

1. Simplify $\sum_{1 \leq i} \lfloor \frac{10}{i} \rfloor$.

2. Simplify $\sum_{1 \leq i < n} i$.

3. Simplify $\sum_i i \binom{r}{i} \binom{s}{n-i}$.

4. Suppose you have k_1 a 's, k_2 b 's, k_3 c 's, and $n = k_1 + k_2 + k_3$ boxes. Each box is labelled with a number in the range 1 to n . How many can you put the a 's, b 's and c 's into the boxes when you must put exactly one letter in each box.
5. Suppose you have the same situation as question 4, except now each box can contain any number of items. (Each item must go in some box). The order of the items in a box as no significance, but the number of a 's, b 's and c 's in the box is significant.
6. Suppose you have k people and n categories. Each person is assigned a category at random. Let p_{nk} be the probability that each person is assigned a different category. Derive a recurrence equation for p_{nk} . Give boundary conditions. Compute a table of p_{nk} for small values of the indexes. (5 to 10 nontrivial values is enough for your table.)