**COMBINATORICS – STARS & BARS**

1. Classic

• Problem: x + y + z = n and x,y,z >= 0

• Solution: (standard star and bars)

1. Lower Bound:

• Problem: x + y + z = n and x,y,z > 0

• Solution: Initially add 1 to each bucket to make it >0. Then use star and bars.

1. More Conditions:

• Problem: x + y + z = n and x > 0, y > 4, y % 2 == 1, z >=0, z % 2 == 0

• Solution: Use variables.

1. Multiplication:

• Problem: x \* y \* z = n and x,y,z > 0

• Solution: Use prime factors as stars.

1. Coefficients:

• Problem: (a+b+c+d+1)^n => 1001 coefficients

• Solution: use powers of a,b,c,d,1 as stars and adjust them using star and bars -lower bound.

1. Non-decreasing Order:

• Problem: x+y+z = n and x<y<z

• Solution:

**VIDEO RESOURCES:**

* (**Non-Decreasing Order**) <https://www.youtube.com/watch?v=hbDP0yaLIlc&t=2s>
* **(Classic, Lower Bound, Coefficients)** <https://www.youtube.com/watch?v=TpG8wlj4eRA>
* **(Coefficients, More Conditions)** <https://www.youtube.com/watch?v=yGJwp72qPzk>

**OTHER RESOURCES:**

* CP – Algorithm: <https://cp-algorithms.com/combinatorics/stars_and_bars.html>

**PROBLEMS:**

**CF - CP Algorithm:** <https://codeforces.com/contest/57/problem/C>

**CF - CP Algorithm:** <https://codeforces.com/problemset/problem/553/A>

**CF - Video:** <https://codeforces.com/problemset/problem/1288/C>

**SPOJ – Video:** <https://www.spoj.com/problems/MARBLES/>

**PARTLY “Star & Bars” PROBLEMS:**

**SPOJ – (SCC Problem):** <https://www.spoj.com/problems/ADAPANEL/>

**CF – (Bits Problem):** <https://codeforces.com/contest/1761/problem/D>