Percentage - Part I

Course on General Aptitude for GATE 2022-23 Batch - Part I

Saurabh Thakur • Lesson 12 • Mar 4, 2021

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PERMUTATION COMBINATION

Q.1
✓
✗

$^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n$

	Q.1	Q.2
$^2C_0$	✓	✓
$^2C_1$	✓	✗
$^2C_2$	✗	✓
	✗	✗

$^2C_2 + {}^2C_1 + {}^2C_0 = 2^n = 2^2 = 4$

$1 + 2 + 1 = 4$

Q.1	Q.2	Q.3
✓	✓	✓
✓	✓	✗
✗	✓	✓
✓	✗	✓
✓	✗	✗
✗	✓	✗
✗	✗	✓
✗	✗	✗

$\Rightarrow$

$^3C_0 = 1$

$+$ $+$

$\boxed{^3C_1} = 3$

$+$ $+$

$^3C_2 = 3$

$+$ $+$

$^3C_3 = 1$

8

Q2

2^n

2^3

$= 8$

A	1, 2, 3
B	1, 2

1|2|3

3!

$(a+y)^n$

$(1+x)^n$

2^n

Attempt : NO CONDITION

(1) $\left(3C_0 + 3C_1 + 3C_2 + 3C_3\right)$

$\left(2C_0 + 2C_1 + 2C_2\right)$

1|1|2 ×

3!/2!

$\boxed{02}$

$8 \times 4 = \boxed{32}$

B

$2^3 \times 2^2 = 2^5$

(A) (B)

$\therefore \boxed{32}$

A	1, 2, 3
B	1, 2

② $\boxed{A \geq 1}$, $\boxed{B\ x}$

$$\underbrace{(2^3 - 3C_0)}_{\substack{(A) \\ (A \geq 1)}} \times 2^2 = 7 \times 4 = 28$$

④ $\boxed{A \leq 2;\ B \geq 1}$

$$(2^3 - 3C_3) \times \underbrace{(2^2 - 2C_0)}_{B \geq 1}$$

$A \leq 2$

$= 7 \times 3 = 21$

Total.

③ $A \geq 1$, $B \geq 1$

$$\underbrace{(2 - 3C_0)}_{A \geq 1} \times \underbrace{(2^2 - 2C_0)}_{B \geq 1} = 7 \times 3 = 21$$

Test.

A.	1 2 3 4 5
B.	1 2 3 4
C.	1 2 3

① No conf.

$\boxed{5} \times \boxed{4} \times \boxed{3} = 2^{12} = 4096.$

$2^{(A)} \quad 2^{(B)} \quad 2^{(C)}$

② $\boxed{A \geq 1}, \boxed{B \geq 1}, C \times$

$\underbrace{(2^5 - {}^5C_0)}_{A \geq 1} \times \underbrace{(2^4 - 4C_0)}_{B \geq 1} \times \underbrace{2}_{(C)}$

(Atmost)

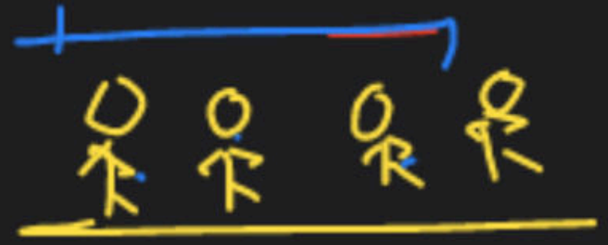
③ $A \boxed{< 3}, \boxed{B \geq 1}, C \geq 1$

$\{2^5 - ({}^5C_5 + {}^5C_4)\} \times C \geq 1$

$A \leq 3 \quad B \geq 1 \quad 3$

$(2^4 - 4C_0) \times (2 - 3C_0)$

~~I~~ 4 ~~R~~ 3



① No condⁿ: ⇒ $\underset{(A)}{{}^{4}C_{4}} \times \underset{(B)}{{}^{3}C_{3}} = \boxed{{}^{7}C_{7}} = 1$ RB.

② I ≥ 1, R X $\underset{(I \geq 1)}{({}^{4}C_{4} - {}^{4}C_{0})} \times \underset{R\,X}{({}^{3}C_{3})} = 15 \times 8 = 120$.

③ I ≤ 3 ; R ≥ 1 ⇒ $\underset{I \leq 3}{({}^{4}C_{4} - {}^{4}C_{4})} \times ({}^{3}C_{3} - {}^{3}C_{0})$

ドンル

$15 \times 7 = \boxed{105}$

Agenda : Addition & Multiplication

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Q.1 Using the digits : 1,2,3,4 and 5 how many three digit numbers can be formed :

(A) Repetition allowed.
(B) Repetition not allowed.

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Q.2 Using the digits : 0,1,2,3,4 and 5 how many three digit numbers can be formed :

(A) Repetition allowed.

(B) Repetition not allowed.

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Q.3 How many four digit numbers can be formed with the 10 digits 0, 1, 2, ... 9 if no number can start with 0 and if repetitions are not allowed?

[GATE 2015 : IIT Kanpur (CE Set - 2)]

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Q.4 How many numbers between 0 and 1 million can be formed using 0, 7 and 8?

(A) 486 (B) 1086

(C) 728 (D) 900

[GATE 2014 : IIT Kharagpur]

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Q.5 How many 3 digit no. are there from100 – 1000

(A) All three digits prime and distinct.

(B) All 3 digits odd.

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Q.6 Using the digits : 1,2,3,4 and 5 how many three digit numbers can be formed , such that it must have :

(A) Exactly one 5
(B) EAxactly two 5
(C) At least one 5

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Q.7 Using the digits : 0,1,2,3,4 and 5 how many three digit numbers can be formed , such that it must have :

(A) Exactly one 5
(B) Exactly two 5
(C) At least one 5

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Q.8 Using the digits : (1) 1,2,3,4,5,6,7,8 and 9 (2) 0, 1,2,3,4,5,6,7,8 and 9 how many three digit numbers can be formed , such that it must have :

(A) Exactly one 7

(B) Exactly two 7

(C) At least one 7

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Q.9 Using the digits : (1) 1,2,3,4 and 5 (2) 0, 1,2,3,4 and 5 how many three digit numbers can be formed , such that :

(A) The ten's place is greater than the unit's place digit .

(B) The ten's place is greater than the unit's place digit and less the hundred's place digit.

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Q.10 Using the digits : (1) 1,2,3,4,5,6,7,8 and 9 (2) 0,1,2,3,4,5,6,7,8 and 9 how many three digit numbers can be formed , such that :

(A) The ten's place is greater than the unit's place digit.

(B) The ten's place is greater than the unit's place digit and less the hundred's place digit.

Agenda : Letters Arrangement

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Q.11 How many different words can be formed from the letters of the word GANESHPURI when:

(A) All the letters are taken.

(B) The letter G always occupies the first place.

(C) The letters P and E respectively occupy the first and last places.

(D) All the vowels are always together.

(E) How many words of 5 letters each can be formed each containing 3 consonants and 2 vowels?

(F) All the vowels are never together.

(G) No 2 vowels are together.

Agenda : Team Formation

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Q.12 How many committees of 5 members each can be formed from 8 official and 4 non-official members in the following cases :

(A) Each consisting of 3 official and 2 nonofficial members.
(B) Each contains at least two non-official members.
(C) Each consisting of at most two official members.
(D) A particular official member is always included.
(E) A particular non-official member is never included.

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Q.13 Out of 8 men and 10 women a committee consisting of 6 men and 5 women is to be formed. How many such committees can be formed when one particular man A refuses to be a member of the committee is which his boss B's wife is there?

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Q.14 There are 4 women *P*, *Q*, *R*, *S* and 5 men *V*, *W*, *X*, *Y*, *Z* in a group. We are required to form pairs each consisting of one woman and one man. P is not to be paired with *Z*, and *Y* must necessarily be paired with someone. In how many ways can 4 such pairs be formed?

[GATE 2017 : IIT Roorkee (ME Set – 2)]

(A) 74
(B) 76
(C) 78
(D) 80

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Q.15 A three-member committee has to be formed a group of 9 people. How many such distinct committees can be formed?

(A) 27

(B) 72

(C) 81

(D) 84

[GATE 2018 : IIT Guwahati (CE Set – 2)]

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Q.16 An e-mail password must contain three characters. The password has to contain one numeral from 0 to 9, one upper and one lower case character from the English alphabet. How many distinct passwords are possible?

(A) 6,760 (B) 13,520
(C) 40,560 (D) 1,05,456

[GATE 2018 : IIT Guwahati (EE Set – 1)]

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Q.17 Arun, Gulab, Neel and Sweta must choose one shirt each from a pile of four shirts coloured red, pink, blue and white respectively. Arun dislikes the colour red and Sweta dislikes the colour white. Gulab and Neel like all the colours. In how many different ways can they choose the shirts so that no one has a shirt with a colour he or she dislikes?

(A) 21 (B) 18

(C) 16 (D) 14

[GATE 2017 : IIT Roorkee (EE, CS, Set – 1)]

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Agenda : Question paper wala Question (Binomial)

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Q.18 A candidate is required to answer 7 out of 15 questions which are divided into three groups A,B,C each containing 4, 5 , 6 questions respectively. He is required to select at least 2 questions from each group. In how many ways can he make up his choice?

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Q.19 There are 3 Indians and 3 Chinese in a group of 6 people. How many subgroups of this group can we choose so that every subgroup has at least one Indian?

(A) 56 (B) 52

(C) 48 (D) 44

$2^3 - 3C_0$ $\times 2^3$

(I ≥ 1)

7×8 56

[GATE 2017 : IIT Roorkee (EC, BT, PI Set – 1)]

LA : LP

① $\boxed{A \mid B \mid C}$

$n \rightarrow \boxed{n!}$

$3 \Rightarrow 3!$

$= 6$

ABC

ACB

BAC

BCA

CAB

CBA

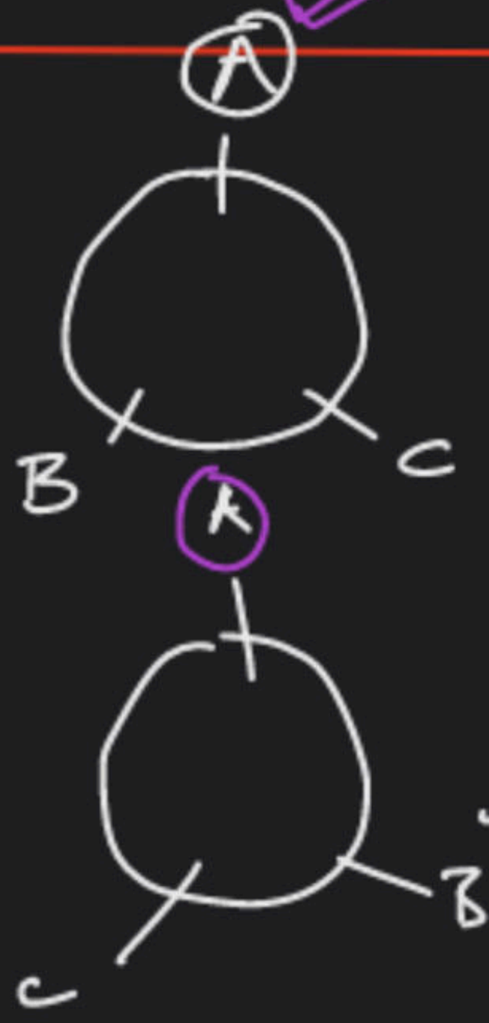
6

$n \rightarrow n!$

$5 \Rightarrow 5!$

$10 \Rightarrow 10!$

CA = CP.



$n \Rightarrow (n-1)!$

$3 \Rightarrow (3-1)!$

$2! = 2!$

$= 2$

$n \Rightarrow (n-1)!$

$5 \Rightarrow (5-1)!$

$4!$

$10 \Rightarrow (10-1)!$

$9!$

LA = LP

② $\boxed{10}$ 5H | 5E

- No cond^{n}: ⇒ 10!

- No ② H × (Pseudo Gap)

LA = $\boxed{5!}$ × (G · E5) × (5) × 5!

$H_1 - H_5$

× G × E2 × E3 × E4 × E5 ×

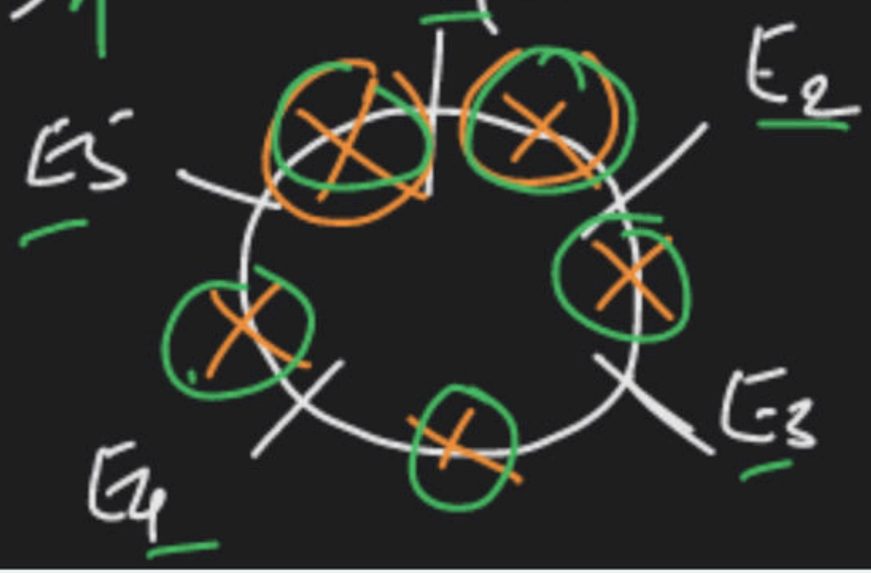
CA = CP

9!

$H_1 - H_5$

No ② H × (Pseudo Gap)

(CA) (G · E5) 4! × (5 · 5 × 5!)



LA : LP

CA : CP

③ Blavest

21

$^nC_r = {}^nC_{n-r}$

① $n \Rightarrow n!$

$21 \Rightarrow 21!$ LA

$(^{21}C_6 \times 6!) \times (^{15}C_{15} \times 15!)$

21

15 6

$(^{21}C_{15} \times 15!) \times (^6C_6 \times 6!)$

③

① $n \Rightarrow (n-1)!$

21

$(21-1)!$

CA = 20!

15

6

$(^{21}C_5 \times 14!) \times (^6C_6 \times 5!)$

Agenda : Number Sum

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Q.20 What is the sum of all 4 digit numbers which can be formed using the digits 1,2,3 and 4 without repetition?

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Q.21 What is the sum of all 5 digit numbers which can be formed using the digits (exactly once):

(A) 1,2,3,4 and 5.
(B) 1,1,2,3 and 4.
(C) 1,1,2,2 and 2
(D) 0,1,2,3 and 4.
(E) 0,1,1, 2 and 3.

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Q.22 A five digit number is formed using the digits 1,3,5,7 and 9 without repeating any of them. What is the sum of all such possible five digit numbers?

[GATE 2014 : IIT Kharagpur (EC Set – 4, ME Set - 4)]

(A) 6666660

(B) 6666600

(C) 6666666

(D) 6666606

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Q.23 In how many ways may 6 Hindi medium students and 6 English medium students sit :

(A) In a line

(B) Around a round table such that two Hindi medium students may never sit together?

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Q.24 Four cards lie on a table. Each card has a number printed on one side and a colour on the other. The faces visible on the cards are 2, 3, red and blue.

Proposition : If a card has an even value one side, then its opposite face is red.

The cards which MUST be turned over to verify the above proposition are

(A) 2, red (B) 2, 3, red

(C) 2, blue (D) 2, red, blue

[GATE 2017 : IIT Roorkee (IN, CE, Set – 2)]

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Agenda : Straight Lines, Triangles, Chess Board, Handshake & Gift Exchange

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Q.25 How many diagonals are there in an n side polygon.

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Q.26 Find the number of :

(A) Straight Lines

(B) Diagonals

(C) Triangles formed in a decagon.

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Q.27 Out of 18 points in a plane, no three are in the same straight line except five points which are collinear. How many

(A) Straight lines
(B) Triangles can be formed by joining them?

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Q.28 A 2 × 4 rectangle grid shown below, each cell is a rectangle. How many rectangles can be observed in the grid?

(A) 21 (B) 27
(C) 30 (D) 36

[GATE 2016 : IISc Bangalore
(EE Set - 1, CSE Set - 1)]

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Q.29 A set of 4 parallel lines intersect with another set of 5 parallel lines. How many parallelograms are formed?

(A) 20 (B) 48
(C) 60 (D) 72

[GATE 2018 : IIT Guwahati (IN Set – 1)]

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Q.30 Everybody in a room shakes hands with everybody else. The total number of hand shakes is 66. The total number of persons in the room is 12. True or False ?

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Q.31 In a football championship, there were played 153 matches. Every two teams played one match with each other. The number of teams. Participating in the championship is ……

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Q.32 930 Deepawali greeting cards are exchanged amongst the students of a class. If every student sends a card to every other student then what is the number of students in the class?

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Q.33 Five teams have to compete in a league, with every team playing every other team exactly once, before going to the next round. How many matches will have to be held complete the league round of matches?

(A) 20 (B) 10
(C) 8 (D) 5

[GATE 2015 : IIT Kanpur (ME Set - 3, IN)]

Agenda : Dictionary Word

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Q.34 If all the letters of the word 'AGAIN' be arranged as per English dictionary , what is the 50th word.

Agenda : Important Notes

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Q.35 How many word can be formed by taking 4 letters at a time out of the letters of the word MATHEMATICS ?

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Q.36 A five digit number is formed using the digits 1,3,5,7 and 9 without repeating any of them. What is the sum of all such possible five digit numbers?

(A) 6666660
(B) 6666600
(C) 6666666
(D) 6666606

[GATE 2014 : IIT Kharagpur (EC Set – 4, ME Set - 4)]