



Department of
Industrial Engineering

IE 454 Combinatorial Analysis

<http://ie454.cankaya.edu.tr>

Fall 2010 Tuesday 9:40-12:30 A201

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HOMework 1 (Due: Oct. 12- Group work (2 students))

- How many ways are there to arrange the letters in *ÇANKAYA*
 - with vowels in alphabetical order?
 - with vowels together?
- How many solutions are there to
 - $x_1 + x_2 + x_3 + x_4 = 11$
 $x_i \geq 0$, integer.
 - $x_1 + x_2 + \dots + x_n = -r$
 $x_i = 0$ or -1 .
- What is the probability that
 - four rolls of a single die produces at least one six?
 - twenty four rolls of a pair of distinct dice produces at least one *düşüş* (6 and 6)?
 - a roll of three distinct dice produces a sum of eleven?
- Intel produces 10 000 new chips. A sample of 85 is taken and 6 are found to be defective. What is the probability that this occurs if there are k defective chips?
- Prove the following from combinatorial viewpoint?
 - $\binom{n}{r} = \binom{n}{n-r}$.
Solution: $\binom{n}{r}$ denotes the number of different ways of selecting r objects out of n objects in an urn. If we look at the same phenomenon from the viewpoint of the objects left in the urn, the number of different ways of selecting $n - r$ objects out of n is $\binom{n}{n-r}$. These two must be equal since we derive them from two viewpoints of the same phenomenon.
 - $\binom{n}{r} = \binom{n-1}{r} + \binom{n-1}{r-1}$.
 - $\binom{n}{0} + \binom{n}{1} + \dots + \binom{n}{n} = 2^n$.
 - $\binom{n}{m} \binom{m}{r} = \binom{n}{r} \binom{n-r}{m-r}$.
 - $\binom{n}{0} + \binom{n+1}{1} + \dots + \binom{n+r}{r} = \binom{n+r+1}{r}$.