

Book Ex 1

Perm or Comb?

Mini-Lecture 11.3

Combinations

$${}_n C_r = \frac{n!}{(n-r)! r!}$$

Examples:

Order NOT matter

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

a. ${}_7 C_3$
 $\frac{7!}{4! 3!} = \frac{7 \cdot 6 \cdot 5}{3 \cdot 2} = 35$

b. ${}_{10} C_7$
 $\frac{10!}{3! 7!} = \frac{10 \cdot 9 \cdot 8}{3 \cdot 2} = 120$

c. ${}_{25} C_{25}$
 $\frac{25!}{0! 25!} = 1$

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

e. ${}_6 C_0$
 $\frac{6!}{6! 0!} = 1$

Evaluate each expression.

a. $\frac{{}_4 C_3}{2!} - 2!$

b. $\frac{6!}{3!} - \frac{{}_{10} P_3}{{}_5 P_2}$

c. $\frac{{}_9 C_5 \cdot {}_4 C_1}{{}_{13} C_6}$

d. $1 - \frac{{}_5 P_2}{{}_6 P_2}$

SKIP

$\frac{4!}{1 \cdot 3!} \rightarrow \frac{4}{2} = 2$

0

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

${}_{15} C_5 = \frac{15!}{(15-5)! 5!} = \frac{15!}{10! 5!} = \frac{15 \cdot 14 \cdot 13 \cdot 12 \cdot 11 \cdot 10!}{8 \cdot 4 \cdot 5 \cdot 2 \cdot 10!} = 3 \cdot 7 \cdot 13 \cdot 11 = 3003$

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. 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?

$\frac{10}{10} \frac{10}{10} \frac{10}{10} \frac{10}{10} = 10^4 = 10,000$

$\frac{10 \cdot 9 \cdot 8 \cdot 7}{10 P_4} = 5040$

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?

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