PERMUTATION, COMBINATION 28.3.2024

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Arrange → P
Combination → C

Note

if position change → meaning change → P

if position is irrelevant but whether they are in a team matters → C

9062395123

$$^{10}C_3 = \frac{10!}{3!\,7!}$$

$$^{10}P_3 = \frac{10!}{7!}$$

C > P

P > C

C < P

1 2
3 4

~~1~~	~~2~~	~~3~~	~~4~~
4	3	2	1
2	3	4	1
2	4	3	1

4!

→ 24

$n! = 1.2.3 - - - - n$

$(2n)! = 2!\,n!$ ✗

$\to 2^n\, n! \,[1.3.5 - - - (2n-1)]$

$\Rightarrow 2^n \cdot n! \; [1 \cdot 3 \cdot 5 \cdots (2n-1)]$

$\frac{5!}{3!} = 20$

Sample Paper 2024

ISI	BStat
ISI	BMath
ISI	BSDS

ISI MSQE

$\frac{n!}{r!} =$ $\quad {}^nP_{n-r} = \frac{n!}{r!}$

$\Rightarrow n(\cancel{n}-1)(n-2)\cdots\cancel{(n-r)}$

$n(n-1)(n-2)\cdots(r+1)$

$\frac{n!}{(n-r)!} = (n)(n-1)(n-2)\cdots(n-r+1)$

ISI 2023

$\frac{1}{n!} + \frac{1}{(n+1)!} = \frac{\lambda}{(n+2)!}$

$\lambda = (n+2)^2$ *

$x! = y!$ $\quad x \neq y \quad x = 0, 1 \quad y = 1, 0 \quad 2$

$\boxed{x = y}$ ∞ possible

7×4

28

$n \geq 500$

$4! = 24$

$5! = 120$

$6! = 720$

$N = \sum_{r=1}^{n} r!$

$N = 1! + 2! + \cdots + n!$

$= (1! + 2! + 3! + 4!) + (5! + 6! + \cdots + n!)$

$1 + 2 + 6 + 24 \Rightarrow 33$

$3 \times 24 = 78$

$= \frac{33}{15} + \frac{120 + 720 + \cdots}{15}$

$120 \times 6 \quad 120 \times 6 \times 7$

15 15

$\to R \to 3$

$$\frac{(1! + 2! + 3! + 4! + \cdots + 12!)}{13} + \frac{(13! + 14!)}{13}$$

$30 \to 5 \times 6$

$5 \times 3 \times 2$

Split into Primes

151 formula

100! → 3 highest power

15!

1 . 2 . 3 . 4 . 5 . 6 . 7 . 8 . 9 . 10 . 11 . 12 . 13 . 14 . 15

3×2 3×3 3×4 3×5

GIF

$$\frac{15}{3} + 100 \left[\frac{15}{3^2}\right] + \left[\frac{15}{3^3}\right] + \left[\frac{15}{3^4}\right]$$

$$= \frac{15}{3} + \frac{15}{9} + \cancel{\frac{15}{27}} + \cancel{\frac{15}{81}} + \cdots$$

11×1 , 11×2 , 11×3

$= 5 + 1$

$= 6$

$43! \rightarrow 11 \rightarrow 1.2 \cdots 11 \cdots 22 \cdots 33 \cdots 43$

$11\times1 \quad 11\times2 \quad 11\times3$

$\frac{43}{11} \rightarrow 3$ $\quad \frac{43}{11^2}$ ✗

$139!$ highest power 5

$$\left[\frac{139}{5}\right] + \left[\frac{139}{25}\right] + \left[\frac{139}{125}\right] + \cdots$$

$\rightarrow 27 + 5 + 1$

$\rightarrow 33$ Ans

180! → highest Power of 80

80 not a Prime

$\cancel{\frac{180}{80} + \frac{180}{80^2}}$

$80 \rightarrow 40\times2$

$\rightarrow 5\times8\times2$

$\rightarrow \boxed{5\times2^4} \rightarrow 5\times16$

$$\frac{180}{2} + \frac{180}{4} + \frac{180}{8} + \frac{180}{16} + \frac{180}{32} + \frac{180}{64} + \frac{180}{128} + 0$$

$= 176$

$2 \quad 4 \quad 8 \quad 16 \quad 32 \quad 64$

$= 126$

$\frac{180}{5} + \frac{180}{25} + \frac{180}{125} + \dots = 44$

we split 180 as two primes

$2, 5 \rightarrow 24 \rightarrow 16$

$90 \qquad 20 \rightarrow 4 \times 5 \rightarrow 2^2 \times 5$

$\cancel{\frac{90}{2} + \frac{90}{4} + \frac{90}{8} + \frac{90}{16} + 90}$

$\frac{90}{5} + \frac{90}{5^2}$

$= 18 + 3 \rightarrow 21$

2333!

$\frac{2333}{19} + \frac{2333}{361} +$

$266 \rightarrow 2 \times 133$

$\rightarrow 2 \times 19 \times 7$

$122 + 6$

128

$5 \quad 6$

2333

$\frac{2333}{361}$

1800

533

400

$\frac{17}{3}$

$12 \quad 58$

$19 \mid 2333$

$5 \quad 6$

1870

320

1710

Zeros at the end

$100! \Rightarrow 1 \times 2 \cdots 5 \times 10 \times 12 \quad 15$

$10 \to 5 \times 2 \qquad 20 \qquad 22 \qquad 25$

$\frac{100}{5} \;\#\; \frac{100}{25} \quad \phi$

$\Rightarrow 20 + 4$

$\Rightarrow 24$

$23! \to 1 \times 2 \cdots 5 \cdots 10 \cdots 12 \cdots 15 \cdots 20 \cdots 22$

1   2   3   4

$\left(\frac{23}{5}\right) + \left(\frac{23}{25}\right)$

$\Rightarrow 4$

abcde

$10^4 a + 10^3 b + 10^2 c + 10 \cdot d + e$

2

check e

678

Is it divisible by 4

$(2d + e)$

Is it div by 8

$4c + 2d + e$

Is it div by 16 $\quad 8d + 4c + 2d + e$

\# 12345678901234567890123456789012345

35 digits

2^5 $\quad$ 32

$$\begin{array}{r} 01234 \\ 32 \overline{)\,1234\,} 38 \\ 96 \\ \hline 274 \end{array}$$

7

$(abcd - 2e)$ must be divisible by 7

11

13

$a\breve{b}c\breve{d}e\breve{f}g\breve{h}i$

$(a+c+e+g+i) - (b+d+f+h)$

(b+d+f+h)

11n or 0

123456 / 11

12-9 = 3/11

13

abcde

(abcd the) → is divisible 13 or not

1388

1638

163 + 32

→ 195/13

→ 15013

13

equation system

(a+b)(c+d+e)(f+g) = 163

$a - b + c - d + f + g \le 13$

$(a + c + f + g) + [-(b + d)] \le a_1 + b_1$

$a_1 + b_1 = 13$

10 × 4

→ 40

1 → 2

1 → 3

1 → 4

2 → 3

2 → 4

CVET PG

160 / 170

520

$y = x^n$

$y' = nx^{n-1}$

$$y_1 = n x^{n-1}$$

$$y_2 = n(n-1)\, x^{n-2}$$

$$y_3 = n(n-1)(n-2)\, x^{n-3}$$

$$y_n = n!$$