Recitation 6

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a) How many ways can we choose the twenty batteries?

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Solution: C(24,20) = 10626

Explanation: n = 5, r = 20,

(n+r-1) choose (r) = (20+5-1) choose 20

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Twenty batteries will be put on the display. The types of batteries are AAA, AA, C, D, and 9-volt.

b) How many ways can we choose the twenty batteries but be sure that at least four batteries that are are 9-volt batteries?

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Solution: C(20,16) = 4845

Explanation: n = 5,

four 9-volt batteries are already selected: r = 20 – 4 = 16

(n+r-1) choose (r) = (16+5-1) choose 16

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Twenty batteries will be put on the display. The types of batteries are AAA, AA, C, D, and 9-volt.

c) How many ways can we choose the twenty batteries but have no more than two batteries that are 9-volt batteries?

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Solution: C(24,20)−C(21,17)=4641

Explanation:

It is harder to do directly, and easier to use the complement.

The complement of "*no more than 2 batteries that are 9-volt*" == "*at least 3 batteries that are 9-volt*".

We need to **subtract** that complement from **the total** in order to get **the number of "no more than 2 batteries that are 9-volt"**.

n = 20 – 3 = 17

C(24,20) - [(17+5-1) choose 17]

Question 2

How many non-negative solutions are there to this equation:

$x1+x2+x3+x4+x5=26$?

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How many non-negative solutions are there to this equation:
$x1+x2+x3+x4+x5=26$?

Solution:

Transfer the original problems into "We have 26 "one"s, and how many ways we have to put them into 5 bags/categories?".

It is a problem of picking "dividers"!

5 categories with 4 dividers" o | o | o | o | o or o | | o o | o | o or o o o | | o | | o ?

The remaining thing is how can we arrange these dividers.

How many available places? Still r+n-1 = 26 + 5 – 1 = 30

And we should have 5-1=4 dividers,

So, **30 choose 4 or (30 choose 26)**