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# Math 218: Combinatorics

HOMEWORK 15 : DUE NOVEMBER 19

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1. Recall that the Lah numbers count the number of ways to place  $k$  books in  $n$  bags where the order they are stacked in the bag matters and each bag must have at least one book.

Use *combinatorial reasoning* to prove the following recurrence of Lah numbers

$$L(k, n) = L(k - 1, n - 1) + (k + n - 1)L(k - 1, n).$$

(Hint: If you aren't sure where to begin, think back to how we broke down similar recurrence problems for related objects.)

2. Suppose we are given a generating function  $g(x) = \frac{1}{(1-x^2)^2}$ . Find a formula for the coefficient of  $x^n$  for this generating function.
3. (The first few minutes of Wednesday class will help with this problem.) Bogart #379
  - (a) What is the exponential generating function (EGF) for the sequence  $0, 1, 2, \dots$ ?
  - (b) You can think of (a) as the EGF for the number of ways to select one element from  $[n]$ . What is the EGF for the number of ways to select two elements from  $[n]$ ?