Combinatorics

Warm-up activity

k – permutation (variation without repetitions), variation with repetitions,
n – factorial, multiplication rule, permutation

An arrangement of members of a set in a sequence or linear order, or the act or process of changing the linear order of an ordered set.

.....

The product of all positive integers less than or equal to n.

.....

The ordered arrangement of k different elements selected from a set of n-elements. When k is equal to n, than they are defined as permutation.

.....

The ordered arrangements of k elements (could be the same) selected from a set of n-elements.

.....

Suppose an event E can occur in m different ways and associated with each way of occurring of E, another event F can occur in n different ways, then the total number of simultaneous occurrences of the two events in the given order is $m \cdot n$.

.....

https://madasmaths.com/archive/maths$_b$*ooklets*/*further*$_t$*opics*/*various*/*combinatorics.pdf*
https : //*probability.oer.math.uconn.edu*/*wp* − *content*/*uploads*/*sites*/2187/2018/01/*prob*3160*ch*1.*pdf*

1. Suppose we have 4 shirts of 4 different colors and 3 pants of different colors. How many different outfits are there?

   Ans. 12

2. What is the number of possible batting orders (in baseball) with 9 players?

   Ans. 362880

3. How many ways can one arrange 4 math books, 3 chemistry books, 2 physics books, and 1 biology book on a bookshelf so that all the math books are together, all the chemistry books are together, and all the physics books are together?

   Ans. 6912

4. A college planning committee consists of 3 freshmen, 4 sophomores, 5 juniors, and 2 seniors. A subcommittee of 4 consists of 1 person from each class. How many choices are possible?

   Ans. 120

5. Recall that for 6-place license plates, with the first three places occupied by letters and the last three by numbers, we have $26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10$ choices. What if no repetition is allowed?

   Ans. 11232000

6. A password can be made up of any 4 digit combination.

   (a) How many different passwords are possible?

   (b) How many are possible if all the digits are odd?

   (c) How many can be made in which all digits are different **or** all digits are the same?

   Ans. (a) 10000, (b) 625, (c) 5050

7. A group of 7 pupils consists of 3 girls and 4 boys. The names of two of the boys are Argi and Bargi. All seven students sit in a random order on a bench. Determine the number of sitting arrangements in which ...

   (a) Argi and Bargi sit next to each other.

   (b) Argi and Bargi do not sit next to each other.

   (c) the three girls and the four boys sit next to each other.

   Ans. a) 1440, b) 3600, c) 288

8. The nine single digit numbers from 1 to 9 are written on nine separate pieces of card. Four of these cards are picked randomly and placed next to each other to form a four digit number. Find the total different number of arrangements of ...

   (a) four digit numbers that can be formed.

   (b) four digit odd numbers that can be formed.

   (c) four digit numbers that can be formed, whose all four digits are odd.

   (d) four digit numbers that can be formed which have odd and even digits.

   (e) four digit numbers that can be formed which have at least three odd digits.

   (f) four digit numbers that can be formed whose sum of digits is 28.

   Ans. a) 3024, b) 1680, c) 120, d) 2880, e) 1080, f) 48