# Permutations and Combinations

## Question1

**The number of positive integers less than 10000 which contain the digit 5 atleast once is**

### AP EAPCET 2025 - 26th May Morning Shift

**Options:**

A.

3168

B.

3420

C.

3439

D.

5832

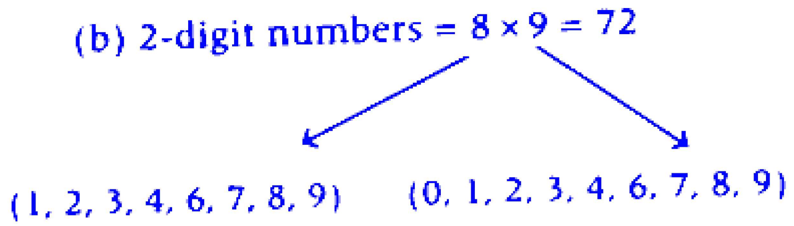
**Answer: C**

## Solution:

Calculate the number excluding the digit 5 .

(a) 1-digit number

$= 8(1, 2, 3, 4, 6, 7, 8, 9)$




Similarly,

(c) 3-digit numbers $= 8 \times 9 \times 9 = 648$

(d) 4-digit numbers $= 8 \times 9 \times 9 \times 9 = 5832$

Total numbers between 1 and 10000 excluding the digit 5

$= 8 + 72 + 648 + 5832 = 6560$

Hence, required numbers $= 9999 - 6560$

$= 3439$

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# Question2

**5 men and 4 women are seated in a row. If the number of arrangements in which one particular man and one particular woman are together is $\alpha$ and the number of arrangements in which those two are not together is $\beta$, then $\alpha : \beta =$**

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**Options:**

A.

2 : 7

B.

2 : 9

C.

4 : 5

D.

7 : 2

**Answer: A**

## Solution:

Total number of people $= 5 + 4 = 9$

So, total arrangements $= 9\,!$

To find $\alpha$ Let the particular man and woman be treated as a single unit or block when they are together.

Remaining 7 peoples +1 block $= 8$ units

$\therefore \quad \alpha = 2 \times 8!$

and $\beta = 9\,! - \alpha = 9\,! - 2 \times 8\,!$

Hence, $\alpha : \beta = \frac{2\times8!}{8} : \frac{9!-2\times8!}{8!}$

$= 2 : 7$

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# Question3

## If a team of 4 persons is to be selected out of 4 married couples to play mixed doubles- tennis game, then the number of ways of forming a team in which no married couple appears is

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**Options:**

A.

12

B.

8

C.

6

D.

24

**Answer: A**

## Solution:

Number of ways to choose 4 couples out of $4 = {}^4C_4 = 1$

From 4 couples, pick 1 person per couple $= 2^4 = 16$

Team formula married couples $= 2^2 = 4$

Hence, required ways $= 16 - 4 = 12$

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# Question4

## The number of integers greater than 6000 that can be formed by using the digits $0, 5, 6, 7, 8$ and 9 without repetition is

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**Options:**

A.

240

B.

840

C.

1440

D.

1680

**Answer: C**

## Solution:

Digits $-0, 5, 6, 7, 8$ and 9

No. greater than 6000

Case I 4 digit numbers greater than 6000

$\overline{\uparrow}\overline{\uparrow}\overline{\uparrow}\overline{\uparrow} = 240$
4543

Case II 5-digit numbers
$\overline{\uparrow}\overline{\uparrow}\overline{\uparrow}\overline{\uparrow}\overline{\uparrow} = 600$
55432

Case III 6-digit numbers

$\overline{\uparrow}\overline{\uparrow}\overline{\uparrow}\overline{\uparrow}\overline{\uparrow}\overline{\uparrow} = 600$
554321

$\therefore$ Total $= 1440$

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# Question5

## The number of ways of dividing 15 persons into 3 groups containing 3,5 and 7 persons so that two particular persons are not included into the 5 persons groups is

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**Options:**

A.

$\frac{117(11!)}{3!(7!)}$

B.

${}^{15}C_5\,{}^{10}C_3$

C.

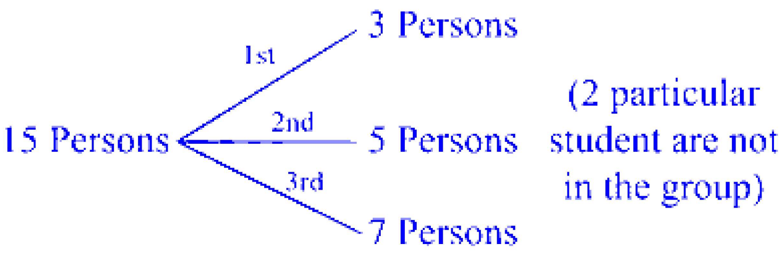
$90 \times \frac{13!}{7!}$

D.

${}^{15}C_5\,{}^{8}C_3$

**Answer: A**

## Solution:




∴ Required case

= (2 particular are in Ist group )+ (2 particular are in 3rd group) + (one is in Ist group and other is in 3rd group)

$$= \frac{13!}{1!5!7!} + \frac{13!}{3!5!5!} + \frac{13!}{2!5!6!}(24)$$
$$= \frac{13!}{7!5!} + \frac{13!}{6!5!} + \frac{13!}{5!6!} = \frac{13!(1+7+7)}{7!5!}$$
$$= \frac{13 \times 12 \times 11! \times 15}{7! \times 5 \times 4 \times 3!} = \frac{117(11!)}{7!3!}$$

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# Question6

## The number of integers between 10 and 10,000 such that in every integer every digit is greater than its immediate preceeding digit, is

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**Options:**

A.

1112

B.

437

C.

246

D.

**Answer: C**

## Solution:

The digit are 1 to 9 . Each such number is strictly increasing sequence of digits, i.e., digits don't repeat and are in order.

e.g., 12, 135, 1239 and soon.

So, total such numbers in the number of increasing digit sequence of length 2 to 4.

We choose subsets of digits from 1 to 9 of lengths 2,3 and 4 in increasing order.

$\therefore$ 2-digits numbers

$= {}^9C_2 = \frac{9!}{2!7!} = \frac{9\times8}{2} = 36$

3-digits numbers

$= {}^9C_3 = \frac{9!}{3!6!} = \frac{9\times8\times7\times6!}{6\times6!} = 84$

$$\begin{aligned} \text{4-digits numbers } &= {}^9C_4 = \frac{9!}{4!5!} \\ &= \frac{9\times8\times7\times6\times5!}{4\times3\times2\times5!} = 126 \end{aligned}$$

So, total such digits

$$= 36 + 84 + 126 = 246$$

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# Question7

## All letters of the word 'AGAIN' are permuted in all possible ways and the words so formed (with or without meaning) are written as in a dictionary, then the 50th word is

## AP EAPCET 2025 - 24th May Morning Shift

**Options:**

A.

IAANG

B.

INAGA

C.

NAAIG

D.

NAAGI

**Answer: C**

## Solution:

Given, word is AGAIN,

So the letters in alphabatical order : A, A, G, I, N

Words starting with $A = \frac{4!}{2!} = 12$

Words starting with $G = \frac{4!}{2!} = 12$

Words starting with $I = \frac{4!}{2!} = 12$

Words starting with $N = \frac{4!}{2!} = 12$

So, total words $= 12 + 12 + 12 + 12 = 48$

Thus, the 50th word starts with $N$.

49th word = NAAGI

$\therefore$ 50 th word = NAAIG.

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# Question8

## The number of ways in which a cricket team of 11 members can be formed out of 6 batsmen, 6 bowlers, 4 all-rounders and 4 wicket keepers by selecting atleast 4 batsmen, atleast 3 bowlers, atleast 2 all-rounders and only one wicket keeper is

## AP EAPCET 2025 - 24th May Morning Shift

**Options:**

A.

11560

B.

6480

C.

7680

D.

13080

**Answer: D**

## Solution:

We select exactly I wicket keeper from 4 .

So, number of ways $= {}^4C_1 = 4$

Now, we have 10 players left to select from batsmen, bowlers and all-rounders with the condition.

Batsmen $\geq 4$, Bowlers $\geq 3$, All-rounders $\geq 2$

So, total of these three $= 10$

So, number of batsmen, $B$ from 4 to 6 , number of bowlers, $L$ (say)from 3 to 6 and number of all-rounder, $A$ (say) from 2 to 4 .

$\therefore B + L + A = 10$ (after 1 wicket keeper)

Now, the possible combinations for, (B, L, A) are

$(4, 4, 2), (4, 3, 3), (5, 3, 2)$

Total number of ways for 10 players

$$\begin{aligned} &= \left({}^6C_4{}^6C_4{}^4C_2 + {}^6C_4{}^6C_3{}^4C_3 + {}^6C_5{}^6C_3{}^4C_2\right) \\ &= (15 \times 15 \times 6 + 15 \times 20 \times 4 + 6 \times 20 \times 6) \\ &= (1350 + 1200 + 720) = 3270 \end{aligned}$$

$\therefore$ Total number of ways for 11 players

$$\begin{aligned} &= 4 \times 3270 \\ &= 13080 \end{aligned}$$

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# Question9

## If all possible 4 -digit numbers are formed by choosing 4 different digits from the given digits $1, 2, 3, 5, 8$ then the sum of all such 4 -

**digit numbers is**

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**Options:**

A.

199980

B.

999990

C.

506616

D.

479952

**Answer: C**

## Solution:

Number of combinations of choosing 4 digits out of 4

$= {}^5C_4 = 5$

Each 4-digit set can be arranged in $4!$ ways $= 24$ ways

So, total number of 4 -digit numbers

$= 5 \times 24 = 120$

In each group, each digit appears

$\frac{24}{4} = 6$ times

So, contribution per group

$= \text{ sum of digits } \times 6 \times (1000 + 100 + 10 + 1)$

Now, compute total sum of digits for all 5 groups

$$\begin{aligned} &(2+3+5+8)+(1+3+5+8) \\ +&(1+2+5+8)+(1+2+3+8) \\ &+(1+2+3+5) \\ &= 18+17+16+14+11 = 76 \end{aligned}$$

Hence, total sum $\begin{aligned} &= 76 \times 6666 \\ &= 506616 \end{aligned}$

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# Question10

## The number of ways of forming the ordered pairs $(p, q)$ such that $p > q$ by choosing $p$ and $q$ from the first 50 natural numbers is

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**Options:**

A.

1275

B.

1250

C.

1225

D.

1200

**Answer: C**

## Solution:

Total possible ordered pairs $(p, q)$ of first 50 natural numbers

$= 50 \times 50 = 2500$

Out of these, exactly half will satisfy $p > q$ and there are 50 pairs where $p = q\{(1,1),(2,2)\ldots(50,50)\}$

So, number of pairs with $p \neq q$

$= 2500 - 50 = 2450$

and for $p > q$

$= \frac{2450}{2} = 1225$

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# Question11

**The number of ways in which a committee of 7 members can be formed from 6 teachers, 5 fathers and 4 students in such a way that at least one from each group is included and teachers form the majority among them, is**

## AP EAPCET 2025 - 23rd May Evening Shift

**Options:**

A.

1865

B.

2370

C.

3050

D.

4380

**Answer: B**

## Solution:

Fathers $(F)=5$, Teachers $(T)=6$, students $(S)=4$

for, $T+F+S=7, T \geq 0$, thus $F \geq 1, S \geq 1$ total combination $(T, F, S)$

$(4,1,2),(4,2,1),(5,1,1),(3,2,2)$

Case $\mathbf{I}(T=4, F=1, S=2)$

$$\begin{aligned} & ={ }^6 C_4 \cdot{ }^5 C_1 \cdot{ }^4 C_2 \\ & =15 \times 5 \times 6=450 \end{aligned}$$

**Case II** $(T=4, F=2, S=1)$

$$\begin{aligned} & ={ }^6 C_4 \cdot{ }^5 C_2 \cdot{ }^4 C_1 \\ & =15 \times 10 \times 4=600 \end{aligned}$$

Case III $(T=5, F=1, S=1)$

$$= {}^{6}C_5 \cdot {}^{5}C_1 \cdot {}^{4}C_1$$
$$= 6 \times 5 \times 4 = 120$$

Case IV ( $T = 3, F = 2, S = 2$ )

$$= {}^{6}C_3 \cdot {}^{5}C_2 \cdot {}^{4}C_2$$
$$= 20 \times 10 \times 6 = 1200$$

Hence, total number of ways

$$= 450 + 600 + 120 + 1200$$
$$= 2370$$

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# Question12

## If 3 sisters and 8 brothers are together playing a game, then the number of ways in which all the sisters and brothers are to be seated around a circle such that all the three sisters are not seated together is

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**Options:**

A.

$8! \times 504$

B.

$11! \times 8$

C.

$7! \times 210$

D.

$8! \times 84$

**Answer: D**

## Solution:

The total number of ways that all sisters and brothers seated around a circle is 10 !

The number of ways that the three sisters seated together along with the brothers is $8! \times 3$ !

So, required number of ways

$= 10! - 8!3! = 8!(10 \times 9 - 6) = 8! \times 84$

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# Question13

## Out of 8 students in a classroom, 4 of them are chosen and they are arranged around a table.

## If the remaining 4 are arranged in a row, then the total number of arrangements that can be made with those 8 students is

## AP EAPCET 2025 - 23rd May Morning Shift

**Options:**

A.

2100

B.

1680

C.

1440

D.

1050

**Answer: A**

## Solution:

Given, 8 students in a class room 4 of them are chosen and arrange in ground table and 4 in row

$$\begin{aligned} \therefore \text{ Total arrangement } &= {}^8C_4(3! + 4!) \\ &= \frac{8!}{4!4!}(6 + 24) = 70 \times 30 \\ &= 2100 \end{aligned}$$

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# Question14

**Three letters are chosen at random from the letters of the word VARIABLE and all possible three letter words (with or without meaning) are formed with them.**

**Then, the probability of getting a three letter word having a consonent as its middle letter is**

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**Options:**

A.

$\frac{22}{57}$

B.

$\frac{21}{28}$

C.

$\frac{43}{57}$

D.

$\frac{31}{57}$

**Answer: D**

## Solution:

Give word VARIABLE

A twice and other are different arrangement of three letter words.

Case 12 alike 1 distinct

$= {}^1C_1 \times {}^6C_1 \times \frac{3!}{2!} = 6 \times 3 = 18$

Case II All are distinct

$^7C_3 \times 3! = 35 \times 6 = 210$

$\therefore$ Total $= 210 + 18 = 288$

$n(S) = 288$

Middle letter is consonant.


$= 6 \times 4 \times 5 = 120$


$= 1 \times 4 = 4$

Total favourable case $= 120 + 4 = 124$

$\therefore$ Required probability $= \frac{124}{288} = \frac{31}{57}$

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# Question15

### If $^{27}P_{r+7} = 7722\,^{25}P_{(r+4)}$, then $r =$

### AP EAPCET 2025 - 22nd May Evening Shift

**Options:**

A.

9

B.

12

C.

11

D.

10

**Answer: D**

## Solution:

$$
\begin{aligned}
& { }^{27} P_{r+7}=7722{ }^{25} P_{r+4} \\
& \Rightarrow \frac{27!}{20-r!}=7722 \cdot \frac{25!}{21-r!} \\
& \Rightarrow \frac{27 \cdot 26 \cdot 25!}{20-r!}=7722 \cdot \frac{25!}{(21-r) 20-r!} \\
& \Rightarrow 27 \cdot 26=7722 \times \frac{1}{(21-r)} \\
& \Rightarrow \text { By option put } r=10 \\
& \Rightarrow \quad 702=702
\end{aligned}
$$

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# Question16

## If the number of diagonals of a regular polygon is 35 , then the number of sides of the polygon is

## AP EAPCET 2025 - 22nd May Evening Shift

**Options:**

A.

12

B.

9

C.

10

D.

11

**Answer: C**

## Solution:

Let number of side $=n$

The number of diagonals of a regular

$$\Rightarrow \quad \frac{n(n-3)}{2}=35$$
$$\Rightarrow \quad n^2-3n=70$$
$$\Rightarrow \quad n^2-3n-70=0$$
$$\Rightarrow \quad n^2-10n+7n-70=0$$
$$\Rightarrow \quad n(n-10)+7(n-10)=0$$
$$\Rightarrow \quad (n-10)(n+7)=0$$
$$\Rightarrow \quad n=10, n=-7(\text{ neglected })$$
$$\therefore \quad n=10$$

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# Question17

## If four letters are chosen from the letters of the word ASSIGNMENT and are arranged in all possible ways to form 4 letter words (with or without meaning), then total number of such words that can be formed is

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**Options:**

A.

1680

B.

2184

C.

2196

D.

2190

**Answer: D**

## Solution:

ASSIGNMENT

Total $= 10$

2 S and 2 N

Different $= 8$

A, I, G, M, E, T

Case I All are different

$= {}^8C_4 \times 4! = 1680$

Case II Two are same and two are different

$$= {}^2C_1 \times {}^7C_2 \times \frac{4!}{2!} = 756$$
$$= 2! \times \frac{7!}{2! \cdot 5!} \times \frac{4!}{2!}$$
$$= \frac{7 \times 6 \times 5!}{2! \times 5!} \times 4 \times 3 \times 2! = 504$$

Case III Two are same and two are same

$= {}^2C_2 \times \frac{4!}{2! \times 2!} = 6$

Total $= 1680 + 504 + 6 = 2190$

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# Question18

## All the letters of the word LETTER are arranged in all possible ways and the words (with or without meaning) thus formed are arranged in dictionary order.

## Then, the rank of the word TETLER is

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**Options:**

A.

171

B.

138

C.

141

D.

168

**Answer: C**

## Solution:

We have, $\mathrm{E}, \mathrm{E}, \mathrm{L}, \mathrm{R}, \mathrm{T}, \mathrm{T}$

Words starting with $\mathrm{E}, \mathrm{L}, \mathrm{R}$, where first letter is T

(i) Starting with $\mathrm{E}: \frac{5!}{2!}=60$

(ii) Starting with $\mathrm{L}: \frac{5!}{2!2!}=30$

(iii) Starting with $\mathrm{R}: \frac{5!}{2!2!}=30$

Total $=60+30+30=120$

Fixed TE next is T

Letters before T is E, L, R

Each gives $3!=6$

$\Rightarrow 3 \times 6=18$

Now, fixed TETL, next is E one word before TETLE

$k$ is remaining letter which is before 2 letters.

Final letter is TETLER =1

Rank $=120+18+2+1=141$.

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# Question19

## 5-digit numbers are formed by using the digits $0,1,2,3,5,7$ without repetetion and all of them are arranged in ascending order. Then, the rank of the number 70513 is

**Options:**

A.

500

B.

499

C.

497

D.

503

**Answer: A**

## Solution:

Given digits $0, 1, 2, 3, 5, 7$

To find rank of $70513$

Total number start with $1 = 5! = 120$

Number start with $2 = 5! = 120$

Number start with $3 = 5! = 120$

Number start with $5 = 5! = 120$

Number start with $701 = 6$

Number start with $702 = 6$

Number start with $703 = 6$

$70512 = 1$
$70513 = 1$

Rank of $70513$

$$\begin{aligned} &= 4 \times 120 + 3 \times 6 + 2 \\ &= 500 \end{aligned}$$

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# Question20

### The number of divisors of 7 ! is
### AP EAPCET 2025 - 22nd May Morning Shift

**Options:**

A.

72

B.

24

C.

64

D.

60

**Answer: D**

## Solution:

Number of divisor of 7!.

$$\begin{aligned} 7! &= 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \\ &= 2^4 \times 3^2 \times 5^1 \times 7^1 \end{aligned}$$

Number of divisor

$$\begin{aligned} &= (4+1)(2+1)(1+1)(1+1) \\ &= 60 \end{aligned}$$

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# Question21

### If all the letters of the word COMBINATION are arranged in all possible ways to form 11 letter words (with or without meaning), then the number of words among them in which $C$ and $N$ occupy the end positions and no vowel appears exactly in the middle position is

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**Options:**

A.

$\frac{5}{2}(8!)$

B.

4 (8!)

C.

2(8!)

D.

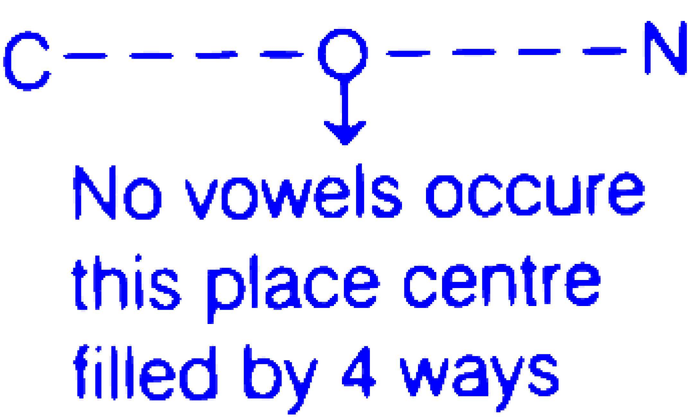
36 (7!)

**Answer: C**

## Solution:

COMBINATION

Vowels- O, O, I, I, A = 5




$$= 4 \times \frac{8!}{2!2!} \times 2(\text{C and N are also be arranged })$$
$$= 2 \times 8!$$

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# Question22

**The number of ways of distributing 3 dozen fruits (no two fruits are identical) to 9 persons such that each gets the same number of fruits is**

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**Options:**

A.

$\frac{36!}{(9!)^4}$

B.

$\frac{36!}{(4!)^9}$

C.

${}^{36}P_9 \times 4\,!$

D.

$\frac{36!}{4!(9!)^4}$

**Answer: B**

## Solution:

Total number of fruits $= 3 \times 12 = 36$

These fruits distributed among 9 persons equals $\because$ Order is taken'.

Total number of ways $= \frac{36!}{(4!)^9 9!} \times 9! = \frac{36!}{(4!)^9}$.

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# Question23

**If $\binom{p}{q} = {}^pC_q$ and $\sum_{i=0}^{m}\binom{10}{i}\binom{20}{m-i}$ is maximum, then $m =$**

**Options:**

A.

10

B.

12

C.

15

D.

20

**Answer: C**

## Solution:

We have, $\sum_{i=0}^{m} {}^{10}C_i {}^{20}C_{m-i}$

$= {}^{10}C_0 {}^{20}C_m + {}^{10}C_1 {}^{20}C_{m-1} + {}^{10}C_2 {}^{20}C_{m-2} + \ldots + {}^{10}C_m \cdot {}^{20}C_0$

Coefficient of $x^m$ in the expansion of the product

$(1+x)^{10}(1+x)^{20}$

$=$ Coefficient of $x^m$ in $(1+x)^{30}$

$= {}^{30}C_m.$

Maximum value of ${}^{30}C_m = {}^{30}C_{15}$

$\therefore \quad m = 15$

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# Question24

### The number of all possible positive integrals solutions of the equation $xyz = 30$ is

**Options:**

A.

24

B.

25

C.

26

D.

27

**Answer: D**

## Solution:

We have, $xyz = 30$

$30 = 1, 2, 3, 5, 6, 10, 15, 30$ are the integral factor of 30

$$30 = 3 \times 2 \times 5 = 3!$$
$$30 = 6 \times 5 \times 1 = 3!$$
$$30 = 10 \times 3 \times 1 = 3!$$
$$30 = 15 \times 2 \times 1 = 3!$$
$$30 = 30 \times 1 \times 1 = \frac{3!}{2!}$$

$$\therefore \text{ Total number of factor } = 4 \times 3! + \frac{3!}{2!}$$
$$= 24 + 3 = 27$$

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# Question25

**The number of all five letter words (with or without meaning) having atleast one repeated letter than can be formed by using the letters of the word INCONVENIENCE is**

**Options:**

A. 3585

B.

2765

C.

3265

D.

3205

**Answer: A**

## Solution:

Given word is INEONVENIENCE. The distinet letters are I, N, C, O, V, E (6 letters) and their frequencies are

I – 2
N – 4
C – 2
O – 1
V – 1
E – 3

Total number of 5-letters words

(i) When 5 distinct letters, number of words $= 6P_5 = 720$

(ii) One pair and 3 distinct letters,

$$\begin{aligned} \text{number of words } &= {}^4C_1 \times {}^5C_3 \times \frac{5!}{2!} \\ &= 4 \times 10 \times 60 = 2400 \end{aligned}$$

(iii) One triple and 2 distinct letters, number of words

$= {}^2C_1 \times {}^5C_2 \times \frac{5!}{3!}$

$= 2 \times 10 \times 20 = 400$

(iv) Two pairs and one distinct, number

$$\begin{aligned} \text{of words } &= {}^4C_2 \times {}^4C_1 \times \frac{5!}{2!2!} \\ &= 6 \times 4 \times 30 = 720 \end{aligned}$$

(v) One triplet and one pair, number of words

$= 4 \times \frac{5!}{3!2!} = 4 \times 10 = 40$

(vi) One 4 a like and one different

$= {}^1C_1 \times {}^5C_1 \times \frac{5!}{4!} = 25$

$\therefore$ Number of words with at least one repealed letters

$$= (720 + 2400 + 400 + 720 + 40 + 25) - 720$$
$$= 3585$$

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# Question26

## The number of ways of arranging all the letters of the word PERFECTION such that there must be exactly two consonants between any two vowels is

## AP EAPCET 2025 - 21st May Morning Shift

**Options:**

A.

$4! + 6!$

B.

$3! + 6!$

C.

$2!3!6!$

D.

$\frac{6!}{4!}$

**Answer: C**

## Solution:

Given, PERFECTION

Vowels E E I O and consonants PRFC T M.

Vowels can be arranged by $\frac{4!}{2!}$

$= 4 \cdot 3! = 2!3!$
$E \times XE \times X \times XO$

Consonants are arranged at $\times$ places by $6$ ! ways.

$\because$ Total number of ways $= 6! \times 3! \times 2!$

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# Question27

## Among the 4 -digit numbers formed using the digits $0, 1, 2, 3$ and 4 when repetition of digits allowed. Then, the number of numbers which are divisible by 4 is

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**Options:**

A. 140

B. 160

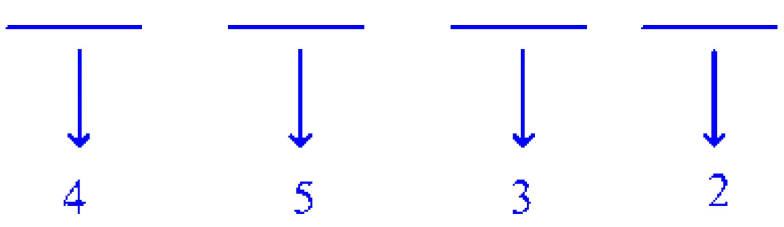
C. 180

D. 200

**Answer: B**

## Solution:

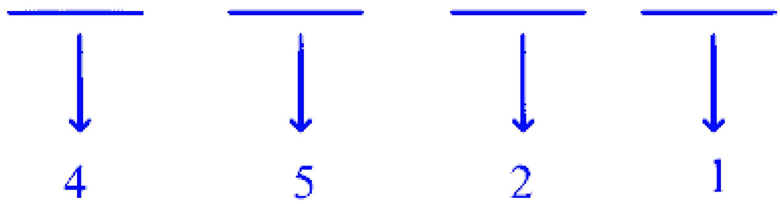
Case I When the unit digit is either 0 or 4 . Then, this digit should be 0,2 or 4.




$\therefore$ 4-digit number in case 1 is

$= 4 \times 5 \times 3 \times 2 = 120$

Case II When, the unit digit is 2 . Then, the ten's digit is either 1 or 3 .




$\therefore$ 4-digit number in case $2 = 4 \times 5 \times 2 \times 1 = 40$

Hence, required number

$= 120 + 40 = 160.$

---

# Question28

## The number of ways of arranging 2 red, 3 white and 5 yellow roses of different sizes into a garland such that no two yellow roses come together is

## AP EAPCET 2024 - 23th May Morning Shift

**Options:**

A. 2880

B. 144

C. 1440 .

D. 288

**Answer: C**

## Solution:

To determine the number of ways to arrange 2 red roses, 3 white roses, and 5 yellow roses of different sizes into a garland, ensuring that no two yellow roses are adjacent, we follow these steps:

**Arrange Red and White Roses:**

Since a garland has no fixed starting point, arranging the 2 red and 3 white roses in a circular fashion is equivalent to arranging them linearly with a rotational symmetry. This can be calculated using the formula for circular permutations, adjusted for identical elements:

$\frac{(5-1)!}{2} = \frac{4!}{2}$

**Calculate Available Spaces:**

After arranging the 2 red and 3 white roses, we create "gaps" between them and at the ends. This creates 5 gaps.

**Arrange Yellow Roses:**

We now need to place the 5 yellow roses in these 5 gaps without any two yellow roses being adjacent, which can be done in 5! ways (as we are using all available spaces).

The calculation for this arrangement is done using permutations:

$^5P_5 = 5!$

**Total Arrangements:**

The total number of ways to arrange the garland is the product of ways to arrange the red and white roses and the distinct ways to fill the gaps with yellow roses:

$\frac{4!}{2} \times ^5P_5 = \frac{4! \times 5!}{2}$

**Calculation:**

Calculate the factorials:

$4! = 24, \quad 5! = 120$

Calculate the total number of arrangements:

$\frac{24 \times 120}{2} = 1440$

Thus, the required number of ways to arrange the roses into a garland such that no two yellow roses are adjacent is 1440.

----------------------------------------------------------------------------------------------------

# Question29

## There were two women participating with some men in a chess tournament. Each participant played two games with the other. The number of games that the men played between themselves is 66 more than that of the men played with the women. Then, the total number of participants in the tournament is

## AP EAPCET 2024 - 22th May Evening Shift

**Options:**

A. 17

B. 13

C. 11

D. 19

**Answer: B**

## Solution:

Let there be $n$ men participents, then the number of games that the men play between themselves is $2 \times {}^nC_2$ and the number of games that the men played with the women is $2 \times 2n$

$\therefore 2 \times {}^nC_2 - 2 \times 2n = 66 \qquad [given]$

or $n^2 - 5n - 66 = 0 \Rightarrow n = 11$

Hence, number of participents men and women $=11$ men $+2$ women $=13$

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# Question30

## The number of ways of arranging 9 men and 5 women around circular table, so that no two women come together are

## AP EAPCET 2024 - 22th May Evening Shift

**Options:**

A. $8!{}^8P_5$

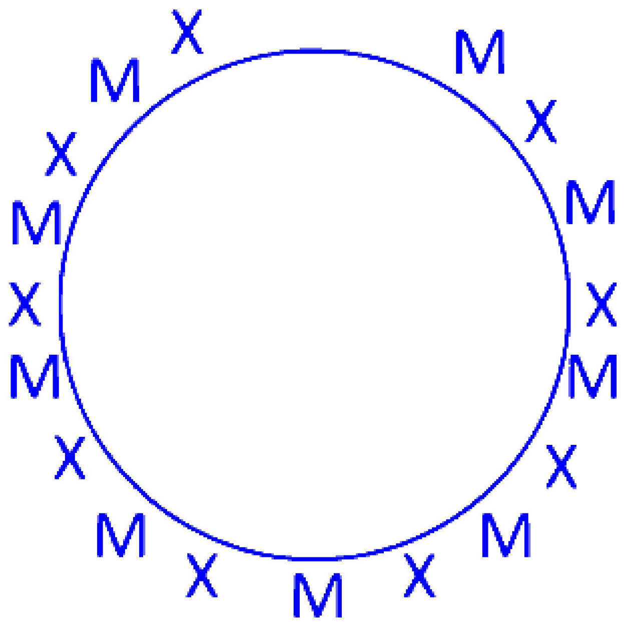
B. $9!{}^9P_5$

C. $8!{}^9P_5$

D. $8!5!$

**Answer: C**

## Solution:




The number of ways arranging a men around a circular table $= 8!$

We have, 9 places to sit of 5 women $= {}^9P_5$

$\therefore$ Number of ways $= 8! \cdot {}^9P_5$

---

# Question31

## If there are 6 alike fruits, 7 alike vegetables and 8 alike biscuits, then the number of ways of selecting any number of things out of them such that at least one from each category is selected, is

### AP EAPCET 2024 - 22th May Evening Shift

**Options:**

A. 504

B. 336

C. 503

D. 335

**Answer: B**

## Solution:

Since the fruits are alike, you can choose any number of fruits from 1 up to 6. This gives 6 possible selections (choosing 1, 2, 3, 4, 5, or 6 fruits).

For the vegetables, you can choose any number from 1 up to 7, which gives 7 possible selections.

For the biscuits, you can choose any number from 1 up to 8, providing 8 possible selections.

Since these choices are made independently (one choice does not affect the others), you multiply the number of ways in each category:

Total number of ways $= 6 \times 7 \times 8$.

Calculating the product:

$6 \times 7 = 42$,

$42 \times 8 = 336$.

Thus, the number of ways of selecting at least one fruit, one vegetable, and one biscuit is $\boxed{336}$.

The correct answer, therefore, is Option B.

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# Question32

## All the letters of the word 'TABLE' are permuted and the strings of letters (may or may not have meaning) thus formed are arranged in dictionary order. Then, the rank of the word 'TABLE' counted from the rank of the word 'BLATE' is

## AP EAPCET 2024 - 22th May Morning Shift

**Options:**

A. 50

B. 97

C. 61

D. 37

**Answer: C**

## Solution:

Write the word TABLE

alphabetically A, B, E, L, T

To finding the rank of BLATE

Fixing B, arrangements with $A$ in the

first position $4! = 24(A +$ permutations

of $B, E, L, T$ )

If permutation starting with $B$, then

fixing $B$ and then $L$, arrangements of,

$A, B, E, T : 3! = 6(BL +$ permutations of

$A, B, E, T$ )

if permuatations starting with $BL$

Fixing BL, arrangements of A, B, E, T

$= 3! = 6$

(BLA + permutations)

arrangements of $A, E, B, T : 2! = 2$

(BLAE + permutations)

arrangement of $A, E, T : 1! = 1$

(BLATE + permutations)

Thus, fixing $A = 24$

fixing $B = A + 6 = 30$

Fixing L: BLA $= 6$

Final E: BLAE $+1 = 31$

Therefore, total permutations of BLATE excluding irredevent permutations.

Thus, BLATE +31 : The possible rank of Table are permutations $= 30 + 31 = 61$

---

# Question33

## 5 boys and 6 girls are arranged in all possible ways. Let $X$ denote the number of linear arrangements in which no two boys sit together and $Y$ denote the number of linear arrangements in which no two girls sit together. If $Z$ denote the number of ways of arranging all of them around a circular table such that no two boys sit together, then $X : Y : Z =$

**Options:**

A. 1 : 1 : 21

B. 21 : 1 : 1

C. 7 : 5 : 5

D. 4 : 3 : 3

**Answer: B**

## Solution:

**Linear arrangements where no two boys sit together (X):**

First, arrange the 6 girls. This can be done in 5! (120) ways since the arrangement of the boys around these gaps is what's crucial. Once the girls are arranged, they create 7 possible gaps (1 before each girl and 1 after the last girl) to place the boys.

Next, select 5 of these 7 gaps to place a boy. This can be done in ${}^7C_5$ ways. Each selection of gaps can be filled by arranging the boys in 5! different ways.

Therefore, the total number of linear arrangements where no two boys sit together (X) is:

$X = 5! \times {}^7C_5 \times 5! = 5! \times \frac{7!}{5!2!} \times 5!$

Simplifying,

$X = \frac{7 \times 6}{2} \times 5! \times 5! = 21 \times 5! \times 5!$

**Linear arrangements where no two girls sit together (Y):**

This problem can be solved similarly to the arrangement for X. Here, arrange the boys first, which can also be done in 5! ways. This arrangement creates 6 gaps.

All 6 girls can be placed into these exact 6 gaps in ${}^6C_6$ ways, and then arrange those girls among themselves in 6! (720) ways.

Thus, the total number of linear arrangements where no two girls sit together (Y) is:

$Y = 5! \times {}^6C_6 \times 6! = 5! \times 1 \times 6!$

Since $Y = 5! \times 6!$, and recognizing $6! = 6$, it remains:

$Y = 5! \times 5!$

**Circular arrangements where no two boys sit together (Z):**

For arranging 11 people in a circle, consider fixing one girl as a reference point, leaving 10 people to arrange, which alters our calculation by one less arrangement over linear. Arrange the remaining 5 boys and 5 girls around this fixed position.

The number of circular arrangements, where no two boys sit together for them is:

$Z = 5! \times 5!$

For the final result, calculating the ratio $X : Y : Z$ gives us:

$X : Y : Z = 21 \times 5! \times 5! : 1 \times 5! \times 5! : 1 \times 5! \times 5! = 21 : 1 : 1$

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# Question34

## The number of ways of distributing 15 apples to three persons $A, B, C$ such that $A$ and $C$ each get at least 2 apples and $B$ gets at most 5 apples, is

## AP EAPCET 2024 - 22th May Morning Shift

**Options:**

A. 57

B. 131

C. 156

D. 251

**Answer: A**

## Solution:

**Distribute the Minimum Apples:**

$A$ receives 2 apples, and $C$ receives 2 apples.

This leaves $15 - 2 - 2 = 11$ apples to be distributed among $A$, $B$, and $C$.

**Define Variables for Remaining Distribution:**

Let $x$ be the number of apples $A$ gets over the initial 2.

Let $y$ be the number of apples $B$ receives.

Let $z$ be the number of apples $C$ gets over the initial 2.

The equation to solve is $x + y + z = 11$.

**Apply Constraints:**

Since $B$ can receive at most 5 apples, $y \leq 5$.

**Use the Stars and Bars Method:**

Calculate the total number of solutions to $x + y + z = 11$ without any constraints:

$\binom{11+2}{2} = \binom{13}{2} = 78$

**Account for the Constraint on $B$:**

For cases where $y > 5$, set $y' = y - 6$, where $y' \geq 0$.

Substitute $y$ with $y'$ to get the equation $x + y' + z = 5$.

Count the number of solutions to $x + y' + z = 5$:

$\binom{5+2}{2} = \binom{7}{2} = 21$

**Calculate the Final Result:**

Subtract the invalid cases from the total solutions:

$78 - 21 = 57$

Thus, there are 57 ways to distribute the apples based on the given conditions.

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# Question35

## There are 6 different novels and 3 different poetry books on a table. If 4 novels and 1 poetry book are to be selected and arranged in a row on a shelf such that the poetry book is always in the middle, then the number of such possible arrangements is

## AP EAPCET 2024 - 21th May Evening Shift

**Options:**

A. 270

B. 180

C. 540

D. 1080

**Answer: D**

## Solution:

and number of poetry $= 3$

$\therefore$ Number of ways of selecting 4 novels from 6

$= {}^6C_4$ way

Number of ways of selecting 1 poetry from 3.

$= {}^3C_1$ way

When poetry is always in middle,

So, 4 nowels can be arrange in 4 ! ways.

$\therefore$ Required number of ways

$$\begin{aligned} & = {}^6C_4 \times {}^3C_1 \times 4! \\ & = \frac{6 \times 5}{2 \times 1} \times 3 \times 24 \\ & = 15 \times 3 \times 24 \\ & = 1080 \end{aligned}$$

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# Question36

## If a five-digit number divisible by 3 is to be formed using the numbers $0, 1, 2, 3, 4$ and 5 without repetition, then the total number of ways this can be done is

## AP EAPCET 2024 - 21th May Evening Shift

**Options:**

A. 120

B. 144

C. 192

D. 216

**Answer: D**

## Solution:

To form a five-digit number using the digits 0, 1, 2, 3, 4, and 5, which must be divisible by 3, we need to consider the divisibility rule for 3. A number is divisible by 3 if the sum of its digits is a multiple of 3. This gives us two possible scenarios to examine:

**Case I:** Using the digits 0, 1, 2, 4, and 5.

The sum of these digits is $0 + 1 + 2 + 4 + 5 = 12$, which is divisible by 3.

To avoid starting with 0 (as it wouldn't be a five-digit number), the first digit has 4 options (1, 2, 4, or 5).

The remaining four digits can be arranged in 4! (4 factorial) ways.

Thus, the number of ways to arrange these digits is:

$4 \times 4 \times 3 \times 2 \times 1 = 96$

**Case II:** Using the digits 1, 2, 3, 4, and 5.

The sum of these digits is $1 + 2 + 3 + 4 + 5 = 15$, which is also divisible by 3.

Any of these five digits can be at the start, providing 5 choices for the first digit.

The remaining four digits are arranged in 4! ways.

Thus, the number of ways to arrange these digits is:

$5 \times 4 \times 3 \times 2 \times 1 = 120$

**Conclusion:**

Adding the numbers from both scenarios gives the total number of five-digit numbers divisible by 3:

$96 + 120 = 216$

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# Question37

## Four-digit numbers with all digits distinct are formed using the digits $1, 2, 3, 4, 5, 6, 7$ in all possible ways.If $p$ is the total number of numbers thus formed and $q$ is the number of numbers greater than 3400 among them, then $p : q =$

## AP EAPCET 2024 - 21th May Evening Shift

**Options:**

A. $3 : 2$

B. $4 : 3$

C. $6 : 5$

D. $7 : 4$

**Answer: A**

## Solution:

Four-digit number formed using the digits $\{1, 2, 3, 4, 5, 6, 7\}$ with all distinct digits.

$p = {}^7P_4 = 7 \times 6 \times 5 \times 4 = 840$

Case I Leading digit is 3 .

For the number to be greater than 3400 , the second digit must be $4, 5, 6$ or 7 .

(i) Fix 3 as first digit.

(ii) Choose one of 4, 5, 6 or 7 for the second digits ( 4 choices).

(iii) For the third and fourth digits, Choose from the remaining 5 digits So, for each choice of the second digit $5 \times 4 = 20$

There are 4 choices for the second digits so, $4 \times 20 = 80$

Case II Leading digit is $4, 5, 6$ or 7 .

Any number starting with $4, 5, 6$ or 7 is automatically greater than 3400 .

There are 4 choices for the first digit (4,5,6 or 7 )

Choose any 3 digits from the remaining 6 digits.

So, for each choice of the first digit

$6 \times 5 \times 4 = 120$

There are 4 choices for the first digit, so

$4 \times 120 = 480$

Total numbers greater than 3400

$q = 80 + 480 = 560$

Now, $\frac{p}{q} = \frac{840}{560} = \frac{3}{2}$

So, the ratio $p : q = 3 : 2$.

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# Question38

## The number of 5 -digit odd numbers greater than 40000 that can be formed by using 3,4,5,6,7,0 so that at least one of its digit must be repeated is

## AP EAPCET 2024 - 21th May Morning Shift

**Options:**

A. 2592

B. 240

C. 3032

D. 2352

**Answer: D**

## Solution:

In all the numbers unit digit either 3 or 5 or 7 .

All 5 digit number (with repetition)

$$\{4,5,6,7\}\{0,3,4,5,6,7\}\{0,3,4,5,6,7\}$$
$$\{0,3,4,5,6,7\}\{3,5,7\}$$
$$=4\times6\times6\times6\times3=2592$$

All 5 digit number (without repetition)

$$\text{Case } I\underset{\{4,5,6,7\}}{\underline{\qquad}}---\frac{3}{}=4\times4\times3\times2\times1=96$$

$$\text{Case II }\underset{\{4,6,7\}}{\underline{\qquad}}---\frac{5}{}=3\times4\times3\times2\times1=72$$

$$\text{Case III }\underset{\{4,5,6\}}{\underline{\qquad}}---\frac{7}{}=3\times4\times3\times2\times1=72$$

Total numbers (without repetition)

$$=96+72+72=240$$

$$\therefore \text{ Required number }=2592-240=2352$$

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# Question39

## The number of ways in which 3 men and 3 women can be arranged in a row of 6 seats, such that the first and last seats must be filled by men is

## AP EAPCET 2024 - 21th May Morning Shift

**Options:**

A. 720

B. 36

C. 144

D. 72

**Answer: C**

## Solution:

To find the number of ways to arrange 3 men and 3 women in a row of 6 seats such that the first and last seats are occupied by men, follow these steps:

### Arrangement Patterns

Since the first and last seats must be occupied by men, we have two initial positions occupied. After placing two men in these spots, we are left with 1 man and 3 women to arrange in the remaining 4 seats. Here are the possible patterns:

Men, Women, Men, Women, Women, Men

Men, Women, Women, Men, Women, Men

Men, Men, Women, Women, Women, Men

Men, Women, Women, Women, Men, Men

### Calculating the Number of Arrangements

For each pattern:

**Men**: We have 3 men, and we've used 2 positions (first and last), leaving us with 1 man to arrange. This can be done in 3! ways.

**Women**: With 3 women, we fill the remaining positions, which can also be done in 3! ways.

Since there are 4 patterns, the total number of arrangements is calculated as:

$= 4 \times (3!) \times (3!)$

Breaking down the calculation:

$3! = 3 \times 2 \times 1 = 6$

So, using these numbers, the calculation is:

$= 4 \times 6 \times 6 = 144$

Thus, there are **144** different ways to arrange 3 men and 3 women in a row of 6 seats, with the first and last seats filled by men.

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# Question40

## If a committee of 10 members is to be formed from 8 men and 6 women, then the number of different possible committees in which the men are in majority is

## AP EAPCET 2024 - 21th May Morning Shift

**Options:**

A. 931

B. 175

C. 48

D. 595

**Answer: D**

## Solution:

For majority, Men should be > ifl number.

Selecting the committee

$\Rightarrow {}^8C_6 \times {}^6C_4 + {}^8C_7 \times {}^6C_3 + {}^8C_3 \times {}^6C_2$

$$\Rightarrow \frac{8 \times 7 \times 6 \times 5}{2 \times 1 \times 2 \times 1} + \frac{8 \times 6 \times 5 \times 4}{1 \times 3 \times 2 \times 1} + \frac{8 \times 6 \times 5}{8 \times 2 \times 1}$$

$= 420 + 160 + 15 = 595$

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# Question41

## A test containing 3 objective type of questions is conducted in a class. Each question has 4 options and only one option is the correct answer. No two students of the class have answered identically and no student has written all correct answer. If every students has attempted all the questions, then the maximum possible number of students who has written the test is

## AP EAPCET 2024 - 20th May Evening Shift

**Options:**

A. 80

B. 63

C. 15

D. 11

**Answer: B**

## Solution:

As there are 4 choices for each question, so we can answer the question in $(4 \times 4 \times 4)$ ways.

And there lies one way to answer the question in $(4 \times 4 \times 4)$, ways to get all the correct answer which should be neglected.

$\therefore$ Maximum possible number of students $= (4 \times 4 \times 4 - 1) = (4^3 - 1) = 63$

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# Question42

## The number of numbers lying between 1000 and 10000 such that every number contains the digit 3 and 7 only once without repetition is

## AP EAPCET 2024 - 20th May Evening Shift

**Options:**

A. 1140

B. 918

C. 720

D. 810

**Answer: C**

## Solution:

A number between 1000 and 10000 contains 4 -digits So, we have to form 4-digit numbers having exactly two of their digits as 3 and 7 only once.

So, we have the following ways to form

4 - digit numbers with above conditions

I. $7 \times 8 \times 1 \times 1 = 56$ numbers

II. $7 \times 1 \times 1 \times 8 = 56$ numbers

III. $1 \times 1 \times 8 \times 8 = 64$ numbers

IV. $1 \times 8 \times 1 \times 8 = 64$ numbers

V. $1 \times 8 \times 8 \times 1 = 64$-numbers

VI. $7 \times 8 \times 1 \times 1 = 56$ numbers

Thus, total number of required type of numbers

$= 2 \times (56 + 56 + 64 + 64 + 64 + 56)$ numbed

($\because$ 3 and 7 can be interchanged.)

$= 2 \times 360$ numbers

$= 720$ numbers

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# Question43

## The number of ways in which 17 apples can be distributed among four guests such that each guest gets at least 3 apples is .

## AP EAPCET 2024 - 20th May Evening Shift

**Options:**

A. 1140

B. 336

C. 36

D. 56

**Answer: D**

## Solution:

The general formula for distribuind $n$ things amongest $r$ people is

${}^{n-1}C_{r-1} = {}^{17-1}C_{4-1} = {}^{16}C_3 = 560$

and the number of ways to distributel objects into $k$ groups such that each group at least $m$ object is ${}^{n-k+m}C_{k-1}$

where $n = 17, k =$ number of groups $= 4$ $m =$ minimum number of objects $= 3$

${}^{17-4\times3}C_{4-1} = {}^{17-12}C_3$

$= {}^5C_3 = 10$

$= {}^5C_3 = 10$

$\therefore$ Required number of ways

$= \frac{560}{10} = 56$

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# Question44

## If a polygon of $n$ sides has 275 diagonals, then $n$ is

## AP EAPCET 2024 - 20th May Morning Shift

**Options:**

A. 25

B. 35

C. 20

D. 15

**Answer: A**

## Solution:

To find the number of sides $n$ of a polygon that has 275 diagonals, we use the formula for the number of diagonals in an $n$-sided polygon:

Number of diagonals $= \frac{n(n-3)}{2}$

Given that there are 275 diagonals, we set up the equation:

$\frac{n(n-3)}{2} = 275$

Multiplying both sides by 2 to eliminate the fraction gives:

$n(n-3) = 550$

This expands to the quadratic equation:

$n^2 - 3n - 550 = 0$

To solve for $n$, we use the quadratic formula:

$n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

where $a = 1$, $b = -3$, and $c = -550$. Plugging these values into the formula:

$n = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times (-550)}}{2 \times 1}$

Simplifying within the square root:

$n = \frac{3 \pm \sqrt{9+2200}}{2}$

$n = \frac{3 \pm \sqrt{2209}}{2}$

The square root of 2209 is 47, so:

$n = \frac{3 \pm 47}{2}$

This gives us two potential solutions:

$n = \frac{3+47}{2} = \frac{50}{2} = 25$

$n = \frac{3-47}{2} = \frac{-44}{2} = -22$

Since $n$ must be a positive integer, the number of sides in the polygon is 25.

---

# Question45

## The number of positive divisors of 1080 is

## AP EAPCET 2024 - 20th May Morning Shift

**Options:**

A. 30

B. 32

C. 23

D. 31

**Answer: B**

## Solution:

| | |
|---|---|
| 2 | 1080 |
| 2 | 540 |
| 2 | 270 |
| 3 | 135 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

$1080 = 2^3 \times 3^3 \times 5^4$

Total number of positive divisors

$= (e_1 + 1)(e_2 + 1) \ldots (e_n + 1)$

Where $e_1, e_2, \ldots . e_n$ are the exponents in the prime factorisation.

so, number of positive divisors of

$$\begin{aligned} 1080 &= (3+1)(3+1)(1+1) \\ &= 4 \times 4 \times 2 = 32 \end{aligned}$$

---

# Question46

**If $a_n = \sum\limits_{r=0}^{n} \frac{1}{{}^nC_r}$, then $\sum\limits_{r=0}^{n} \frac{r}{{}^nC_r} =$**

## AP EAPCET 2024 - 20th May Morning Shift

**Options:**

A. $(n-1)a_n$

B. $n \cdot a_n$

C. $\frac{n}{2} a_n$

D. $a_{n+1}$

**Answer: C**

## Solution:

We have, $a_n = \sum\limits_{r=0}^{n} \frac{1}{n_{c_r}}$

Let $S = \sum_{r=0}^{n} \frac{r}{^{n}c_r}$

Replacing $r$ by $n - r$, we get

$$S = \sum_{r=0}^{n} \frac{n-r}{^{n}c_{n-r}}$$
$$S = \sum_{r=0}^{n} \frac{n-r}{^{n}c_r}$$

[as $^{n}c_r = {}^{2}c_{n-1}$

On adding Eqs. (i) and (ii), we get

$$2S = \sum_{r=0}^{n} \frac{r}{n_{c_r}} + \sum_{r=0}^{n} \frac{n-r}{^{n}c_r}$$
$$2S = n \sum_{r=0}^{n} \frac{1}{n^{c_r}}$$
$$2S = n \cdot a_n \Rightarrow S = \frac{n}{2} \cdot a_n$$

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# Question47

## If all the letters of the word MASTER are permuted in all possible ways and words (with or without meaning) thus formed are arranged in dictionary order, then the rank of the word MASTER is

### AP EAPCET 2024 - 19th May Evening Shift

**Options:**

A. 357

B. 527

C. 257

D. 752

**Answer: C**

## Solution:

The alphabetical order of the letters of the given word MASTER is A, E, M, R, S and T.

Number of ways begin with letter $A$

$= 5! = 120$

Number of ways begin with letter E

$= 5! = 120$

Number of ways begin with letter MAE

$= 3! = 6$

Number of ways being with letter MAR

$= 3! = 6$

Number of ways begin with letter

$\text{ MASE } = 2! = 2$

Number of ways begin with letter

$\text{ MASR } = 2! = 2$

Next word is MASTER.

$\therefore$ Rank of the word MASTER in the dictionary order

$= 120 + 120 + 6 + 6 + 2 + 2 + 1 = 257$

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# Question48

## If Set $A$ contains 8 elements, then number of subsets of $A$ which contain at least 6 elements is

## AP EAPCET 2024 - 19th May Evening Shift

**Options:**

A. 28

B. 73

C. 37

D. 82

**Answer: C**

## Solution:

Total number of elements $= 8$

$\therefore$ Required number of subsets

$$= {}^8C_6 + {}^8C_7 + {}^8C_8 = \frac{8 \times 7}{1 \times 2} + 8 + 1$$
$$= 28 + 9 = 37$$

---

# Question49

## The number of different permutations that can be formed by taking 4 letters at a time from the letters of the word 'REPETITION' is

## AP EAPCET 2024 - 19th May Evening Shift

**Options:**

A. 1380

B. 1218

C. 1398

D. 1286

**Answer: C**

## Solution:

There are total 10 letters in the word 'REPETITION'.

Case I There are 7 distinct letter in the given work all 4 letters are distinct.

So, number of ways of choosing 4 letters out of $7 = {}^7C_4$.

4 letters can be arranged in 4 ! ways.

$\therefore$ Number of ways of arranging these 4 letters $= {}^7C_4 \times 4! = 840$ ways

Case II Two distinct and 2 alike letters number of ways of choosing two distinct and 2 alike letters.

$= \frac{{}^3C_1 \times {}^6C_2 \times 4!}{2!} = 3 \times 15 \times 12 = 540$

Case III Both pair are alike.

Number of ways of choosing both alike pairs

$= \frac{{}^3C_2 \times 4!}{2! \times 2!} = 18$

$\therefore$ Required number of ways

$= 840 + 540 + 18 = 1398$

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# Question50

## The number of different ways of preparing a garland using 6 distinct white roses and 6 distinct red roses such that no two red roses come together, is

## AP EAPCET 2024 - 18th May Morning Shift

**Options:**

A. 43200

B. 86400

C. 59200

D. 76800

**Answer: A**

## Solution:

To prepare a garland using 6 distinct white roses and 6 distinct red roses such that no two red roses are adjacent, follow these steps:

**Arranging White Roses:**

Since we have 6 distinct white roses, they can be arranged in a garland. The formula to arrange flowers in a garland using circular permutations is $\frac{(n-1)!}{2}$, where $n$ is the number of items. For the white roses, this gives us:

$\frac{(6-1)!}{2} = \frac{5!}{2} = \frac{120}{2} = 60$

**Arranging Red Roses:**

When the white roses are arranged, they create gaps in between them where red roses can be placed so that no two red roses come together. For 6 white roses arranged circularly, this results in 6 distinct positions for placing the red roses to separate them.

**Placing Red Roses:**

The number of ways to arrange these 6 distinct red roses in these 6 positions is given by the permutation of 6 distinct items, which is $6!$. Thus, the calculation is:

$6! = 720$

**Calculating Total Arrangements:**

Finally, combine the permutations of both sets of roses. The total number of ways to arrange the garland while maintaining the condition is:

$60 \times 720 = 43200$

Thus, there are 43,200 different ways to prepare the garland with the given conditions.

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# Question51

## The number of ways a committee of 8 members can be formed from a group of 10 men and 8 women such that the committee contains at, most 5 men and atleast 5 women, is

### AP EAPCET 2024 - 18th May Morning Shift

**Options:**

A. 8061

B. 8612

C. 8082

D. 8271

**Answer: A**

## Solution:

We have 10 men and 8 women.

Possible number of ways of forming a committee are

5 women, 3 men or 6 women, 2 men or 7 women, 1 men or 8 women

$\therefore$ Required number of ways

$$\begin{aligned} &= {}^8C_5 \times {}^{10}C_3 + {}^8C_4 \times {}^{10}C_2 + {}^8C_7 \times {}^{10}C_1 + {}^4C_1 \\ &= 6720 + 1260 + 80 + 1 = 8061 \end{aligned}$$

---

# Question52

## If all the letters of the word CRICKET are permuted in all possible ways and the words (with or without meaning), thus

**formed are arranged in the dictionary order, then the rank of the word CRICKET is**

## AP EAPCET 2024 - 18th May Morning Shift

**Options:**

A. 561

B. 531

C. 546

D. 513

**Answer: B**

## Solution:

To find the rank of the word "CRICKET" when all its permutations are arranged in dictionary order, follow these steps:

**List the Letters in Alphabetical Order**: Arrange the letters of "CRICKET" alphabetically: C, C, E, I, K, R, T.

**Compute Permutations for Each Case**:

**Starting with C followed by C (CC)**: Calculate permutations of the remaining letters E, I, K, R, T. This would be $5! = 120$ ways.

**Starting with C followed by E (CE)**: Calculate permutations of the remaining letters C, I, K, R, T. This would also be $5! = 120$ ways.

**Starting with C followed by I (CI)**: Calculate permutations of the remaining letters C, E, K, R, T. Again, $5! = 120$ ways.

**Starting with C followed by K (CK)**: Calculate permutations of the remaining letters C, E, I, R, T. Again, $5! = 120$ ways.

**Starting with C followed by R and then C (CRC)**: Calculate permutations of the remaining letters E, I, K, T. This is $4! = 24$ ways.

**Starting with C followed by R and then E (CRE)**: Calculate permutations of the remaining letters C, I, K, T. This also results in $4! = 24$ ways.

**Starting with CRIC**: You need to arrange the remaining letters K, E, T. "CRICE" results in 2 distinct permutations:

CRICEK

CRICKET (the word we are interested in)

Therefore, the number of arrangements before CRICKET is 2 (starting at CRICE_).

**Determine the Rank**:

The rank of "CRICKET" is therefore $120+120+120+120+24+24+2+1=531$.

Thus, the rank of the word "CRICKET" is 531 in the list of all possible permutations arranged in dictionary order.

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# Question53

If $10^n C_2 = 3^{n+1} C_3$, then the value of $n$ is

### AP EAPCET 2022 - 5th July Morning Shift

**Options:**

A. 3

B. 10

C. 7

D. 9

**Answer: D**

## Solution:

$10^n C_2 = 3^{n+1} C_3$

$$\frac{10 n!}{(n-2)!2!}=\frac{3(n+1)!}{(n+1-3)!\times 3!}$$
$$\Rightarrow \quad \frac{10 n!}{2}=\frac{3(n+1) n!}{3 \times 2}$$
$$\Rightarrow \quad 10=n+1$$
$$\Rightarrow \quad n=9$$

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# Question54

**There are 10 points in a plane, out of these 6 are collinear. If $N$ is the total number of triangles formed by joining these points, then $N=$**

**Options:**

A. 120

B. 850

C. 100

D. 150

**Answer: C**

## Solution:

Here's how to solve this problem:

First, let's understand the concepts involved:

- **Collinear points:** Points that lie on the same straight line.
- **Triangle:** A polygon with three sides.

To form a triangle, we need to choose 3 points out of the 10. We can do this using combinations:

Total number of ways to choose 3 points out of 10 = ${}^{10}C_3 = \frac{10!}{3!7!} = 120$

However, this count includes triangles formed using the 6 collinear points. We need to subtract these invalid triangles.

Number of ways to choose 3 points out of 6 collinear points = ${}^{6}C_3 = \frac{6!}{3!3!} = 20$

Therefore, the total number of valid triangles (those not formed by the collinear points) is:

$N = 120 - 20 = 100$

So the answer is **Option C: 100**.

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# Question55

## In an examination, the maximum marks for each of three subjects is $n$ and that for the fourth subject is $2n$. The number of ways in which candidates can get $3n$ marks is

**Options:**

A. $\frac{1}{6}(n+1)^2\left(5n^2+10n+6\right)^2$

B. $\frac{1}{6}(n+1)\left(5n^2+10n+6\right)^2$

C. $\frac{1}{6}(n+1)^2\left(5n^2+10n+6\right)$

D. $\frac{1}{6}(n+1)\left(5n^2+10n+6\right)$

**Answer: D**

## Solution:

Total marks $=$ Marks for first 3 papers + Marks for fourth paper $= 3n+2n=5n$

Candidate needs to get $3n$ marks.

Let $x_1, x_2, x_3, x_4$ be the marks of candidate in I, II, III and IV paper, respectively.

Then, $x_1+x_2+x_3+x_4=3n\ (0 \leq x_1, x_2, x_3, \leq n$ and $0 \leq x_4 \leq 2n)$

Using multinomial theorem,

$$\text{Number of ways } = \text{ Coefficient of } x^{3n} \text{ in } \underbrace{(1+x+\ldots+x^n)^3}_{\text{GP series}}\underbrace{(1+x+\ldots x^{2n})}_{\text{GP Series}}$$

$$\Rightarrow \left(\frac{1-x^{n+1}}{1-x}\right)^3\left(\frac{1-x^{2n+1}}{1-x}\right)$$

$$\Rightarrow 1-x^{3(n+1)}-3x^{n+1}\left(1-x^{n+1}\right)\left(1-x^{2n+1}\right)(1-x)^{-4}$$

$$\Rightarrow \left(1-x^{3(n+1)}-3x^{n+1}+3x^{2n+2}\right)\left(1-x^{2n+1}\right)(1-x)^{-4}$$

$$\Rightarrow \left(1-x^{3(n+1)}-3x^{n+1}+3x^{2n+2}-x^{2n+1}+x^{5n+4}\right.$$
$$\left.+3x^{3n+2}-3x^{4n+3}(1-x)^{-4}\right)$$

Finding the coefficient of $x^{3n}$ using binomial expansion, we get

$$^{3n+3}C_3-3^{2n+2}C_3+3^{n+2}C_3-{}^{n+3}C_3$$
$$=\frac{1}{6}(n+1)\left(5n^2+10n+6\right)$$

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# Question56

**If a set $A$ has $m$-elements and the set $B$ has $n$-elements, then the number of injections from $A$ to $B$ is**

## AP EAPCET 2022 - 4th July Evening Shift

**Options:**

A. ${}^nC_m$ if $n \geq m$

B. ${}^nP_m$ if $n \geq m$

C. 0 if $n \geq m$

D. $m \cdot {}^nC_m$ if $n \geq m$

**Answer: B**

## Solution:

If set $A$ contains $m$ elements and set $B$ comprises $n$ elements, the number of injections from $A$ to $B$ can be defined as follows:

$$\begin{cases} 0, & \text{if } n < m \\ {}^nP_m, & \text{if } n \geq m \end{cases}$$

This means that if the number of elements in set $B$ is less than the number in set $A$ $(n < m)$, there are no injections possible. Conversely, if $n \geq m$, the number of injections is given by the permutation notation ${}^nP_m$.

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# Question57

**In how many ways can the letters of the word "MULTIPLE" be arranged keeping the position of the vowels fixed?**

## AP EAPCET 2022 - 4th July Evening Shift

**Options:**

A. 60

B. 360

C. 600

D. 300

**Answer: B**

## Solution:

MULTIPLE has 8 letters, with 5 consonant (L repeated twice) and 3 vowels.

The vowels in 2nd, 5th and 8th places, these can be arranged in $3!$ ways $= 6$ ways

The remaining 5 consonants can be arranged in $\frac{5!}{2!}$ ways $= \frac{120}{2} = 60$ ways

Thus, the total number of ways $= 6 \times 60 = 360$

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# Question58

### A natural number $n$ such that $n!$ ends in exactly 1000 zeroes is

## AP EAPCET 2022 - 4th July Evening Shift

**Options:**

A. 4010

B. 4000

C. 4009

D. 4004

**Answer: C**

## Solution:

Number of zeroes at the end of 4000!

$$= \left[\frac{4000}{5}\right] + \left[\frac{4000}{5^2}\right] + \left[\frac{4000}{5^{-3}}\right] + \left[\frac{4000}{5^4}\right] + \left[\frac{4000}{5^5}\right]$$
$$= 800 + 160 + 32 + 6 + 1 = 999$$

Now, we need one more pair of 5 and 2 so that the number ends in exactly 1000 zeroes.

$4005 \leq N < 4009$

$\therefore$ From the option (c), $N = 4009$

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# Question59

## The total number of permutations of $n$ different things taken not more than $r$ at a time, when each thing may be repeated any number of times is

## AP EAPCET 2022 - 4th July Morning Shift

**Options:**

A. $\frac{n(n'+1-1)}{n-1}$

B. $\frac{n^{r+1}-1}{n-1}$

C. $\frac{n(n'-1)}{n-1}$

D. $\frac{(n'-1)}{n-1}$

**Answer: C**

## Solution:

Total number of things $= n$

Repetition of things is allowed and atmost $r$ can be taken at a time.

The number of ways of taking 1 thing at a time $= n$

The number of ways of taking 2 things at a time $= n^2$

The number of ways of taking 3 things at a time $= n^3$ ..........

The number of ways of taking $r$ things at a time $= n^3$

Total number of permutations of $n$ different things taken not more than $r$ at a time i.e. number of permutations of taking $1, 2, \ldots, r$ at a time.

$= n + n^2 + n^3 + \ldots . + n'$

$= \frac{n\left(n^2 - 1\right)}{n - 1} \quad [\because \text{ sum of GP}]$

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# Question60

### How many chords can be drawn through 21 points on a circle?

## AP EAPCET 2022 - 4th July Morning Shift

**Options:**

A. 105

B. 210

C. 420

D. 840

**Answer: B**

## Solution:

There are 21 points on the circle, denoted as $n = 21$. A chord is formed by connecting any two points on the circle.

Therefore, the number of possible chords is given by the combination formula ${}^nC_2$:

${}^{21}C_2 = \frac{21 \times 20}{2 \times 1} = 210$

Hence, 210 chords can be drawn through the 21 points on the circle.

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# Question61

### If a polygon of $n$ sides has 560 diagonals, then $n =$

## AP EAPCET 2022 - 4th July Morning Shift

**Options:**

A. 35

B. 36

C. 37

D. 38

**Answer: A**

## Solution:

$$\begin{aligned}
&\text{Number of sides } = n \\
&\text{Number of diagonals } = 560 \\
&\because \text{ Number of diagonals } = \frac{n(n-3)}{2} \\
&\Rightarrow \quad 560 = \frac{n(n-3)}{2} \\
&\Rightarrow \quad 1120 = n^2 - 3n \\
&\Rightarrow \quad n^2 - 3n - 1120 = 0 \\
&\Rightarrow \quad n^2 - 35n + 32n - 1120 = 0 \\
&\Rightarrow \quad n(n-35) + 32(n-35) = 0 \\
&\Rightarrow \quad (n-35)(n+32) = 0 \\
&\Rightarrow \quad n = 35, -32 \\
&\quad n \neq -32 \\
&\therefore \quad n = 35.
\end{aligned}$$

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# Question62

**A person writes letters to 6 friends and addresses the corresponding envelopes. In how many ways can the letters be placed in the envelopes so that at least two of them are in the wrong envelopes?Notation** $D_n = n!\left(\sum_{i=0}^{n} \frac{(-1)^i}{i!}\right)$

### AP EAPCET 2022 - 4th July Morning Shift

**Options:**

A. ${}^6C_4 \cdot D_2$

B. $\sum_{r=3}^{6} {}^6C_{6-r} \cdot D_r$

C. $\sum_{r=2}^{6} {}^6C_{6-r} \cdot D_r$

D. ${}^6C_1 D_5 + {}^6C_0 \cdot D_6$

**Answer: C**

## Solution:

If the total number of letters is $n$, then the number of ways in which $r$ letters goes into wrong envelopes $= {}^nC_{n-r}D_r$

The number of ways in which atleast two of the letters are in wrong envelopes

$$= {}^6C_{6-2}D_2 + {}^6C_{6-3}D_3 + {}^6C_{6-4}D_4$$
$$+ {}^6C_{6-5}D_5 + {}^6C_{6-6}D_6 \quad [\because r = 2, 3, 4, 5, 6]$$
$$= \sum_{r=2}^{6} {}^6C_{6-,} D_r \quad \left[\text{where, } D^r = r!\left(\sum_{i=0}^{r} \frac{(-1)^r}{i!}\right)\right]$$

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# Question63

## A set contains 11 elements. The number of subsets of the set which contain at most 5 elements is

## AP EAPCET 2021 - 20th August Evening Shift

**Options:**

A. ${}^{12}C_0 + {}^{12}C_2 + {}^{12}C_4$

B. ${}^{12}C_1 + {}^{12}C_3 + {}^{12}C_5$

C. ${}^{11}C_0 + {}^{11}C_1 + {}^{11}C_2 + {}^{11}C_4$

D. ${}^{11}C_0 + {}^{11}C_1 + {}^{11}C_2 + {}^{11}C_3$

**Answer: B**

## Solution:

Here, n = 11 and subset have atmost 5 elements

$\therefore$ Total subset = (Subset with 0 element) + (Subset with 1 element) + (Subset with 2 element) + (Subset with 3 element) + (Subset with 4 element) + (Subset with 5 element)

$$= \left({}^{11}C_0 + {}^{11}C_1\right) + \left({}^{11}C_2 + {}^{11}C_3\right) + \left({}^{11}C_4 + {}^{11}C_5\right)$$
$$= {}^{12}C_1 + {}^{12}C_3 + {}^{12}C_5 \quad \left[\because {}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r\right]$$

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# Question64

### The value of ${}^6P_4 + 4 \cdot {}^6P_3$ is

### AP EAPCET 2021 - 20th August Morning Shift

**Options:**

A. 5040

B. 2520

C. 840

D. 720

**Answer: C**

## Solution:

$${}^6P_4 + 4 \cdot {}^6P_3$$
$$\left(\frac{6!}{2!} + 4 \cdot \frac{6!}{3!}\right) = 360 + 480 \quad \left[\because {}^nP_r = \frac{n!}{(n-r)!}\right]$$
$$= 840$$

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# Question65

### The number of ways in which 3 boys and2 girls can sit on a bench so that no two boysare adjacent is

### AP EAPCET 2021 - 20th August Morning Shift

**Options:**

A. 6

B. 10

C. 12

D. 32

**Answer: C**

## Solution:

$\underline{B_1}G_1\underline{B_2}G_2\underline{B_3}$

$G_1$ and $G_2$ can be arranged in 2! ways. $B_1, B_2$ and $B_3$ can be arranged in 3! ways.

$\therefore$ Required number of arrangements

$= 2! \times 3!$

$= 12$

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# Question66

### In how many ways can 5 balls be placed in4 tins if any number of balls can be placed inany tin?

### AP EAPCET 2021 - 20th August Morning Shift

**Options:**

A. $^5P_4$

B. $^5C_4$

C. $4^5$

D. $5^4$

**Answer: C**

## Solution:

5 balls $\rightarrow$ 4 Tins

Each ball can be placed in 4 ways.

So, number of ways $= 4 \times 4 \times 4 \times 4 \times 4 = 4^5$

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# Question67

**For $1 \leq r \leq n$, $\frac{1}{r+1}\left\{{}^nP_{r+1} - {}^{(n-1)}P_{r+1}\right\}$ is equal to**

### AP EAPCET 2021 - 19th August Evening Shift

**Options:**

A. ${}^nP_n$

B. ${}^{n-1}P_r$

C. ${}^nP_{n+1}$

D. 0

**Answer: B**

## Solution:

$$\frac{1}{r+1}\left\{{}^nP_{r+1} - {}^{n-1}P_{r+1}\right\}$$
$$= \frac{1}{r+1}\left[\frac{n!}{(n-r-1)!} - \frac{(n-1)!}{(n-r-2)!}\right]$$
$$= \frac{1}{(r+1)} \cdot \frac{(n-1)!}{(n-r-2)!}\left(\frac{n}{n-r-1} - 1\right)$$
$$= \frac{1}{(r+1)} \frac{(n-1)!}{(n-r-2)!} \frac{(r+1)}{(n-r-1)}$$
$$= \frac{(n-1)!}{(n-r-1)!} = {}^{n-1}P_r$$

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# Question68

## In how many ways 4 balls can be picked from6 black and 4 green coloured balls such thatat least one black ball is selected?

## AP EAPCET 2021 - 19th August Evening Shift

**Options:**

A. 212

B. 210

C. 209

D. 15

**Answer: C**

## Solution:

Total number of balls $= 10$

Total number of ways of selecting four balls $= {}^{10}C_4 = 210$

Number of ways of selecting all green balls $= {}^{4}C_4 = 1$

Number of ways of selecting 4 balls in which at least one black ball is selected $= 210 - 1 = 209$

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# Question69

## In how many ways can 9 examination papersbe arranged so, that the best and the worstpapers are never together?

## AP EAPCET 2021 - 19th August Evening Shift

**Options:**

A. $9! - 2! \times 7!$

B. $9! - 2! \times 8!$

C. $9! - 8!$

D. $9! - 7!$

**Answer: B**

## Solution:

Total number of arrangements = $9!$

Number of arrangements of best and worst paper together = $2! \times 8!$

Number of arrangements when best and worst are never together = $9! - 2! \times 8!$

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# Question70

## If a person has 3 coins of different denominations, the number of different sums can be formed is

## AP EAPCET 2021 - 19th August Morning Shift

**Options:**

A. 3

B. 7

C. 8

D. 3!

**Answer: B**

## Solution:

Total number of coins = 3

The number of different sums

$= {}^3C_1 + {}^3C_2 + {}^3C_3$

$= 3 + 3 + 1 = 7$

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# Question71

## There are 7 identical white balls and 3 identical black balls. The number of distinguishable arrangements in a row of all the balls, so that no two black balls are adjacent is

## AP EAPCET 2021 - 19th August Morning Shift

**Options:**

A. 120

B. 89 . (8!)

C. 56

D. $42 \times 5^4$

**Answer: C**

## Solution:

Number of white balls = 7

Number of black balls = 3 $\times$ W $\times$ W $\times$ W $\times$ W $\times$ W $\times$ W $\times$ W $\times$

$\times$ are the places in row where black balls can be placed, which are 8 in number for 3 black balls.

Number of arrangements $= {}^8C_3 = \frac{8\times7\times6}{1\times2\times3} = 56$

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# Question72

## The number of ways of distributing eight identical rings to three different girls so that every girl gets at least one ring is

### AP EAPCET 2021 - 19th August Morning Shift

**Options:**

A. 21

B. 120

C. $^8P_3$

D. $^8P_3 - 6$

**Answer: A**

## Solution:

Total number of ways of dividing n identical rings to r different girls, so that every girl gets at least one ring $= {}^{n-1}C_{r-1}$

Here, we have to distribute 8 identical rings to 3 different girls.

This can be done in ${}^{8-1}C_{3-1} = {}^7C_2 = \frac{7\times6}{1\times2} = 21$ ways

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# Question73

## If the letters of the word REGULATIONS bearranged in such a way that relative positionsof the letters of the word GULATIONSremain the same, then the probability thatthere are exactly 4 letters between R and E is

### AP EAPCET 2021 - 19th August Morning Shift

**Options:**

A. $\frac{3}{55}$

B. $\frac{6}{55}$

C. $\frac{9}{55}$

D. $\frac{7}{55}$

**Answer: B**

## Solution:

Number of letters in the word REGULATIONS= 11

Number of possible arrangements = 11!

Except R and $E_1$ there are remaining 9 letters

Favourable number of arrangements

$= {}^9C_4 \times 4! \times 2! \times 6!$

Required probability $= \frac{{}^9C_4 \times 4! \times 2! \times 6!}{11!} = \frac{6}{55}$

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