Book Ex 1

Perm or Comb?

Mini-Lecture 11.3

Combinations

$${}_nC_r = \frac{n!}{(n-r)!\,r!}$$

Order NOT matter

Examples:

1. Use the formula for ${}_nC_r$ to evaluate each expression.

   a. ${}_7C_3$ $\frac{7!}{4!\,3!} = \frac{7\cdot6\cdot5}{3\cdot2}$ [35]

   b. ${}_{10}C_7$ $\frac{10!}{3!\,7!} = \frac{10\cdot9\cdot8}{3\cdot2}$ [120]

   c. ${}_{25}C_{25}$ $\frac{25!}{0!\,25!}$ [1]

   d. ${}_{95}C_{94}$ [95]

   e. ${}_6C_0$ $\frac{6!}{6!\,0!}$ [1]

~~2.~~ SKIP Evaluate each expression.

a. $\frac{{}_4C_3}{2!} - 2!$ $\frac{4!}{1\cdot3!} \rightarrow \frac{4}{2} - 2$ [0]

b. $\frac{6!}{3!} - \frac{{}_{10}P_3}{{}_5P_2}$

c. $\frac{{}_9C_5 \cdot {}_4C_1}{{}_{13}C_6}$

d. $1 - \frac{{}_5P_2}{{}_6P_2}$

3. A five-person committee is to be elected from an organization's membership of 15 people. How many different committees are possible?

   ${}_{15}C_5 = \frac{15!}{(15-5)!\,5!} = \frac{15!}{10!\,5!} = \frac{15\cdot14\cdot13\cdot12\cdot11\cdot10!}{8\cdot4\cdot3\cdot2\cdot10!} = 3\cdot7\cdot13\cdot11 =$ [3003]

~~4.~~ 4. To win at Mega Millions lottery, you must pick 5 numbers from a collection of 56, and the Megaball number from a collection of 46. The order in which the selection is made out of the first 5 does not matter. How many different selections are possible?

   ${}_{56}C_5 \cdot {}_{46}C_1 = 3{,}819{,}816\,(46) =$ [175,711,536]

~~5.~~ 5. An exam consists of 20 multiple-choice questions and 10 open-ended problems in which all work must be shown. If an examinee must answer 15 of the multiple- choice and 5 of the open-ended questions, in how many ways can the questions and problems be chosen?

   ${}_{20}C_{15} \cdot {}_{10}C_5 = 15{,}504 \cdot 252 =$ [3,907,008]

6. How many different four-number passwords can be formed from the numbers $0-9$ if no repetition of numbers is allowed? How many if repetitions is allowed?

   $10\cdot9\cdot8\cdot7 =$ [5040] ${}_{10}P_4$

   $10\cdot10\cdot10\cdot10 = 10^4 =$ [10,000]

7. A medical researcher needs 10 people to test the effectiveness of an experimental drug. If 25 people have volunteered for the test, in how many ways can 10 people be selected?

   ${}_{25}C_{10} =$ [3,268,760]