Explore | Expand | Enrich

Permutation and combinations

Definition:

Both **permutations and combinations** are collections of objects. But while a **combination** is a collection of the objects where the order doesn't matter, a **permutation** is an arrangement of a group of objects where the order does matter.

Example:

A **permutation** is an arrangement of all or part of a set of objects, with regard to the order of the arrangement.
Formula:

nPr = (n!) / (n-r)!

Consider arranging 3 letters: A, B, C. How many ways can this be done?

The possible permutations are

ABC, ACB,

BAC, BCA,

CAB, CBA.

Hence, there are six distinct arrangements.

Example:

An arrangement of objects in which the order is not important is called a **combination.**

This is denoted by $^{n}C_{r}$ which is equal to **n!/r!(n-r)!**

Picking a team of 3 people from a group of 10. C(10,3) = 10!/(7! · 3!) = 10 · 9 · 8 / (3 · 2 · 1) = 120. ...

Question: 01

Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

A.24400

B.21300

C.210

D.25200

Answer: D

Explanation: 01

Number of ways of selecting 3 consonants out of 7 = 7C3
Number of ways of selecting 2 vowels out of 4 = 4C2Number of ways of selecting 3 consonants out of 7 and 2 vowels out of 4 = 7C3 x 4C2

$=(7\times6\times53\times2\times1)\times(4\times32\times1)=210$

It means that we can have 210 groups where each group contains total 5 letters (3 consonants and 2 vowels).
Number of ways of arranging 5 letters among themselves =
5! = 5 x 4 x 3 x 2 x = 120 Hence, Required number of ways = 210 x 120 = 25200

Question: 02

What is the rank of a word "college" using permutations?

A.179

B.190

C.178

D.180

Answer: A

Explanation: 02

Dictionary order of letters

C,E,E,G,L,L,O

C E _ _ _ _ _ = 5!/2!= 60 words

C G _ _ _ _ _ = 5!/(2!*2!)= 30 words

C L _ _ _ _ _ = 5!/2! = 60 words

C O E _ _ _ _ = 4!/2! = 12 words

C O G _ _ _ _ = 4!/(2!*2!)= 6 words

C O L E _ _ _ = 3! = 6words

C O L G _ _ _ = 3!/2! = 3 words

C O L L E E _ = 1!= 1 word

C O L L E G E = 1 word

= 60 + 30 + 60 + 12 + 6 + 6 + 3 + 1 + 1

=179

Question: 03

In how many different ways can the letters of the word ‘CORPORATION’ be arranged so that the vowels always come together?

A.47200

B.48000

C.42000

D.50400

Answer: D

Explanation: 03

The word ‘CORPORATION’ has 11 letters. It has the vowels ‘O’,’O’,’A’,’I’,’O’ in it
An these 5 vowels should always come together. Hence these 5 vowels can be
Grouped and considered as a single letter. that is, CRPRTN(OOAIO).Hence we
can assume total letters as 7. But in these 7 letters, ‘R’ occurs 2 times and rest
of the letters are different.
Number of ways to arrange these letters = 7!2!=7×6×5×4×3×2×12×1=2520
In the 5 vowels (OOAIO), 'O' occurs 3 and rest of the vowels are different.
Number of ways to arrange these vowels among themselves = 5!3!=5×4×3×2×13×2×1=20
Hence, required number of ways = 2520 x 20 = 50400

Question: 04

How many 3-letter words with or without meaning, can be formed out of the letters of the word, ‘LOGARITHMS’, if repetition of letters is not allowed?

A. 720

B. 420

C. None of these

D. 5040

Answer: A

Explanation: 04

The word ‘LOGARITHMS’ has 10 different letters. Hence, the number of 3-letter words(with or without meaning) formed by using these letters

= 10P3

= 10 x 9 x 8

= 720

Question: 05

In how many different ways can the letters of the word ‘DETAIL’ be arranged such that the vowels must occupy only the odd positions?

A.None of these

B.120

C.64

D.36

Answer: D

Explanation: 05

The word ‘DETAIL’ has 6 letters which has 3 vowels (EAI) and 3 consonants(DTL)The 3 vowels(EAI) must occupy only the odd positions.

Let’s mark the positions as (1) (2) (3) (4) (5) (6).

Now, the 3 vowels should only occupy the 3 positions marked as (1),(3) and (5) in any order.

Hence, number of ways to arrange these vowels = 3P3

= 3! = 3 x 2 x 1 = 6 Now we have 3 consonants(DTL) which can be arranged in the remaining 3 positions in any order

Hence, number of ways to arrange these consonants = 3P3

= 3! = 3 x 2 x 1 = 6

Total number of ways

= number of ways to arrange the vowels x number of ways to arrange the consonants

= 6 x 6 = 36

Question: 06

In how many ways can an interview panel of 3 members be formed from 3 engineers, 2 psychologists and 3 managers if at least 1 engineer must be included?

A. 30

B .15

C .46

D .45

Answer:C

Explanation:06

The interview panel of 3 members can be formed in 3 ways by selecting 1 engineer and 2 other professionals, 2 engineers and 1 other professionals and all 3 engineers.

1 engineer out of 3 engineers and 2 other professionals out of 5 professionals can be selected as

= 3C1 * 5C2 = 3 * 10 = 30 ways…... 2 engineers out of 3 engineers and 1 other professional out of 5 professionals can be selected as

= 3C2 * 5C1 = 3 * 5 = 15 ways. 3 engineers out of 3 engineers and 0 other professional out of 5 professionals can be selected as

= 3C3 * 5C0 = 1 way.

Hence, total number of ways = 30 + 15 + 1 = 46 ways.

Question: 07

How many words can be formed by using 3 letters from the word “INDIA” ?

A.40

B.50

C.60

D.70

Answer:C

Explanation: 07

The word “INDIA” has 5 different words.

${}^{n}P_{r} = n! / (n – r)!$

Required number of words = ${}^{5}P_{3} = 5! / (5 – 3)!$

Required number of words = 5! / 2! = 120 / 2 = 60

Question: 08

How many words can be formed by using the letters from the word “DRIVER” such that all the vowels are always together ?

A.60

B.120

C.70

D.80

Answer: B

Explanation: 08

Assume all the vowels to be a single character,

i.e., “IE” is a single character.

So, now we have a total of 5 characters in the word, namely, D, R, V, R, IE.

But, R occurs 2 times.

=> Number of possible arrangements = 5! / 2! = 60

Now, the two vowels can be arranged in 2! = 2 ways.

=> Total number of possible words such that the vowels are always together= 60 x 2 = 120

Question: 09

In how many ways, can we select a team of 4 students from a given choice of 15 students?

A.1234

B.1364

C.1365

D.1563

Answer: C

Explanation: 09

Number of possible ways of selection = $^{15}C_4$ = 15 ! / [(4 !) x (11 !)]

Number of possible ways of selection = (15 x 14 x 13 x 12) / (4 x 3 x 2 x 1) = 1365

Question: 10

In how many ways can a group of 5 members be formed by selecting 3 boys out of 6 and 2 girls out of 5 ?

A.100

B.120

C.180

D.200

Answer: D

Explanation: 10

Number of ways 3 boys can be selected out of 6 = $^{6}C_{3}$ = 6 ! / [(3 !) x (3 !)] = (6 x 5 x 4) / (3 x 2 x 1) = 20

Number of ways 2 girls can be selected out of 5 = $^{5}C_{2}$ = 5 ! / [(2 !) x (3 !)] = (5 x 4) / (2 x 1) = 10

Therefore, total number of ways of forming the group = 20 x 10 = 200

Question: 11

How many number greater than thousand can be formed from the digits 0, 1, 2, 3, 4 without repetition ?

A.86

B.96

C.72

D.64

Answer: B

Explanation: 11

In order to form a number greater than 1000 we should have only 5 digits. Since, we have 5 digits we cannot take 0 in starting position.

For first digit, we have 4 choices.

For second digit, again we have 4 choices because we can include 0 from here onwards.

For third digit, we have 3 choices.

and for fourth digit only left 2 choices.

Total numbers = 4x4x3x2= 96 Hence, only 96 numbers possible.

Question: 12

In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

A.86

B.209

C.720

D.950

Answer: B

Explanation: 12

We may have (1 boy and 3 girls) or (2 boys and 2 girls) or (3 boys and 1 girl) or (4 boys).

Required number

of ways= $({}^6C_1 \times {}^4C_3) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_4) = ({}^6C_1 \times {}^4C_1) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_2)$

$= (24 + 90 + 80 + 15)$

$= 209.$

Question: 13

How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?

A.20

B.24

C.72

D.150

Answer: A

Explanation:

Each desired number is divisible by 5, so we must have 5 at the unit place.

So there is 1 way of doing it.

The tens place can now be filled by any of the remaining 5 digits (2, 3, 6, 7, 9).

So, there are 5 ways of filling the tens place.

The hundreds place can now be filled by any of the remaining 4 digits. So, there are 4 ways of filling it.

Required number of numbers = (1 x 5 x 4) = 20

Question: 14

How many three letter words are formed using the letters of the word TIME?

A. 12

B. 20

C. 16

D. 24

Answer: D

Explanation:

The number of letters in the given word is four.

The number of three letter words that can be formed using these four letters is ${}^{4}\mathrm{P}_{3}$ = 4 * 3 * 2 = 24.

Question: 15

In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?

A.120

B.150

C.550

D.720

Answer: D

Explanation:

The word 'OPTICAL' contains 7 different letters.

When the vowels OIA are always together, they can be supposed to form one letter.

Then, we have to arrange the letters PTCL (OIA).

Now, 5 letters can be arranged in 5! = 120 ways.

The vowels (OIA) can be arranged among themselves in 3! = 6 ways.

Required number of ways = (120 x 6) = 720.

THANK YOU