1. Suppose you role a pair of dice, where each die has faces numbered from 1 to 6. If sum of the numbers is greater than 2, the role counts, otherwise you role a second time and the numbers from the second role count. (You never role a third time.) What is the average of the sum of the numbers from the roles that count.

2. Simplify \( \sum_{0 \leq i \leq n} \frac{1}{i^2 - 1} \) or explain why it does not simplify.

3. Simplify \( \sum_i k! \frac{x^i y^{k-i}}{i!(n-i)!} \). (The \( n \) and \( k \) are not misprints.)

4. Prove that \( \sum_{0 \leq i \leq n} i^k = O(n^{k+1}) \).

5. Write \( \Gamma(n + 1/3) \) in a form where the only gamma function with a non-integer argument is \( \Gamma(1/3) \).