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Permutations and combinations: Problem type 3

QUESTION

Serial numbers for a product are to be made using 3 letters followed by 3 digits. The letters are to be taken from the first 5 letters of the alphabet, with no repeats. The digits are taken from the 10 digits (0, 1, 2, ..., 9), with no repeats. How many serial numbers can be generated?

EXPLANATION

We will use the fundamental counting principle.

Fundamental Counting Principle

Suppose an event E_1 can occur in m_1 ways, and another event E_2 can occur in m_2 ways. Then the number of ways that E_1 followed by E_2 can occur is $m_1 \cdot m_2$.

The principle for three events

For our problem, we first find the number of ways that each of our two events can occur.

Event	Description	Number of ways that the event can occur
E_1	A permutation of 3 letters is chosen from the first 5 letters of the alphabet. No letters are repeated.	$m_1 = {}_5P_3 = \frac{5!}{2!} = 60$
E_2	A permutation of 3 digits is chosen from the first 10 digits. No digits are repeated.	$m_2 = {}_{10}P_3 = \frac{10!}{7!} = 720$

Other notations

Now we find the number of ways that our two events can occur together. That is, we find the total number of possible serial numbers.

$$\begin{aligned} m_1 \cdot m_2 &= 60 \cdot 720 \\ &= 43,200 \end{aligned}$$

Permutations and combinations: Problem type 3

A catering service offers 6 appetizers, 3 main courses, and 5 desserts. A customer is to select 3 appetizers, 2 main courses, and 3 desserts for a banquet. In how many ways can this be done?

order does not matter

$$\begin{array}{ccc} A & M & D \\ 6C_3 & \cdot & 3C_2 \cdot 5C_3 = \end{array}$$

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