

a. unusual
unusual
5 elements
 $2^5 = 32$ different subsets

b. (u r!)
2 u's $\binom{5}{2} \binom{4}{1} \binom{3}{1} \binom{2}{1}$
3 u's $\binom{5}{3} \binom{4}{1} \binom{3}{1}$

$$5! + \frac{5!}{2!1!} \cdot 4 \cdot 1 \cdot 2 + \frac{5!}{3!1!} \cdot 4 \cdot 3$$

$$5! (1 + 2 + 1)$$

$$\boxed{4(5!)}$$

2. $\binom{11}{2} \binom{4}{3} \binom{4}{2} \binom{4}{1}$
 $\frac{11!}{2!9!} \cdot \frac{4!}{3!1!} \cdot \frac{4!}{2!2!} \cdot 4 \cdot 4$
 $11 \cdot 6 \cdot 6 \cdot 6 \cdot 4 \cdot 4 = \boxed{123,552}$

3. $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 = 16$
say x_1 has the 1 song in this case
 $x_2 + x_3 + x_4 + x_5 + x_6 + x_7 = 15$
 $\binom{15}{15}$ ways

full solution of

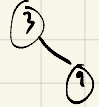
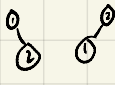

$$7 \cdot \binom{15}{15} \text{ for 7 different songs to get the 1 song}$$

$$= 7 \cdot \frac{20!}{15!5!}$$

$$= 7 \cdot \frac{20 \cdot 19 \cdot 18 \cdot 17 \cdot 16}{5 \cdot 4 \cdot 3 \cdot 2}$$

$$= 21 \cdot 19 \cdot 17 \cdot 16$$

$$= \boxed{108,528}$$

4.  3 left subtree
 2
 1

9 right subtree
10, 11, 12
7 different rotations

9 left subtree



n=1	1	f(1)	2 ⁰
n=2	2	(f(1)) ²	2 ¹
n=3	4	(f(1)) ²	2 ¹⁺¹
n=4	16	(f(1)) ²	2 ²⁺¹
n=5		f(n) = f(n-1) ²	
		f(n) = 2 ^{2(n-1)}}	

n=6
f(6) = 1024

5. is on break
each gets 1
so 7 people
over 3 names
2 stars
7 stars
 $\binom{7}{7} = \frac{7!}{7!0!} = 1 \cdot 4 = 36$

not on break
each gets 1
so 6 people left
3 bars
6 stars
 $\binom{9}{6} = \frac{9!}{6!3!} = \frac{7 \cdot 8 \cdot 7}{2 \cdot 2} = 27 \cdot 3 = 104$
104 + 36
 $\boxed{140}$