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# Factorial & Sum of Natural Numbers



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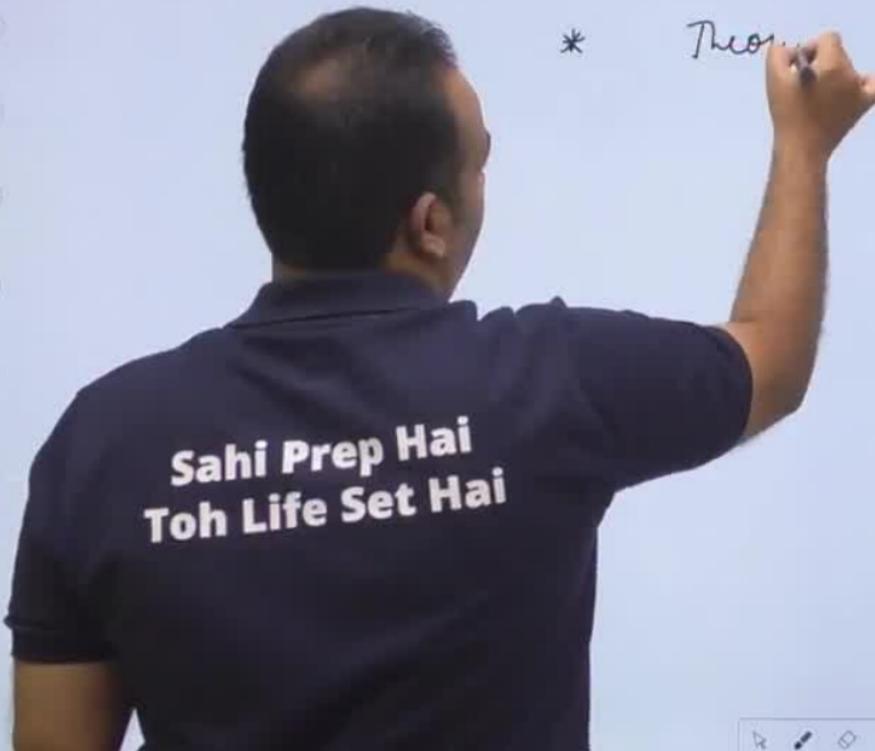
# Factorial & of Natural Numbers



## Agenda

\*

Theo.



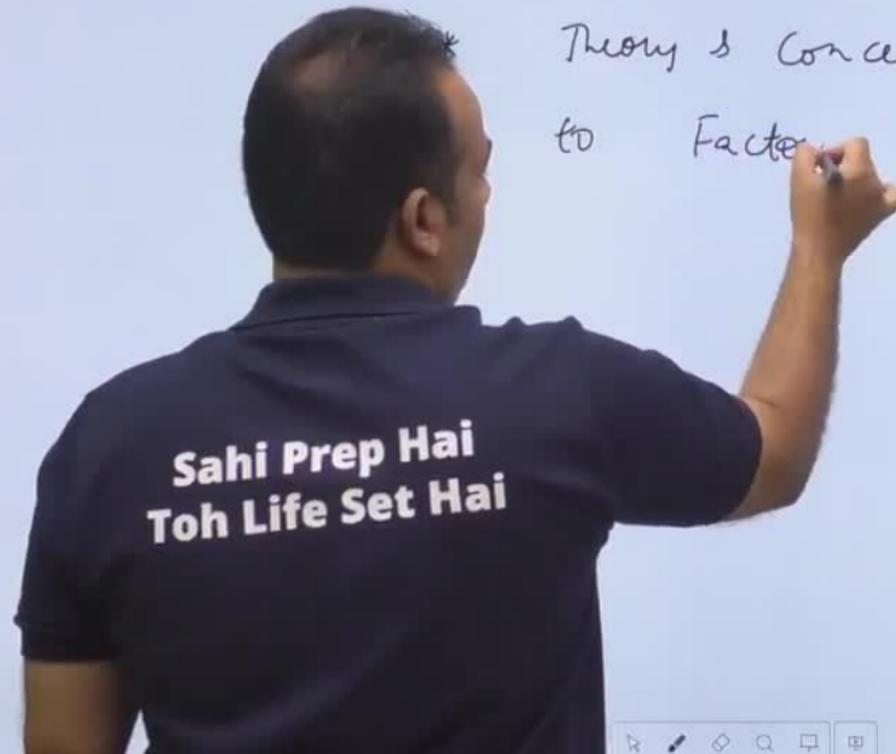
## Agenda

Theory & Con-

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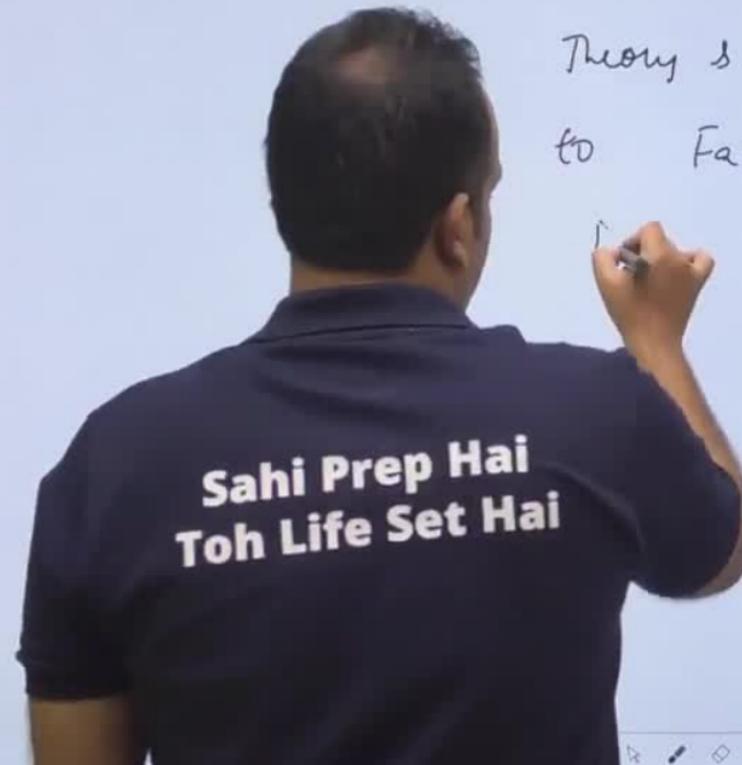
## Agenda

Theory & Concept Related  
to Factor



## Agenda

Theory & Concept Related  
to Factorial



## Agenda

Theory & Concept Related  
to Factorial

No. of Traini

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## Agenda

Theory & Concept Related  
to Factorial

→ (12-15) min

No. of Trailing zero's

Practice Question

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## Agenda

- \* Theory & Concept Related  
to Factorial → (12-15)min  
No. of Trailing zero's
- \* Practice Question



## Agenda

\* Theory & Computation Related

to Factors → (12-15) min

No. of Techniques

\* P → 60

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## Agenda

- \* Theory & Concepts Related  
to Factorial → (12-15) min  
No. of Trials
- \* Practice → 60 min - 65

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## Agenda

\* Theory & Concept Related

to Factorial

→ (12-15) min

No. of Trailing zero's

Practice Question → (60 min - 65 min)

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## Agenda

\* Theory & Concept Related

Factorial

→ (12-15) min

Trailing zero's

Practice Question → (60 min - 65 min)

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such number

## Agenda

\* Theory & Concept Related  
to Factorial

→ (12-15) min

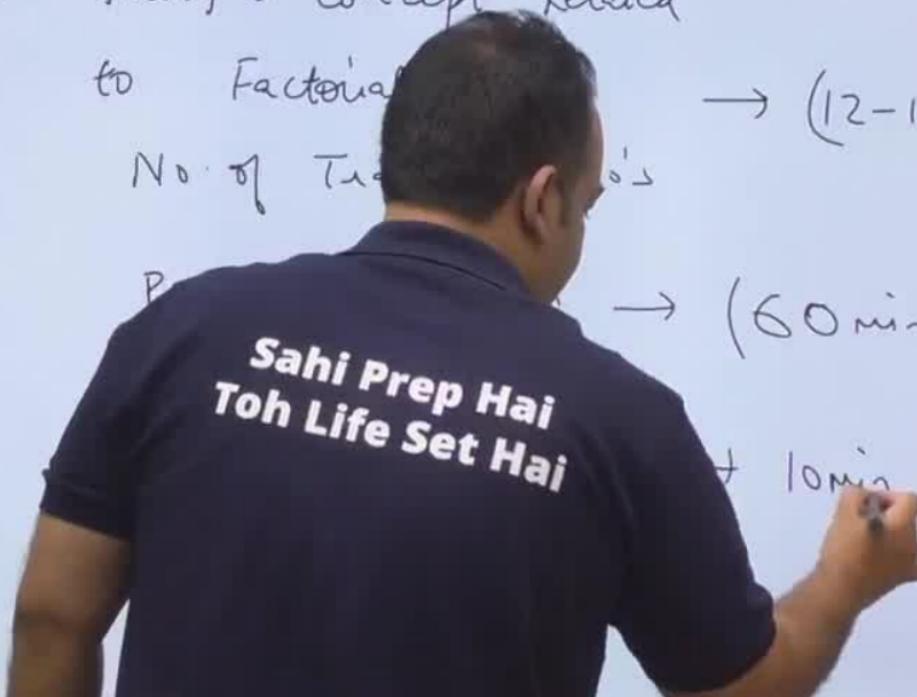
No. of Trials

\* P

→ (60 min - 65 min)

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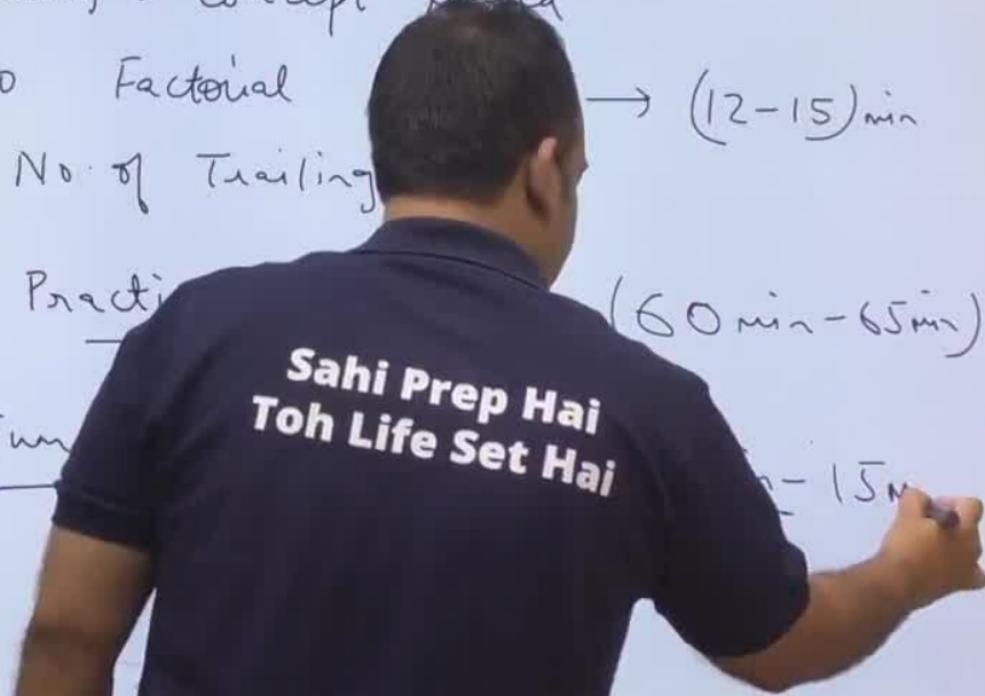
+ 10 min



## Agenda

- \* Theory & Concept Related  
to Factorial → (12-15) min  
No. of trailing
- \* Practice → (60 min - 65 min)

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## Agenda

- \* Theory & Concept Related  
to Factorial  $\rightarrow (12-15)\text{min}$   
No. of Trailing zero's
- \* Practice Question  $\rightarrow (60\text{ min}-65\text{ min})$
- Sum of natural numbers  $\rightarrow (\underline{10\text{ min}}-\underline{15\text{ min}})$

Agenda

\* Theory & Concept Related

to Factorial

→ (12-15) min

No. of Trailing zero's

Practice Question → (60 min - 65 min)

Sum of natural numbers → (10 min - 15 min)

Ques.

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## Factorial:

The product of first n consecutive natural numbers is called as n !

**Eg.** 3 ! is defined as product of first three natural numbers.

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

$$3! = 6$$

$$1! = 1$$

$$2! = 2$$

$$3! = 6$$

$$4! = 24$$

$$5! = 120$$

$$6! = 720$$

$$7! = 5040$$

$$8! = 40320$$

**Note :-**

$$0! = 1$$

## Factorial:

The product of first n consecutive natural numbers is called as n !

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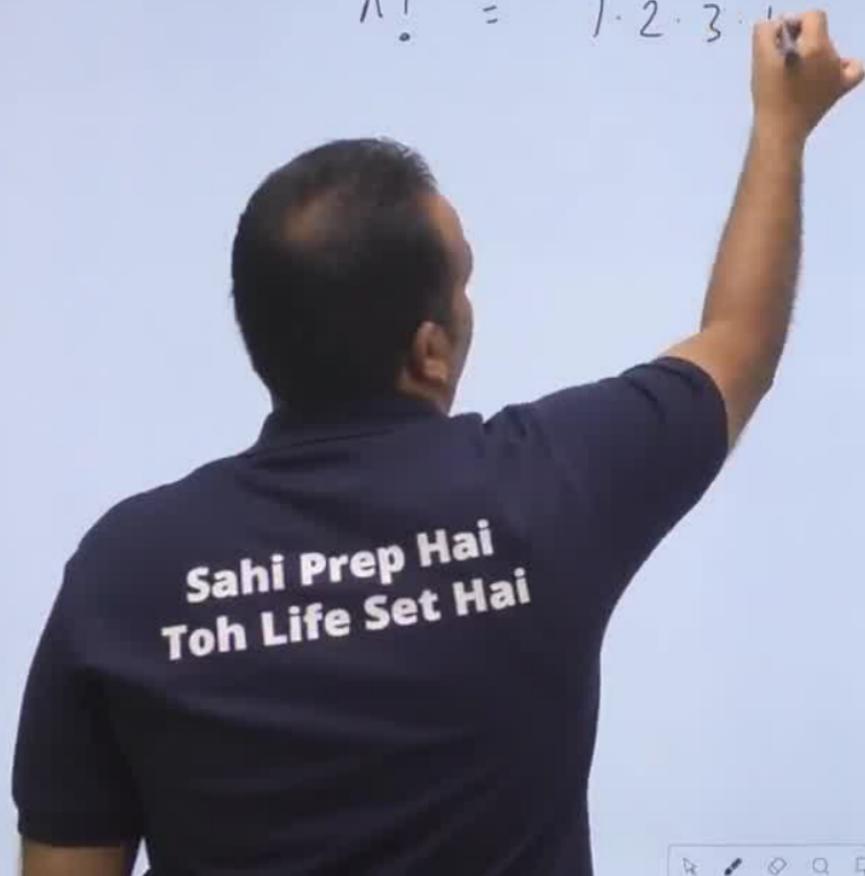
$$6 ! = 720$$

$$8 ! = 40320$$

Note :-

$$0 ! = 1$$

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



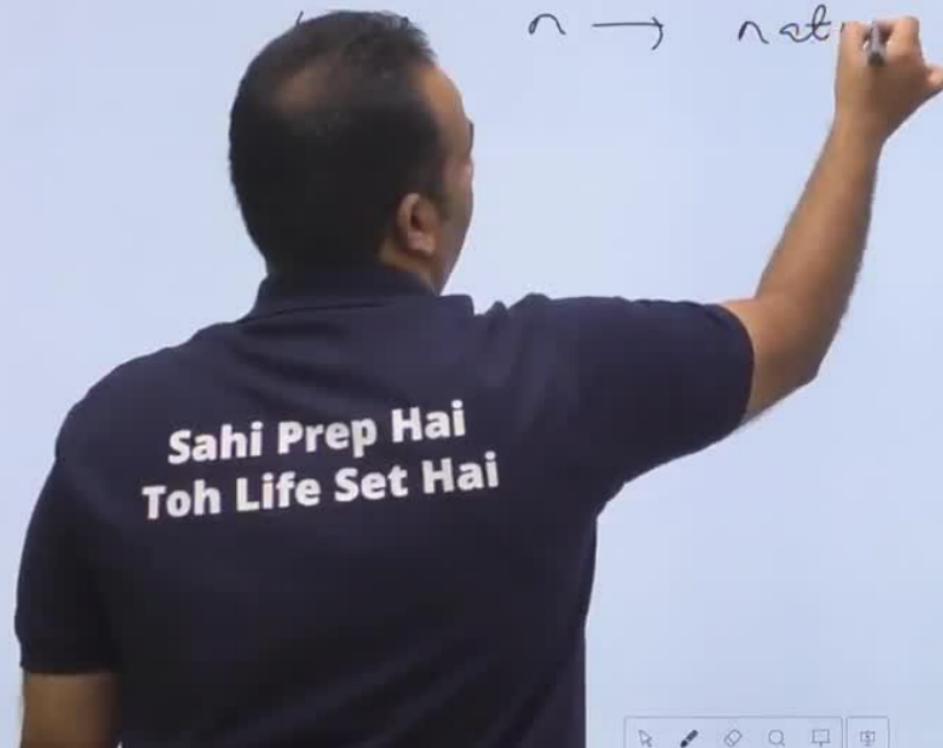
$$n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdots \cdots (n-1) n$$

where  $n -$

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$$n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdots \cdots (n-1) n$$

$$n \rightarrow n! \text{ at}$$



$$n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdots \cdots (n-1) n$$

$n \rightarrow$  natural no

$$= (n) (n-1)$$

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$$n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdots \cdots (n-1) n$$

where  $n \rightarrow$  natural no

$$n! = (n)(n-1)(n-2) \cdots \cdots 3 \cdot 2 \cdot 1$$

$$n! =$$

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$$n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdots \cdots (n-1) n$$

where  $n \rightarrow$  natural no

$$\begin{aligned} & (n) \underbrace{(n-1)(n-2) \cdots \cdots 3 \cdot 2}_{1} \\ & = (n)(n-1)! \end{aligned}$$

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$$n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdots \cdots (n-1) n$$

where  $n \rightarrow \text{natural no}$

$$n! = \underbrace{(n)(n-1)(n-2) \cdots \cdots 3 \cdot 2 \cdot 1}_{(n-1)!}$$

$$n! = (n)(n-1)!$$

If I put  $n = 1$

$$1! = 1 \cdot 0!$$

$$\boxed{1 = 0!}$$

## Factorial:

The product of first n consecutive natural numbers is called as n !

Eg. 3 ! is defined as product of first three natural numbers.

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Note :-

$$0! = 1$$

## To calculate number of zero's at the end of N !

As we know that if a number ends on 0, it is a multiple of 10.

$$10 = 2 \times 5$$

So if the factors of a number contains atleast one 2 and atleast one 5, then only there will be zero at the end of that number.

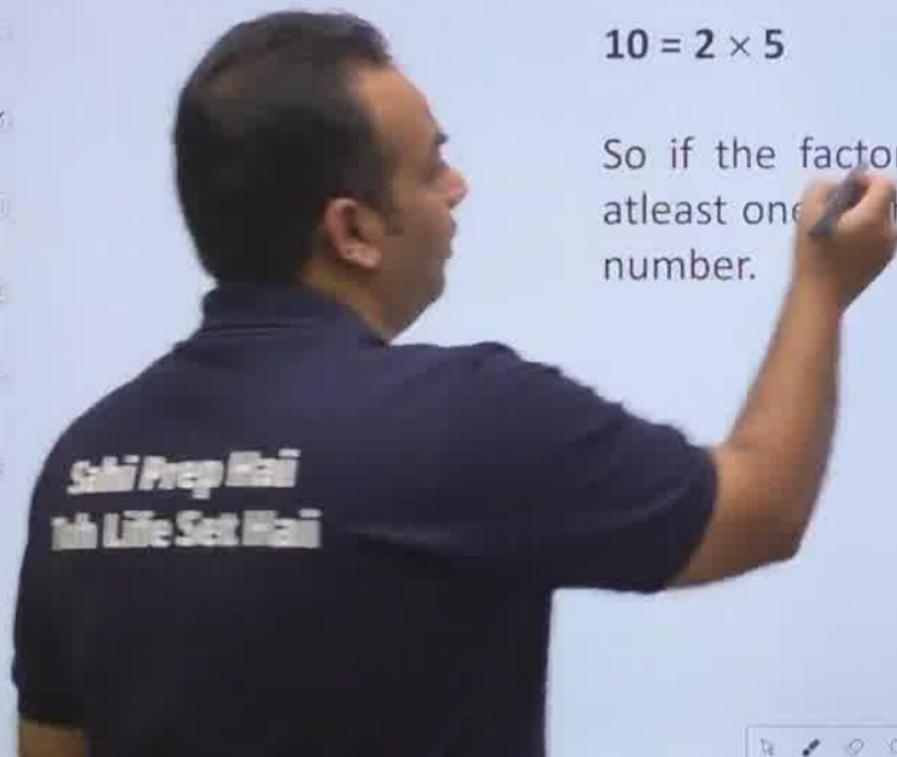
V. Gopal

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Eg. How many zero's are there at the end of  $8!$  ?

**Ans.** As  $8! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$

So  $8!$  contains powers of 2 as well as powers of 5.

$$8! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$$

$$= 1 \times 2^1 \times 3^1 \times (2^2) \times 5^1 \times (2^1 \times 3^1) \times 7^1 \times (2^3)$$

$$= (2^1 \times 2^2 \times 2^1 \times 2^3) \times 3^1 \times 5^1 \times 7^1$$

$$8! = 2^7 \ 3^1 \ 5^1 \ 7^1$$

So  $8!$  contains  $2^7$  and  $5^1$

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$$= 1 \times 2^1 \times 3^1 \times (2^2) \times 5^1 \times (2^1 \times 3^1) \times 7^1 \times (2^3)$$

$$= (2^1 \times 2^2 \times 2^1 \times 2^3) \times 3^1 \times 5^1 \times 7^1$$

$$= 2^7 \times 3^1 \times 5^1 \times 7^1$$

So  $8!$  contains  $2^7$  and  $5^1$

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$$\begin{aligned} &= 1 \times 2^1 \times 3^1 \times (2^2) \times 5^1 \times (2^1 \times 3^1) \times 7^1 \times (2^3) \\ &\quad \times 2^2 \times 2^1 \times 2^3 \times 3^1 \times 5^1 \times 7^1 \end{aligned}$$

$$8! = 2^7 \times 3^1 \times 5^1 \times 7^1$$

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$$8! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$$

$$\begin{aligned}&= 1 \times \underline{2^1} \times 3^1 \times \underline{(2^2)} \times 5^1 \times \underline{(2^1 \times 3^1)} \times 7^1 \times \underline{(2^3)} \\&= (2^1 \times 2^2 \times 2^1 \times 2^3) \times 3^1 \times 5^1 \times 7^1\end{aligned}$$

$$8! = \underline{2^7} \underline{3^1} \underline{5^1} 7^1$$

$8!$  contains  $2^7$  and  $5^1$

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$$8! = 40320$$

$\rightarrow$  1 zero

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So  $8!$  contains powers of 2 as well as powers of 5.

$$2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$$

$$\begin{aligned} &= \underline{2^1} \times 3^1 \times (\underline{2^2}) \times 5^1 \times (\underline{2^1} \times 3^1) \times 7^1 \times (\underline{2^3}) \\ &\quad \times 2^2 \times 2^1 \times 2^3 \times 3^1 \times 5^1 \times 7^1 \end{aligned}$$

$$\underline{3^1} \underline{5^1} \underline{7^1}$$

$8!$  contains  $2^7$  and  $5^1$

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1 zero

(To calculate number of zero's we will consider only powers of 2 and 5)

For 1 zero we need one pair of (2 and 5).

For 2 zero's we need two pair and so on.

But in  $8!$  we have  $2^7 5^1$ , so we have only 1 pair of (2 and 5).

So  $8!$  ends with one zero.

But for large numbers this process is difficult so to calculate number of zero's, we will calculate power of 5 by the following method.

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(To calculate number of zero's we will consider only powers of 2 and 5)

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But for larger numbers this process is difficult so to calculate number of zero's, we will calculate power of 2's and 5's by the following method.

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But for larger numbers this process is difficult so to calculate number of zero's, we will calculate power of 2's and 5's by the following method.

Eg. Find number of zero's at the end of 100 !.



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Eg. Find number of zero's at the end of 100 !.

[2]

$$\frac{100}{2} = 50$$

$$\frac{50}{2} = 25$$

$$\frac{25}{2} = \cancel{12}$$

$$\frac{12}{2} = 6$$

$$\frac{6}{2} = 3$$

$$\frac{3}{2} = 1$$

Eg. Find number of zero's at the end of 100 !.

(2)

(5)

$$\frac{100}{2}$$

$$\frac{50}{2}$$

$$\frac{25}{2}$$

97  
2

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Eg. Find number of zero's at the end of 100 !.

(2)

97  
2

$$\frac{100}{2} = 50$$

$$\frac{50}{2} = 25$$

$$\frac{25}{2} = 12$$

(5)

$$\frac{100}{5} = 20$$

$$\frac{20}{5} = 4$$

$$\frac{24}{5}$$

$$5^{24}$$

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Eg. Find number of zero's at the end of 100 !.

(2)

$$\frac{100}{2} = 50$$

$$\frac{50}{2} = 25$$

$$\frac{25}{2} = 12 \cancel{5}$$

$$\frac{12}{2} = 6$$

$$\frac{6}{2} = 1$$

(5)

$$\frac{100}{5} = 20$$

$$\frac{20}{5} = 4$$

$$\frac{24}{5}$$

$$5^{24}$$

24 zero's

Eg. Find number of zero's at the end of 100 !

(2)

$$\begin{array}{r}
 \frac{100}{2} = 50 \\
 \frac{50}{2} = 25 \\
 \frac{25}{2} = 12\cancel{5} \\
 \frac{12}{2} = 6 \\
 \frac{6}{2} = 3 \\
 \frac{3}{2} = 1
 \end{array}$$

(5)

$$\frac{100}{5} = 20$$

$$\frac{20}{5} = 4$$

$$\begin{array}{r}
 24 \\
 5 \overline{)24}
 \end{array}$$

24 zero's

Eg. Find number of zero's at the end of 100 !.

(2)

$$\frac{100}{2} = 50$$

$$\frac{50}{2} = 25$$

$$\frac{25}{2} = 12$$

$$\frac{12}{2} = 6$$

$$\frac{6}{2} = 3$$

$$\frac{3}{2} = 1$$

(5)

$$\frac{100}{5} = 20$$

$$\frac{20}{5} = 4$$

---

---

 $5^{24}$



No. of zero's



2

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No. of zeros

2

5

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Toh Life Set Hai

No. of zeros

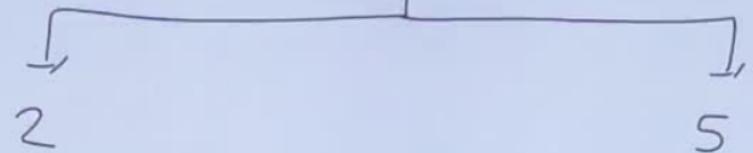
],  
2

5

If questi

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Toh Life Set Hai

No. of zero's

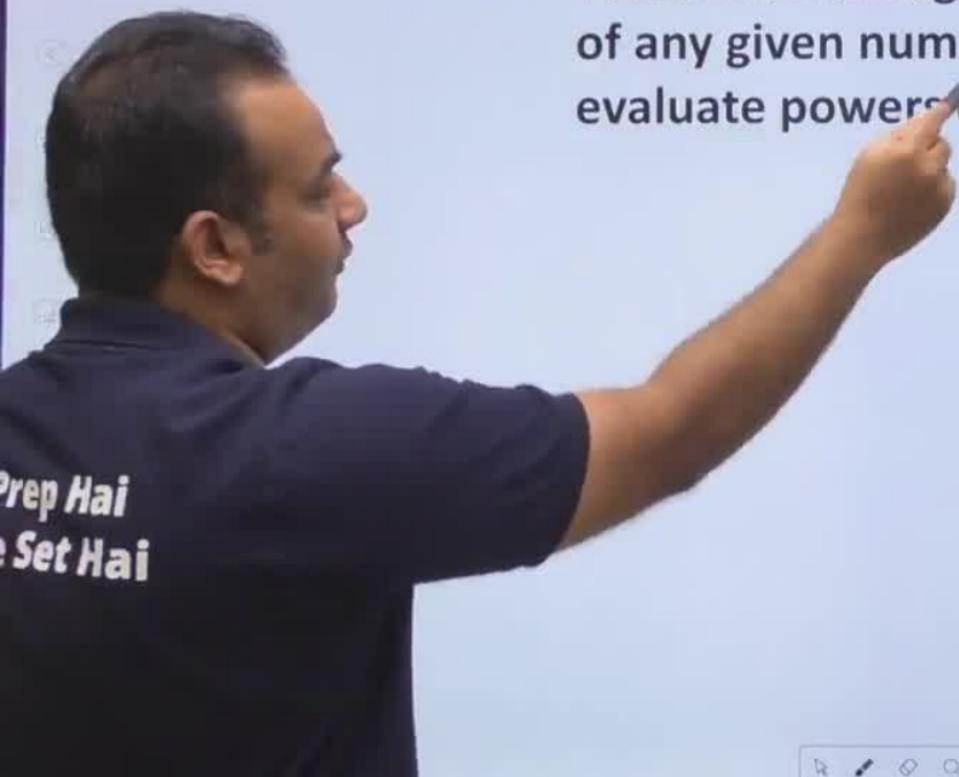


If question is only on Factorial  
then answer

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Toh Life Set Hai**

## Summary

While calculating number of trailing zeroes at the end of any given number or expression we have to evaluate powers of 2 and 5.



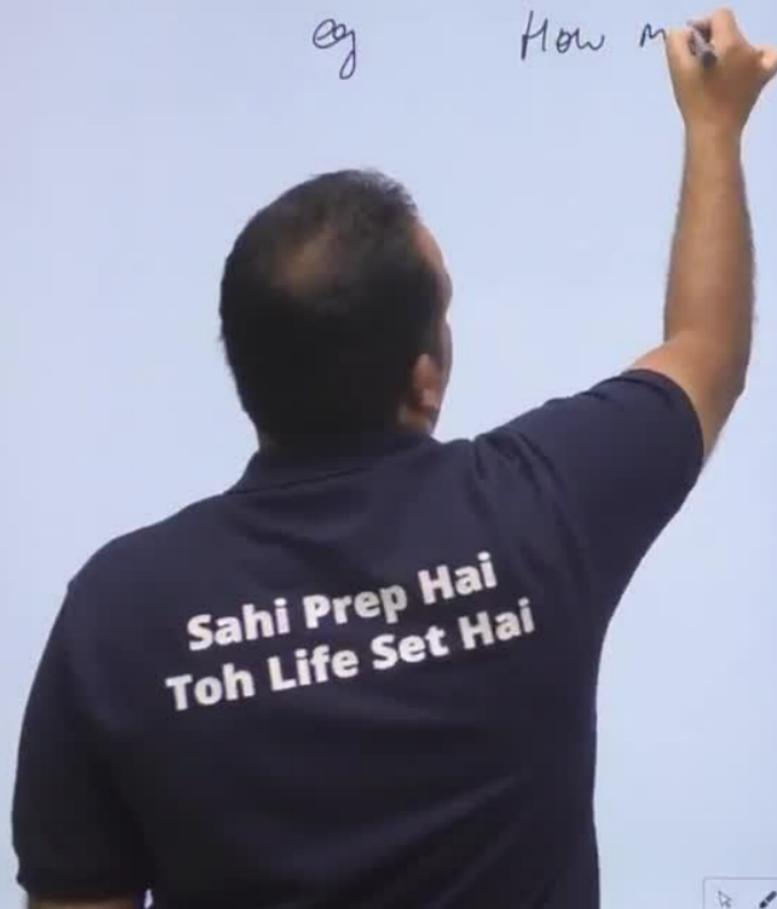
Prep Hai  
Set Hai

## Summary

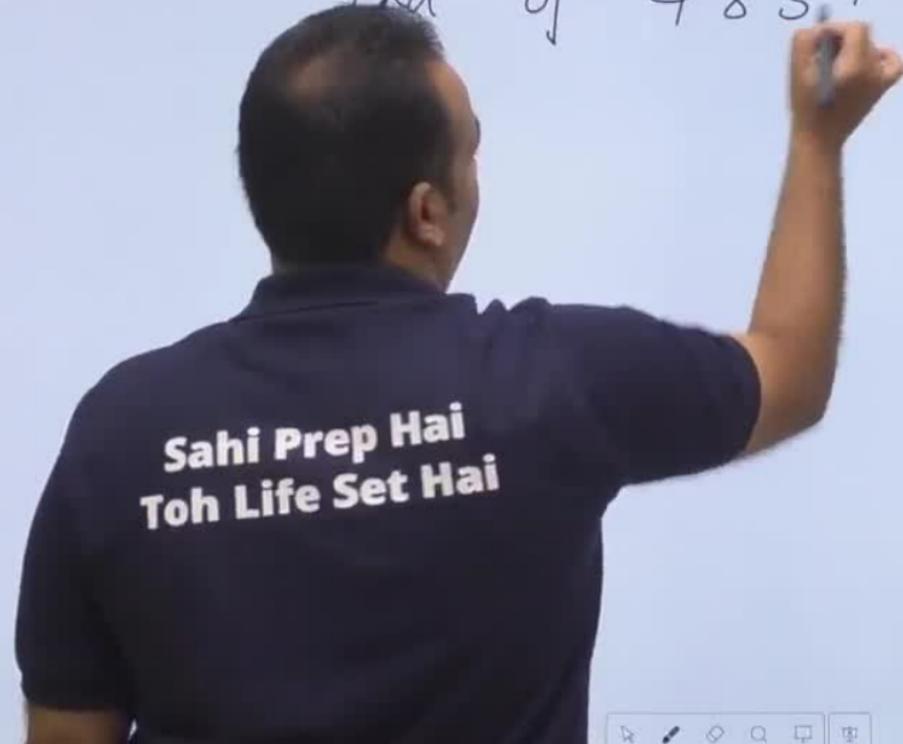
While calculating number of trailing zeroes at the end of any given number or expression we have to evaluate powers of 2 and 5.

eg

How m



eg How many zero's are there at the  
end of 4851



Find the number of zero's at the end of followings numbers or expression.

1.  $A = 300!$

- (A) 74      (B) 72      (C) 75      (D) 76

Find the number of zero's at the end of followings numbers or expression.

1.  $A = 300!$

(A) 74

(B) 72

(C) 75

(D) 76

$$\begin{array}{r} 60 \\ 12 \\ \hline 2 \\ \hline 74 \end{array}$$

2.  $B = 625!$

(A) 125

(B) 150

(C) 155

(D) 156

$$\begin{array}{r} 125 \\ 25 \\ \hline 5 \\ \hline 155 \end{array}$$

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3.  $C = 2^{502} \times 5^{205}$

(A) 502  
(B) 707

(C) 205  
(D) None of these



$$3. C = 2^{502} \times 5^{205}$$

- (A) 502
- (B) 205
- (C) 707
- (D) None of these



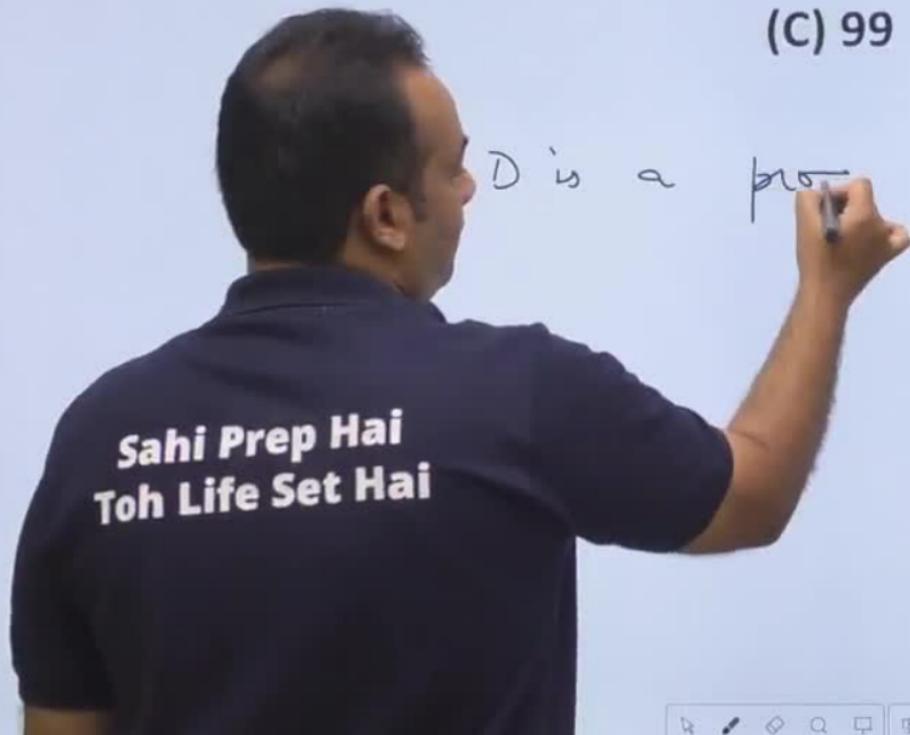
4.  $D = 1 \times 3 \times 5 \times 7 \times \dots \times 999$

- (A) 246
- (B) 199
- (C) 99
- (D) 0



$$4. D = 1 \times 3 \times 5 \times 7 \times \dots \times 999$$

- (A) 246
- (B) 199
- (C) 99
- (D) 0



$$4. D = 1 \times 3 \times 5 \times 7 \times \dots \times 999$$

- (A) 246                      (B) 199  
(C) 99                      (D) 0

D is a product of all odd numbers  
So the

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$$4. D = 1 \times 3 \times 5 \times 7 \times \dots \times 999$$



D is a product of all odd numbers  
So there is no  $\frac{2}{\equiv}$

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$$4. D = 1 \times 3 \times 5 \times 7 \times \dots \times 999$$

(A) 246

(B) 199

(C) 99

(D) 0

B/c D is a product of all odd numbers  
so there is no 2

No. of zero's  $\rightarrow$  0

$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times 128$$



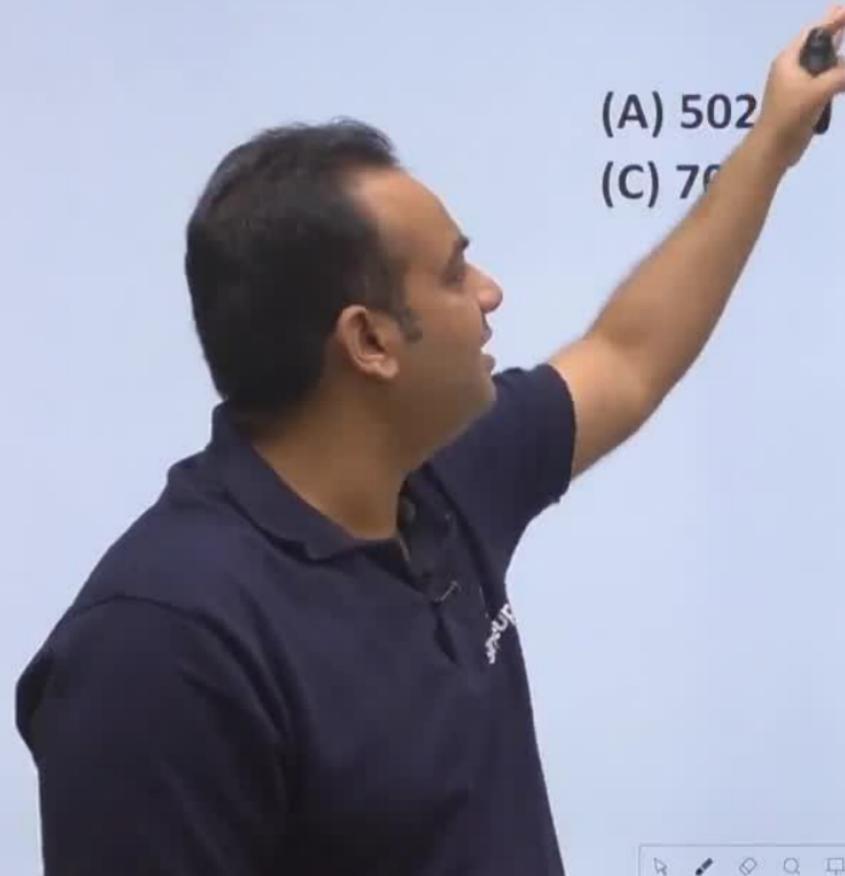
3.  $C = 2^{502} \times 5^{\underline{205}}$

(A) 502

(C) 70

(B) 205

(D) None of these

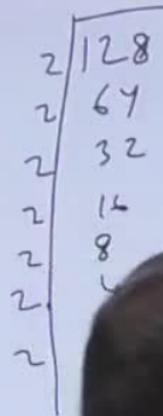


$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times 128$$



$\leftarrow x \dots \quad 99 \right)$

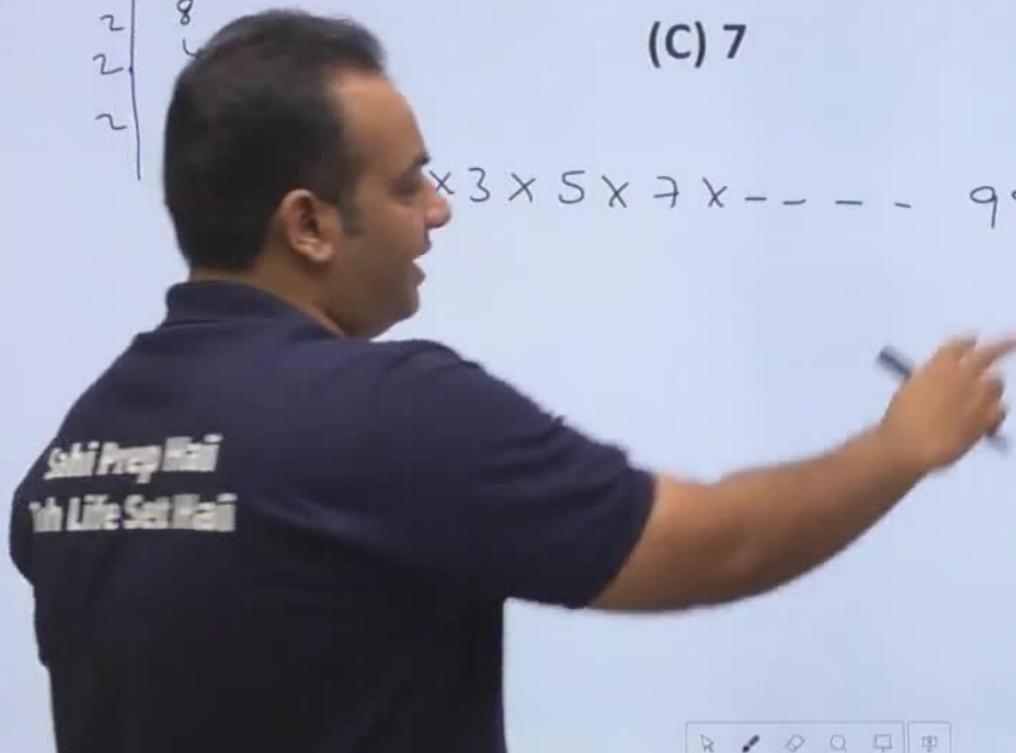
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$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times \underline{128}$$



$$\times 3 \times 5 \times 7 \times \dots \times 99) \quad 2^7$$



$$\begin{array}{r} 128 \\ \times 2 \\ \hline 64 \\ \times 2 \\ \hline 32 \\ \times 2 \\ \hline 14 \\ \times 2 \\ \hline 8 \\ \times 2 \\ \hline 4 \\ \times 2 \\ \hline 2 \\ \hline \end{array}$$

$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times 128$$



$$5x7x\cdots 99) \quad 2^7$$

5, 15, 25, 35, 45, 55

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$$\begin{array}{r} 128 \\ 2 \overline{)128} \\ 64 \\ 2 \overline{)64} \\ 32 \\ 2 \overline{)32} \\ 16 \\ 2 \overline{)16} \\ 8 \\ 2 \overline{)8} \\ 4 \\ 2 \overline{)4} \\ 2 \\ | \end{array}$$

$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times 128 =$$

- (A) 10                      (B) 12  
(C) 7                      (D) 19

$$(5 \times 7 \times \dots \times 99) 2^7$$

5, 15, 25, 35, 45, 55

5, 75, 85,

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$$\begin{array}{r} 128 \\ \hline 2 \end{array}$$

64

32

16

8

4

2

$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times 128 =$$

- (A) 10                      (B) 12  
(C) 7                           (D) 19

$$(1 \times 3 \times 5 \times 7 \times \dots \times 99) \quad 2^7$$

5, 15, 25, 35, 45, 55

65, 75, 85, —

Study Material  
in Life Set Mai

$$\begin{array}{r} 128 \\ \hline 2 \quad | \\ 64 \\ \hline 32 \\ \hline 16 \\ \hline 8 \\ \hline 4 \\ \hline 2 \\ \hline 1 \end{array}$$

$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times 128 =$$

- (A) 10                      (B) 12  
 (C) 7                      (D) 19

$$(1 \times 3 \times 5 \times \dots \times 99) \quad 2^{\oplus}$$

25, 35, 45, 55

75, 85, --

7 zeros

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$$\begin{array}{r} 128 \\ 64 \\ 32 \\ 16 \end{array}$$

$$5. E = 1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99 \times \underline{128}$$



$$(1 \times 3 \times 5 \times \dots \times 99) \quad 2^{\textcircled{7}}$$

1, 35, 45, 55  
75, 85, --

→ 7 zeros

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$$\begin{array}{r} 128 \\ \times 2 \\ \hline 64 \end{array}$$

$$5. E = (1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99) \times \underline{\underline{128}}$$



$$5x \neq x - \dots - 99) \quad 2^{\textcircled{7}}$$

5, 15, 25, 35, 45, 55  
| 75, 85, --

→ 7 zero's

6.  $H = 168! \times 143!$

(A) 40

(B) 34

(C) 74

(D) 1360

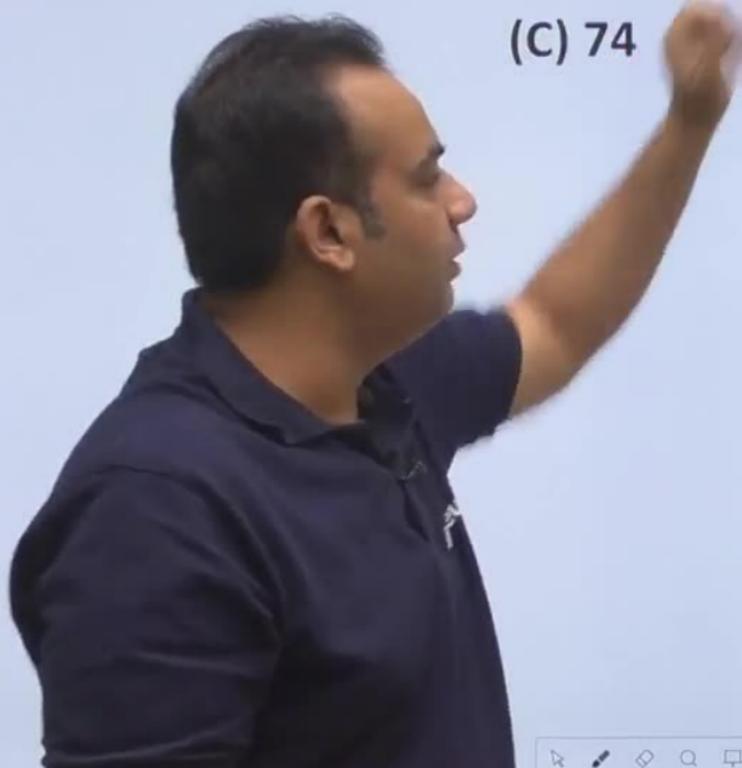
6.  $H = 168! \times 143!$

(A) 40

(C) 74

(B) 34

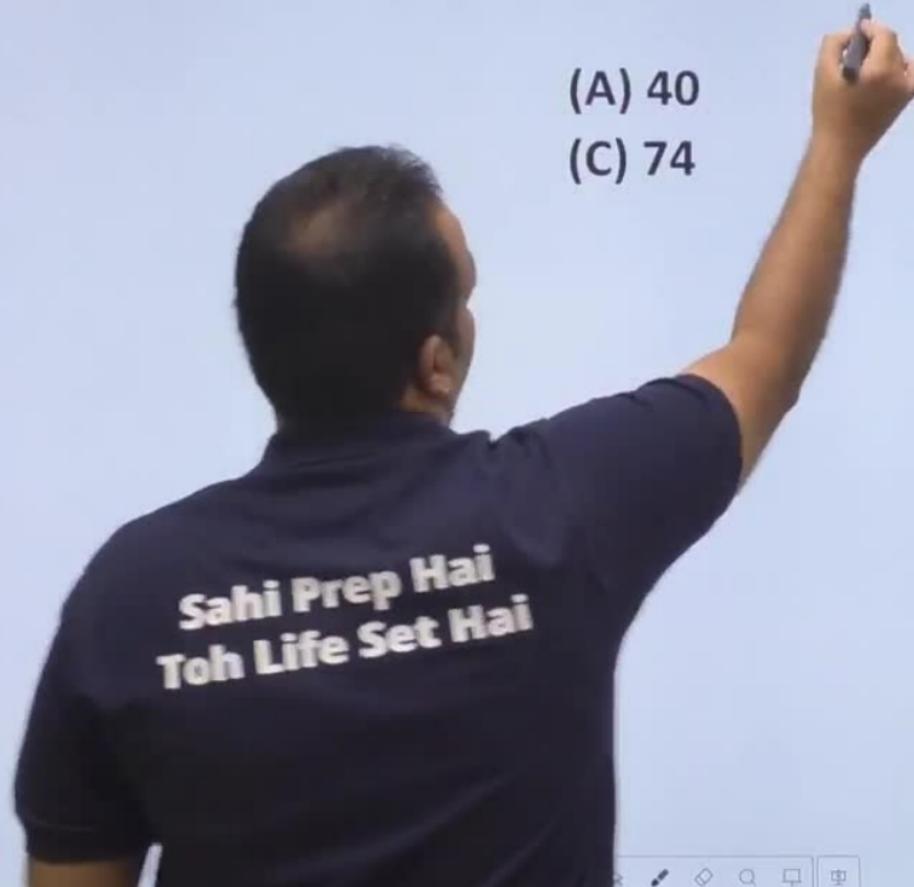
(D) 1360



$$6. H = \underline{168!} \times 143!$$

- (A) 40  
(C) 74

- (B) 34  
(D) 1360



$$6. H = \underline{168!} \times \underline{143!}$$

(A) 40

(B) 34

(C) 74

(D) 1360

$$\begin{array}{r} 33 \\ \times 6 \\ \hline 143 \end{array}$$

**Sahi Prep Hai  
Toh Life Set Hai**

$$6. H = \underline{168!} \times \underline{143!}$$

(A) 40

(B) 34

(C) 74

(D) 1360

168!

5

143!

28

**Sahi Prep Hai  
Toh Life Set Hai**

a mfp

7.  $J = 5 \times 10 \times 15 \times 20 \times \dots \dots 1000$

- (A) 49
- (B) 111
- (C) 197
- (D) 247

a m p

7.  $J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$

- (A) 400  
(B) 111  
(C) 111  
(D) 247

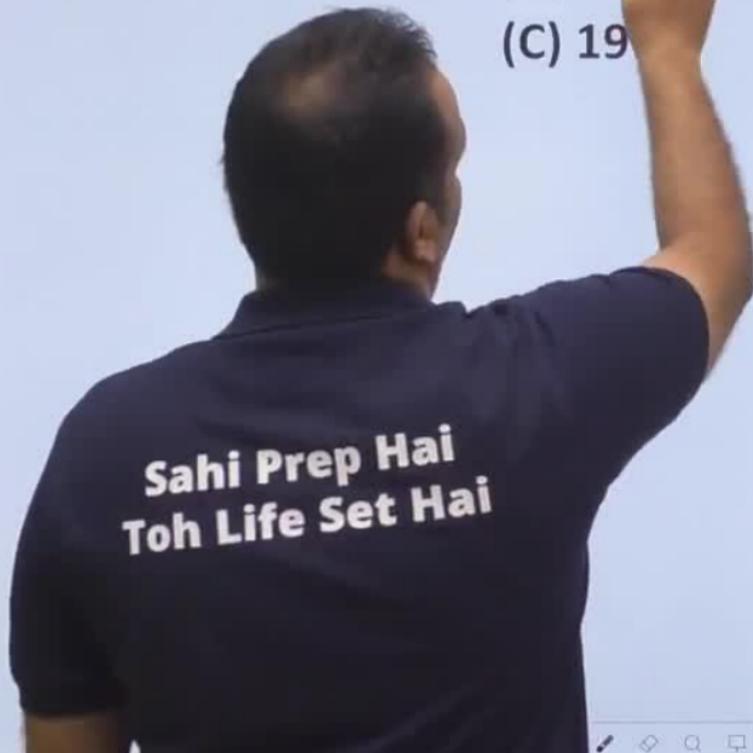
$J =$

Sahi Prep Hai  
Toh Life Set Hai

a.m.p

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \dots \dots \times 1000$$

- (A) 49
- (B) 111
- (C) 19
- (D) 247



amp

7.  $J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$

(A) 49

(C) 7

(B) 111

(D) 247

J =

Sahi Prep Hai  
Toh Life Set Hai

A M P

7.  $J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$

(A) 49

(B) 111

(C) 197

(D) 247

=  $(5 \times 1) \times (\dots)$

Sahi Prep Hai  
Toh Life Set Hai

Amp

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(A) 49

(B) 111

(C) 197

(D) 247

$$\begin{aligned}J &= (5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 20) \\&= 5^{20} \times\end{aligned}$$

Amp

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(A) 49

(B) 111

(C) 197

(D) 247

$$J = (5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$= 5^{200} (1 \cdot 2 \cdot 3 \cdot 4 \dots \cdot 200)$$

$$5^2$$

Sahi Prep Hai  
Toh Life Set Hai

Amb

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$



$$(5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$5^{200} (1 \cdot 2 \cdot 3 \cdot 4 \cdots \cdots 200)$$

5<sup>200</sup> 2001

*Sahi Prep Hai  
Toh Life Set Hai*

Amp

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$



$$J = (5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$= 5^{200} (1 \cdot 2 \cdot 3 \cdot 4 \cdots \cdots 200)$$

5<sup>200</sup> 2001

Amp

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$



$$= (5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$= 5^{200} (1 \cdot 2 \cdot 3 \cdot 4 \cdots \cdots 200)$$

$$5^{200}$$

*Sahi Prep Hai  
Toh Life Set Hai*

200!

~~a M P~~

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(2)

(S)

100

40

50

25

12

2

1

*Sahi Prep Hai  
Toh Life Set Hai*

(A) 49

(B) 111

(C) 197

(D) 247

$$(5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$5^{200} (1 \cdot 2 \cdot 3 \cdot 4 \dots \cdot 200)$$

$$5^{200}$$

200!  
X

54

200!

~~a M P~~

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(2)

(S)

100

40

(A) 49

(B) 111

(C) 197

(D) 247

50

25

12

6

3

1

8

1

49

$$J = \dots \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$(1 \cdot 2 \cdot 3 \cdot 4 \dots \cdot 200)$$

200°

200!

549 17

Sahi Prep Hai  
Toh Life Set Hai

200!

Amp

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(2)

(5)

100

40

50

25

12

6

3

1

8

1

49

(A) 49

(B) 111

(C) 197

(D) 247

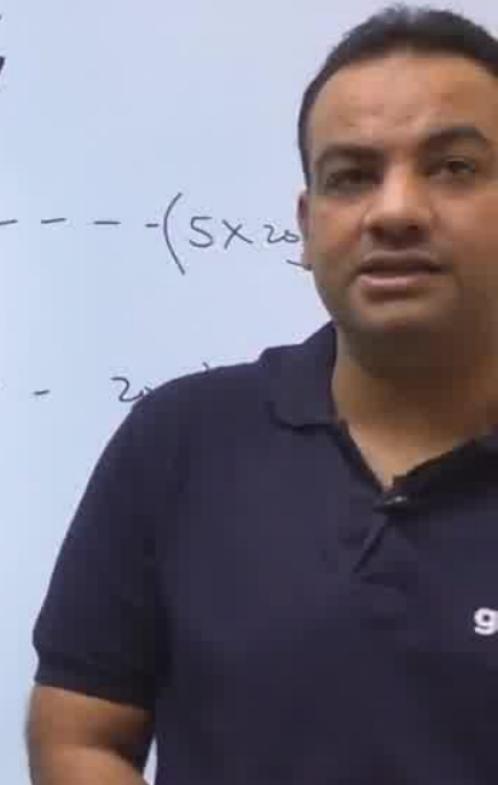
$$J = (5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 20)$$

$$= 5^{200} (1.2.3.4 \dots 20)$$

$$5^{200} \cdot 5^{49} \cdot 2^{197}$$

200!

197



200!

~~a Mf~~

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(2)

(5)

(A) 49

(C) 7

(B) 111

(D) 247

$$J = (5^{200} \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200))$$

$$5^{200} (1, 2, 3, 4, \dots, 200)$$

$$5^{200} \quad 5^{49} \quad 2^{197}$$

Sahi Prep Hai  
Toh Life Set Hai

200!

~~a MP~~

$$7. J = 5 \times 10 \times 15 \times 20 \times \dots \times 1000$$

(2)

(S)

(A) 49

(B) 111

(C) 197

(D) 247

100

4

50

25

125

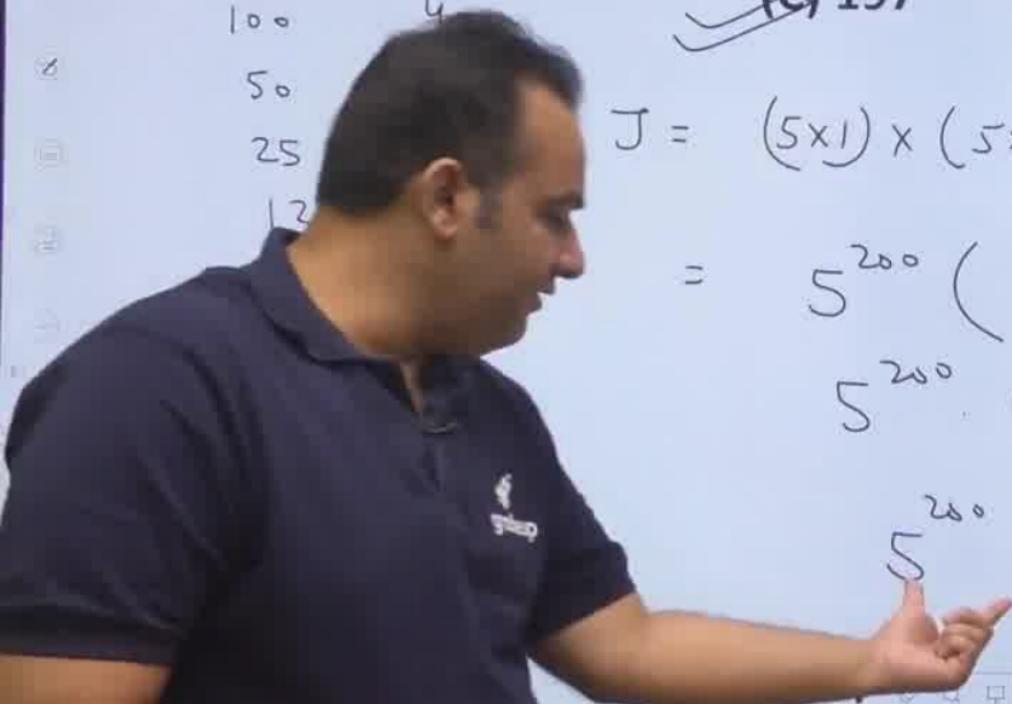
$$J = (5 \times 1) \times (5 \times 2) \times (5 \times 3) \times \dots \times (5 \times 200)$$

$$= 5^{200} (1 \cdot 2 \cdot 3 \cdot 4 \dots \cdot 200)$$

$$5^{200}$$

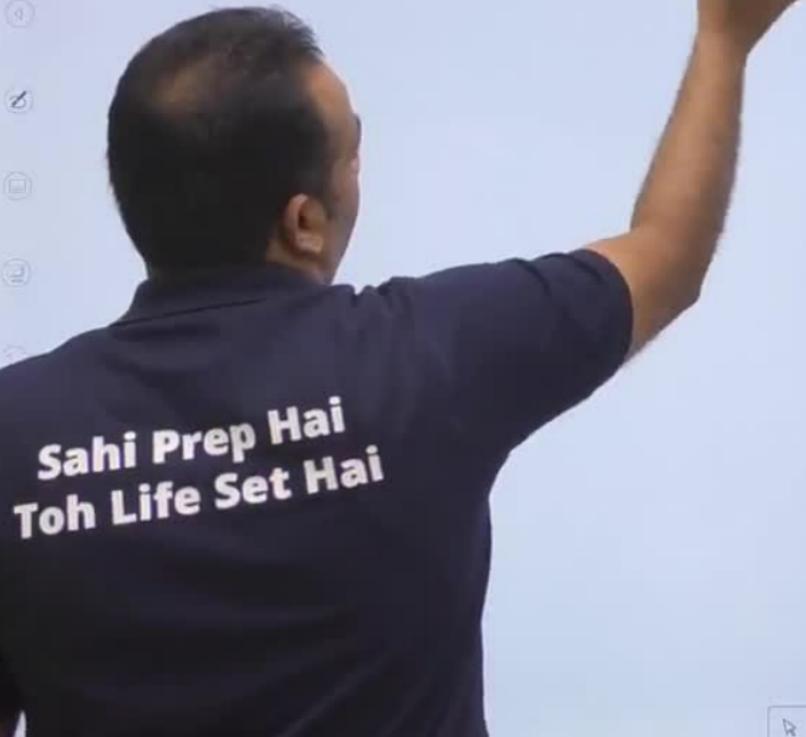
200!  
-

$$5^{200} \quad 5^{49} \quad 2^{197}$$



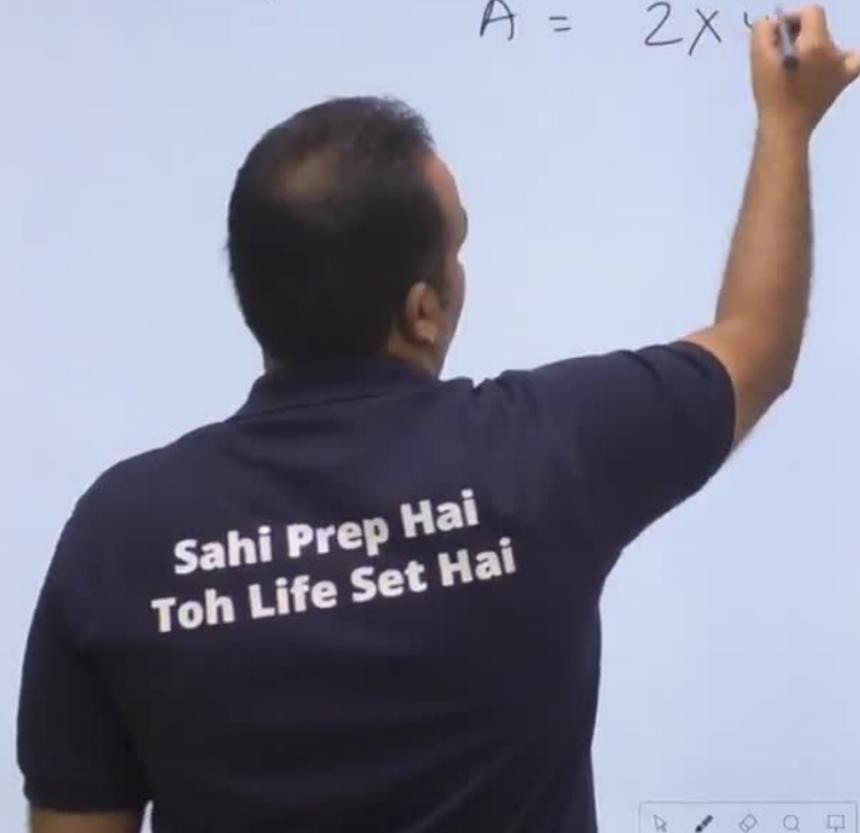
eg

$$A =$$



eg

$$A = 2 \times 4$$



eg

$$A = 2 \times 4 \times 6 \times 8 \times \dots \times 60$$

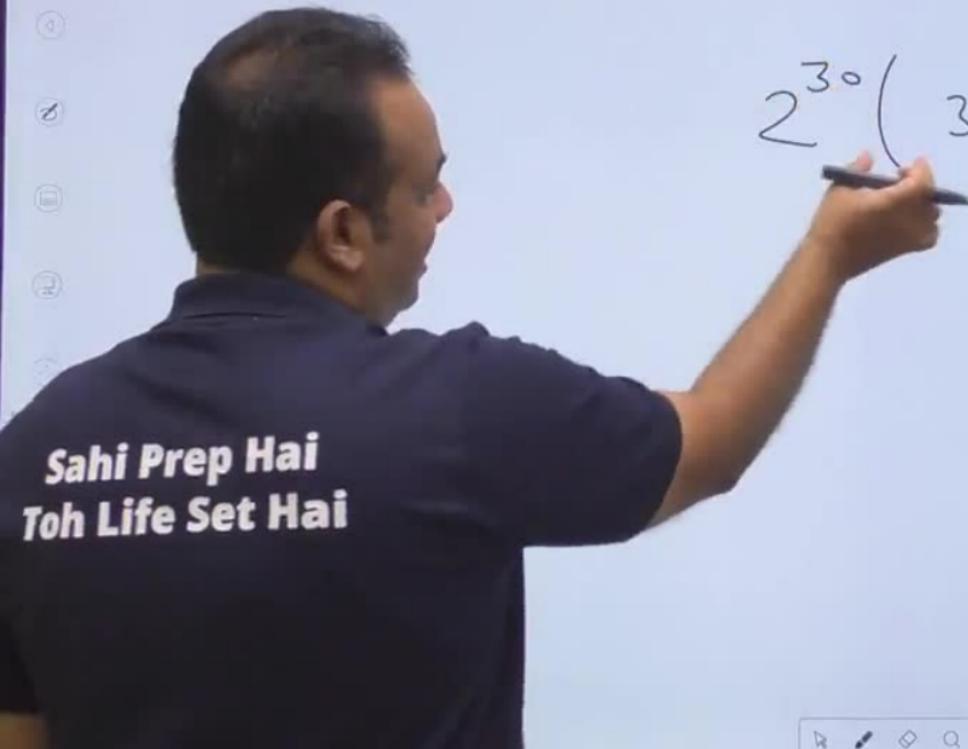
$$2^{30} (30)$$

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Toh Life Set Hai

eg

$$A = 2 \times 4 \times 6 \times 8 \times \dots \times 60$$

$$2^{30} (30!)$$



$$8. K = 10^{100} + 10^{90} + 10^{80} + \dots + 10^{20} + 10^{10}$$

- (A) 10  
(C) 550

- (B) 100  
(D) 55

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Toh Life Set Hai

$$8. K = 10^{100} + 10^{90} + 10^{80} + \dots + 10^{20} + 10^{10}$$

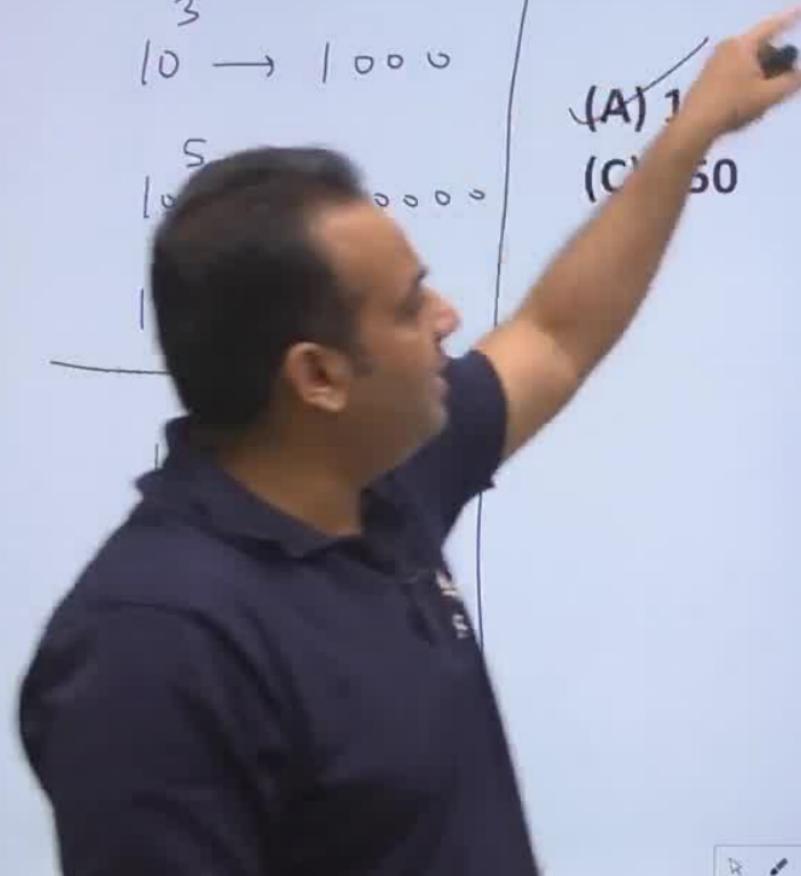
3  
10 → 1 00 0

5  
10 → 1 00 0 0

1

(A) 1  
(C) 50

(B) 100  
(D) 55



$$8. K = 10^{100} + 10^{90} + 10^{80} + \dots + 10^{20} + 10^{10}$$

$$10^3 \rightarrow 1000$$

$$10^5 \rightarrow 100000$$

$$10^2 \rightarrow 100$$

$$10^5 + 10^3 + 10^2$$

$$100000$$

(A) 10

(B) 100

(D) 55

→ 'to zero'

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Toh Life Set Hai**

9.  $L = (5!)^6!$

(A) 120

(B) 720

(C) 600

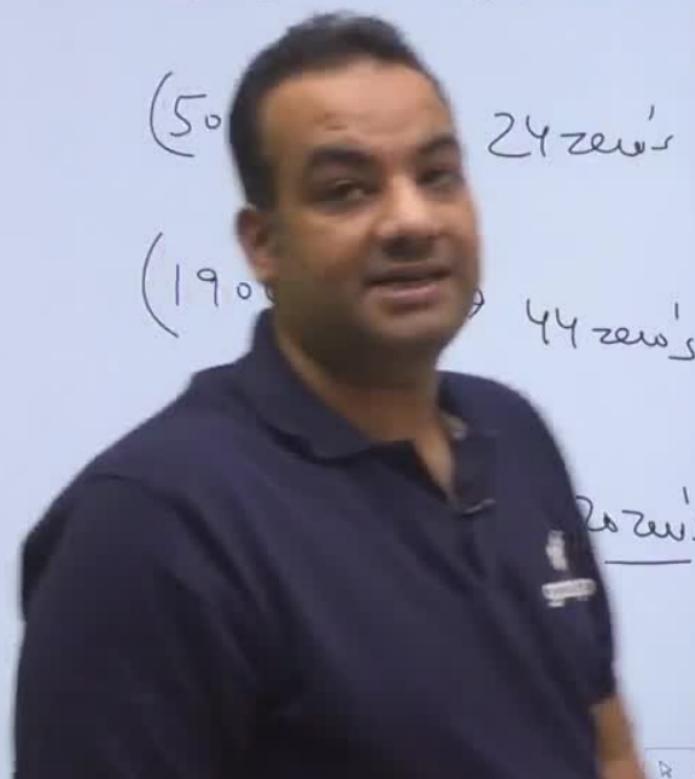
(D) 840

$$\binom{200}{3} \rightarrow 6 \text{ zeros}$$

$$\binom{50}{0} \rightarrow 24 \text{ zeros}$$

$$\binom{190}{0} \rightarrow 44 \text{ zeros}$$

20 zeros

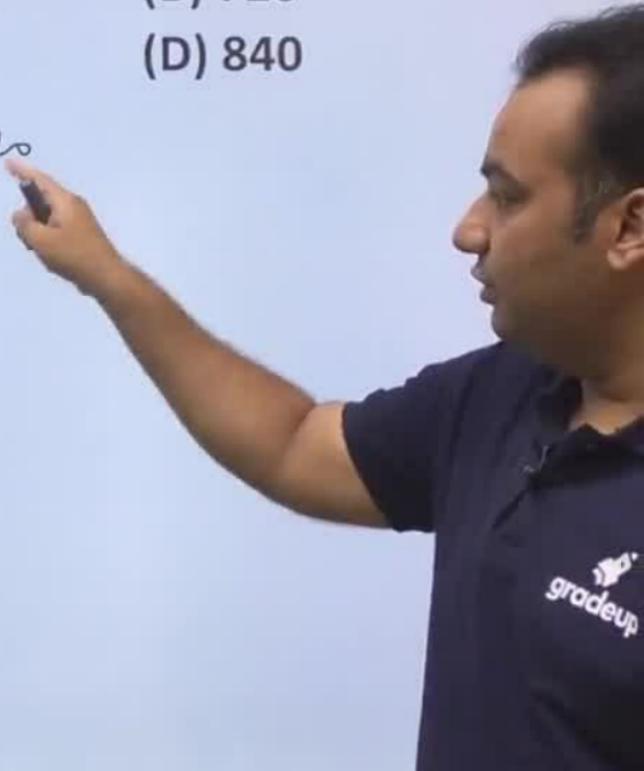


$$\begin{aligned}(200)^3 &\rightarrow 6 \text{ zeros} \\(5000)^8 &\rightarrow 24 \text{ zeros} \\(190000)^{11} &\rightarrow 44 \text{ zeros} \\(120)^{720} &\rightarrow \underline{720 \text{ zeros}}\end{aligned}$$

9.  $L = (5!)^6!$

- (A) 120    (B) 720  
(C) 600    (D) 840

$$(120)^{720}$$



$$9. L = (5!)^6!$$

(A) 120

(B) 720

(C) 600

(D) 840

$$(200)^3 \rightarrow 6 \text{ zeros}$$

$$(5000)^8 \rightarrow 24 \text{ zeros}$$

$$(190000)^{11} \rightarrow 44 \text{ zeros}$$

$$(120)^{720} \rightarrow \underline{720 \text{ zeros}}$$

$$(120)^{720}$$

720 zeros



$$(200)^3 \rightarrow 6 \text{ zero's}$$

$$(5000)^8 \rightarrow 24 \text{ zero's}$$

$$(190000)^{11} \rightarrow 44 \text{ zero's}$$

$$(120)^{720} \rightarrow \underline{720 \text{ zero's}}$$

$$9. L = (5!)^6!$$

(A) 120

(B) 720

(C) 600

(D) 840

$$(120)^{720}$$

720 zero's



9.  $L = (5!)^6!$

(A) 120

(B) 720

(C) 600

(D) 840

$$(200)^3 \rightarrow 6 \text{ zero's}$$

$$(5000)^8 \rightarrow 24 \text{ zero's}$$

$$(190000)^{11} \rightarrow 44 \text{ zero's}$$

$$(120)^{720} \rightarrow \underline{720 \text{ zero's}}$$

$$(120)^{720}$$

720 zero's

10.  $M = 10 \times 100 \times 1000 \times \dots \dots 10000000000$

- (A) 1      (B) 10
- (C) 45      (D) 55



$$9. L = (5!)^6!$$

$$(200) \xrightarrow{3} 6 \text{ zero's}$$
$$(5000) \xrightarrow{8} 7 \text{ zero's}$$
$$(190000) \xrightarrow{6} 5 \text{ zero's}$$
$$(1- \quad \quad \quad ) \xrightarrow{1} 0 \text{ zero's}$$

(A) 120

(C) 600

(B) 720

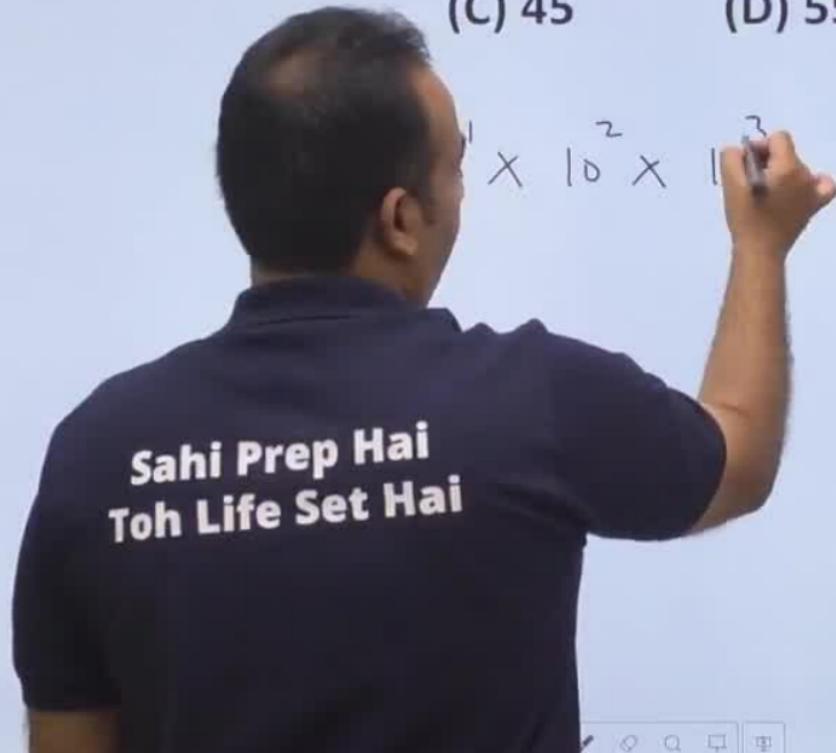
(D) 840

$$(1w) \xrightarrow{720}$$

0 zero's

$$10. M = 10 \times 100 \times 1000 \times \dots \times 10000000000$$

- (A) 1
- (B) 10
- (C) 45
- (D) 55



$$10. M = 10 \times 100 \times 1000 \times \dots \underbrace{10000000000}$$

- (A) 1
- (B) 10
- (C) 45
- (D) 55

$$10^1 \times 10^2 \times 10^3 \times \dots \quad | 10^{10}$$

+ +

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Toh Life Set Hai**

$$10. M = 10 \times 100 \times 1000 \times \dots \underline{\underline{100000000000}}$$

- (A) 1      (B) 10  
(C) 45      (D) 55

$$10^1 \times 10^2 \times 10^3 \times \dots \quad 10^{10}$$

$$1 + 2 + 3 + 4 + \dots \quad 10$$

5

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Toh Life Set Hai*

# Sum of Natural Number

Sum of First n natural numbers

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

Sum of squares of First n natural numbers =  $\frac{n(n+1)(2n+1)}{6}$

Sum of cubes of First n natural numbers =  $\left(\frac{n(n+1)}{2}\right)^2$

Sahi Prep Hai  
Toh Life Set Hai

# Sum of Natural Number

$$\text{Sum of First } n \text{ natural numbers} = \frac{n(n+1)}{2}$$

$$\text{Sum of squares of First } n \text{ natural numbers} = \frac{n(n+1)(2n+1)}{6}$$

$$\text{Sum of cubes of First } n \text{ natural numbers} = \left( \frac{n(n+1)}{2} \right)^2$$

Sahi Prep Hai  
Toh Life Set Hai

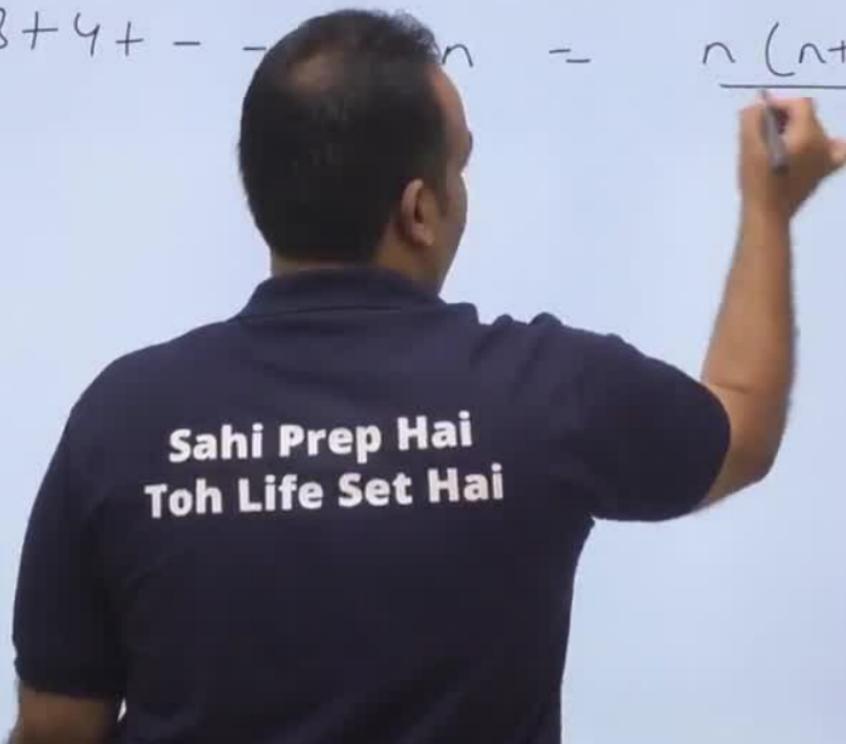
Eg1. Find the sum of all numbers from 1 to 40.



<sup>natural</sup>

Eg1. Find the sum of all numbers from 1 to 40.

$$1 + 2 + 3 + 4 + \dots + n = \frac{n(n+1)}{2}$$



*method*

Eg1. Find the sum of all numbers from 1 to 40.

$$1+2+3+4+\dots+n = \frac{n(n+1)}{2}$$

$$1+2+3+\dots$$

**Sahi Prep Hai  
Toh Life Set Hai**

Eg2. Find the sum of squares of all Natural numbers from 1 to 40.

$$1^2 + 2^2 + 3^2 +$$

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Toh Life Set Hai

Eg2. Find the sum of squares of all Natural numbers from 1 to 40.

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$1^2 + 2^2 + 3^2 +$$

Sahi Prep Hai  
Toh Life Set Hai

Eg2. Find the sum of squares of all Natural numbers from 1 to 40.

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$3^2 + \dots + 4^2$$

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Eg2. Find the sum of squares of all Natural numbers from 1 to 40.

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$1^2 + \dots + 40^2 = \frac{40 \cdot 41 \cdot 81}{6}$$

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Eg2. Find the sum of squares of all Natural numbers from 1 to 40.

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

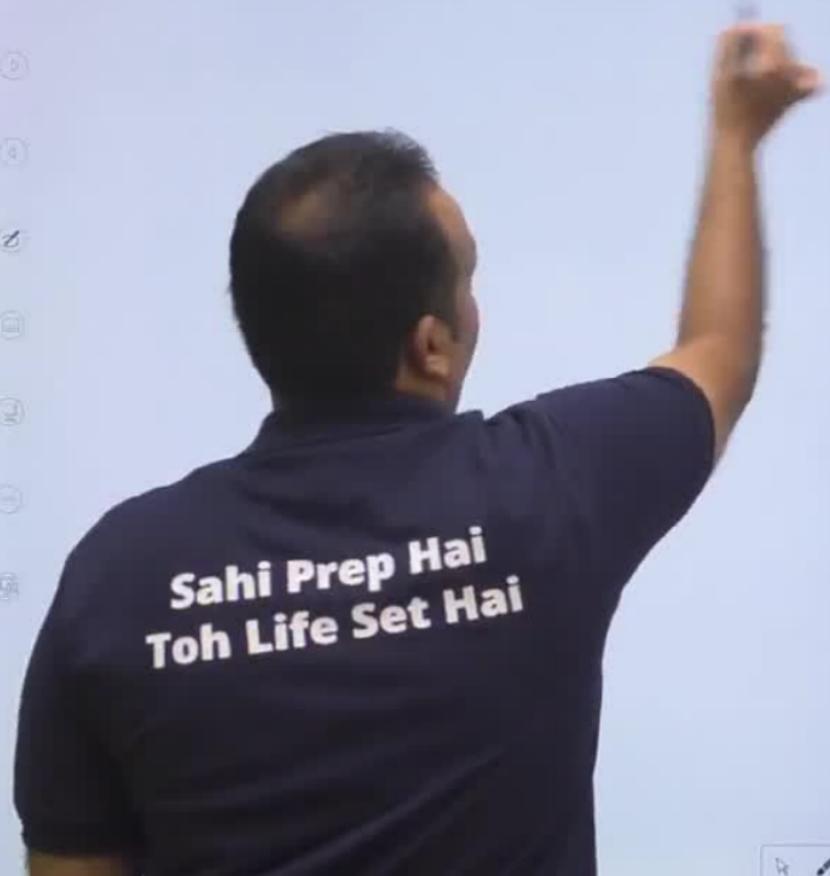
$$1^2 + 2^2 + 3^2 + \dots = \frac{20 \cdot 40 \cdot 27}{6} \\ \underline{8x}$$

Eg2. Find the sum of squares of all Natural numbers from 1 to 40.

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

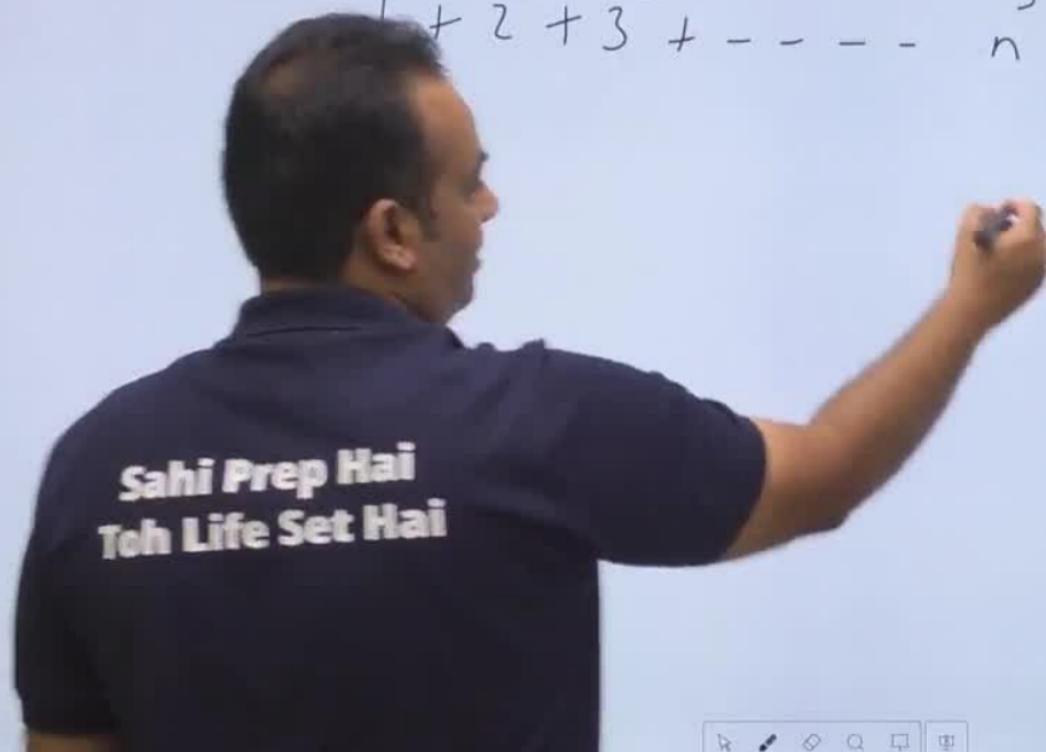
$$1^2 + 2^2 + 3^2 + \dots + 40^2 = \frac{20 \cdot 41 \cdot 81}{6}$$
$$= \underline{\underline{22140}}$$

Eg3. Find the sum of cubes of all Natural numbers from 1 to 10.



Eg3. Find the sum of cubes of all Natural numbers from 1 to 10.

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left[ \frac{n(n+1)}{2} \right]^2$$



Eg3. Find the sum of cubes of all Natural numbers from 1 to 10.

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left[ \frac{n(n+1)}{2} \right]^2$$
$$= \frac{10 \cdot 11}{2}$$

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Toh Life Set Hai**

Eg3. Find the sum of cubes of all Natural numbers from 1 to 10.

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left[ \frac{n(n+1)}{2} \right]^2$$

$$= \left( \frac{10 \cdot 11}{2} \right)^2$$

$$= 3025$$



Eg4. Find  $21 + 22 + 23 + \dots + 59 + 60$

I<sup>st</sup>

$$1 + 2 + 3 + 4 + \dots$$

Sahi Prep Hai  
Toh Life Set Hai

Eg4. Find  $21 + 22 + 23 + \dots + 59 + 60$

$$\text{I}^{\text{st}} = (1+2+3+4+\dots+60) - (1+2+3+\dots+20)$$

$$\underline{51} - \underline{20 \cdot 21}$$

Sahi Prep Hai  
Toh Life Set Hai

Eg4. Find  $21 + 22 + 23 + \dots + 59 + 60$

$$\text{I}^{\text{st}} = (1+2+3+4+\dots+60) - (1+2+3+\dots+20)$$

$$\frac{30}{60 \cdot 61} - \frac{10}{20 \cdot 21}$$

1830

**Sahi Prep Hai  
Toh Life Set Hai**

Eg4. Find  $21 + 22 + 23 + \dots + 59 + 60$

I<sup>st</sup>

$$(1+2+3+4+\dots+60) - (1+2+3+\dots+20)$$

$$\begin{array}{r} 30 \\ 60 \\ \hline 210 \end{array}$$

$$\begin{array}{r} 10 \\ 20 \\ \hline 210 \end{array}$$

$$210 = 1620$$

*Sahi Prep Hai  
Toh Life Set Hai*

Eg4. Find  $21 + 22 + 23 + \dots + 59 + 60$

T<sup>st</sup>

$$(1+2+3+4+\dots+60) - (1+2+3+\dots+20)$$

$$\frac{61}{2} - \frac{20 \cdot 21}{2}$$

$$1830 - 210 = \underline{1620}$$

$$21 + 22 + ?$$

Sahi Prep Hai  
Toh Life Set Hai

$$21 + 22 + 23 + \dots + 58 + 59 + 60$$

II<sup>nd</sup>

$$(20+1) + (20+2) +$$

Sahi Prep Hai  
Toh Life Set Hai

$$21 + 22 + 23 + \dots + 58 + 59 + 60$$

11<sup>th</sup>

$$(20+1) + (20+2) + \dots + (20+39) + (20+40)$$

ahi Prep Hai  
h Life Set Hai

$$21 + 22 + 23 + \dots + 58 + 59 + 60$$

1<sup>nd</sup>

$$(\underline{20+1}) + (\underline{20+2}) + \dots + (\underline{20+39}) + (\underline{20+40})$$

$$40 + 1 + 2 + 3 + \dots$$

Sahi Prep Hai  
Toh Life Set Hai

$$21 + 22 + 23 + \dots + 58 + 59 + 60$$

II<sup>nd</sup>

$$(\underline{20+1}) + (\underline{20+2}) + \dots + (\underline{20+39}) + (\underline{20+40})$$

$$40 + (1 + 2 + 3 + \dots + 40)$$

$$800 + \frac{40 \cdot 41}{2} =$$

Sahi Prep Hai  
Tah Life Set Hai

$$21 + 22 + 23 + \dots + 58 + 59 + 60$$

11<sup>th</sup>

$$(\underline{20+1}) + (\underline{20+2}) + \dots + (\underline{20+39}) + (\underline{20+40})$$

$$40 + (1 + 2 + 3 + \dots + 40)$$

$$800 + \frac{40 \cdot 41}{2} = \underline{\underline{1620}}$$

Sahi Prep Hai  
Toh Life Set Hai

$$21 + 22$$

$$21 + 22 + 23 + \dots + 58 + 59 + 60$$

II<sup>nd</sup>

$$(20+1) + (20+2) + \dots + (20+39) + (20+40)$$

$$20 \cdot 40 + (1+2+3+\dots+40)$$

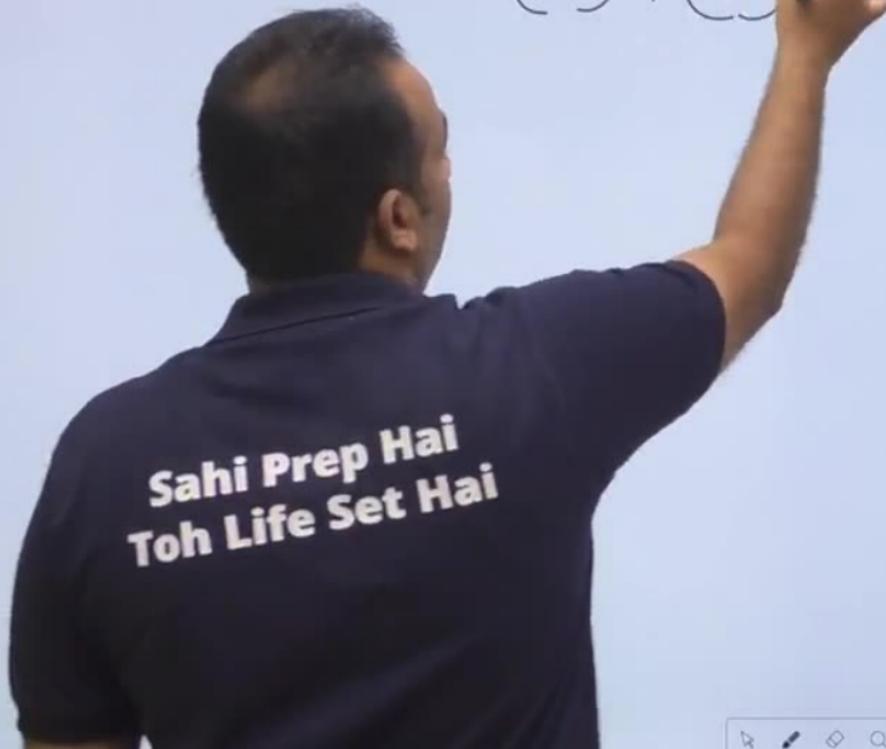
$$= 800 + \frac{20 \cdot 41}{2} = \underline{\underline{1620}}$$

III

$$21 + 22 + \dots + 59 + 60$$

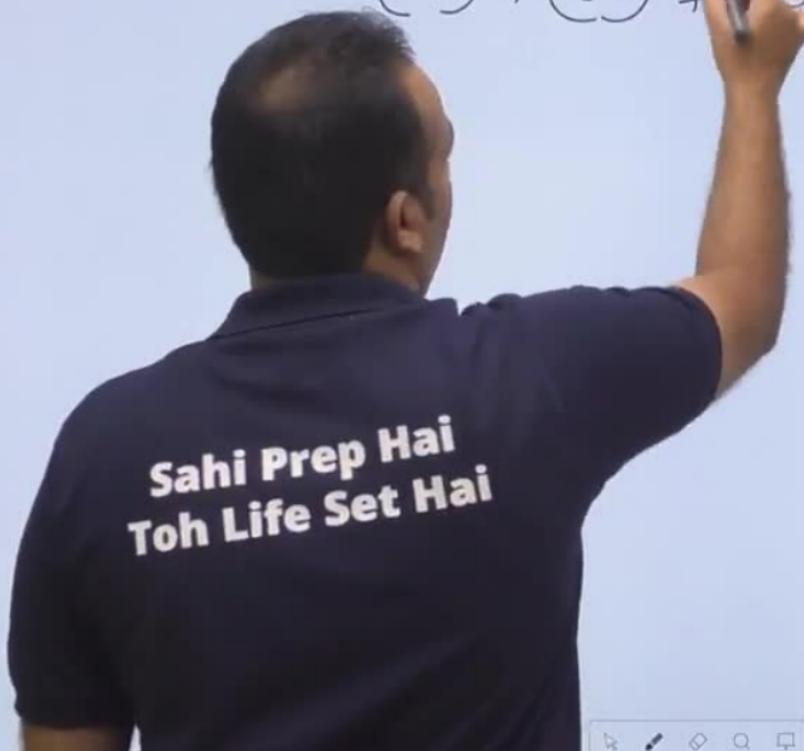
Eg5. Find :  $2^2 + 4^2 + 6^2 + \dots + 50^2$

$$(2 \cdot 1)^2 + (2 \cdot 2)^2$$



Eg5. Find :  $2^2 + 4^2 + 6^2 + \dots + 50^2$

$$(2 \cdot 1)^2 + (2 \cdot 2)^2 + \dots + (2 \cdot 3)$$



Eg5. Find :  $2^2 + 4^2 + 6^2 + \dots + 50^2$

$$(2 \cdot 1)^2 + (2 \cdot 2)^2 + (2 \cdot 3)^2 + \dots + (2 \cdot 25)^2$$

$$2^2 [1^2 + 2^2 + 3^2 + \dots]$$

Sahi Prep Hai  
Toh Life Set Hai

Eg5. Find :  $2^2 + 4^2 + 6^2 + \dots + 50^2$

$$(2 \cdot 1)^2 + (2 \cdot 2)^2 + (2 \cdot 3)^2 + \dots + (2 \cdot 25)^2$$

$$2^2 [1^2 + 2^2 + 3^2 + \dots + 25^2]$$

$$4 \cdot \left( \frac{25 \cdot 26 \cdot 51}{82} \right)$$

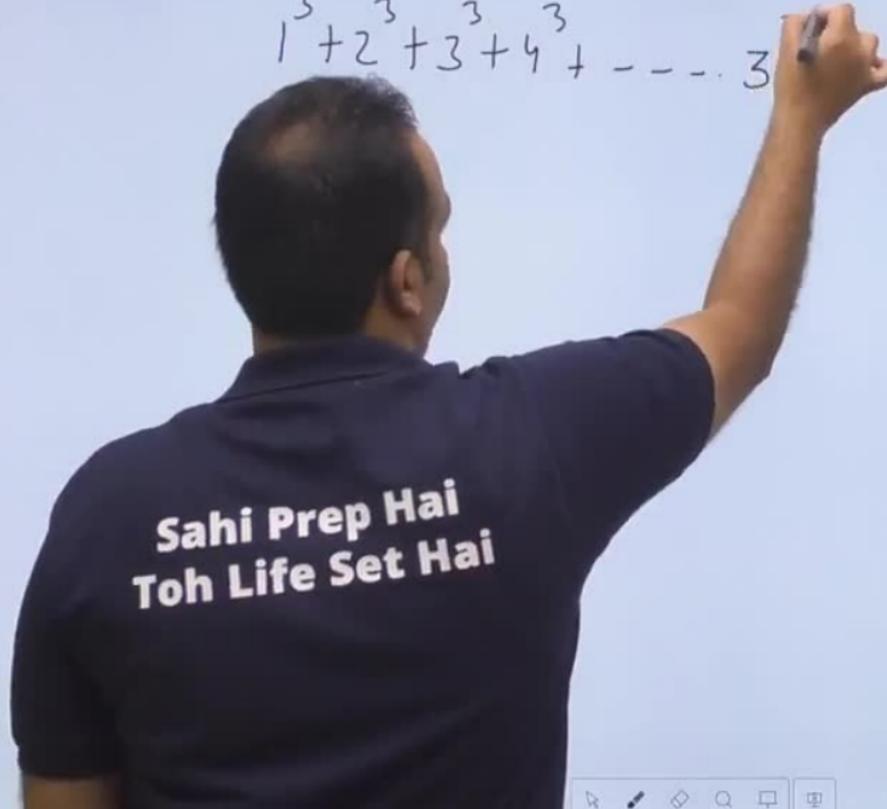
$$\underline{22100}$$

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$



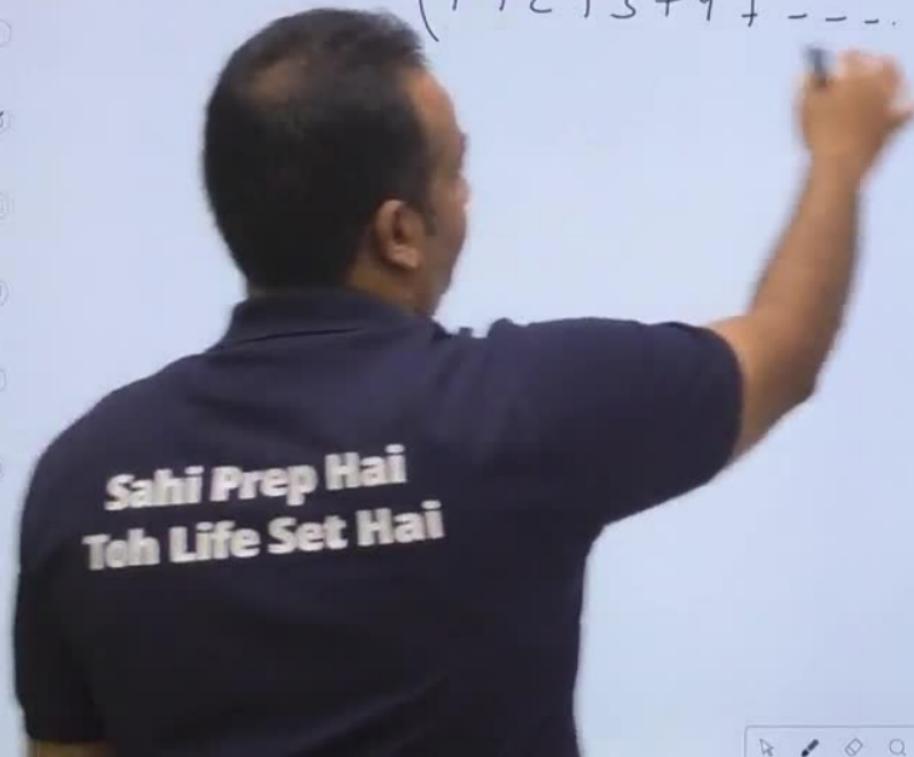
Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$1^3 + 2^3 + 3^3 + 4^3 + \dots + 29^3$$



Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$(1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3)$$



Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$\left( 1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 30^3 \right)$$

$$\left( \frac{30 \cdot 31}{x} \right)^2 - 2^3 \left( 1^3 + 2^3 + \dots + 15^3 \right)$$

$$(15 - 31)^2$$

Sahi Prep Hai  
Toh Life Set Hai

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$(1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3) - (2^3 + 4^3 + 6^3 + \dots + 30^3)$$

$$\left(\frac{15}{x}\right)^2 - 2^3 (1^3 + 2^3 + \dots + 15^3)$$

$$(15 - 31)^2 - 2^3 \cdot \left(\frac{15}{x}\right)^2$$

$$15^2 - 31^2$$

*Sahi Prep Hai  
Toh Life Set Hai*

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$\left( 1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 30^3 \right)$$

$$= 31^2 - 2^3 (1^3 + 2^3 + \dots + 15^3)$$

$$= 31^2 - 2^3 \cdot \left( \frac{15 \cdot 16}{2} \right)^2$$

$$= 8 \cdot 15^2$$

*Sahi Prep Hai  
Toh Life Set Hai*

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$\left( 1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 30^3 \right)$$

$$\left( \frac{31}{2} \right)^2 - 2^3 \left( 1^3 + 2^3 + \dots + 15^3 \right)$$

$$\left( \frac{31}{2} \right)^2 - 2^3 \cdot \left( \frac{15 \cdot 16}{2} \right)^2$$

$$\left[ \frac{31}{2} - 8 \cdot 15 \cdot 8 \right]^2$$

$$[961 - 512]$$

*Sahi Prep Hai  
Toh Life Set Hai*

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$(1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3) - (2^3 + 4^3 + 6^3 + \dots + 30^3)$$

$$\left(\frac{15}{2} \cdot 31\right)^2 - 2^3 (1^3 + 2^3 + \dots + 15^3)$$

$$= \frac{1,01,025}{15^2 \cdot 31^2 - 8 \cdot 15^2 \cdot 8^2} \left(15 \cdot \frac{8}{15}\right)^2$$

$$15^2 [961 - 512]$$

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$\begin{aligned}
 & \left( 1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 30^3 \right) \\
 & 225 \times 449 \\
 & = \frac{(15-31)^2}{x} - 2^3 (1^3 + 2^3 + 3^3 + 4^3 + \dots + 14^3) \\
 & = \frac{(15-31)^2}{x} - 2^3 (15^2 \cdot 8) \\
 & = 15^2 [961 - 5]
 \end{aligned}$$

Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$(1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3) - (2^3 + 4^3 + 6^3 + \dots + 30^3)$$

$$225 \times 44 \times \left( \frac{5}{8} \cdot \frac{31}{x} \right)^2 - 2^3 (1^3 + 2^3 + \dots + 15^3)$$

$$= 1,01,82 \times (15-31)^2 - 2^3 \cdot \left( \frac{15 \cdot 16}{x} \right)^2$$

$$= 31^2 - 8 \cdot 15^2 \cdot 8^2$$

$$= [9(1-512)]$$



Eg6. Find:  $1^3 + 3^3 + 5^3 + \dots + 29^3$

$$\left( 1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 30^3 \right)$$

$$225 \times 449 \quad \left( \frac{30 \cdot 31}{x} \right)^2 - 2^3 \left( 1^3 + 2^3 + \dots + 15^3 \right)$$

$$= \underline{\underline{1,010,25}} \quad (15 \cdot 31)^2 - 2^3 \left( \frac{15 \cdot 8}{x} \right)^2$$

$$15^2 \cdot 31^2 - 8 \cdot 15^2 \cdot 8^2$$

$$15^2 [961 - 512]$$

Click to add notes

Notes



$$10. M = 10 \times 100 \times 1000 \times \dots \underline{10000000000}$$

$$1 + 2 + 3 + \dots + n$$

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

$$= \frac{5}{4 \times 11}$$

$$= \frac{2}{55}$$

- (A) 1      (B) 10  
 (C) 45      ~~(D) 55~~

$$10^1 \times 10^2 \times 10^3 \times \dots \times 10^{10}$$

$$1 + 2 + 3 + 4 + \dots + 10$$

$$= 55$$

Click to add notes

Notes

$$10. M = 10 \times 100 \times 1000 \times \dots \underset{\text{10}}$$

- (A) 1                    (B) 10  
(C) 45                    ~~(D) 55~~

$1 + 2 + 3 + \dots + n$

$= n$

$$10^1 \times 10^2 \times 10^3 \times \dots \underset{10}{10^{10}}$$

$$1 + 2 + 3 + 4 + \dots \underset{10}{10}$$

55

$$10. M = 10 \times 100 \times 1000 \times \dots \underset{\text{10 digits}}{10000000000}$$

$$1 + 2 + 3 + \dots + n$$

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

$$= \frac{5}{10} \cdot 11$$

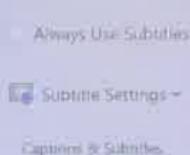
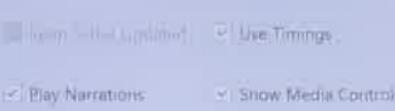
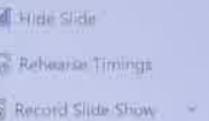
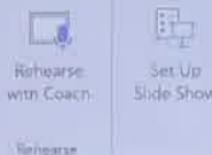
$$= \boxed{55}$$

- (A) 1                    (B) 10  
 (C) 45                    ~~(D) 55~~

$$10^1 \times 10^2 \times 10^3 \times \dots \times 10^{10}$$

$$1 + 2 + 3 + 4 + \dots + 10$$

$$= \boxed{55}$$



$$(1^3 + 2^3 + 3^3 + 4^3 + \dots + 30^3) - (2^3 + 4^3 + 6^3 + \dots + 30^3)$$

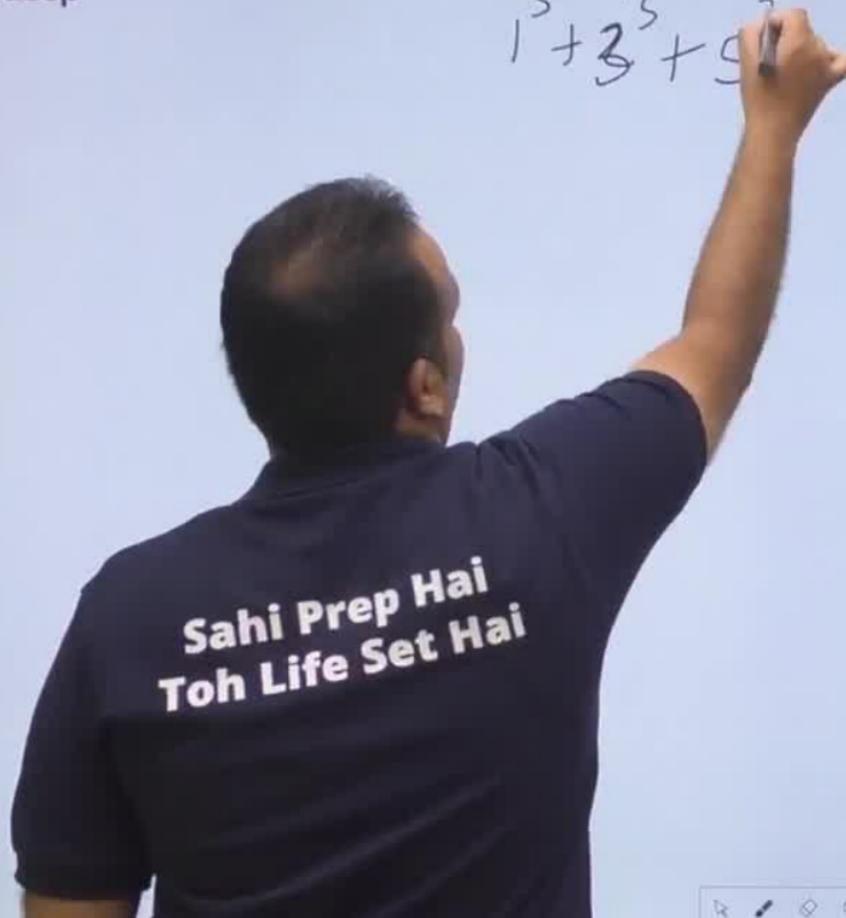
$$225 \times 449 = \left( \frac{30 \cdot 31}{2} \right)^2 - 2^3 (1^3 + 2^3 + \dots + 15^3)$$

$$\begin{aligned} &= \underline{\underline{1,01,025}} \quad (15 \cdot 31)^2 - 2^3 \left( \frac{15 \cdot 8}{2} \right)^2 \\ &\quad 15^2 \cdot 31^2 - 8 \cdot 15^2 \cdot 8^2 \\ &\quad 15^2 [961 - 512] \end{aligned}$$

Click to add notes

Notes

$$1^3 + 3^3 + 9^3$$



$$1^3 + 3^3 + 5^3 + \dots - 29^3$$

$$+ 2^3 + 3^3 + \dots - 29^3)$$

Chi Prep Hai  
Life Set Hai

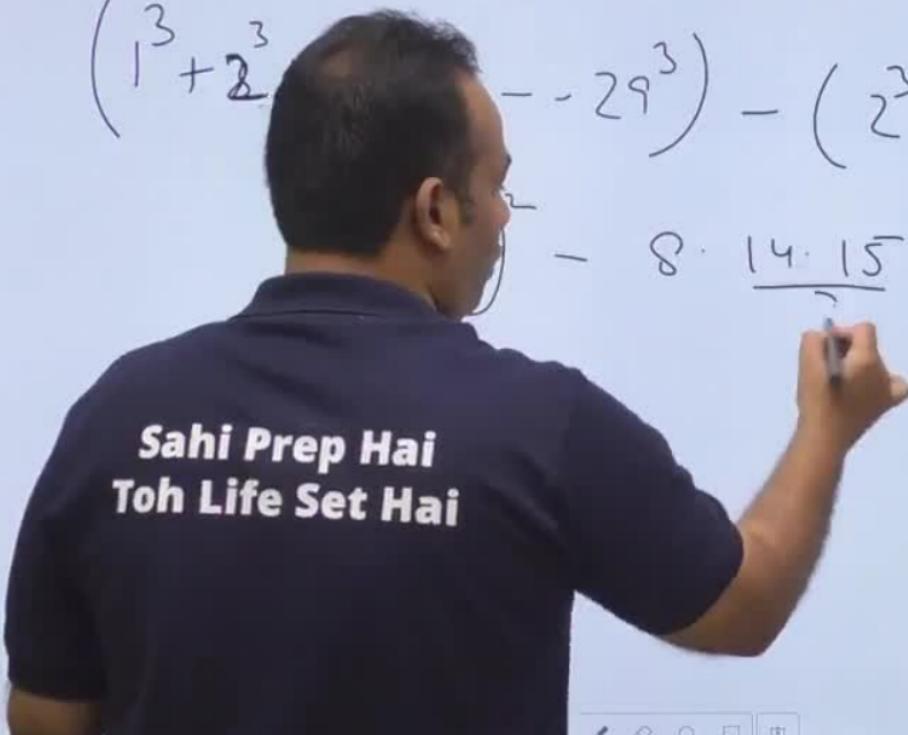
$$1^3 + 3^3 + 5^3 + \dots - 29^3$$

$$(1^3 + 3^3 + 5^3 + \dots - 29^3) - (2^3 + 4^3 + 6^3 + \dots - 28^3)$$
$$\frac{(30)^2}{2} - 8 \cdot 1$$

Sahi Prep Hai  
Toh Life Set Hai

$$1^3 + 3^3 + 5^3 + \dots - 29^3$$

$$\left( 1^3 + 2^3 - 29^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots - 28^3 \right)$$
$$= 8 \cdot \frac{14 \cdot 15}{2}$$



$$1^3 + 3^3 + 5^3 + \dots - 29^3$$

$$\left( 1^3 + 3^3 + 5^3 + \dots - 29^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots - 28^3 \right)$$

$$= \left( \frac{3^0}{2} \right)^2 - 8 \cdot \left( \frac{14 \cdot 15}{2} \right)^2$$

$$= 2 \cdot 14^2$$

*Sahi Prep Hai  
Toh Life Set Hai*

$$1^3 + 3^3 + 5^3 + \dots + 29^3$$

$$(1^3 + 3^3 + 5^3 + \dots + 29^3) - (2^3 + 4^3 + 6^3 + \dots + 28^3)$$

$$\left(\frac{30}{2}\right)^2 - 8 \cdot \left(\frac{14 \cdot 15}{2}\right)^2$$

$$29^2 - 15^2 - 2 \cdot 14^2 - 15^2$$
$$(841 - 39)$$

Sahi Prep Hai  
Toh Life Set Hai

$$1^3 + 3^3 + 5^3 + \dots + 29^3$$

$$\left( 1^3 + 3^3 + 5^3 + \dots + 29^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 28^3 \right)$$

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Keep Discard

$$\left( \frac{29+30}{2} \right)^2 - \left( \frac{15}{2} \right)^2$$

$$- 15^2 - 2 \cdot 14 \cdot 15^2$$

$$15^2 (841 - 392)$$

$$225 \times (449)$$



$$1^3 + 3^3 + 5^3 + \dots + 29^3$$

$$\left( 1^3 + 3^3 + 5^3 + \dots + 29^3 \right) - \left( 2^3 + 4^3 + 6^3 + \dots + 28^3 \right)$$

$$\left( \frac{29 \cdot 30}{2} \right)^2 - 8 \cdot \left( \frac{14 \cdot 15}{2} \right)^2$$

$$29^2 - 15^2 - 2 \cdot 14^2 \cdot 15^2$$

$$15^2 (841 - 392)$$

$$225 \times (449)$$

Click to add notes

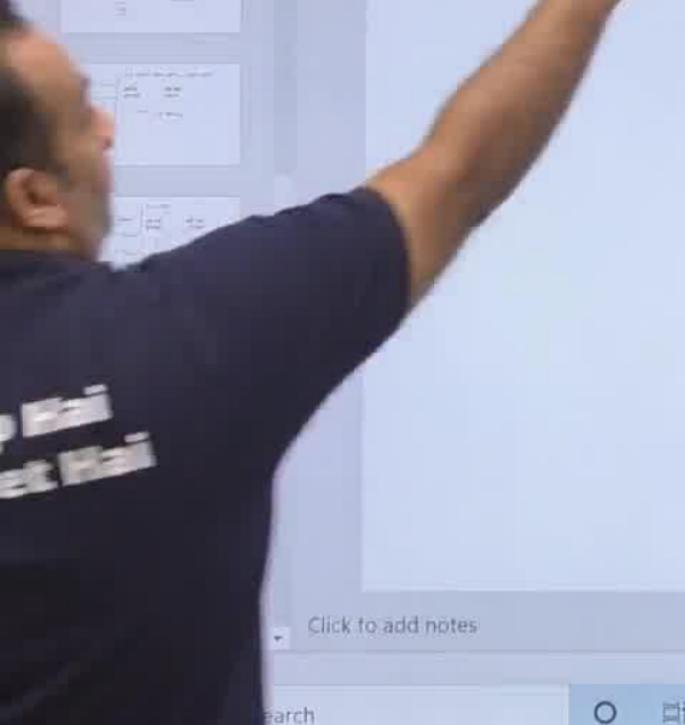


20



$$11. N = (25!)^{20} + (20!)^{25}$$

- (A) 100
- (B) 120
- (C) 220
- (D) 20



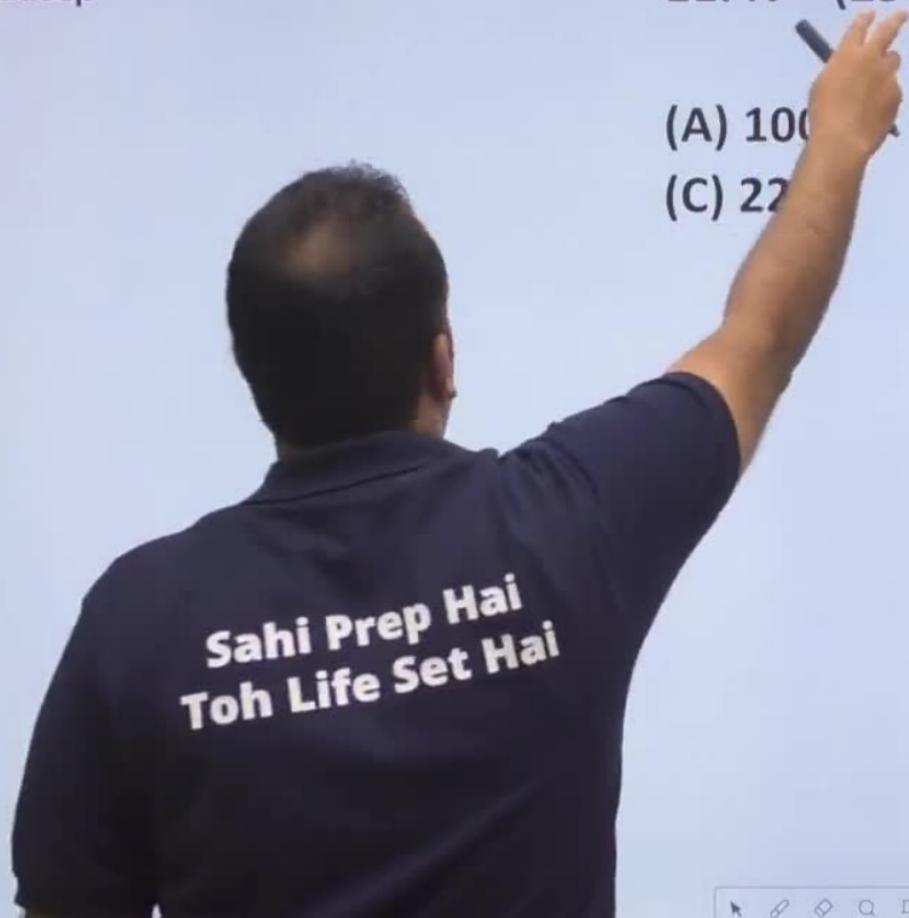
Click to add notes

Notes



$$11. N = (25!)^{20} + (20!)^{25}$$

- (A) 100
- (B) 120
- (C) 220
- (D) 20



$$10. M = 10 \times 100 \times 1000 \times \dots \underset{\text{10 digits}}{10000000000}$$

$$1 + 2 + 3 + \dots + n$$

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

$$= \frac{5}{10} \cdot 11$$

$$= \boxed{55}$$

- (A) 1                      (B) 10  
 (C) 45                      ~~(D) 55~~

$$10^1 \times 10^2 \times 10^3 \times \dots \times 10^{10}$$

$$1 + 2 + 3 + 4 + \dots + 10$$

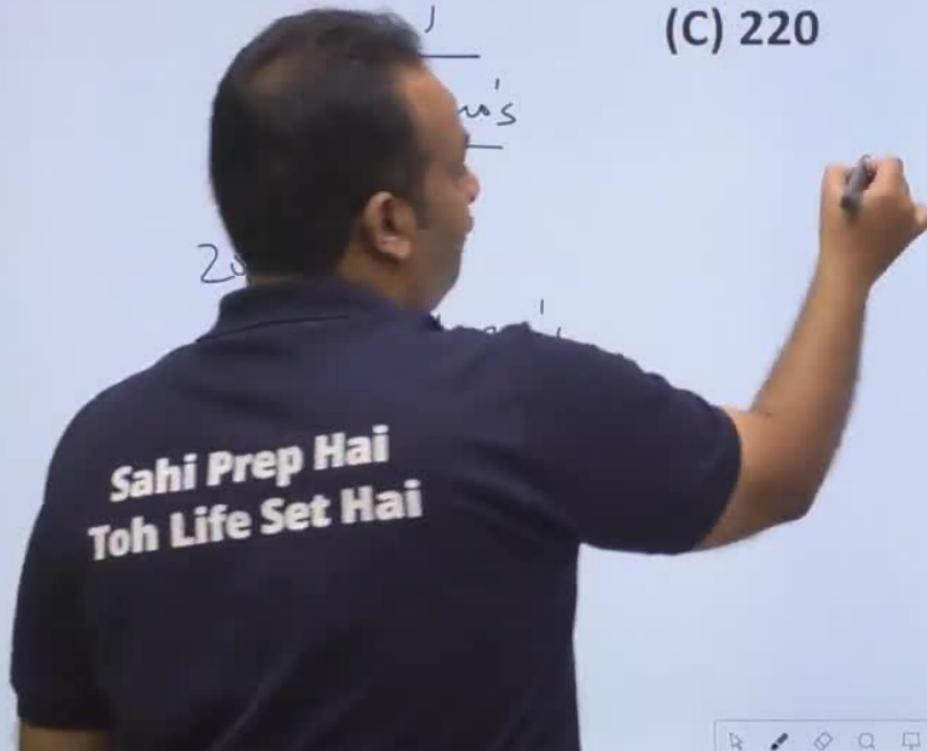
$$= \boxed{55}$$

$$11. N = (25!)^{20} + (20!)^{25}$$

$25!$

5  
J  
m's

- (A) 100
- (B) 120
- (C) 220
- (D) 20



$$11. N = (25!)^{20} + (20!)^{25}$$

$25!$

$$\begin{array}{r} 5 \\ \times 1 \\ \hline 5 \end{array}$$

(A) 100

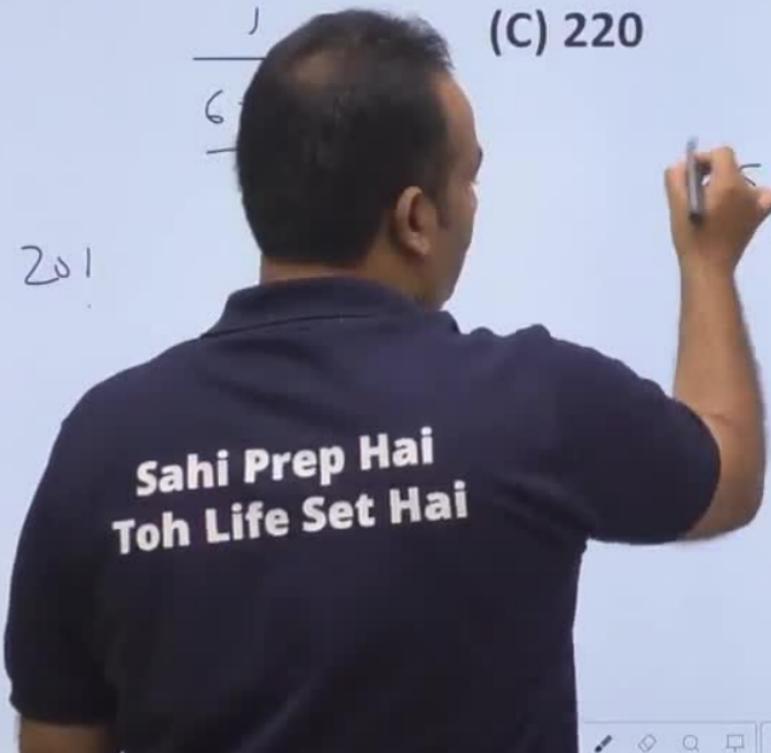
(B) 120

(C) 220

(D) 20

$20!$

$(25!)$



$$11. N = (25!)^{20} + (20!)^{25}$$

25!

5

1

1

1

20

zero's

(A) 100

(B) 120

(C) 220

(D) 20

$$(25!)^{20} + (20!)^{25}$$

*Sahi Prep Hai  
Toh Life Set Hai*

$$11. N = (25!)^{20} + (20!)^{25}$$

25!

5

)

(A) 100

(B) 120

(C) 220

(D) 20

20!

~~20~~  
20

$$(25!)^{20} + (20!)^{25}$$

↓                      ↓

20 zero's            10 zero's

$$12. O = (3^{123} - 3^{122} - 3^{121}) (2^{121} - 2^{120} - 2^{119})$$

(A) 0

(B) 119

(C) 1

(D) 120



$$12. O = \underbrace{(3^{123} - 3^{122} - 3^{121})}_{\text{ }} (2^{121} - 2^{120} - 2^{119})$$

(A) 0

(B) 1

(C) 119

(D) 120

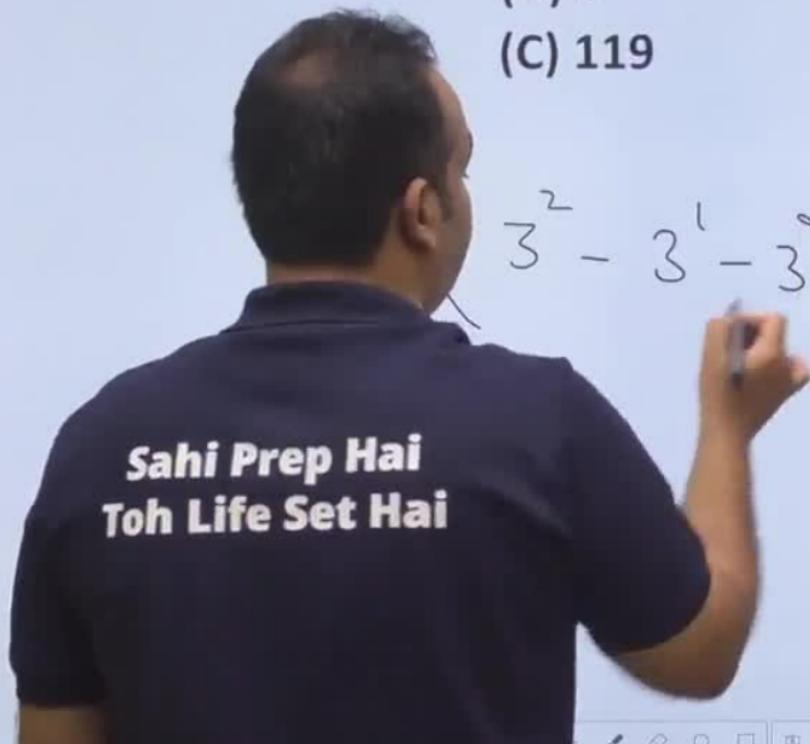
$3^{121}/$

ahi Prep Hai  
Life Set Hai

$$12. O = \underbrace{(3^{123} - 3^{122} - 3^{121})}_{\text{ }} (2^{121} - 2^{120} - 2^{119})$$

- (A) 0
- (B) 1
- (C) 119
- (D) 120

$$3^2 - 3^1 - 3^0)$$



$$12. O = \underbrace{(3^{123} - 3^{122} - 3^{121})}_{\text{ }} (2^{121} - 2^{120} - 2^{119})$$

(A) 0

(B) 1

(C) 119

(D) 120

$$3^2 - 3^1 - 3^0 \Big) 2^{119} \Big( 2^2 - 2^1 - 2^0 \Big)$$

$$5 \cdot 2^{118}$$

*Sahi Prep Hai  
Toh Life Set Hai*

$$12. O = \underbrace{(3^{123} - 3^{122} - 3^{121})}_{\text{ }} (2^{121} - 2^{120} - 2^{119})$$

- (A) 0                          (B) 1  
(C) 119                        (D) 120

$$3^{121} \left( 3^2 - 3^1 - 3^0 \right) 2^{119} \left( 2^2 - 2^1 - 2^0 \right)$$
$$3^{121} \cdot \underbrace{5^1}_{\text{ }} \cdot 2^{119} (1)$$

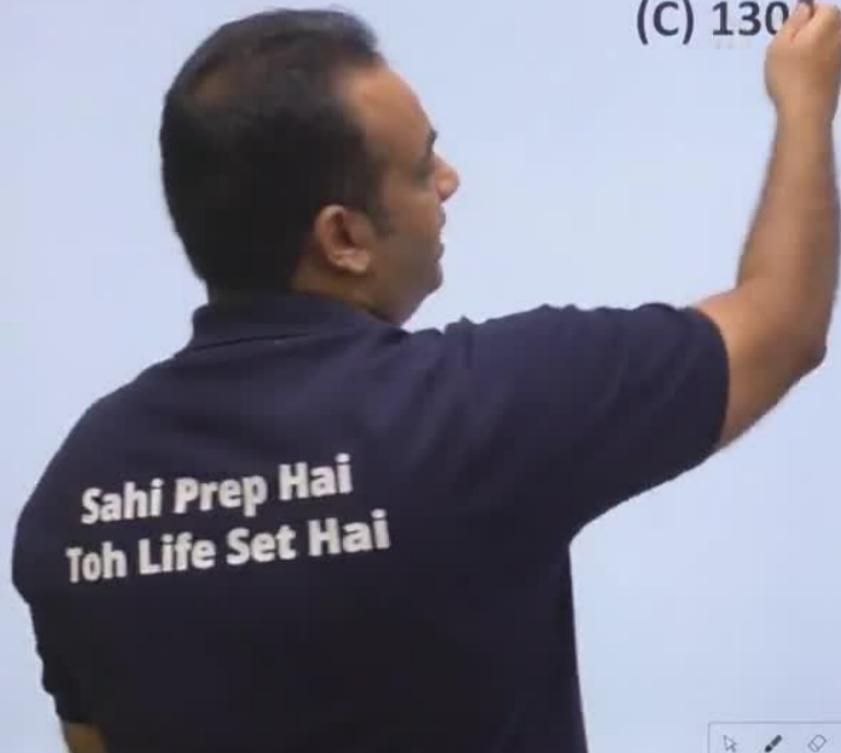
zero

Sahi Prep Hai  
Toh Life Set Hai

Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050
- (B) 1200
- (C) 1300
- (D) 1450



Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050
- (B) 1200
- (C) 1300
- (D) 1450

$$15^{15} \sim 2$$

Sahi Prep Hai  
Toh Life Set Hai

Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$5^5 \cdot 10^{10} \cdot 15^{15} \cdot 25^{25} \cdots - 75^{75} \cdots 10^{10}$$

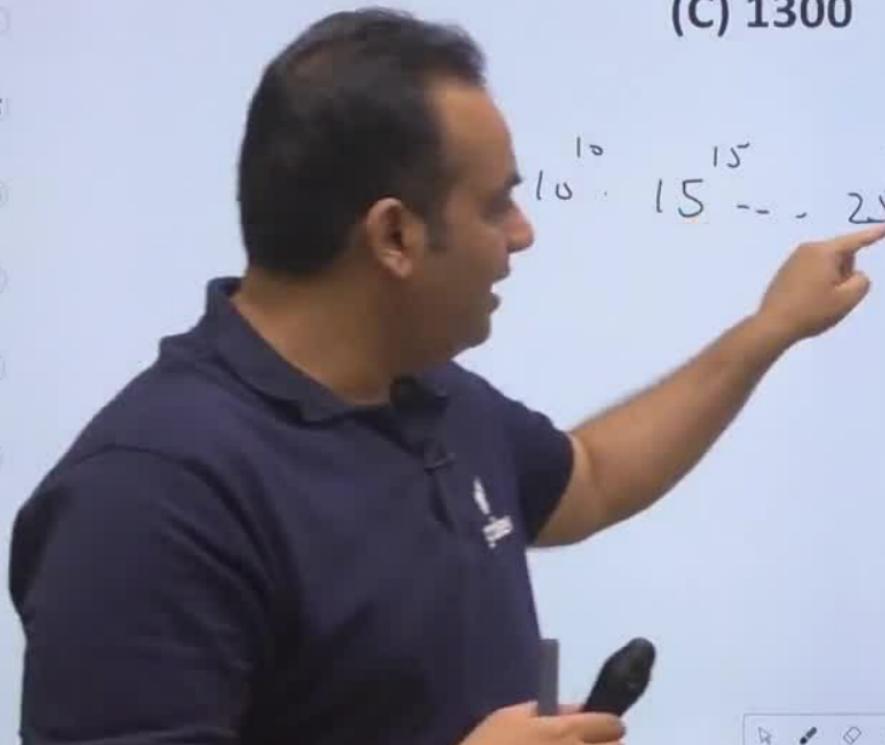
**Sahi Prep Hai  
Toh Life Set Hai**

Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050    (B) 1200  
(C) 1300    (D) 1450

$$10^1, 15^2, 25^3, 50^5, 75^{75}, 100^{100}$$



Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$10^{10} \cdot 15^{15} \cdot 25^{25} \cdot 50^{50} \cdot 75^{75} \cdot 100^{100}$$

$$+ 10 + 15 + 25 + \dots + ( ) +$$

Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                          (B) 1200  
(C) 1300                           (D) 1450

$$5^5 : 10 : 15 \dots$$

$$(5 + 10 + 15 + \dots)$$

$$50 : 75 : 100 \dots$$

$$25 + 50$$

**Sahi Prep Hai  
Toh Life Set Hai**

Level ↑↑

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

Laser Pointer

Pen

Highlighter

Eraser

Erase All Ink on Slide



(A) 1050

(B) 1200

(C) 1300

(D) 1450

$$5 \cdot 1^1 \cdot 15^1 \cdot 25^2 \cdot 50^5 \cdot 75^7 \cdot 100^{10}$$

$$5 + 10 + 15 + 2 + \dots + 100 + 5(1+2+3+\dots+20) + 25 + 50 + 75 + 100$$

$$5 \cdot \frac{10 \cdot 21}{2}$$

$$1050$$

$$250$$

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050
- (B) 1200
- (C) 1300
- (D) 1450

$$10 \cdot 15 \cdot 20 \cdot 25$$

**Sahi Prep Hai  
Toh Life Set Hai**

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050
- (B) 1200
- (C) 1300
- (D) 1450

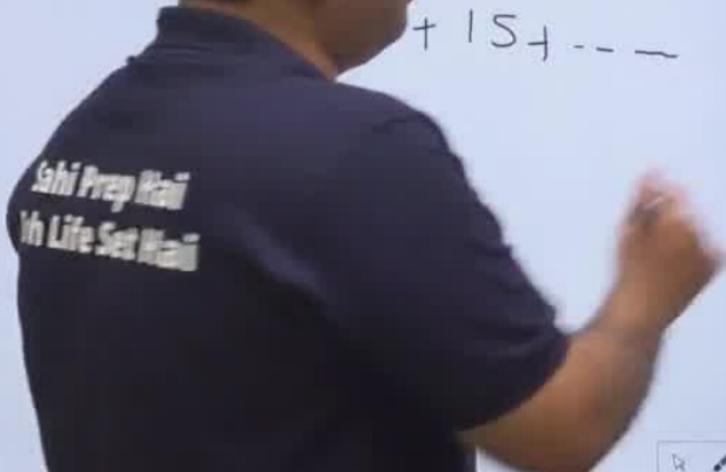
$$5^5 = 25 \times 25 \times 25 \times 25 \times 25$$

Sahi Prep Hai  
Toh Life Set Hai

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$\begin{aligned} & 15 \cdot 25 \cdot 35 \cdot 45 \cdot 55 \cdot 65 \cdot 75 \cdot 85 \cdot 95 \\ & + 15 + \dots + 100 \end{aligned}$$



$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$\begin{aligned} & 5^5 \cdot 10^{10} \cdot 15^{15} \cdot 20^{20} \cdots - 50^{50} \cdots 75^{75} \cdots 100^{100} \\ & (5+10+15+20+\dots + 25+50+\dots) \end{aligned}$$

**Sahi Prep Hai  
Toh Life Set Hai**

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$\begin{aligned} & 5 \cdot \underline{10} \cdot \underline{25} \cdot \underline{50} \cdot \underline{75} \cdot \underline{100} \\ & (5 + 10 + 25 + 50 + 75 + 100) + 25 + 50 + 75 + 100 \\ & \quad + 25 \end{aligned}$$

Sahi Prep Hai  
Toh Life Set Hai

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$\begin{aligned} & 5^5 \cdot 10^10 \cdot 15^15 \cdot 20^20 \cdot 25^25 \cdots - 50^{50} \cdots - 75^{75} \cdots - 100^{100} \\ & (5+ \cdots + 100) + 25 + 50 + 75 + 100 \\ & (5+ \cdots + 25) + 250 \end{aligned}$$

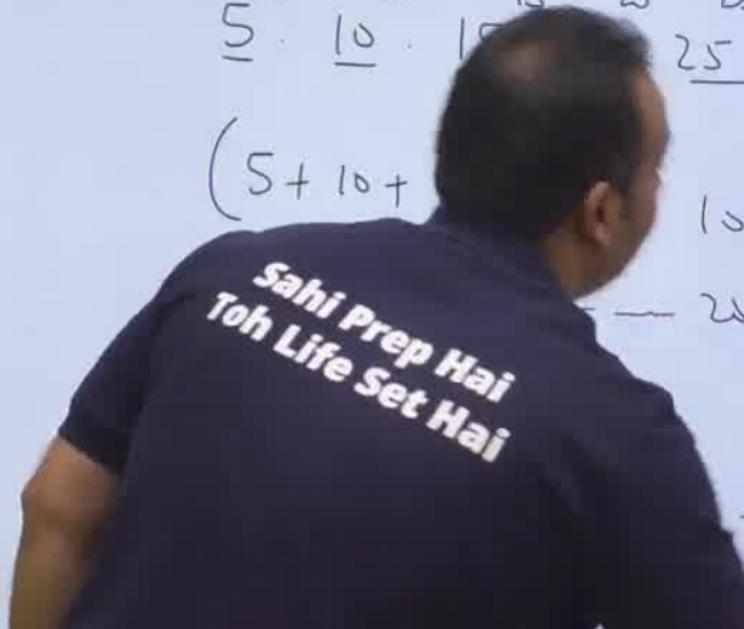
Sahi Prep Hai  
Toh Life Set Hai

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

- (A) 1050                      (B) 1200  
(C) 1300                      (D) 1450

$$\begin{aligned} & 5 \cdot \underline{10} \cdot 1 \cdot \underline{15} \cdot \underline{20} \cdot \underline{25} \cdots - \underline{50} \cdots \underline{75} \cdots \underline{100} \\ & (5 + 10 + 15 + 20 + 25 + \dots - 50 - 75 - 100) \\ & - 25 ) + 25 + 50 + 75 + 100 \\ & - 25 ) + 250 \end{aligned}$$

$$250 = 1300$$



$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

(A) 1050

(B) 1200

(C) 1300

(D) 1450

$$5 \cdot \underline{10} \cdot \underline{15} \cdot \underline{20} \cdot \underline{25} \cdots - \underline{50} \cdots \underline{75} \cdots \underline{100}$$

$$(5 + 10 + 15 + \dots + 100) + 25 + 50 + 75 + 100$$

$$5(1+2+3+\dots+20) + 250$$

$$5 \cdot \underline{25} \cdot 2$$

$$1050 + 250 = 1300$$

$$13. P = 1^1 \times 2^2 \times 3^3 \times 4^4 \times 5^5 \times \dots \times 100^{100}$$

(A) 1050

(B) 1200

(C) 1300

(D) 1450

$$\begin{aligned} & 5^5 \cdot 2^2 \cdot 3^3 \cdot 4^4 \cdot 5^5 \cdots 75^5 \cdots 100^{100} \\ (5) & \quad \underline{25} \cdot \underline{25} \cdot \underline{3} \cdot \underline{50} \cdots \underline{75} \cdots \underline{100}^{100} \\ & + 25 + 50 + 75 + 100 \\ & + 250 \end{aligned}$$

**Sahi Prep Hai  
Toh Life Set Hai**

$$+ 250 = 1300$$

Level ↑↑

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121

 $100^1 +$ Prep Hai  
Ji Se Set Hai

Level ↑↑

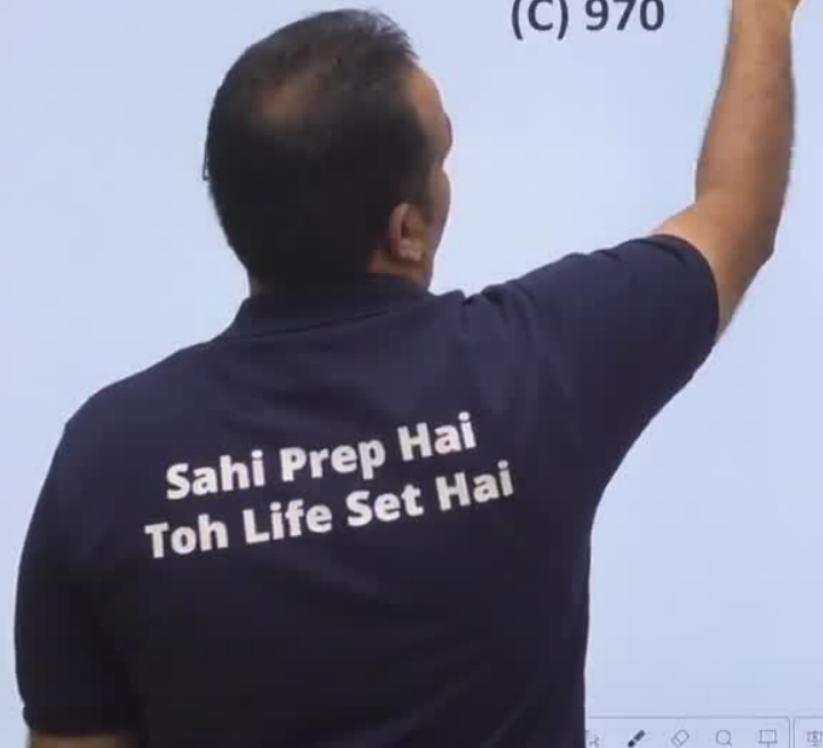
$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121



Level 11

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121

$$6 + 9_0^{11} + \dots - 75^{26}$$

Sahi Prep Hai  
Toh Life Set Hai

Level 11

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

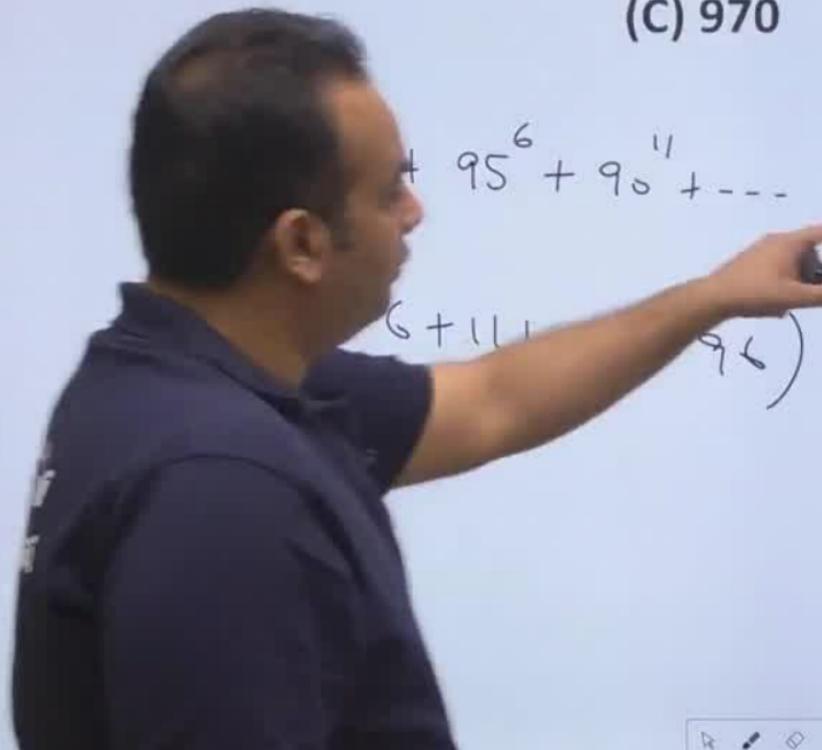
(A) 1124

(B) 1120

(C) 970

(D) 1121

$$\begin{aligned} & + 95^6 + 90^{11} + \dots - 75^{26} + \dots - 5^{51} + \dots - 75^{26} + \dots - 5^{90} \\ & (6+11) \quad 95 ) + 1 \end{aligned}$$



Level 11

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121

$$100^1 + 95^6 + 90^{11} + \dots \quad ?$$
  
$$(1 + 6 + 11 + \dots + 95)$$

$$5^1 + \dots + 25^{24} + \dots + 5^{99}$$

Sahi Prep Hai  
Toh Life Set Hai

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121

15.  $90^{11} \dots - 71$

Sahi Prep Hai  
Toh Life Set Hai

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

- (A) 1124                      (B) 1120  
(C) 970                      (D) 1121

$$\begin{aligned} & 100^1 \cdot 99^2 \cdot 98^3 \cdots 75^{24} \cdot 50^{51} \cdots 25^{78} \cdot 5^{99} \\ & (1+6+11+\cdots+99) \end{aligned}$$

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121

$$95^{\text{th}} \cdot 90^{\text{th}} \cdots 75^{\text{th}} \cdot 50^{\text{th}} \cdots 25^{\text{th}} \cdots 5^{\text{th}}$$

$$(1 + \dots + 9) + (1 + 2 + 5 + 7)$$

 $\downarrow$ 

970

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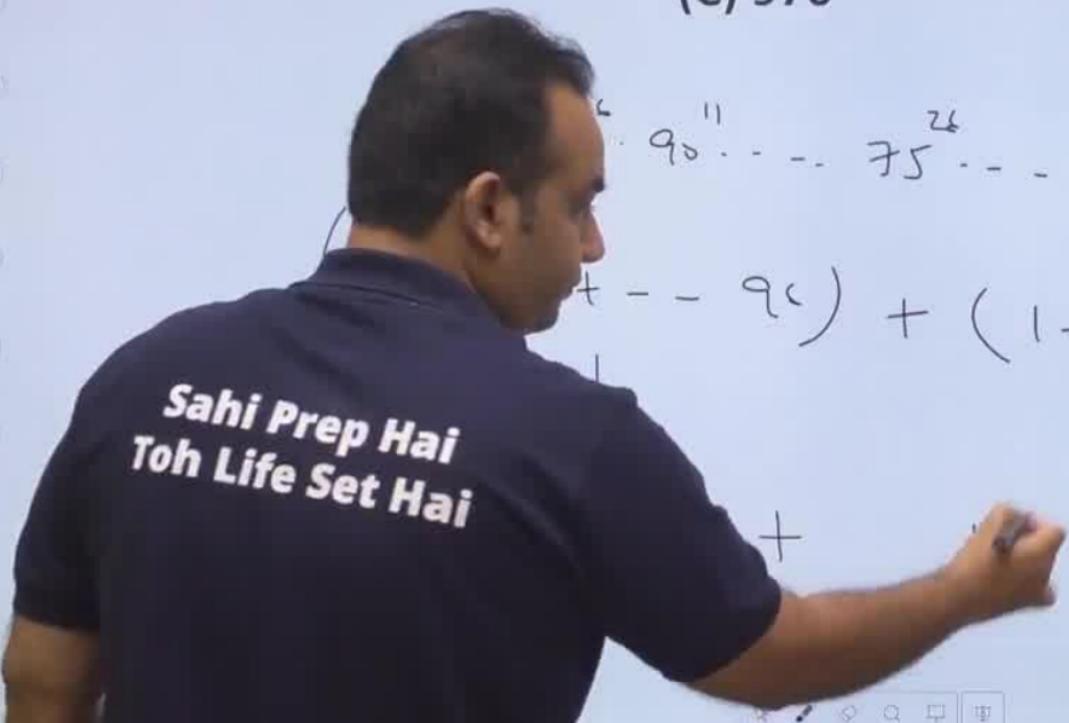
$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

(A) 1124

(B) 1120

(C) 970

(D) 1121



15. What is the highest power of 4 in  $100!$ ?



$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

- (A) 1124  
(C) 970

- (B) 1120  
(D) 1121

$$\begin{array}{r} 95 \\ 90 \\ 85 \\ 75 \\ 50 \\ 25 \\ 5 \\ + 11 + - 9 \\ \hline + (1 + 26 + 51 + 75) \end{array}$$

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$$\begin{array}{r} 170 + 154 \\ 1124 \end{array}$$

$$14. Q = 100^1 \times 99^2 \times 98^3 \times \dots \times 2^{99} \times 1^{100}$$

- (A) 1124  
(C) 970

- (B) 1120  
(D) 1121

$$\begin{array}{ccccccccc} & & & & & & & & \\ 100 & - & 99 & - & 98 & - & 97 & - & 96 \\ | & & | & & | & & | & & | \\ 21 & 24 & 27 & 31 & 35 & 38 & 41 & 45 & 48 \\ -80 & 75 & 70 & 65 & 60 & 55 & 50 & 45 & 40 \\ \hline 19 & 14 & 10 & 6 & 5 & 4 & 3 & 2 & 1 \end{array}$$
$$(1 + 6 + 10 + 14 + 19) + (2 + 3 + 4 + 5 + 6 + 7 + 8)$$

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15. What is the highest power of 4 in  $100!$  ?

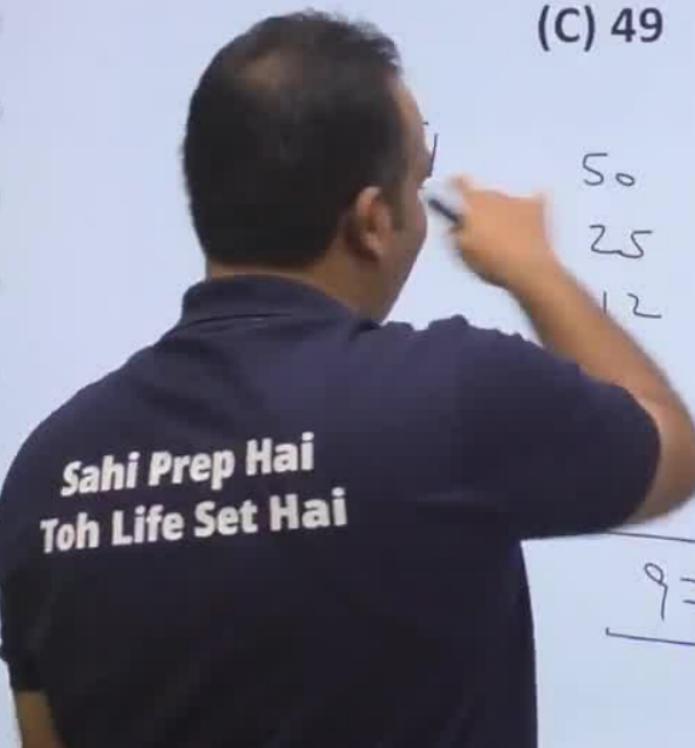
$$100! = (4)^x$$

- (A) 32  
(B) 48  
(C) 49  
(D) None of these

50  
25  
12

(3)

97



15. What is the highest power of 4 in  $100!$  ?

$$100! = (4)^x$$

(A) 32

(B) 48

(C) 49

(D) None of these

(2)

(3)

33

11

3

1

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15. What is the highest power of 4 in  $100!$  ?

$$\begin{aligned}100! &= (4)^x \\&= (2^2)^x\end{aligned}$$

(A) 32

(C) 49

(B) 48

(D) None of these

(2)

50

25

12

5

20

4

 $\frac{4}{X}$ 

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48

16. What is the highest power of 72 in  $100!$  ?

(a)

(b)

(c)

(d)

(e)

(f)

(g)

$$72 = \underline{\underline{2 \cdot 3^3 \cdot 2}}$$

16. What is the highest power of 72 in  $100!$  ?

$100!$

2

50

25

12

6

3

1

97

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$$72 = \underline{\underline{2 \cdot 3^2}}$$

16. What is the highest power of 72 in  $100!$ ?

$100!$

2

3

33

11

3

1

48

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$$72 = \underline{\underline{2^3 \cdot 3^2}}$$

16. What is the highest power of 72 in  $100!$  ?

A man in a blue polo shirt is writing on a whiteboard. He has just written the number 24 next to the fraction  $\frac{2}{3}$ . To the right of the fraction is a box containing the number 2. Further to the right, there is a division problem: 50 divided by 3, with a quotient of 16 and a remainder of 2. Below the whiteboard, a large fraction  $\frac{16}{3}$  is written with a horizontal line through it, and the number 97 is written below the line.

$$\begin{array}{r} 50 \\ \times 31 \\ \hline 97 \end{array}$$

$$\frac{100!}{72^{24}}$$

24

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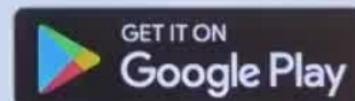


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live classes





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