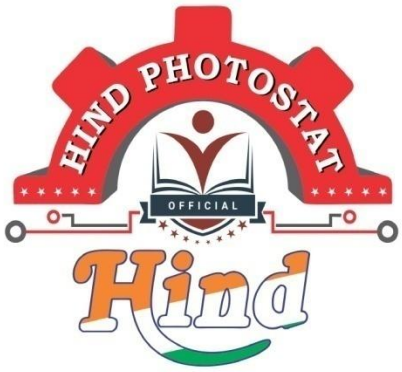

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REASONING

BY- ANJANIYA SIR

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

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NUMBER SYSTEM

TYPE I:

* Prime no: having 2 factors.
* Composite no: More than 2 factors.
* 1: Neither Prime nor Composite. → have only 1 Factor.

PRIME NUMBER: (1-100)

↓

25 Prime no.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 73, 79, 89, 83, 97.

COMPOSITE NUMBER:

4, 6, 8, 10 ...

Ex: 15 → Factors → 1, 3, 5, 15 → 4 Factors

NO. OF FACTORS : 4
NO. OF PRIME FACTORS : 2
NO. OF DIFFERENT PRIME FACTORS : 2
ODD FACTORS : 4
EVEN FACTORS : 0

2
3
5
7
11

13 ← Rare

3	15
5	5
	1

$15 = 3^1 \times 5^1$

No. of Factors $= a^p \times b^q$

No. of Factors $= (p+1)(q+1)\ldots$

$= (1+1)(1+1)$

$= 2 \cdot 2 = 4$

Ex: 16 : NO. of Factors

2	16
2	8
2	4
2	2
	1

$= 2^4$

No. of Factors $= 4+1$

$= 5$

Ex: 60

2	60
2	30
5	15
3	3
	1

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

$3 \cdot 2 \cdot 2$

$= 12$ Factors

Total Factors $= 12$

No. of Prime Factors → 4

No. of diff. Prime Factors → 3

No. of Factors 9009.

3	9009
3	3003
7	1001
11	143
	13

$3^2 \times 7^1 \times 11^1 \times 13^1$

No. of Factors: $3 \times 2 \times 2 \times 2$
$= 24$

No. of Prime F = 5

No. of diff Prime Factors = 4

Ex. No. of Factors: 7200

2	7200
2	3600
2	1800
2	900
2	450
5	225
5	45
3	9
3	3
	1

$2^5 \times 5^2 \times 3^2$

Total $= 6 \times 3 \times 3$
$= 54$

No of Prime = 9

Different = 3

Ex: No. of Prime Factors of $(30)^7 \times (22)^5 \times (34)^{11}$

2	30
5	15
3	3
	1

2	22
11	11
	1

2	34
17	17
	1

$(2^1 \times 5 \times 3) \times (2^1 \times 11)^5 \times (2^1 \times 17)^{11}$

~~$2^3 \times 5^1 \times 3^1 \times 11^1 \times 17^1$~~

~~$4 \times 2 \times 2 \times 2 \times 2 =$~~

$(30)^7 = (2 \times 3 \times 5)^7 = 2^7 \times 3^7 \times 5^7 =$ 7+7+7 = 21

$(22)^5 = (2 \times 11)^5 = 2^5 \times 11^5 =$ 10

$(34)^{11} = (2 \times 17)^{11} = 2^{11} \times 17^{11} =$ 22

Prime Factors Total = 53

No of diff. Prime Factors = 5 (2, 3, 5, 11, 17)

EVEN AND ODD FACTORS:

Odd Factors : Consider odd Prime Number.

$$3^1 \times 5^1 = a^p \times b^q$$
$$= (p+1) \times (q+1)$$
$$= 2 \times 2 = 4$$

No. of Even Factors = Total − No. of odd Factors

Ex: $15 = 3^1 \times 5^1$

No. of Even Factors = Power of Even Prime number × (No. of odd Factors)
$= 0 \times$ (No. of odd Factors)
$= 0$

Ex: $60 = 2^2 \times \boxed{3^1 \times 5^1}$ → $O = (1+1)(1+1) = 4$

$E = 4 \times 2 = 8$

Total $= E + O = 12$

Ex: $7200 = 2^5 \times \boxed{3^2 \times 5^2}$ → $O = (2+1)(2+1) = 9$

$E = (9 \times 5) = 45$

Total $= 9 + 45 = 54$

Ex: No. of Even Factors 10,800 ?

2	10800
2	5400
2	2700
2	1350
5	675
5	135
3	27
3	9
3	3
	1

$2 \times \boxed{2^4 \times 3^3 \times 5^2}$ → $O = 3 \times 4 = 12$

$E = 4 \times 12 = 48$

Total $= 48 + 12 = 60$

TYPE II: POWER OF PRIME NO.

Ex: $4! = 24 = 2^3 \times 3^1$

Power of p in $n! = \frac{n}{p^1} + \frac{n}{p^2} + \frac{n}{p^3} + \frac{n}{p^4} + \cdots$

Power of 2 in $4! = \frac{4}{2} + \frac{4}{2^2} + \frac{4}{2^3} + \boxed{\frac{4}{2^4} \cdots}$ (X)

$= 2 + 1 + 0$

$= 3$

↑ den > Num (Stop)

$\frac{1}{2} = 0 + \cdots$ ↑ only Take before decimal

$\frac{4}{3} = 2 + 1 \cdots$ ↑ only this