

■ PROBABILITY FORMULA CHEAT SHEET

Factorial

$$n! = n \times (n-1) \times (n-2) \times \dots \times 1$$

Permutation (Order Matters)

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

Used when arrangement/order matters.

Combination (Order Does NOT Matter)

$$nCr = n! / (r!(n-r)!)$$

Used when selecting items without caring about order.

Probability Distribution Condition

Sum of all probabilities must equal 1.

$$\sum f(x) = 1$$

Example (From Your Question)

(a) $f(x)=c(x^2+4)$: sum values then set $cxtotal=1$

(b) $f(x)=c \times C(2,x) \times C(3,3-x)$: use combination formula

Combination Formula (Used in b part)

$$C(n,r) = n! / (r!(n-r)!)$$

Examples:

$$C(2,0)=1, C(2,1)=2, C(2,2)=1$$

$$C(3,3)=1, C(3,2)=3, C(3,1)=3$$

Quick Summary

Permutation → Order matters

Combination → Order does NOT matter

Probability distribution → Total probability = 1

Diagram:

Permutation vs Combination

Permutation ■■ Combination ■■ (Order matters) ■■ (Order doesn't) ■■

Permutation $\square\square\square$ Combination $\square\square\square$ (order matters) $\square\square\square$ (order does not matter)