Answer on Question#42619- Math - Combinatorics | Number Theory

Task:

A group consists of 4 men and 7 women. In how many ways can a team of 5 be selected, if the team has at least 3 women?

Solution:

At least 3 women have to be selected, so there are three variants:

1. 3 women and 2 men were selected

2. 4 women and 1 men were selected

3. 5 women and 0 men were selected

1 item

So, the number of variants to choose 3 women out of 7:

$$C_7^3 = \frac{7!}{3! * 4!} = \frac{7 * 6 * 5 * 4 * 3 * 2}{3 * 2 * 4 * 3 * 2} = 35$$

The number of variants to choose 2 men out of 4:

$$C_4^2 = \frac{4!}{2! * 2!} = \frac{4 * 3 * 2}{2 * 2} = 6$$

So, the overall number of variants in item 1 is $C_7^3 * C_4^2 = 35 * 6 = \mathbf{210}$.

2 item

Analogous to the 1 item,

The number of variants to choose 4 women out of 7:

$$C_7^4 = \frac{7!}{3! * 4!} = \frac{7 * 6 * 5 * 4 * 3 * 2}{3 * 2 * 4 * 3 * 2} = 35$$

The number of variants to choose 1 men out of 4:

$$C_4^1 = \frac{4!}{1! * 3!} = \frac{4 * 3 * 2}{3 * 2} = 4$$

So, the overall number of variants in item 2 is $C_7^4 * C_4^1 = 35 * 4 = \mathbf{140}$.

3 item

Analogous to the 1 item,

The number of variants to choose 5 women out of 7:

$$C_7^5 = \frac{7!}{5! * 2!} = \frac{7 * 6 * 5 * 4 * 3 * 2}{5 * 4 * 3 * 2 * 2} = 21$$

The number of variants to choose 0 men out of 4:

$$C_4^0 = \frac{4!}{0! * 4!} = 1$$

So, the overall number of variants in item 3 is $C_7^4 * C_4^1 = \mathbf{21}$.

So, a team of 5 person, if the team has at least 3 women, can be selected in $210 + 140 + 21 = 371$ ways.

Answer:

371