

2

1008000

1008

180000

3

NUMBER SYSTEM

(No. of Trailing Zero)

NO. OF QUESTIONS	MAXIMUM DAYS	CLASS DURATION
10 Questions	1 DAY	2 HOURS

CONCEPT

Question. What is Trailing Zero ??

Ans : No of Zeros at the end of Number or power of 10.

Example : find the trailing zero in

$\textcircled{10^3}$

I) 1000

II) 1400

III) 1004

IV) 80020

V) 806300

14×100

$\textcircled{10^2}$

8002×10^1

no. of Zeros at the end of No.

power of 10

What is TZ $\rightarrow$

$\rightarrow$ power of 10

OR no. of zeros

at the end of Number

How to find TZ :-

$$10 = \underbrace{2 \times 5}$$

We count
pairs of " 2×5 "

#

↓ $10 = \underline{2 \times 5}$

↓ $100 = 25 \times 4$

$N=2$

5×5 2×2

$S_0 = \checkmark S \times \boxed{S \times 2}$

$\Rightarrow \boxed{100} = 2 \times 100$

$2 \times$ 25×4
 2×2 5×5

⑤ $5000 = 5 \times \underline{1000}$

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

CONCEPT

No. of Trailing Zero

No of trailing zero generated from the pair of $(2*5)$.

Example: $15*12 = 5*3 * 2*2*3$ (Having Only 1 Pair of $2*5$)

Hence there is **Only 1 Trailing Zero**
in the result of $15*12$ (**i.e, 180**)

2×5

$n(2) = 100$
 $n(5) = 5$
pair = 5

CLASS EXERCISE

Q : Find the no. of trailing zero in :

$$27 \times 51 \times 91 \times 59$$

$$N(2) = 0$$

Pair (2x5)
↓
0

$$2^0 \leftarrow$$
$$\downarrow$$
$$5 \times 6$$

Pair

$$2 \times 5$$

digit +
↓
0/5

even

$$15 = 5 \times 3$$

CLASS EXERCISE

Q : Find the no. of trailing zero in :

$$27 \times 28 \times 34 \times 59 \times 66$$

$$\begin{array}{l} 2 \times 4 \\ 2 \times 12 \\ 2 \times 3^3 \end{array}$$

$$\begin{array}{l} n(5) = 0 \\ n(2) = 4 \end{array}$$

$$\frac{T_2 = 0}{\quad}$$

CLASS EXERCISE

Q : Find the no. of trailing zero in :

$$28 \times 27 \times 65 \times 94 \times 64$$

Handwritten prime factorizations:

- $28 = 2^2 \times 7$ (green circles)
- $27 = 3^3$ (black circle)
- $65 = 5 \times 13$ (black circle)
- $94 = 2 \times 47$ (red circles)
- $64 = 2^6$ (green circle)

$$n(2) = 9$$
$$n(5) = 1$$

$$\text{Pair} = 1$$
$$T2 = 1$$

CLASS EXERCISE

Q : Find the no. of trailing zero in :

I) $65 \times 1250 \times 128 \times 39 \times 73 \times 56$

II) $65 \times 24 \times 75 \times 28 \times 35 \times 34$

III) $2^{102} \cdot 5^{405}$

$65 \times 1250 \times 128 \times 39 \times 73 \times 56$

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

13×5 125×10 2^7 3×13 7×11 $2^3 \times 7$

$5^4 \times 2^2$

$n(5) = 5$
 $n(2) = 11$

$T_2 = 5$

CLASS EXERCISE

Q : Find the no. of trailing zero in :

I) $65 \times 1250 \times 128 \times 39 \times 73 \times 56$

II) $65 \times 24 \times 75 \times 28 \times 35 \times 34$

III) $2^{102} \cdot 5^{405}$

Handwritten prime factorization of $65 \times 24 \times 75 \times 28 \times 35 \times 34$ with annotations for trailing zeros:

- $65 = 5 \times 13$ (circled in red)
- $24 = 2^3 \times 3$ (circled in blue)
- $75 = 3 \times 5^2$ (circled in blue)
- $28 = 2^2 \times 7$ (circled in blue)
- $35 = 5 \times 7$ (circled in blue)
- $34 = 2 \times 17$ (circled in blue)

Summary of prime factors:

- $n(5) = 4$ (circled in red)
- $n(2) = 6$ (circled in red)
- $TZ = 4$ (circled in red)

CLASS EXERCISE

Q : Find the no. of trailing zero in :

I) $65 \times 1250 \times 128 \times 39 \times 73 \times 56$ ✓

II) $65 \times 24 \times 75 \times 28 \times 35 \times 34$ ✓

III) $2^{102} \cdot 5^{405}$ ✓

TZ = 102 Ans

CLASS EXERCISE

Q : Find the number of Zeros –
शून्यकों की संख्या ज्ञात कीजिए –

$$2^{222} \times 5^{555}$$

(A) 222

(B) 555

(C) 777

(D) 333

factorial -

$$1! = 1$$

$$2! = 1 \times 2$$

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

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

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

and so on.

$$5! \text{ or } \frac{5!}{1}$$

$2 \times 5 \times 3 \times 7 = 10! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10$

$25 = 5 \times 5 = 5^2$

$n(2) = 8$
 $n(5) = 2$

$2 \times 2 = 2^2$

$\text{Pair} = 2$
 $TZ = 2$
 $2 \times 2 \times 2 = 2^3$

OR How to find no. of Any Prime no

in Any ^p factorial

10!

$$n(3) = \frac{10}{3} = 3$$

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

$$n(3) = 4$$

$$n(2) = \frac{10}{2} = 5$$

$$= 2$$

$$= 1$$

$$n(2) = 8$$

$$n(5) = \frac{10}{5} = 2$$

$$n(5) = 2$$

$$\begin{aligned}
 n(2) &= \frac{2}{2} = 1 \\
 n(5) &= 25 \quad \checkmark \\
 n(4) &= 12 \\
 n(2) &= 6 \\
 n(3) &= 3 \\
 n(3) &= 1
 \end{aligned}$$

$n(2) = 97$

$$\begin{aligned}
 n(3) &= \frac{3}{3} = 1 \\
 \frac{33}{3} &= 11 \\
 \frac{11}{3} &= 3 \\
 \frac{3}{3} &= 1
 \end{aligned}$$

$$10! = 1 \times 2 \times 3 \times \dots \times 10 = \frac{2^8 \times 3^4 \times 5^2 \times 7^1}{2 \times 3 \times 5 \times 7}$$

$$8 = 2 \times 2 \times 2 = 2^3$$

$$100! = 50 \times 100$$

$$100! = 7 \times 3$$

$$(1 \times 3) \times 100$$

$$2 \times 100$$

$$100! = (3 \times 2) \times 100$$

$$100! = 100$$

$$2 \times 100$$

How to find **Maximum Power of Prime No.** in Any Factorial

find no. of Trailing Zero in $500!$?

CLASS EXERCISE

Q : Find the Maximum Power of 3 in 60! ?

I) 28

II) 30

III) 29

IV) none of these

$$n(3) = \frac{60}{3} = 20$$

$$\frac{20}{3} = 6$$

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

$$n(3) = 28$$

$$= 2 \times 3 \times 5 \times 7 \times 11 \times 13 \times 17 \times 19 \times 23 \times 29 \times 31 \times 37 \times 41 \times 43 \times 47 \times 53 \times 59$$

CLASS EXERCISE

Q : Find the Largest Power of 2, 3 and 5 in 124! ?

$$\frac{124}{2} = 62 \quad 62$$

$$\frac{62}{2} = 31$$

$$\frac{31}{2} = 15$$

$$\frac{15}{2} = 7$$

$$\frac{7}{2} = 3$$

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

$$46$$

$$=$$

$$119$$

$$\frac{124}{3} = 41$$

$$\frac{41}{3} = 13$$

$$\frac{13}{3} = 4$$

$$\frac{4}{3} = 1$$

$$59$$

$$\frac{124}{5} = 24$$

$$\frac{24}{5} = 4$$

$$n(5) = 28$$

CLASS EXERCISE

Q : Find trailing zero at the end of $60!$?

i) 12

ii) 14 ✓

iii) 8

iv) none of these

$$\frac{60}{5} = 12$$
$$\frac{12}{5} = 2$$

in factorial no. 2×5 always

Count no. $\frac{60}{5} = 12$
 $\frac{12}{5} = 2$

Only 14 for factorial

CLASS EXERCISE

Q : Find trailing zero at the end of 100! ? (Imp)

i) 20

ii) 24 ✓

iii) 28

iv) none of these

$$\frac{100}{5} = 20$$
$$\frac{20}{5} = 4$$
$$\frac{4}{5} = 0$$
$$20 + 4 + 0 = 24$$