1. How many possible ways are there to rearrange the letters in the word SUM?

2. How many possible ways are there to rearrange the letters in the word ADD?

3. How many possible ways are there to rearrange the letters in the word DADDA?

Permutation Rule (some items identical)

If you have a set of n items in which there are duplicate items, then the total number of ways to rearrange all

n items into _____ is given by

n_1 = the number of duplications of item 1,
n_2 = the number of duplications of item 2,
$\vdots$
n_s = the number of duplications of item s,
and
$n_1 + n_2 + \ldots + n_s = n$.

4. Given an organization with 12 members,

(a). How many different ways could they choose a President, Vice-President, and Treasurer?

(b). If they need to send a delegation of 3 members to a conference, how many different delegations could be formed?

Def. Given n objects and choosing r of them where order does not matter, the resulting unordered subsets are called _____. The total number of _____ is given by

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Note: ${}_nC_r = \binom{n}{r}$ are also called the _____

$$(x+y)^4 = \sum_{r=0}^{4} \binom{4}{r} x^{4-r}y^r = \binom{4}{0}x^4y^0 + \binom{4}{1}x^3y^1 + \binom{4}{2}x^2y^2 + \binom{4}{3}x^1y^3 + \binom{4}{4}x^0y^4 = x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4.$$

Similarly, $\binom{n}{n_1, n_2, \ldots, n_s} = \dfrac{n!}{n_1!n_2!\cdots n_s!}$ is called the _____ because it gives the coefficient of the term $x_1^{n_1}x_2^{n_2}\cdot\ldots\cdot x_s^{n_s}$ in the multinomial expansion $(x_1 + x_2 + \ldots + x_s)^n$

5. Suppose a study is conducted of families with 5 children. List out all possible ways of having 3 girls and 2 boys.

Is it a coincidence that this number ended up being _____ ?

Suppose a set of n objects has r of one type and $n - r$ (the rest) of another type. The number of distinguishable permutations is given by

EXAMPLES

1. An organization with 16 members, 9 male and 7 female, must form a team of 4 members. The team must have 2 males and 2 females. How many ways can such a team be formed?

2. An automobile comes in 8 possible colors. You also have 5 possible upgrades. How many different cars are possible if you choose

(a). 2 upgrades?

(b). 0, 1, up to 5 upgrades?

(c). 0, 1, or 2 upgrades?

3. In the Illinois Little Lotto, a person chooses 5 numbers between 1 and 39 without replacement. The first three prizes are determined as follows.

First Prize: Match all 5 numbers in any order and win \$100,000.
Second Prize: Match 4 numbers in any order and win \$100.
Third Prize: Match 3 numbers in any order and win \$10.

Find the probability of winning each of these prizes.

4. Given a standard 52-card deck, find the probability of getting the following 5 card hands.

(a). Pair of Aces with a pair of Kings.

(b). Three of a kind.

Homework: Section 1.2, p. 18: #1-9(odd), 17
1.2 Exam P Study Problems #2, 3