

C12 - 11.5 - Combination ABC Cases Notes

Rearranging All the Letters of ABC two at a time

No restrictions (repeats allowed)

$$\frac{3}{(A, B \text{ or } C)} \times \frac{3}{(A, B \text{ or } C)} = 9$$

AA	AB	AC	CB
BB	BA	CA	BC
CC			

} 9

Case 1: 2 same
Case 2: 2 different

Case 1: 2 same + Case 2: 2 different

$${}_3C_1 + {}_3C_2 \times 2!$$

$$= 3 + 6$$

$$= 9$$

Rearranging All the Letters of ABC

No restrictions (repeats allowed)

$$\frac{3}{\text{Eg.}(A, B \text{ or } C)} \times \frac{3}{\text{Eg.}(A, B \text{ or } C)} \times \frac{3}{\text{Eg.}(A, B \text{ or } C)} = 3^3 = 27$$

27

AAA	AAB	ABA	BAA	ABC
BBB	AAC	ACA	CAA	ACB
CCC	BBA	BAB	ABB	BAC
	BBC	BCB	CBB	BCA
	CCA	CAC	ACC	CAB
	CCB	CBC	BCC	CBA

Case 1: 3 same
Case 2: 2 same, 1 different
Case 3: 3 different

Case 1: 3 same + Case 2: 2 same, 1 different + Case 3: 3 different

$${}_3C_1 + {}_3C_2 \times 2 \times 1 \times 1 + {}_3C_2 \times 2 \times 1 \times 1 + {}_3C_2 \times 2 \times 1 \times 1 + {}_3C_3 \times 3!$$

$$= 3 + 6 + 6 + 6$$

$$= 27$$

C12 - 11.5 - Cases 0,1,2,3 nPr, n! Notes

How many four digit numbers can we make from the numbers 0,1,2,3 with no restrictions?

$$\frac{3}{\substack{\text{Eg. (1,2,3) \\ \text{NOT '0'}}}} \times \frac{4}{\text{Eg. (0,1,2,3)}} \times \frac{4}{\text{Eg. (0,1,2,3)}} \times \frac{4}{\text{Eg. (0,1,2,3)}} = 3 \times 4^3 = 192$$

How many 4 digit numbers can we make from the numbers 0,1,2,3 without repeating numbers?

Permutation: Order matters

$$18 \left\{ \begin{array}{lll} 1230 & 2130 & 3210 \\ 1203 & 2103 & 3201 \\ 1320 & 2310 & 3120 \\ 1302 & 2301 & 3102 \\ 1023 & 2013 & 3021 \\ 1032 & 2031 & 3012 \end{array} \right.$$

(A number may not begin with a zero. Hence, there are only three choices (1,2,3) for the first digit, not four.)

$$\frac{3}{\substack{\text{Eg. (1,2,3) \\ \text{NOT '0'}}}} \times \frac{3}{\text{Eg. (0,2,3)}} \times \frac{2}{\text{Eg. (0,3)}} \times \frac{1}{\text{Eg. (3)}} = 3 \times 3! = 18$$

Permutation: ${}_3P_1 \times {}_3P_3 = 18$

How many 4 digit **EVEN** numbers can we make from the numbers 0,1,2,3 with no repeats?

Permutation: Order Matters

$$\begin{array}{l} 1230 \\ 1320 \\ 2130 \\ 2310 \\ 3120 \\ 3210 \end{array} + \begin{array}{l} 1302 \\ 1032 \\ 3012 \\ 3102 \end{array} = 10$$

An even number must have a 0 or 2 last. If the 0 is last, we can use the 2 first. But, if we use the 2 last, the 0 cannot come first (Not a 4 digit number with the 0 first). Therefore, 2 cases.

Case 1: $\frac{3}{\text{Eg. (1,2,3)}} \times \frac{2}{\text{Eg. (2,3)}} \times \frac{1}{\text{Eg. (3)}} \times \frac{1}{\text{Eg. (0 or 2)}} = 6$

$$6 + 4 = 10$$

Case 2: $\frac{2}{\text{Eg. (1,3)}} \times \frac{2}{\text{Eg. (0,3)}} \times \frac{1}{\text{Eg. (0)}} \times \frac{1}{2} = 4$ Add cases.

If the last number affects the first numbers you can choose from: multiple cases.