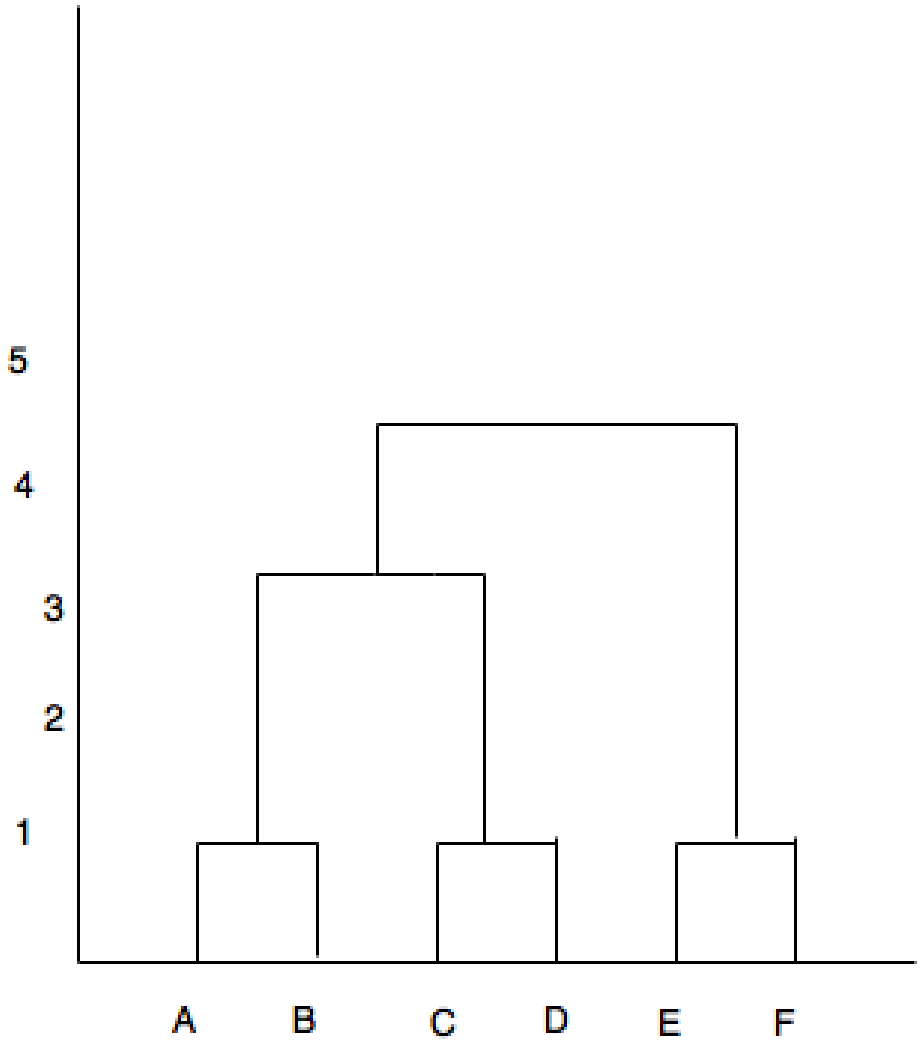
	A	B	C	D	E	F
A						
B	1					
C	$\sqrt{5}$	$\sqrt{2}$				
D	$\sqrt{10}$	$\sqrt{5}$	1			
E	$\sqrt{13}$	$\sqrt{10}$	2	$\sqrt{5}$		
F	$\sqrt{20}$	$\sqrt{17}$	3	$\sqrt{10}$	1	

	C	D	E	F	AB
C					
D	1				
E	2	$\sqrt{5}$			
F	3	$\sqrt{10}$	1		
AB	$\sqrt{5}$	$\sqrt{10}$	$\sqrt{13}$	$\sqrt{20}$	

	E	F	AB	CD
E				
F	1			
AB	$\sqrt{13}$	$\sqrt{20}$		
CD	$\sqrt{5}$	$\sqrt{10}$	$\sqrt{10}$	

	AB	CD	EF
AB			
CD	$\sqrt{10}$		
EF	$\sqrt{20}$	$\sqrt{10}$	

	EF	CDAB
EF		
CDAB	$\sqrt{20}$	



average linkage

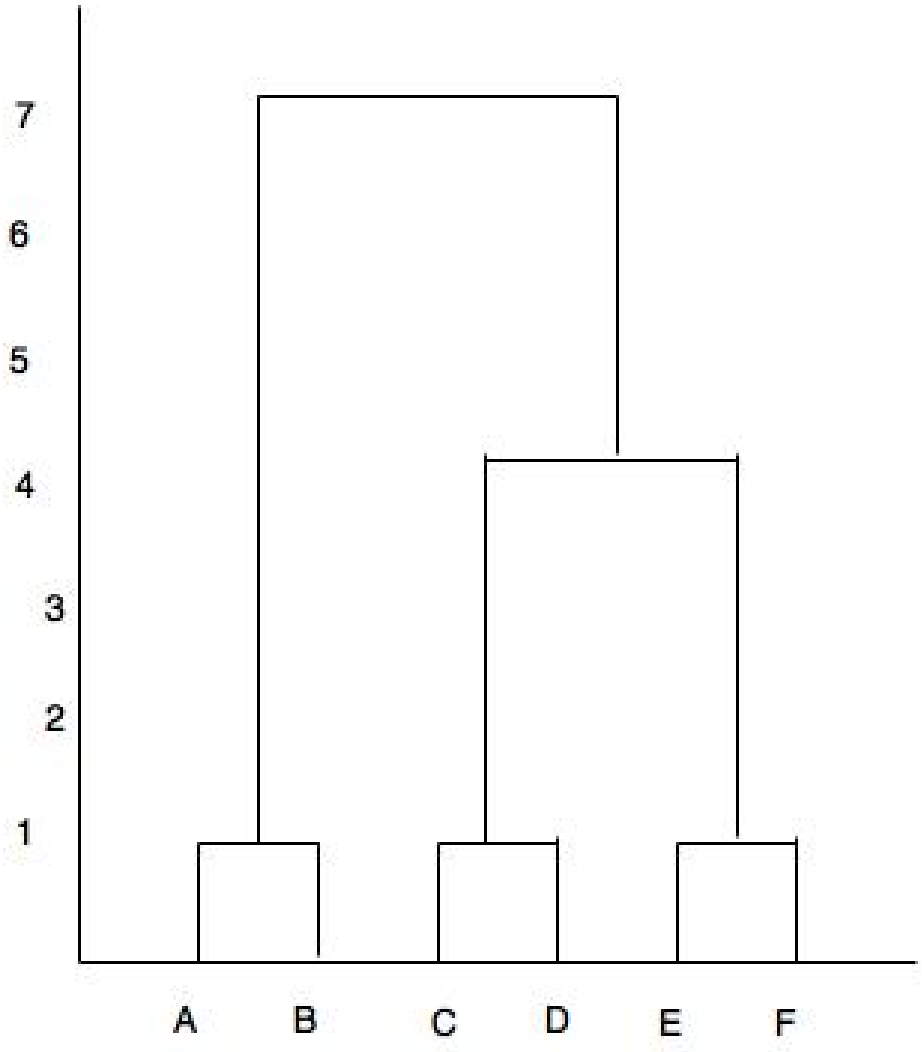
	A	B	C	D	E	F
A						
B	1					
C	$\sqrt{5}$	$\sqrt{2}$				
D	$\sqrt{10}$	$\sqrt{5}$	1			
E	$\sqrt{13}$	$\sqrt{10}$	2	$\sqrt{5}$		
F	$\sqrt{20}$	$\sqrt{17}$	3	$\sqrt{10}$	1	

	C	D	E	F	AB
C					
D	1				
E	2	$\sqrt{5}$			
F	3	$\sqrt{10}$	1		
AB	1.825	5.398	6.767	8.595	

	E	F	AB	CD
E				
F	1			
AB	6.767	8.595		
CD	2.236	6.162	7.223	

	AB	CD	EF
AB			
CD	7.223		
EF	7.681	4.199	

	AB	CDEF
AB		
CDEF	7.452	


7
6
5
4
3
2
1
A
B
C
D
E
F