CDS/CAPF VIRAAT 2.0 2024

Number System

Part - 02

Mathematics | Lecture - 02

By – Pramod Yadav Sir

TOPICS *to be covered*

1. Numbers of factors
2. Unit digit
3. Number of zeros at the end of expression
4. Questions and Doubts

Aryan Narad 2 day ago

sir I didn't understood co-prime and relatively prime

Nitish Dakot 2 day ago

Sir twin prime samajh ni aaya

Ahmed Khan 2 day ago

(Co-Prime/Relatively Prime)
(सह-अभाज्य/आपेक्षिक अभाज्य संख्या)

(1,5) (9,11) (2,5)

- coprime / Reli

(2,3)

HCF = 1

(16,25)

HCF

#Q. यदि N^2-33, N^2-31 और N^2-29 अभाज्य संख्याएँ हैं, तो N के संभावित मानों की संख्या क्या है, जहाँ N एक पूर्णांक है?

If N^2-33, N^2-31 and N^2-29 are prime numbers, then what is the number of possible values of N, where N is an integer ?

[2014-II]

N=6 $N^2-33=?$

Integer

N=6

HCF = N=-6

Highest common factor

$36-33=3(N^2-33)$

$36-31=5(N^2-31)$

$36-29=7(N^2-29)$

→ Prime Number

N=

N=6, -6

N= 2 value possible

N=1

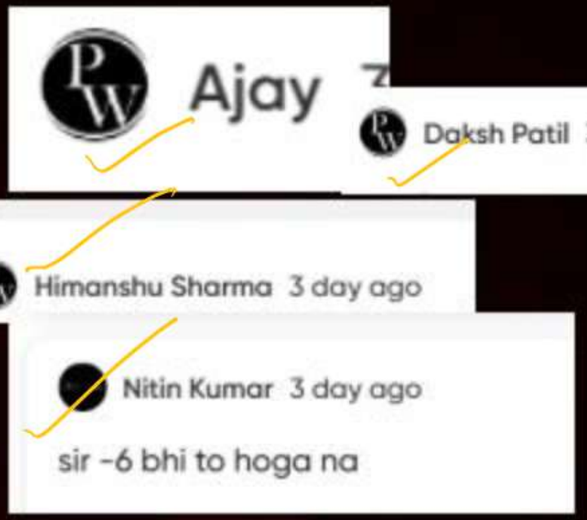
N=6

N= Natural Number

Possible value (N)

N= integer {1, 2, 3 - - ∞}

Lokesh joshi



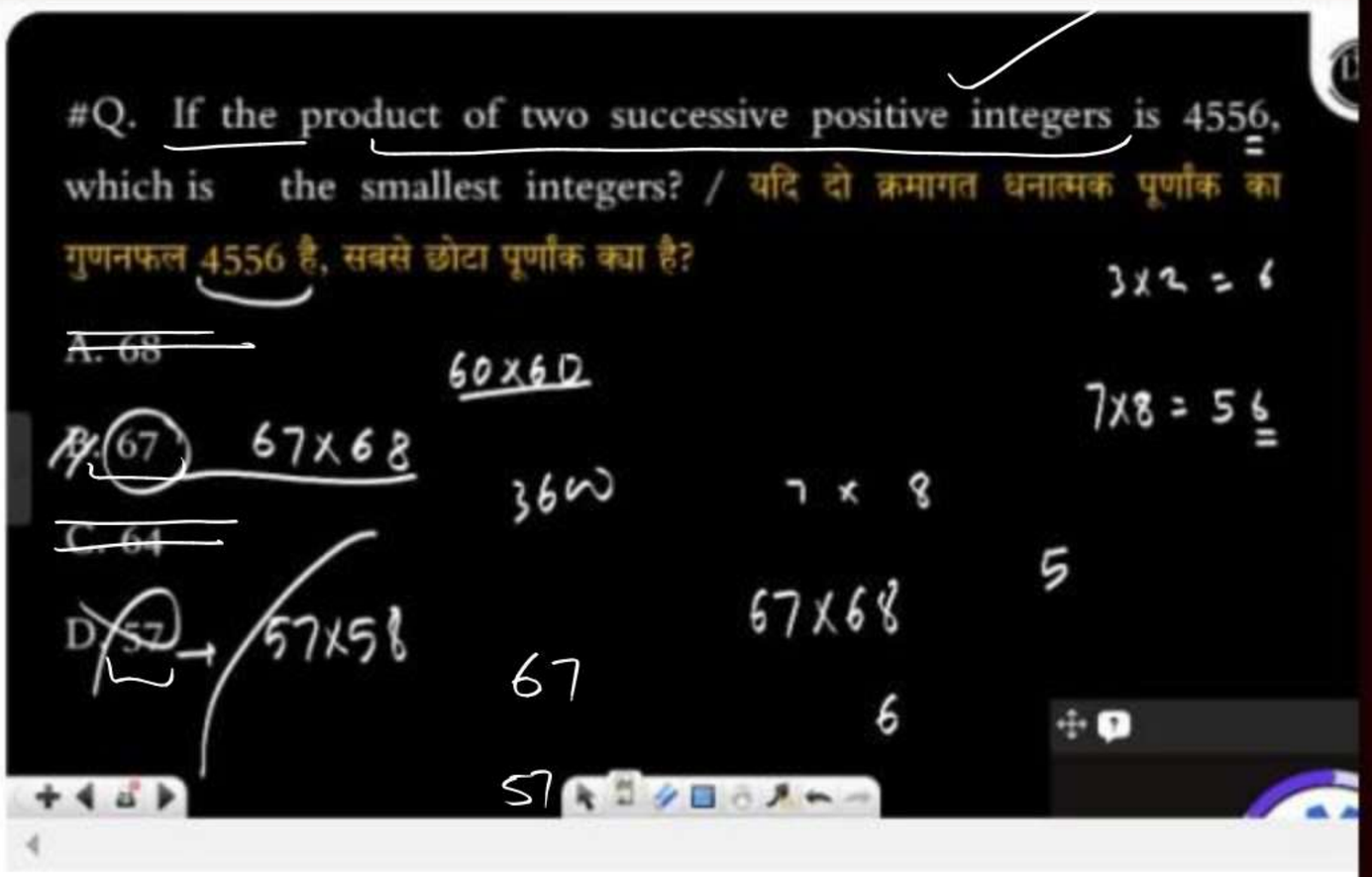
#Q. If the product of two successive positive integers is 4556, which is the smallest integers? / यदि दो क्रमागत धनात्मक पूर्णांक का गुणनफल 4556 है, सबसे छोटा पूर्णांक क्या है?

~~A. 68~~

B. 67

~~C. 64~~

D. 57



Ajay Singh 2 day ago

Dikshit Sharma Sharma 2 day ago

sir here what we did i understood but

4556

Unit digit

$3 \times 2 = 6$

$7 \times 8 = 56$

$2 \times 3 = 6$

$60 \times 60 = 60^2 = 3600$

$7 \times 8 = 56$

$57 \times 58 =$

$67 \times 68 =$

Rahul Andotra 2 day ago

#Q. निम्नलिखित कथनों पर विचार करें:

I. यदि n 5 से बड़ी एक अभाज्य संख्या है, तो $n^4 - 1, 2400$ से विभाज्य है।

द्वितीय. प्रत्येक वर्ग संख्या 5n,(5n-1) या (5n+1) के रूप की होती है, जहाँ n एक पूर्ण संख्या है।

उपरोक्त में से कौन सा/से कथन सही है/हैं?

Consider the following statements:

I. If n is a prime number greater than 5, then $n^4 - 1$ is divisible by 2400.

II. Every square number is of the form 5n,(5n-1) or (5n+1), where n is a whole number.

Which of the above statements is/are correct?

[2012-II]

n = Whole Numbers

n = 0

5n, (5n-1), (5n+1)

5×0, (5×0-1), (5×0+1)

0, -1, (1) → $(1)^2$

n = 1

5, 4, 6

$(2)^2$

n = 2 = 10, 9, 11

$(3)^2$

n = 3

15, 14, 16

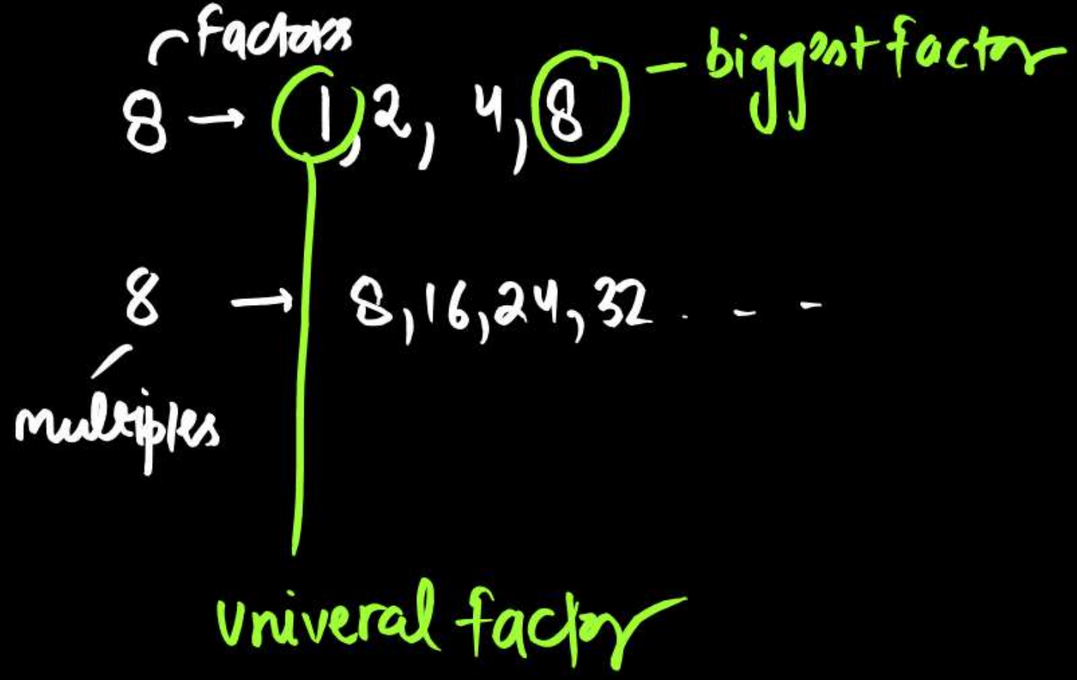
$(4)^2$

- Only one set of prime number N,N+2 and N+4(3,5,7)
- अभाज्य संख्या N, N +2 और N +4 (3,5,7) का केवल एक सेट।

Vipin Yadav 3 day ago

$N, N+2, N+4 \longrightarrow (3,5,7)$

Factors and Multiples:



prime factorization

$a^0 = 1$

200 = {1, 2, 4, 5, 8, 10, 20, 25, 40, 50, 100, 200}

Factors

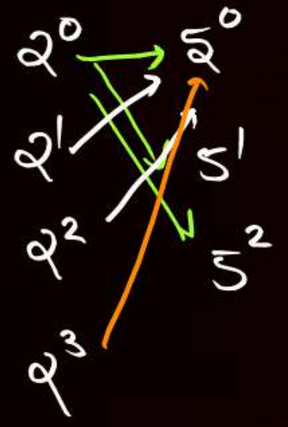
Total Factor = {12}

$= (3+1) \times (2+1)$

$= 4 \times 3 = 12$

$200 \Rightarrow 2^3 \times 5^2$

$\Rightarrow$



$= 3 \times (2+1)$

$= 3 \times 3 = 9$

odd fact

$2^0 \times 5^0, 2^0 \times 5^1, 2^0 \times 5^2 = [1, 5, 25]$

$2^1 \times 5^0, 2^1 \times 5^1, 2^1 \times 5^2 = [2, 10, 50]$

$2^2 \times 5^0, 2^2 \times 5^1, 2^2 \times 5^2 = [4, 20, 100]$

$2^3 \times 5^0, 2^3 \times 5^1, 2^3 \times 5^2 = [8, 40, 200]$

2	200
2	100
2	50
5	25
5	5
	1

No of even fact

$36 \Rightarrow 2^2 \times 3^2$

Total factors $= (2+1)(2+1)$

$= 3 \times 3 = 9$

No. of even factor $= 2 \times (2+1) = 2 \times 3 = 6$

No. of odd factor $= (2+1) = 3$

$150 \Rightarrow 2^1 \times 3^1 \times 5^2$

No. of factor $= (1+1)(1+1)(2+1)$

$2 \times 2 \times 3 = 12$

No. of even $= 1 \times (1+1)(2+1) = 1 \times 2 \times 3$

$= 6$

No. of odd $= (1+1)(2+1) = 6$

144 ⇒

Total Number of factor = $2^4 \times 3^2$

$N = (4+1)(2+1)$

$= 5 \times 3$

$= 15$

2	144
2	72
2	36
2	18
3	9
3	3
	1

If $N = 2^a \times 3^b \times 5^c \ldots\ldots\ldots$

Total Number of factors for $N = (a+1)(b+1)(c+1)$

Total Number of odd factors for $N = (b+1)(c+1)$

Total Number of even factors for $N = a(b+1)(c+1)$

For 2160

- ❑ Find the total number of factors ?
- ❑ Find the number of Even/odd factors ?

$2160 \Rightarrow 2^4 \times 3^3 \times 5^1$

T.F = $5 \times 4 \times 2 = 40$

EF = $4 \times 4 \times 2 = 32$

OF = $4 \times 2 = 8$

$1500 = 2^2 \times 3^1 \times 5^3$

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

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

T.F $= (2+1)(1+1)(3+1) = 3 \times 2 \times 4 = 24$

E.F $= 2 \times (1+1)(3+1) = 2 \times 2 \times 4 = 16$

O.F $= (1+1)(3+1) = 2 \times 4 = 8$

No. of prime factor $= (2+1+3) = 6$

No. of distinct prime factor $= 3$

No. of perfect square factor $= (2^2)^1 \times (5^3)^1 = (1+1)(1+1) = 2 \times 2 = 4$

No. of perfect cube factor $= (5^3)^1 = (1+1) = 2$

$2^4 \times 3^3 \times 5^1$

2	2160
2	1080
2	540
2	270
5	135
3	27
3	9
3	3
	1

$5 \times 4 \times 2 = 40$

$216 \Rightarrow 2^3 \times 3^3$

$(3+1)7 \times (3+1)$

$2^3 \times 3^3$

$(2)^1 \times (3^2)^1 \times 2 \times 3$

T.F = (4)x(4) = 16

O.F = (3+1) = 4

E.F = 3x(3+1) = 3x4 = 12

No. of prime Fact = 3+3 = 6

No. of distinct prime fact = 2

No. of perfect square = $(2^2)^1 \times (3^2)^1 = (1+1)(1+1) = 2 \times 2 = 4$

" " " cube = $(2^3)^1 \times (2^3)^1 = (1+1) \times (1+1) = 2 \times 2 = 4$

$N = 1728 = 2^6 \times 3^3 = (2^2)^3$

$(2^3)^2$

$T.F = (6+1)(3+1) = 7 \times 4 = 28$

$EF = 6 \times 4 = 24$

$OF = 4$

$P.F = 6+3 = 9$

Distinct prime factors

$D.P.F = 2$

$P.S.F = (2^2)^3 \times (3^2)^1 = (3+1)(1+1) = 4 \times 2 = 8$

$P.C.F = (2^3)^2 \times (3^3)^1 = (2+1)(1+1)$

$= 3 \times 2 = 6$

Sum of Factors:

$36 \Rightarrow 2^2 \times 3^2$

$= [2^0+2^1+2^2][3^0+3^1+3^2]$

$= [1+2+4][1+3+9]$

$= 7 \times 13 = 91$

all factor

Sum of factor = 91

Sum of even factor $2^2 \times 3^2$

$= [2^1+2^2][3^0+3^1+3^2]$

$= [2+4][1+3+9]$

$= 6 \times 13 = 78$

Sum of odd factor $= [3^0+3^1+3^2]$

$= 13$

$144 = 2^4 \times 3^2$

Sum of All Factor

$= [2^0+2^1+2^2+2^3+2^4][3^0+3^1+3^2]$

$= 31 \times 13$

$= 403$

Sum of Even factor

$= [2^1+2^2+2^3+2^4][3^0+3^1+3^2]$

$= 30 \times 13$

$= 390$

Sum of odd factor $= [3^0+3^1+3^2]$

$= 13$

$2^0+2^1+2^2 - - - - 2^n = \{2^{n+1}-1\}$

Sum of Reciprocal of factor of a number:

$$\text{Sum of Reciprocal of factor of a number} := \frac{\textbf{Sum of factors}}{\textbf{Number}}$$

$16 \Rightarrow \quad 1, 2, 4, 8, 16$

$$\frac{1}{1} + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16}$$

$$\Rightarrow \frac{\overbrace{16+8+4+2+1}^{\text{Sum of All Factors}}}{16 - \text{Number}}$$

#Q. Find the total number of factors of 888888.
888888 के गुणनखंडों की कुल संख्या ज्ञात कीजिये।

A. 6

B. 64

C. 32

D. 128

$\Rightarrow 8 \times 111111$

$\Rightarrow 8 \times 3 \times 37037$

$\Rightarrow 8 \times 3 \times 37 \times 1001$

$1001 = 7 \times 11 \times 13$

$= 2^3 \times 3^1 \times 7^1 \times 11^1 \times 13^1 \times 37^1$

$4 \times 2 \times 2 \times 2 \times 2 \times 3$

888888

aaaaaa

↓

3, 7, 11, 13, 37, 1001

#Q. Which of the following numbers has maximum factors?

निम्नलिखित में से किस संख्या के अधिकतम गुणनखंड है?

A. 36 ⇒ $2^2 \times 3^2 = 3 \times 3 = 9$

B. 76 ⇒ $2^2 \times 19^1 = 3 \times 2 = 6$

C. 82 ⇒ $2 \times 41 = 2 \times 2 = 4$

D. 191

#Q. Find the No. of Prime Factor of 536?
536 के अभाज्य गुणनखंड की संख्या ज्ञात कीजिए।

A. 4

B. 5

C. 6

D. 3

$536 \Rightarrow 4 \times 134$

$4 \times 2 \times 67$

$2^3 \times 67^1$

Number of P.F = 3 + 1 = 4

#Q. Find the No. of prime factor of $(30)^{26} \times (25)^{51} \times (12)^{23}$.
$(30)^{26} \times (25)^{51} \times (12)^{23}$ के अभाज्य गुणनखंडो की संख्या ज्ञात कीजिये।

A. 249

B. 250

C. 255

D. 260

$$(30)^{26} \times (25)^{51} \times (12)^{23}$$

$$\Rightarrow (2\times3\times5)^{26} \times (5^2)^{51} \times (2^2\times3)^{23}$$

$$= 2^{26} \times 3^{26} \times 5^{26} \times 5^{102} \times 2^{46} \times 3^{23}$$

$$= 2^{72} \times 3^{49} \times 5^{128}$$

$$= 72+49+128$$

$$= 249$$

26, 46 → 72

26, 23 → 49

102, 26 → 128

#Q. What is the number of prime factors of 30030?
30030 के अभाज्य गुणनखंडो की संख्या कितनी है?

A. 4

B. 5

C. 6

D. None of these

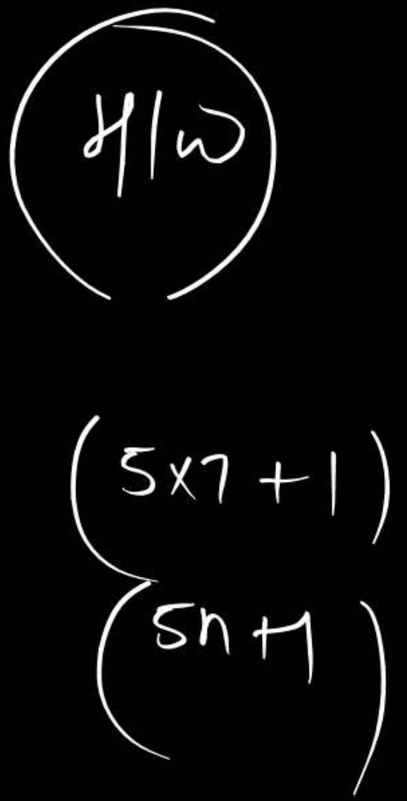
#Q. Find the sum of all factors of 144.
144 के सभी गुणनखंडों का योग ज्ञात कीजिये।

A. 204

B. 403

C. 304

D. 203



$6 \Rightarrow \quad 1, 2, 3, 6$

$= \quad 1, \frac{1}{2}, \frac{1}{3}, \frac{1}{6}$

$= \quad 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$

$= \quad \frac{6+3+2+1}{6}$ $= \text{sum of fs}$

#Q. What is the sum of the all the factors of 2450.
2450 के सभी गुणनखण्डों का योग कितना है?

A. 5301

B. 5310

C. 4301

D. 4310

$2450 = 2^1 \times 5^2 \times 7^2$

$= [2^0+2^1][5^0+5^1+5^2][7^0+7^1+7^2]$

$= 3 \times [1+5+25][1+7+49]$

$= 3 \times 31 \times 57$

$= 5301$

2	2450
5	1225
5	245
7	49
7	7
	1

#Q. Find the sum of odd factors of 544?
544 के विषम गुणनखंडो का योग ज्ञात कीजिए?

A. 16

B. 18

C. 20

D. 22

#Q. Find the sum of the sum of even divisors of 96 and the sum of odd divisors of 3600?

96 के सम भाजकों के योग तथा 3600 के विषम भाजकों के योग का योग ज्ञात कीजिये?

A. 645

B. 741

C. 734

D. 651

#Q. Find the product of all the factors of 1001.
1001 के सभी गुणनखंडों का गुणनफल ज्ञात कीजिए।

A. 1001^3

B. 1001^6

C. 2001^3

D. 1001^4

Total No. of factor = $7^1 \times 11^1 \times 13^1$

$2 \times 2 \times 2$

$= 8$

1001

$7 \times 11 \times 13$

Product of factor = $(N)^{f/2}$

Product of factor = $(1001)^{8/2}$

$= (1001)^4$

3X31X57

93X57

5301

2

8

1
15
63
2
80

#Q. N is the smallest number that has 5 factors. How many factors does (N-1) have?

N वह सबसे छोटी संख्या है जिसके 5 गुणनखंड हैं। (N-1) के कितने गुणनखंड हैं?

A. 2

B. 3

C. 4

D. 5

15 ⇒ 1, 3, 5, 15

16 ⇒ 1, 2, 4, 8, 16

N = 16

(16-1) = 15 = $3^1 \times 5^1$

= 2 × 2

= 4

1,

abcabc

1001

7, 11, 13

T.N.F = 2 × 2 × 2 = 8

Product of ft = $(1001)^4$

#Q. How many factors of 1080 are perfect squares?
1080 के कितने गुणनखंड पूर्ण वर्ग हैं?

A. 4

B. 6

C. 8

D. 5

#Q. The sum of the factors of a number is 124. What is the number?
एक संख्या के गुणनखंडों का योग 124 है। संख्या क्या है?

A. Number lies between 40 and 50/ 40 और 50 के मध्य की संख्या

B. Number lies between 50 and 60/50 और 60 के मध्य की संख्या

C. Number lies between 60 and 80/60 और 80 के मध्य की संख्या

D. More than one such number exists / इस प्रकार की एक से अधिक संख्या हैं

Unit Digit of any Expresssion:

43×67 – unit digit

$2 \times 7 = 14$

$61 + 72 + 43 + 100 + 1000 + 720$

$= 6$

Unit = 6

$5^1 = 5$

$5^2 = 25$

$5^3 = 125$

$6^1 = 6$

$6^2 = 36$

$6^3 = 216$

$6^4 = 1296$

$1^2 = 1$

$1^3 = 1$

$1^4 = 1$

$(10)^2 = 100$

$(10)^3 = 1000$

$(10^4) = 10000$

$\{7932^{78642}\} = 1$

$\{(7934276)^{793462}\}$ unit digit $\Rightarrow 6$

$\{247930^{67294}\} =$ unit digit $= \{0\}$

$\{1397255^{732}\} \rightarrow$ unit digit $= 5$

cyclicity $= \{1\}$ $\{0,1,5,6\}$

cyclicity {2} → {4, 9}

$4^1 = 4$

$4^2 = 16$

$4^3 = 64$

$4^4 = 256$

$9^1 = 9$

$9^2 = 81$

$9^3 = 729$

$9^4 = 6561$

$4^{odd} = 4$

$4^{even} = 6$

$9^{odd} = 9$

$9^{even} = 1$

$4^{odd} + 4^{even} = '0'$

$9^{odd} + 9^{even} = '0'$

{2, 3, 7, 8}

$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$

$3^1 = 3$
$3^2 = 9$
$3^3 = 27$
$3^4 = 81$

$7^1 = 7$
$7^2 = 49$
$7^3 = 343$
$7^4 = 2401$

$8^1 = 8$
$8^2 = 64$
$8^3 = 512$
$8^4 = 4096$
$\times 8$

8

{2, 3, 7, 8}
↓
cyclicity {4}

$= \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
↓
All cyclicity

$(255)^{962} \times (2336)^{71} + (6431)^{62} \times (496)^{32}$

$5 \times 6 + 1 \times 6$

$30 + 6$

$3 \underline{6}$

Remainder	Pair
1	1
2	2
3	3
0	4

$4 \overline{)31}\ 7$

28

3 ✓

2^{6431} → unit digit

$2^3 \Rightarrow 8$ - unit digit

7^{153} → unit digit

$= 7^1 = 7$

#Q. The unit digit in the expansion of $(2137)^{754}$ is?

$(2137)^{754}$ के विस्तार में इकाई अंक है:

$4\overline{)54}$ → 13, 52, 2

A. 1

B. 3

C. 7

D. 9

$7^2 = 49$

#Q. The unit's digit in the product $7^{71} \times 6^{63} \times 3^{65}$ is?

गुणनफल $7^{71} \times 6^{63} \times 3^{65}$ का इकाई अंक क्या है?

$7^3 \times 6 \times 3^1$

343×18

α 4

A. 1

B. 2

C. 3

D. 4

#Q. The unit digit in the product $(2467)^{153}(341)^{72}$ is:

$(2467)^{153}(341)^{72}$ में इकाई अंक है:

$7^1 \times 1$

$= 7$

A. 1

B. 3

C. 7

D. 9

#Q. What will come in the place of unit digit in the value of

$(13227)^{35} \times (1123)^{71} \times (121)^{55}$?

$(13227)^{35} \times (1123)^{71} \times (121)^{55}$ के मान में इकाई अंक के स्थान पर क्या आएगा?

A. 0

B. 1

C. 3

D. 6

$7^3 \times 3^3 \times 1$

343×27

3×7

$= 21$

#Q. What is the last digit in $7^{402}+3^{402}$?

$7^{402}+3^{402}$ में अंतिम अंक क्या है?

$7^2 + 3^2$

$49 + 9$

8

A. 0

B. 4

C. 8

D. None of these

#Q. The unit digit of the expression $25^{6251} + 36^{528} + 73^{54}$ is:

व्यंजक $25^{6251} + 36^{528} + 73^{54}$ का इकाई अंक है:

$5 + 6 + 3^2$

A. 6

$11 + 9$

B. 5

$= 20$

C. 4

D. 0

#Q. The unit digit in the sum of $(124)^{372} + (124)^{373}$ is:

$(124)^{372} + (124)^{373}$ के योग का इकाई अंक है:

A. 5

B. 4

C. 2

D. 0

$y^{even} + y^{odd} = 0$

$q^{even} + q^{odd} = 0$

#Q. The digit in the units place of the resulting number of the expression $(234)^{100} + (234)^{101}$ is:

व्यंजक $(234)^{100} + (234)^{101}$ के परिणामी संख्या के इकाई स्थान का अंक है:

A. 6

B. 4

C. 2

D. 0

#Q. The digit in unit's place of the number

$(1570)^2 + (1571)^2 + (1572)^2 + (1573)^2$ is?

A. 4

$0 + 1 + 4 + 9 = 14$

B. 1

C. 2

D. 3

#Q. Find the unit place of $(17)^{1999} + (11)^{1999} - (7)^{1999}$

A. 0

B. 1

C. 2

D. 7

$7^3 + 1 - 7^3$

$7 + 1 - 7$

$8 - 7 = 1$

Viraat 1.0

#Q. The last digit of the expression

$$4 + 9^2 + 4^3 + 9^4 + 4^5 + 9^6 + \cdots \ldots + 4^{99} + 9^{100}$$ is:

$4^{odd} + 9^{even}$

$\downarrow \quad \downarrow$

$4 + 1$

$= 5$

50×5

$= 250$

A. 4

B. 6

C. 5

D. 0

#Q. Find the unit digit of 111 !

A. 0

B. 1

C. 5

D. 3

Maths by Pramod Yadav

$11! = 1$ $= 1$

$21 = 1 \times 2$ $= 2$

$31 = 1 \times 2 \times 3$ $= 6$

$41 = 1 \times 2 \times 3 \times 4 = 24$

$51 = 1 \times 2 \times 3 \times 4 \times 5 = 120$

$61 =$ $= 0$

$71 =$ $= 0$

$1111 = 1 \times 2 \times 3 \cdots 25 \times 111$ $= 0$

$(1321)^{621!} \Rightarrow$

Unit digit

01

#Q. What is the unit digit of 1! + 2! + 3!+.....+99! + 100! + 101! ?

A. 3

B. 1

C. 5

D. 6


JAI
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