

Arrange → P
 Combination → C

Note

if position change →

meaning change

P

if position is irrelevant

but whether they are in a team

matter → C

9062395123

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

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

C > P
 P > C

C < P

12
34

4!
 ⇒ 24

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

$$n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot n$$

$$(2n)! = 2! \cdot n! \quad \times$$

$$2^{2n} n! \left[1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1) \right]$$

$$\Rightarrow 2^n \cdot n! \left[1 \cdot 3 \cdot 5 \dots (2n-1) \right]$$

$\frac{5!}{3!} = 20$ Sample Paper 2024

$$\frac{n!}{r!} =$$

$${}^n P_{n-r} = \frac{n!}{r!}$$

ISI	BSMR
ISI	BMath
ISI	BSDS

$$\Rightarrow n(n-1)(n-2) \dots (n-r)$$

$$\Rightarrow n(n-1)(n-2) \dots (r+1)$$

ISI
MSBE

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

ISI 2023

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

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

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

$x=y$ ∞ possible 7×4

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

$n \geq 500$
 $4! = 24$
 $5! = 120$
 $6! = 720$

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

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

$$= \frac{33}{15} + \frac{(120 + 720 + \dots)}{15}$$

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



$$\frac{(1! + 2! + 3! + 4! + \dots + 19!)}{13} + \frac{(13! + 14!)}{13}$$

$$30 \rightarrow 5 \times 6$$

$$\underline{\underline{5 \times 3 \times 2}}$$

Split into Primes \leftarrow

151 formula

1001 \rightarrow 3 highest power

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

$\frac{15}{3 \times 2}$ + $\frac{15}{3 \times 3}$ + $\frac{15}{3 \times 4}$ + $\frac{15}{3 \times 5}$

$\frac{15}{3^2}$ + $\frac{15}{3^3}$ + $\frac{15}{3^4}$

$\frac{15}{3} + \frac{15}{9} - \frac{15}{27} - \frac{15}{81} + \dots$

11x1, 11x2, 11x3

$\binom{57}{1} \rightarrow \binom{57}{1}$
 $\rightarrow \binom{57}{1}$
 $\rightarrow 1 \cdot 2 \dots 11 \dots 22 \dots 33 \dots 44 \dots 55$
 $\rightarrow 11 \times 1 \quad 11 \times 2 \quad 11 \times 3$

$43! \rightarrow \binom{43}{11}$
 $\frac{43}{11} \rightarrow \binom{43}{11}$

$139!$ highest power $\binom{139}{5}$

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

$$\rightarrow 27 + 5 + 1$$

$\rightarrow \binom{33}{1}$

$\# 180!$ \rightarrow highest power of $\binom{180}{80}$

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

80 not a prime

$80 \rightarrow 40 \times 2$
 $\rightarrow 5 \times 8 \times 2$
 $\rightarrow 5 \times 2^4 \rightarrow 5 \times 16$

$$\binom{180}{2} + \binom{180}{4} + \binom{180}{8} + \binom{180}{16} + \binom{180}{32} + \binom{180}{64} + \binom{180}{128} + \dots$$

2 4 8 16 32

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

We split 180 as two primes
 2, 5 → 24 → 16

#

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

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

→ 4x5 → 12² x 5

= 18 + 3 → 21

2333!

#

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

266 → 2 x 133
 → 2 x 19 x 7

122 + 6

56

128

12 → 5 → 17/3

2333

1800

533

400

1570

300

1500

19 | 2333

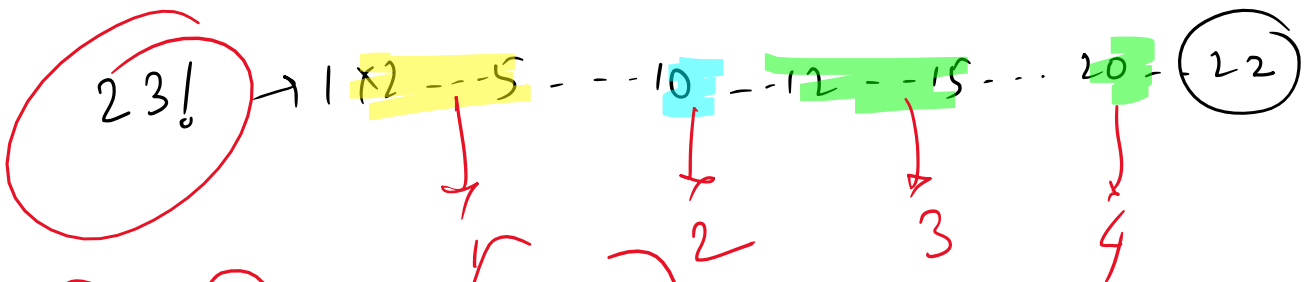
5 16

Zeros at the end

$$100! \Rightarrow 1 \times 2 \times \dots \times 5 \times 10 \times 12 \times 15 \times 20 \times 22 \times \dots \times 25$$

$$\frac{100!}{5} \neq \frac{100}{25} \neq \phi$$

$$\Rightarrow 20 \times 4 \rightarrow 24$$



$$\# \left(\underline{\underline{10^4}} a + \underline{\underline{10^3}} b + \underline{\underline{10^2}} c + \underline{\underline{10}} \cdot d + \underline{\underline{e}} \right)$$

check $\underline{\underline{e}}$ 2 $\underline{\underline{678}}$

11

$(b+d+f+h)$
11 or 0

1 2 3 4 5 6
1 2 9 = 3/11

13

abcde
abcd + 4e) → 13 divide 13 or not

1368 1638

163 + 32 → 195/13
→ 1570/13
13

Equation System

~~(a+b+d+e+f+g)~~ → 163

~~(a+b+c+d+e+f+g) = 105~~

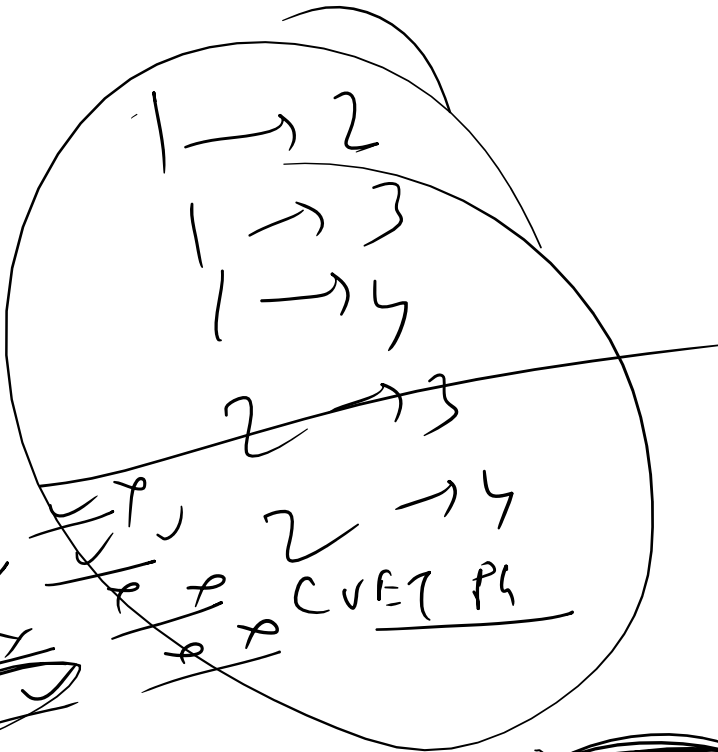
$$(a+b+c) - d + f + g \leq 13$$

$$(a+c+f+g) + (b+d) \leq a+b$$

$a, b \geq 13$

$$\downarrow 10 \times 4$$

$\rightarrow 40$



~~CVET PH~~

160/170

~~520~~

$$y = x^n$$

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

$$\begin{aligned}y_1 &= nx^{n-1} \\y_2 &= n(n-1)x^{n-2} \\y_3 &= n(n-1)(n-2)x^{n-3} \\&\vdots \\y_n &= n!\end{aligned}$$