

3.

In Question 1 of Exercise 3, ~~there~~ there are $\binom{N+k-1}{k-1}$ (1)
 solutions of $x_1 + x_2 + \dots + x_k = n$ where x_i are non-negative.

If we subtract k from both sides ~~the~~ our equation becomes,

$$\underbrace{(x_1 - 1) + (x_2 - 1) + \dots + (x_k - 1)}_{k \text{ terms}} = n - k$$

Let $x_i - 1 = y_i$

then

$$y_1 + y_2 + \dots + y_k = n - k = N$$

~~So~~ So according to (1) there are $\binom{N+k-1}{k-1}$ solutions

if $y_1 + y_2 + \dots + y_k = N$ where y_i are non-negative.

So there are $\binom{N+k-1}{k-1} \geq \binom{n-k+k-1}{k-1} = \binom{n-1}{k-1}$

Solutions to the equation

where $x_i - 1 = y_i \geq 0$

$$\Rightarrow x_i \geq 1$$

So there are $\binom{n-1}{k-1}$

solutions to the equation $(x_1, x_2, \dots, x_k)$

$$x_1 + x_2 + \dots + x_k = n$$

with

$$x_i > 0$$

□