1. a) u _ _ _ _ $= \binom{4}{4} = 1$

$u\,u$ _ _ _ $= \binom{4}{3} = 4$

$u\,u\,u$ _ _ $= \binom{4}{2} = 6$

total = 11

b) 1u $5! = 120$

2u $\frac{5!}{2!} \cdot 4 = 240$

3u $\frac{5}{3!} \cdot 6 = 120$

480

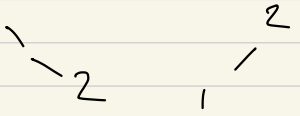
2) $\binom{13}{2}\binom{4}{2}\binom{4}{2} \cdot 44$

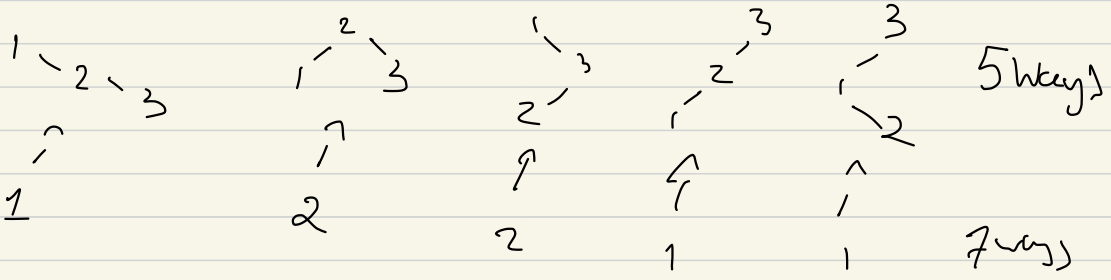
3) If fighting couple receives no songs: $\binom{21}{5} = 20349$

If fighting couple receives 1 song: $\binom{20}{5} = 15504$

Total: 35,853 ways

stars and bars

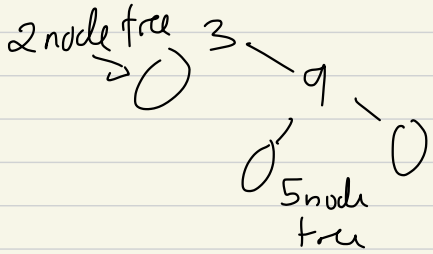
4) 2 nodes:  2 ways

Repeat 3 nodes:  5 ways

4 nodes

7 ways

5 nodes : 42 ways to generate based on above pattern ✱



$= 2 \cdot 42 \cdot 5 =$ 420

5) 17 ways:

no nurse on break

7111 3214 2233
6211 2512
5311 2224
4411 3331

1 nurse on break

712 631
811 622
541 532
442 433