Basic Counting Principle

Combinatorics

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Fulfilment

1. 5.1

2. 5.2

Now we on. . .

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2. 5.2

Two Basic Counting Principle

1. Product Rule

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Product Rule: Suppose that a procedure can be broken down into a sequence of two tasks. If there are n_1 ways to do the first task and for each of these ways of doing the first task, there are n_2 ways to do the second task, then there are $n_1 n_2$ ways to do the procedure.

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Sum Rule: If a task can be done either in one of n_1 ways or in one of n_2 ways, where none of the set of n_1 ways is same as the any of set n_2 ways. Then there are $n_1 + n_2$ ways to do the task.

Inclusion-Exclusion Principle

Suppose that a task can be done in n_1 ways or in n_2 ways, but that some of the set of n_1 ways is same as some of the set of n_2 ways.
To correctly count the ways to do the two task:
We add

- The number of ways to do it in one way

then subtract.

So. . .

The number of ways to do the task in a way that is both among the set of n_1 ways and the set of n_2 ways.
This technique is called **Inclusion-Exclusion**.

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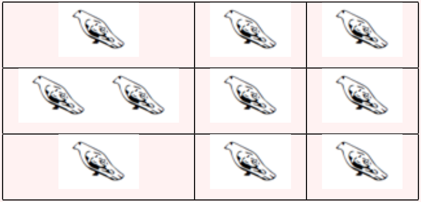

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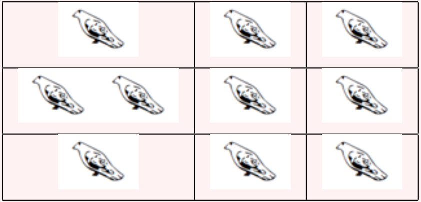

Principle:

k is a positive integer. There are n objects $(n > k)$ placed in k boxes, then there are at least one box containing two or more objects.

Corollary 1

A function (f) from set with $k+1$ of more elements to a set of k elements, not $one - to - one$.

Proof: We can proof this by pigeonhole principle. Suppose elements of x is pigeon(Domain), y elements are pigeonhole(Co-domain). Then there are at least one pigeonhole(Co-domain) that contains more than one element. That's mean, the function is not $one - to - one$.

Generalized Pigeonhole Principle

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