

1. You flip two coins, A and B . You continue flipping the pair until
 - a. you have at least one head, or
 - b. coin A is a head.

In each case give the probability for the different possible outcomes.

2. Simplify $\sum_{0 \leq i \leq n} \binom{i}{2} 2^i$.

3. Simplify

$$\sum_{b_0, s_0, s_1} \prod_{0 \leq i \leq 1} \left[\binom{a_i}{b_i - s_{i+1}} \binom{a_i - b_i + s_{i+1}}{s_i} (1 - i)^{b_i - s_{i+1}} \left(\frac{i}{2}\right)^{a_i - b_i + s_{i+1}} \right]$$

under the assumption that $b_1 = 0$ and $s_2 = 0$. Use the convention that $0^i = \delta_{i,0}$.

4. Simplify $\sum_i \binom{2n}{2p + 2i + 1} \binom{p + i}{i}$.

5. How many terms are summed in the expression $\sum_{1 \leq i \leq j \leq k \leq n} a_i b_j c_k$?