Name: Richard

QUIZ 8

MATH 300
September 17, 2024

1. How many permutations of the letters A,B,C,D,E,F,G are there in which the letters ABD appear consecutively, in alphabetical order?

ABC [4|3|2|1] ← 4! of these

[4] ABC [3|2|1] ← 4! of these

[4|3] ABC [2|1] ← 4! of these

[4|3|2] ABC [1] ← 4! of these

[4|3|2|1] ABC ← 4! of these

Answer $5 \cdot 4! = 5 \cdot 24 = \boxed{120}$

2. How many 10-digit binary strings are there that do not have exactly four 1's? Show and explain your work fully.

All together there are 2^n 10-digit binary strings. Of these, $\binom{10}{4}$ have exactly four 1's.

By the subtraction principle, our answer is

$$2^n - \binom{10}{4} = 1024 - \frac{10!}{4!6!} = 1024 - \frac{10 \cdot 9 \cdot 8 \cdot 7}{4 \cdot 3 \cdot 2}$$

$$= 1024 - 210 = \boxed{814 \text{ strings}}$$

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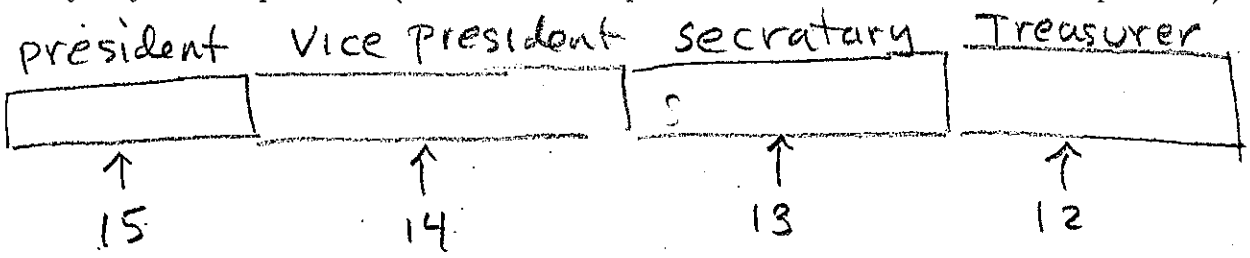
1. In a club of 15 people, a president, vice-president, secretary and treasurer must be chosen. In how many ways is this possible? (Assume that no person can serve in more than one position.)

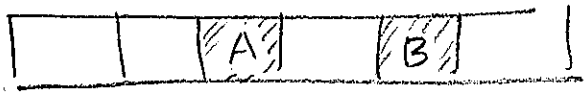


Ans $P(15,4) = 15 \cdot 14 \cdot 13 \cdot 12$

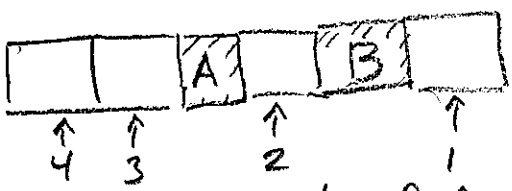
$= \boxed{32,760 \text{ ways}}$

2. This problem concerns lists of length 6 made from the letters A,B,C,D,E,F, without repetition. How many such lists are there for which the D occurs before the A? Show and explain your work.

First select 2 positions from 6 for the A and B. Fill in the A first and B second.



There are $\binom{6}{2} = 15$ ways to do this.



Next there are 4! ways to fill in the other spots.

Ans $\binom{6}{2} 4! = \frac{6!}{2!4!} 4! = \frac{6!}{2} = \frac{720}{2} = \boxed{360}$