Tips, Formulae and shortcuts for Permutations and Combinations

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Cracku Tip 1 – Permutations & Combinations

- Permutations & Combinations is an extremely important topic in CAT.

- This topic can be the most rewarding topic in quant section.

- Unlike number systems questions, most of these questions generally take lesser time to solve.

- Also, they are generally fairly basic in nature.

Cracku Tip 2 – Permutations & Combinations

- The more questions you solve, the better you will get at this topic.

- So look through the formula list a few times and understand the formulae.

- But the best way to tackle this subject is by solving questions.

- Solve as many questions as you can, from this topic that you will start to see that all of them are generally variations of the same few themes that are listed in the formula list.

Cracku Tip 3 – Permutations & Combinations

- N! = N(N-1)(N-2)(N-3)……1

- 0! = 1! = 1

- $^{n}C_{r} = \dfrac{n!}{(n-r)! \, r!}$

- $^{n}P_{r} = \dfrac{n!}{(n-r)!}$

Cracku Tip 4 – Permutations & Combinations

- **Arrangement** :

n items can be arranged in n! ways

- **Permutation** :

A way of selecting and arranging r objects out of a set of n objects, $^nP_r = \dfrac{n!}{(n-r)!}$

- **Combination** :
A way of selecting r objects out of n (arrangement does not matter)

$$^nC_r = \dfrac{n!}{(n-r)!r!}$$

Cracku Tip 5 – Permutations & Combinations

- Selecting r objects out of n is same as selecting (n-r) objects out of n, $^{n}C_{r} = {}^{n}C_{n-r}$

- Total selections that can be made from 'n' distinct items is given $\sum_{k=0}^{n} {}^{n}C_{k} = 2^{n}$

Cracku Tip 6 – Permutations & Combinations

Partitioning :

- Number of ways to partition n identical things in r distinct slots is given by $^{n+r-1}C_{r-1}$

- Number of ways to partition n identical things in r distinct slots so that each slot gets at least 1 is given by $^{n-1}C_{r-1}$

- Number of ways to partition n distinct things in r distinct slots is given by r^n

- Number of ways to partition n distinct things in r distinct slots where arrangement matters $= \dfrac{(n+r-1)!}{(r-1)!}$

Cracku Tip 7 – Permutations & Combinations

Arrangement with repetitions :

If x items out of n items are repeated, then the number of ways of arranging these n items is $\frac{n!}{x!}$ ways. If a items, b items and c items are repeated within n items, they can be arranged in $\frac{n!}{a!\ b!\ c!}$ ways.

Cracku Tip 8 – Permutations & Combinations

Rank of a word :

- To get the rank of a word in the alphabetical list of all permutations of the word, start with alphabetically arranging the n letters. If there are x letters higher than the first letter of the word, then there are at least $x*(n-1)!$ Words above our word.

- After removing the first affixed letter from the set if there are y letters above the second letter then there are $y*(n-2)!$ words more before your word and so on. So rank of word = $x*(n-1)! + y*(n-2)! + .. +1$

Cracku Tip 9 – Permutations & Combinations

Integral Solutions :

- Number of positive integral solutions to $x_1+x_2+x_3+.....+x_n= s$ where $s \geq 0$ is $^{s-1}C_{n-1}$

- Number of non-negative integral solutions to $x_1+x_2+x_3+.....+x_n = s$ where $s \geq 0$ is $^{n+s-1}C_{n-1}$

Cracku Tip 10 – Permutations & Combinations

Circular arrangement :

Number of ways of arranging n items around a circle are 1 for n = 1,2 and (n-1)! for n≥3. If its a necklace or bracelet that can be flipped over, the possibilities are $\frac{(n-1)!}{2}$

Derangements :

If n distinct items are arranged, the number of ways they can be arranged so that they do not occupy their intended spot is

$$D = n!(\frac{1}{0!} - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \ldots\ldots \frac{(-1)^n}{n!})$$

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