

## Answer on Question #56997 - Math - Discrete Mathematics

### Question

A book publisher has 3000 copies of a discrete mathematics book. How many ways are there to store these books in their three warehouses if the copies of the book are indistinguishable?

### Solution

The books in the warehouses are indistinguishable, that's why no matter which books will be in the warehouses. The matter is how many books will be in every warehouse.

Let us denote

the number of books in warehouse №1 by  $n_1$ ,

the number of books in warehouse №2 by  $n_2$ ,

the number of books in warehouse №3 by  $n_3$ .

We know that  $n_1 + n_2 + n_3 = 3000$ . We must find number of sets  $(n_1, n_2, n_3)$  that satisfy this equation.

This problem is equivalent to the problem:

We have a set  $A = \{0111..01111..101111..1\} =$   
 $= 0 \underbrace{11111 \dots 111}_{n_1} 0 \underbrace{1111 \dots 1111}_0 \underbrace{1111 \dots 1111}_{n_3} .$

Find the number of ways to locate the second 0 and the third 0 in the set A.

The number of 1 is 3000. The numbers of 0 is 3. The number of 1 between the nearest 0 or number of 1 after last 0 is a number of books in some warehouse. If we find the number  $n$  of possible location of second and third 0 in the set A - we will solve the problem with the warehouses.

$$n = C_{3-1}^{3000+3-1} = \frac{3002!}{3000! * 2!} = \frac{3002 \cdot 3001}{2} = 4504501$$

**Answer:** 4504501.