Probability Problems

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Abstract

This document contains a section for listing problems, and detailed subsections for each problem including the statement, hints, and solutions.

1 Problems

1.1 Problem 1

Let n and k are positive integers, where $2 \leq k \leq n+1$. Prove:

$$\sum_{i=2}^{k} \binom{i}{2} \cdot \binom{n+1}{i} = \sum_{j=0}^{k-2} \binom{n-1}{j} \cdot \binom{n+1}{2}$$

Hint: Consider a graph with $n+1$ vertices. Color the edges of the graph with $k-1$ colors, where i th color has $\binom{n+1}{i+1}$ shades. Count the number of edges.
Solution: