Counting Problems

Saman Nejad

1) A) Unique subsets of 5 letters from unusual : unusual = U shows up 3 times

so set = {U, N, S, A, L}

B) How many diff strings could be made from 5 of those 7 letters.

with replacement

$5! = 120$

A) 1

B) 120

2) Combination

$\binom{13}{2}\binom{4}{2}^2\binom{11}{1}\binom{4}{1} = 78 \times 36 \times 11 \times 4 = 123,552$

3) combination

$n = 16$ songs

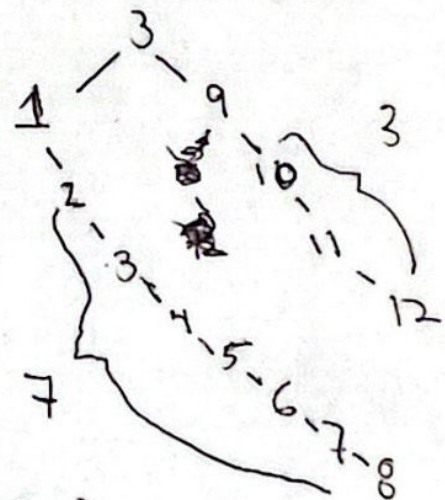
r = # sets of couple = 7

1 couple has 15 left so 1 song

$\binom{16}{1}\binom{15}{6} = 16 \times 5005 = 80,080$

4) $n = 12$

Distinct values {1, 123



Using Catalan formula

$\frac{1}{n+1}\binom{2n}{n}$

$\binom{2(7)}{7}\left(\frac{1}{7+1}\right) = \binom{14}{7}\left(\frac{1}{8}\right) = 3432 \cdot \frac{1}{8} = 429$

$\binom{2(3)}{3}\left(\frac{1}{3+1}\right) = \binom{6}{3}\left(\frac{1}{4}\right) = 20 \cdot \frac{1}{4} = 5$

$429 \times 5 = 2145$

5] 10 people

4 identical nurses

1 nurse may or may not be on break

1 person served per nurse guaranteed, but service of arbitrary

X combinations for number of patients served by nurse

$|A \cup B| = |A| + |B| - |A \cap B|$

A: Nurse is on break

b: Nurse is not on break

A: $\binom{10}{7} = 120$

$\Rightarrow 210 + 120 -$

B: $\binom{10}{3} = 120$

$n = 4$

$r = 10$

$\binom{n-1+r}{r} = \binom{n-1+r}{n-1}$

$\binom{13}{3} = 286$

Or

After

r = indistinguishable aka identical

$\binom{r-1}{r-n}$, where $r = 10$

$n = 4$

$\therefore$

$\binom{10-1}{10-4} = \binom{9}{6} = 84$