

1. Simplify
 - a. $4^{\lg n}$.
 - b. $\sum_{5 \leq i \leq 10} i^2$.

2. Simplify
 - a. $\sum_i (i - a)^2 \binom{n}{i}$.
 - b. $\sum_i \binom{n-i}{n-m} \binom{n}{n-i}$.

3. For the following three divide and conquer algorithms, assume that the overhead for dividing into parts is unimportant in determining the rate of growth of the running time (for large problems). The first algorithm divides the problem into three parts of half the size, the second algorithm divides the problem into four parts of one third the size, and the third algorithm divides the problem into five parts of one third the size.
 - a. What is the running time for each algorithm? (The precision of your answer should correspond to the precision of the problem statement.)
 - b. Just how big can the overhead be for each algorithm for the problem statement to remain true?
 - c. Rank the algorithms in overall speed (for large problems) from fastest to slowest.

4. Simplify $\sum_{2 \leq r \leq N} \lceil \log_3 r \rceil$.

5. Solve the equation $x = 1 + e^{ax}$ for x in terms of a when a goes to zero. That is, we want an asymptotic formula for x that is accurate for small a .

6. Suppose $T_0 = 1$, $T_1 = 2$, and $T_n = 3T_{n-1} + 4T_{n-2}$. What is the value of T_n ?