

Problem 1

(a) group  $\binom{n}{2}$  consecutive numbers.

$\underbrace{n+1}_{\text{numbers}} \xrightarrow{\text{Choosing}} \underbrace{n}_{\text{groups}}$

(b)  $\underbrace{\text{Vertices}}_n \xrightarrow{\deg(v)} \underbrace{\{1 \dots n^2\}}_{n-1}$  degrees

Problem 2

$$\begin{aligned}
 & |S_{AII}| - |S_{18062}| + |S_{6042}| \\
 & - |S_{35876}| + |S_1 \cap S_6 \dots| + |S_6 \cap S_{3\dots}| \\
 & + |S_1 \cap S_3| - 3 |S_1 \cap S_2 \cap S_6| = \\
 & 9! - 6! - 7! - 6! + 0 + 3! + 0 - 0 \neq
 \end{aligned}$$

## Problem 3

(a)  $13 \cdot \binom{4}{2} \cdot 4^3 \cdot \binom{12}{3}$

(b)  $\binom{n+k+1}{k}$

(c) We add an extra variable  $n_{k+1}$ 

And then ignore it in the original

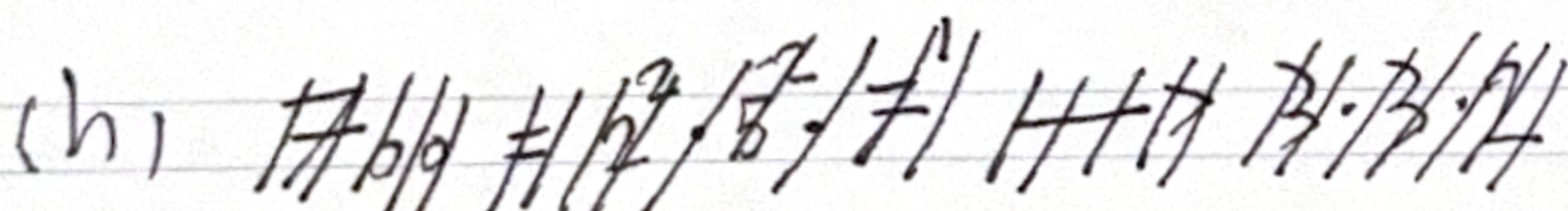
sum.  $\binom{n+k+1}{k+1}$

(d)  $2^{\binom{n}{2}}$

(e)  $2^{n^2}$

(f)  $2^{\binom{n}{2}}$

(g) We map it to a totally ordered set.  $n!$ 

(h) 

$|S_2| + |S_5| + |S_7| - |S_2 \cap S_5| - |S_2 \cap S_7| - |S_5 \cap S_7|$

$$+ 3|S_2 \cap S_5 \cap S_7| = \frac{7^{00}}{2} + \frac{7^{00}}{5} + \frac{7^{00}}{7} - \frac{7^{00}}{2 \cdot 5}$$

$$- \frac{7^{00}}{2 \cdot 7} - \frac{7^{00}}{5 \cdot 7} + 3 \frac{7^{00}}{2 \cdot 5 \cdot 7}$$

(i)  $\binom{n+k-1}{k-1} \cdot n!$

(j)  $k! \binom{n}{k} (n-k)! \binom{n-k+k-1}{k-1}$

Subject:

Year:

Month:

Date:

## Problem 4

$$(\text{Place of } *, \{0, 1\}^{h-1}) \rightarrow h 2^{h-1}$$

$$(\text{Place of } k \text{ nonzero digits, Place of } *) \\ \rightarrow \sum_{k=1}^h \binom{h}{k} k$$

## Problem 5

$h$  is odd  $\rightarrow \binom{2h}{h}$  has unequal number of reps.  
 $\rightarrow \frac{1}{2} \binom{2h}{h}$  have more reps.

$h$  is even  $\rightarrow \binom{2h}{h} - \binom{h}{n/2} \binom{h}{n/2} // // //$  reps.  
 $\rightarrow \frac{1}{2} \left( \binom{2h}{h} - \binom{h}{n/2} \binom{h}{n/2} \right)$