

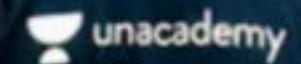




Number System - Part VI

Complete Course on General Aptitude - GATE & ESE, 2024 & 2025

PREVIEW



HINDI GA,GS AND MATHEMATICS

Complete Course on General Aptitude - GATE & ESE, 2024 & 2025

Saurabh Thakur



Starts on May 7, 2:15 PM

May 7 - Aug 13 • 15 weeks

UNACADEMY
PLUS CLASS

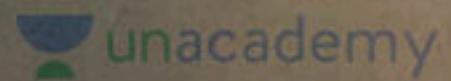
COMPLETE COURSE ON GENERAL APTITUDE FOR GATE 2024/25

BRANCH : CS & IT

USE CODE : ST26

DATE : 7TH MAY

SAURABH SIR

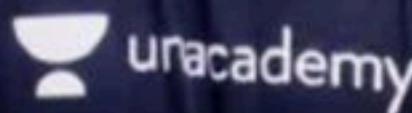


32M+ WATCH MINUTE
12+ YEARS TEACHING EXPERIENCE

SUBSCRIPTION

CODE:ST26

SAURABH THAKUR
IIM ROHTAK



NUMBER SYSTEM.

$$\frac{3}{4} \Rightarrow \boxed{\sqrt[4]{3}}$$

$$\frac{11}{4} \Rightarrow \boxed{\sqrt[4]{3}}$$

$$\frac{5+10}{4} \Rightarrow 1+2 = \textcircled{3}$$

$$\frac{6+9}{4} \Rightarrow 2+1 = \textcircled{3}$$

$\equiv \equiv$

~~$$15 \Rightarrow \boxed{5}$$~~

$$\frac{3 \times 5}{4}$$

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

$\textcircled{3}$

NUMBER SYSTEM

$$\frac{3}{4} \rightarrow \boxed{3}$$

$$\frac{11}{4} \rightarrow \boxed{3}$$

$$\frac{15}{4} \rightarrow \boxed{3}$$

$$\frac{5+10}{4} \Rightarrow 1+2 = \boxed{3}$$

$$\frac{6+9}{4} \Rightarrow 2+1 = \boxed{3}$$

$$\frac{3 \times 5}{4}$$

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

Concept of -

Remainder

$$\hookrightarrow \frac{15 \times 17}{4} \Rightarrow \frac{3 \times 1}{4} \Rightarrow \boxed{3 \text{ } 08 \text{ } -1}$$

$$\begin{array}{r} 0 \\ \times 4 \\ \hline \end{array} \Rightarrow$$

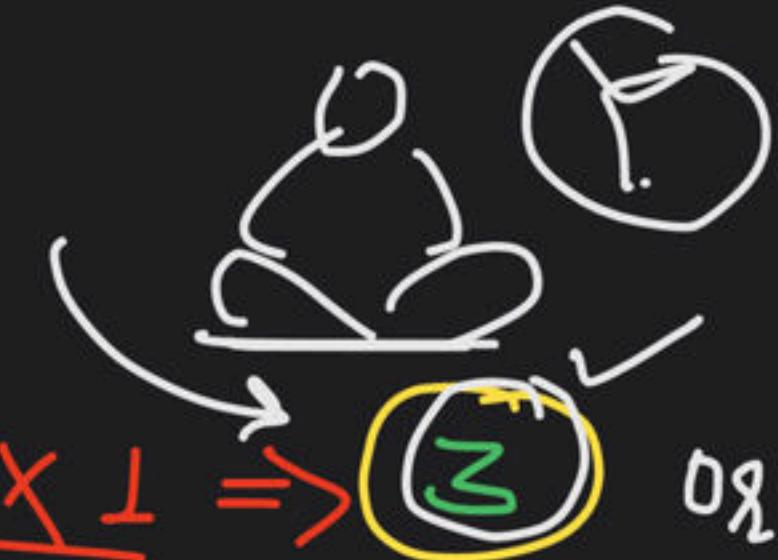
$$\frac{11 \times \underline{\underline{3}} \times 15}{4}$$

$$\frac{3 \times 1 \times 3}{4} \Rightarrow \frac{9}{4}$$

$$\frac{25 \times 7 \times 11 \times 13}{5} \Rightarrow$$

$$\frac{2 \times 1 \times 2 \times 1}{3} = \frac{4}{3} \Rightarrow \boxed{1 \text{ or } -2}$$

TEST



$\frac{-1}{08}$

$$\begin{array}{r} \perp \\ 21 \times 23 \times 25 \\ \hline 11 \end{array}$$

0	2
1	3

$$\begin{array}{r} \perp \times 3 \times \perp \\ 4 \end{array}$$

$$\frac{08}{=}$$

$$\begin{array}{r} 2 \\ 0 \\ 3 \\ 1 \\ 2 \end{array}$$

$$\begin{array}{r} 41 \times 43 \times 47 \times 49 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 1 \times 3 \times 5 \times 7 \times 9 \\ 5 \end{array}$$

$$\frac{08}{=}$$

$$\begin{array}{r} +2 \\ 93 \times 95 \times 97 \times 99 \\ \hline 5 \end{array}$$

$$0 - 12$$

$$\begin{array}{r} 13 \\ \hline \end{array}$$

$$\begin{array}{r} +2 \\ 8 \times 4 \times 6 \times 6 \\ 13. \end{array}$$

$$\frac{36}{13} \rightarrow 10$$

$+2$

$$93 \times 95 \times 97 \times 99 \rightarrow 13$$

$\Rightarrow 2 \times 4 \times 6 \times 8$

$$\frac{7}{13} = \frac{2 \times 4 \times 9}{13}$$

$$\frac{61 \times 63 \times 65 \times 67 \times 69}{?}$$

?



$$\frac{G \times 11}{3} = \frac{66}{3} = 0$$

A photograph of an open book lying flat. The left page is dark and textured, while the right page features a vibrant, detailed illustration of a lush green landscape with rolling hills and a small white bird flying in the sky. The book is resting on a light-colored wooden surface.

01

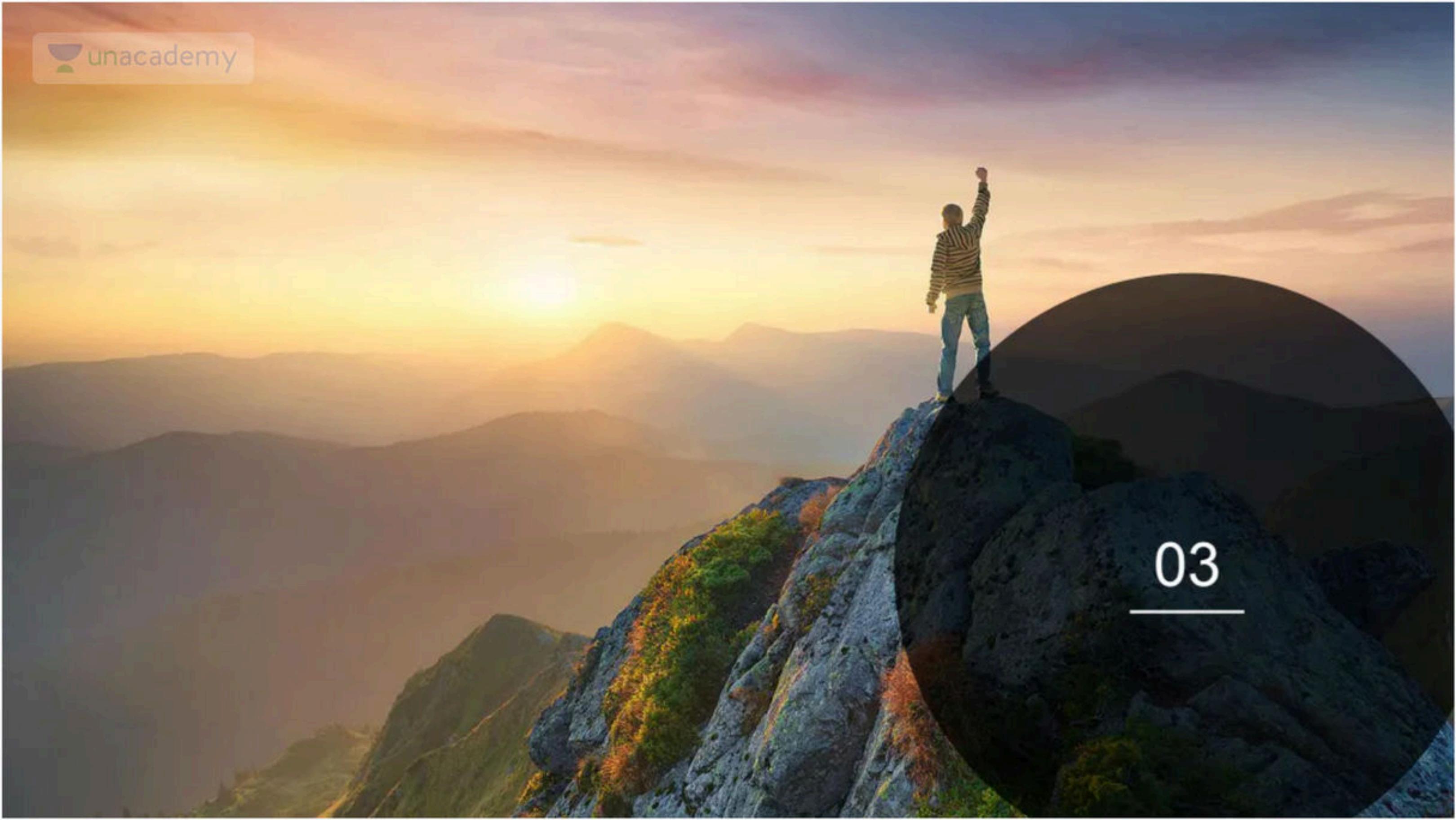


100!, 150!, 250!

05



$2^{23}, 2^{51}, 3^{59}, 4^{99}, 3^{171}, 7^{208}$

A person stands triumphantly on the peak of a rugged mountain at sunset, with their right arm raised. The sky is a vibrant orange and yellow gradient.

03



$12^{71}, 16^{51}, 21^{99}, 39^{235}, 17^{999}, 37^{897}, 127^{200899}$



04



$$13^{666} \times 44^{777} \times 616^{333} \times 777^{444}, 8898^{222} \times 999^{555},$$



05



$$1^2 + 2^2 + 3^2 + \dots + 99^2 + 100^2$$

06



$$1^1 + 2^2 + 3^3 + \dots + 9^9 + 10^{10}$$



07



The numeral in the units position of

$$211^{870} + 146^{127} + 3^{424} \text{ is.....}$$

[GATE 2016 : IISc Bangalore (EE Set - 2)]

08





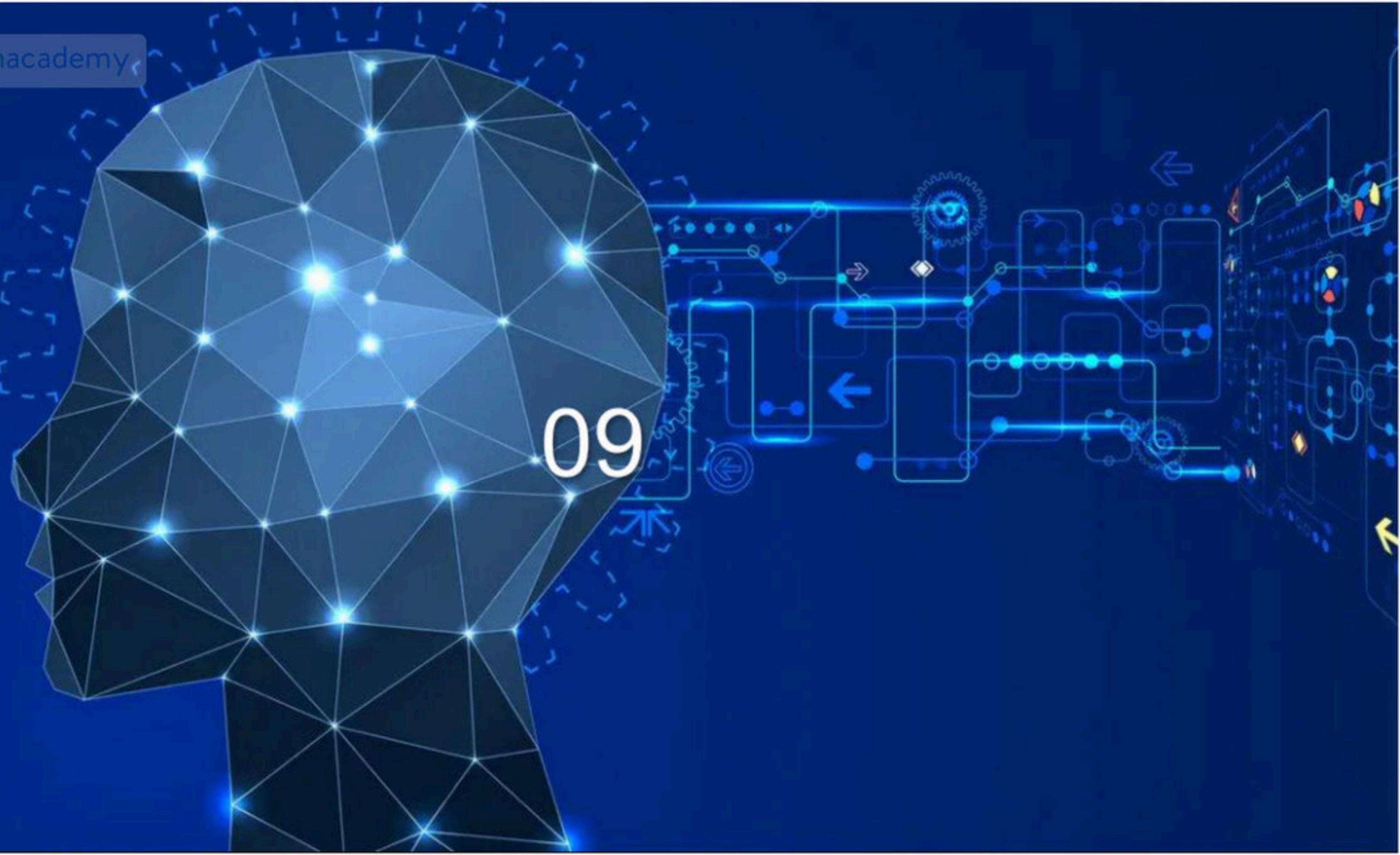
The last digit of

$$(2171)^7 + (2172)^9 + (2173)^{11} + (2174)^{13}$$
 is

- (A) 2
- (B) 4
- (C) 6
- (D) 8

[GATE 2017 : IIT Roorkee (CH, CE, Set - 1)]

09



$21^{23}, 31^{53}, 51^{93}$



10



$3^{53}, 7^{53}, 9^{93}$

11

$2^{53}, 4^{83}, 8^{93}$



unacademy
CAT.

$$\frac{(123 \times 1234)}{15}$$



$$\begin{array}{r} +3 \\ \times +4 \\ \hline 123 \quad \times \quad 1234 \\ \hline 15 \end{array}$$

$$\begin{array}{r} 12 \\ \cancel{15} \\ \hline = \boxed{12 \text{ } 08-3} \end{array}$$

$$\frac{R}{3} \Rightarrow \frac{\cancel{R}}{\cancel{3}}$$

$$\frac{\cancel{R} \times \cancel{3}}{4} \Rightarrow \frac{3 \times 3}{4} \Rightarrow \boxed{L}$$

$$\frac{\cancel{R} \times \cancel{3}}{4} \Rightarrow \frac{3 \times 3}{4} \Rightarrow \boxed{3}$$

$$\frac{1}{1} \overline{)1}$$

$$\frac{133}{7}$$

$$\frac{11^3}{7} \Rightarrow \frac{11^2 \times 11}{7}$$

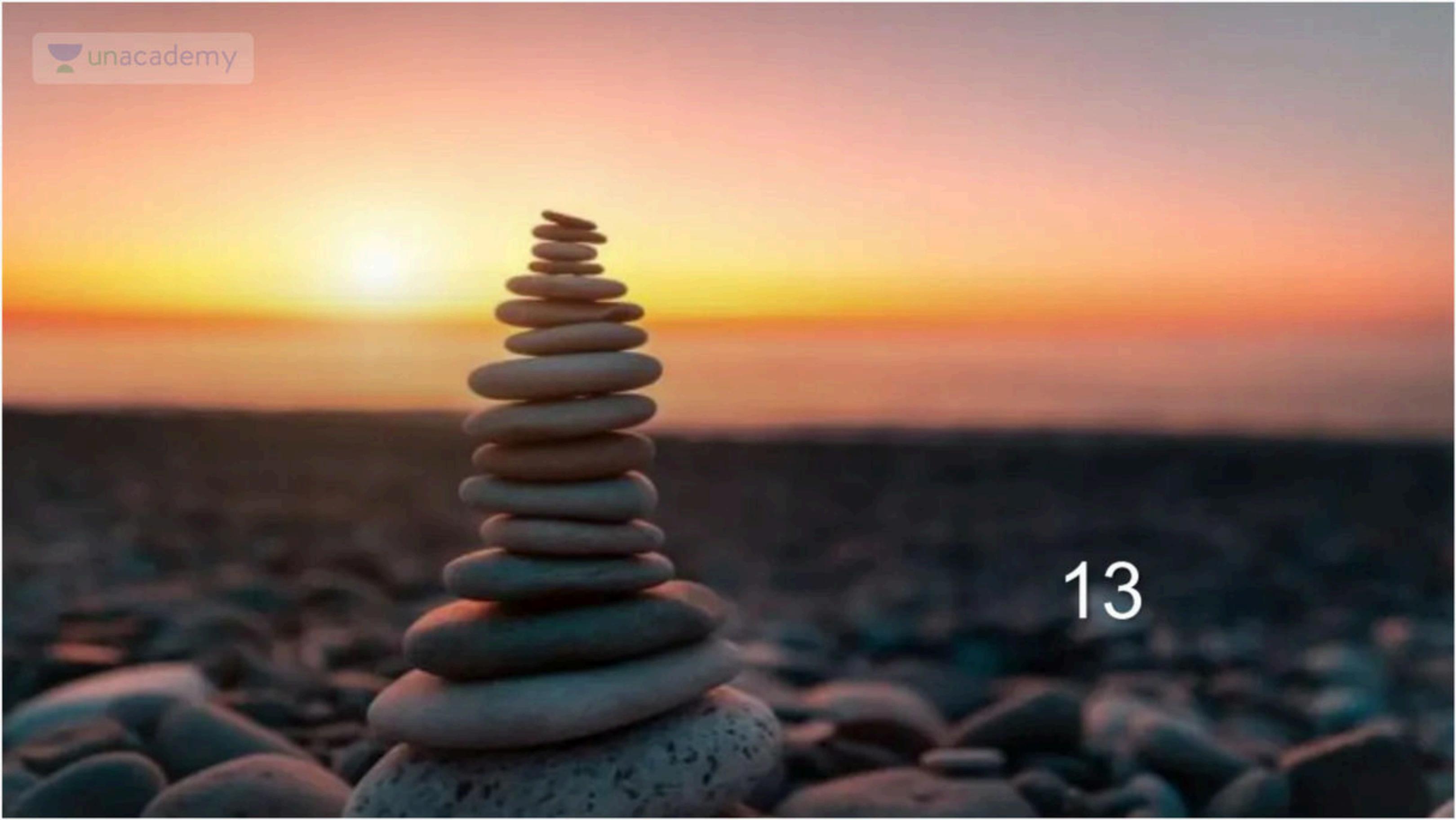
$$\frac{11}{7} \Rightarrow 1\overline{)1}$$

$$\frac{9 \times 4}{7}$$

$$\frac{11^2}{7} \Rightarrow \boxed{\frac{121}{7}} \Rightarrow 1\overline{)2}$$

$$\begin{aligned} & \text{---} \\ & \frac{(11^3)^2 \times 11}{7} \\ & \frac{1 \times 11}{7} \Rightarrow 1\overline{)1} \end{aligned}$$

$$\frac{11 \times 11}{7} \Rightarrow \frac{4 \times 4}{7} = 1\overline{)2}$$

A photograph of a tall, perfectly balanced stack of smooth, grey stones, likely zen stones, set against a vibrant sunset or sunrise sky. The stones are arranged in a spiral pattern, creating a sense of depth and balance. In the foreground, there are more stones scattered across a dark, textured surface.

13



PSU

CAT PSU ✓

$$(1218 \times 1220 \times 1222 \times 1224) \div 9 \Rightarrow 0$$

$$PS = 1 + 2 + 0 + 4 = 9$$

+1



3

3
-



14



$$(1719 \times 1721 \times 1723 \times 1725 \times 1727) \div 18$$



The remainder when S is divided by 20 ,

$$\text{where } S = 1! + 2! + 3! + 4! + 5! + 6! + \dots + 19! + 20!$$

16





The rightmost non-zero digit of the number 30^{2720} .



$$\frac{7}{4} \Rightarrow 3$$

$$7^{77} \div 4$$

$$\frac{7}{4} \Rightarrow \frac{7 \cdot 7}{4} \Rightarrow \frac{3 \cdot 3}{4} \Rightarrow \boxed{G}$$

$$\frac{(-1)^{38}}{4} \times (-1) \Rightarrow \frac{1 \times 3}{4} \Rightarrow \boxed{3} =$$



18

$$11^{88} \div 7$$

$$\frac{11}{7} \Rightarrow \boxed{4}$$

$$\frac{11^2}{7} \Rightarrow \frac{4 \cdot 4}{7} \Rightarrow \textcircled{2}$$

$$\frac{11^3}{7} \Rightarrow \frac{11^2 \times 11}{7} \Rightarrow \frac{2 \times 4}{7} \Rightarrow \textcircled{1}$$

$$\cancel{\frac{(11^3) \cancel{2} \cancel{9} \times 11}{7}} \Rightarrow \frac{1 \times 4}{7} \Rightarrow \textcircled{4}$$



$$\frac{(5^3)^{41}}{7} \Rightarrow \frac{6\textcircled{4})}{7} = \text{odd}$$

$$5^{123} \div 7 =$$

$$5^1 \div 7 \Rightarrow \boxed{5}$$

$$5^2 \div 7 \Rightarrow \boxed{4}$$

$$5^3 \div 7 \Rightarrow \frac{5^2 \times 5}{7}$$

$$5^4 \div 7 \Rightarrow \boxed{6} \quad \frac{5}{7} \quad \frac{a}{a+1}$$

$$\frac{5^4}{7} \Rightarrow \frac{5^3 \times 5}{7}$$

$$\frac{5^5}{7} \Rightarrow \frac{5^4 \times 5}{7} \Rightarrow \frac{25}{7}$$

$$\frac{5^6}{7} \Rightarrow \frac{3 \times 5^5}{7} \Rightarrow \boxed{3} \quad \boxed{1}$$

$$\cancel{(5^6)^{20} \times 5^{-3}} \Rightarrow \frac{1 \cdot 6}{7} \quad \boxed{6}$$

3.

42

89

$$\text{ny} = n \times 10^1 + y \times 10^0$$

(Original)

Reverse

$$y_n = y \times 10^1 + n \times 10^0$$

$$89 = 8 \times 10^1 + 9 \times 10^0$$

$$42 = 4 \times 10^1 + 2 \times 10^0$$

$$89 = 8 \times 10^1 + 9 \times 10^0$$

Reverse — Original = $\boxed{45}$ [Given]

$$y_n - ny = \boxed{45}$$

$$\underline{y_n} - \underline{xy} = 45^\circ$$

$$(\underline{10y+n}) - (\underline{10n+y}) = 45^\circ$$

$$9y - 9n = \cancel{45^\circ}$$

$$\boxed{y-n = 5^\circ}$$

$$y-x = 5^\circ \quad y_n \quad xy$$

$$9-4 = \cancel{5^\circ} \quad 91 \quad 41$$

$$8-3 = 5 \quad 83 \quad 38$$

$$7-2 = 5 \quad 72 \quad 27$$

$$6-1 = 5 \quad 61 \quad 16$$

$$5-0 = 5 \quad 50$$

Q3.

Q2

$$\underline{xy} = \underline{x \times 10^1 + y \times 10^0}$$

(Original)

$$\text{Reverse } \underline{yx} = \underline{y \times 10^1 + x \times 10^0}$$

$$\text{Reverse - Original} = \underline{45-} \quad [\text{Given}]$$

$$\underline{yx - xy} = \underline{45-}$$

$$(\underline{10y+1}) - (\underline{10x+y}) = \underline{45-}$$

$$\underline{9y - 9x} = \underline{45-}$$

$$\underline{9(y-x)} = \underline{5 \times 9}$$

B7

$$\underline{23} = \underline{2 \times 10^1 + 3 \times 10^0}$$

$$\underline{42} = \underline{4 \times 10^1 + 2 \times 10^0}$$

$$\underline{89} = \underline{8 \times 10^1 + 9 \times 10^0}$$

No. of Solutions

$$y-x = \underline{s-} \quad y > xy$$

$$9-4 = \underline{s-} \quad 91 \quad 41 \quad \checkmark$$

$$8-3 = \underline{s-} \quad 83 \quad 38 \quad \checkmark$$

$$7-2 = \underline{s-} \quad 72 \quad 27 \quad \checkmark$$

$$6-1 = \underline{s-} \quad 61 \quad 16 \quad \checkmark$$

$$5-0 = \underline{s-} \quad 50 \quad \text{05} \quad \text{X}$$

Given

$$y_n - ny = f_2$$

$$\cancel{g(y-n)} = \cancel{g} \times b$$

$$q-j$$

$$\underline{\underline{q-j}}$$

$$\underline{y_n} - ny = \boxed{\text{L.H.S}}$$

$$\cancel{y(y-n)} = \cancel{3 \times 3}$$

(G) .

$y - 5$
$8 - 5$
$\boxed{7 - 4}$
$6 - 3$
$5 - 2$
$4 - 1$

$$\boxed{y+2 = 11}$$

$$2y = 14$$

$$y = \boxed{7}$$

$$n = 4$$

Natural No.

$$\frac{(a+1)^n}{a}$$

R = L

$$\begin{cases} \frac{4}{3} \Rightarrow \underline{\perp} \\ \frac{1}{3} \Rightarrow \frac{1 \cdot 1}{3} \Rightarrow \perp \end{cases}$$

$$\frac{43}{3} \Rightarrow \perp$$

$$\frac{\overline{a \cdot a \cdot a}}{a+1} \Rightarrow \underline{a}$$

$$\frac{3}{3} \Rightarrow \underline{2}$$

$$\frac{23}{3} \Rightarrow \underline{2}$$

even

$$\frac{a}{a+1} \Rightarrow \underline{\perp}$$

$$\frac{2^2}{3} \Rightarrow \perp$$

$$\frac{2^4}{3} \Rightarrow \perp$$

$$\begin{array}{r}
 & 10 \\
 2024 & \xrightarrow{\quad} \\
 \hline
 2023
 \end{array}$$

$$\begin{array}{c}
 (a+1)^n \\
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 2025 - 2026 = 1 \\
 2024 \\
 \hline
 2023
 \end{array}$$

$$20501$$

$$2024$$

$$2023$$

$$1$$

$$\begin{array}{r} 202 \\ \times 021 \\ \hline 2023 \end{array}$$

$$\begin{array}{r} 2022 2024 \\ \hline 2023 \end{array} \Rightarrow \textcircled{1}$$

$$\begin{array}{r}
 & 2024 \\
 & 2023 \Rightarrow \text{odd} \\
 2022 \\
 \hline
 & 2023
 \end{array}$$

$$\begin{array}{r}
 & 2024 \\
 & 2023 \Rightarrow \text{odd} \\
 2022 \\
 \hline
 & 2023
 \end{array}$$

2022

$$n! > n!$$

Even

①

$$3!, 3(2)!$$

$$\begin{aligned}
 & 2! : 2.1 \\
 4! : 4. 3(2) !
 \end{aligned}$$

$$7^{84} \div 342$$

A photograph of a two-lane road stretching into the distance under a dark, star-filled sky. The road is marked with white dashed lines. In the background, there's a small blue and white triangular road sign. The foreground is dark, while the sky above is filled with numerous stars and some faint clouds.

21



Find : Number of factors, Sum of factors and Product of factors of the following :

12, 24, 288.

How many factors of 12 are divisible by : 2, 3 , 4, 6 , 12.

How many factors of 24 are divisible by : 2, 3 , 4, 6 , 8.



24



Find the smallest number y such that : $y \times 162$ is a perfect cube.

- (A) 24
- (B) 27
- (C) 32
- (D) 36

[GATE 2017 : IIT Roorkee (EE, CS, Set - 1)]

If all the natural numbers starting from 1 are written side by side
then find the :

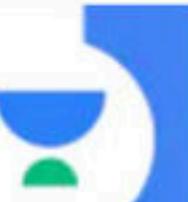
25th, 50th, 100th, digit of the sequence.



26



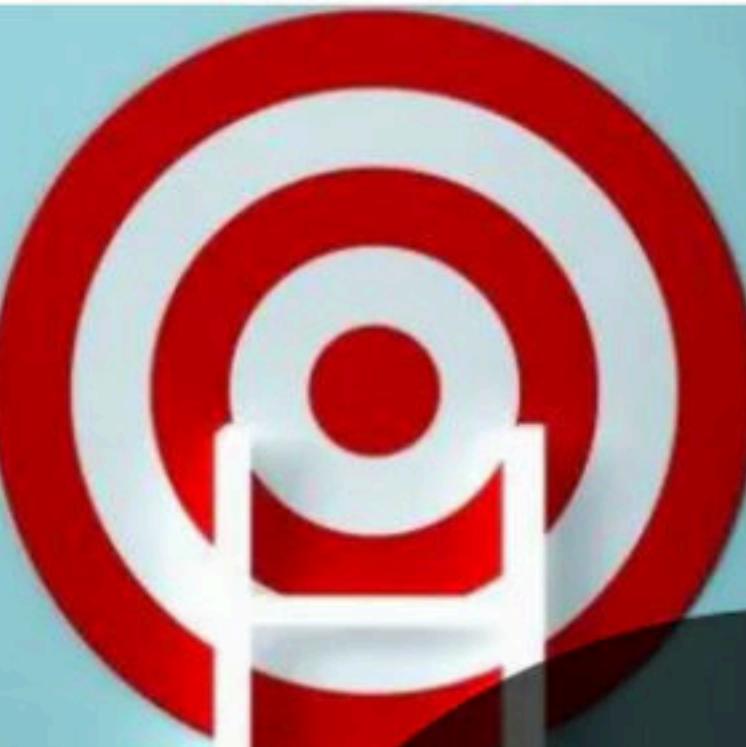
In the above question find the remainder when the sequences are divided by : 2, 4, 8, 16 , 5 , 25 , 125 , 3 , 9



If the number $715 \blacksquare 423$ is divisible by 3 (\blacksquare denotes the missing digit in the thousandths place), then the smallest whole number in the place of \blacksquare is _____.

- A. 0
- B. 2
- C. 5
- D. 6

[GATE 2018 : IIT Guwahati (EC Set – 1)]



28



How many numbers less than 21 are co-primes to 21?

- (A) 24
- (B) 96
- (C) 11
- (D) 12



If a and b are integers and $a - b$ is even, which of the following must always be even?

- (A) ab
- (B) $a^2 + b^2 + 1$
- (C) $a^2 + b + 1$
- (D) $ab - b$

[GATE 2017 : IIT Roorkee (ME Set – 2)]



30



Given that a and b are integers and $a + a^2 b^3$ is odd then, which one of the following statements is correct?

- (A) a and b are both odd
- (B) a and b are both even
- (C) a is even and b is odd
- (D) a is odd and b is even

[GATE 2018 : IIT Guwahati (ME Set – 1)]

31



If $x = -0.5$, then which of the following has the smallest value?

(A) $2^{1/x}$

(B) $\frac{1}{x}$

(C) $\frac{1}{x^2}$

(D) $2x$

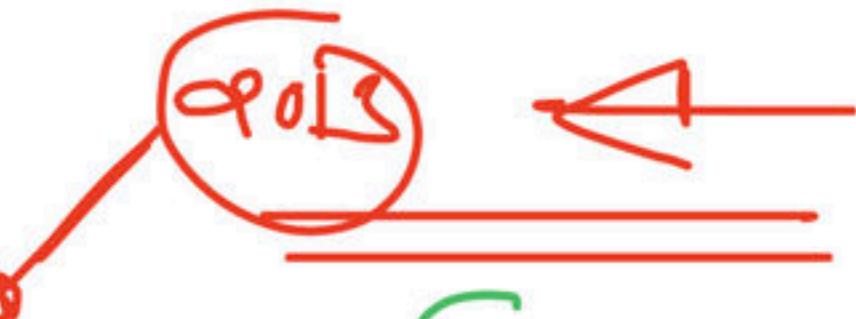
32



The sum of the digits of a two digit number is 12. If the new number formed by reversing the digits is greater than the original number by 54, find the original number.

- (A) 39
- (B) 57
- (C) 66
- (D) 93

$$\boxed{x + y = 12}$$



$$10x + y - (10y + x) = 54 \Rightarrow 9x - 9y = 54 \Rightarrow \boxed{9(x - y) = 54}$$

$$\boxed{y - x = c}$$

$$y - x = c$$

$$y - x = 6$$

$$x + y = 18$$

y = 9	x = 3
-------	-------

$$\boxed{[8013 | 17]}$$

33

A number is as much greater than 75 as it is smaller than 117.
The number is:

- (A) 91
- (B) 93
- (C) 89
- (D) 96

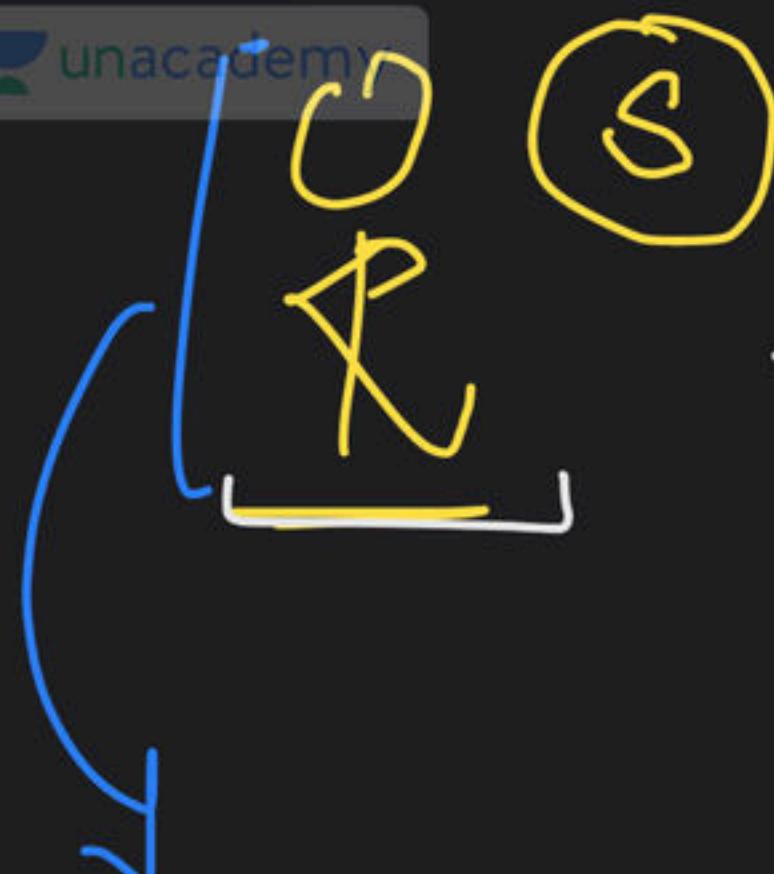
- (B) 93
- (D) 96

$$\begin{aligned}x - 75 &= 117 - x \\2x &= 117 + 75\end{aligned}$$

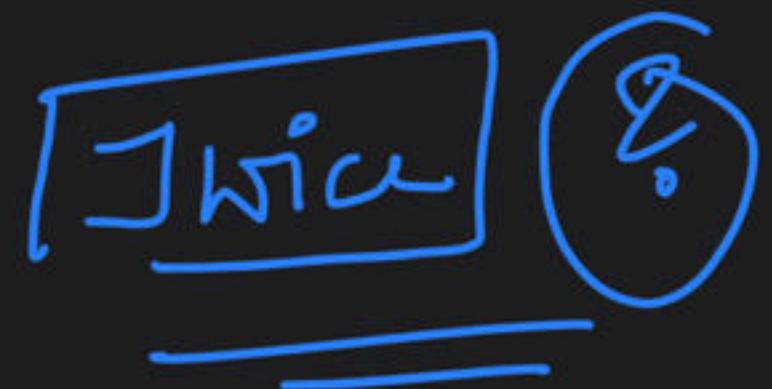
$$\boxed{x = \frac{192}{2}}$$

Q6

[GATE 2013 : IIT Bombay (CE)]



$$1+2+3+4+5+\dots+n = \boxed{1555}$$



34





$$\boxed{x+y=9} \rightarrow \textcircled{1}$$

A number consists of two digits, the sum of digits is $\textcircled{9}$. If $\textcircled{45}$ is subtracted from the number, its digits are interchanged. What is the number?

- (A) 63
 (C) 81

~~63~~

- (B) 72
 (D) 90

$$\overline{xy} - 45 = \overline{yx}$$

$$\overline{xy} - \overline{yx} = 45 = 9 \times 5$$

$$x-y = 5$$

$$x = 7$$

$$y = 2$$

$$\boxed{x-y=5} \rightarrow \textcircled{11}$$

$$\overline{xy} : \boxed{72}$$

$$\boxed{2018}$$

SUCCESS

35



The sum of eight consecutive odd numbers is 656. The average of four consecutive even numbers is 87. What is the sum of the smallest odd number and second largest even number?

[GATE 2014 : IIT Kharagpur (EC Set – 2, ME Set - 2)]



36



In a sequence of 12 consecutive odd numbers, the sum of the first 5 numbers is 425. What is the sum of the last 5 numbers in the sequence?

[GATE 2014 : IIT Kharagpur (EC Set - 4, ME Set - 4)]



Direction (37 – 40) : Given, $m = 1! + 2! + 3! + 4!$
+..... + 99! + 100!

A photograph of an open book resting on top of a stack of books. The book has a green cover and a purple feather bookmark. The stack of books below it has a dark blue cover with the name 'MALIK' printed on it. A large, semi-transparent white number '37' is overlaid on the right side of the stack.

37



Given, $m = 1! + 2! + 3! + 4! + \dots + 99! + 100!$

Find the unit digit of “m”



38



Given, $m = 1! + 2! + 3! + 4! + \dots + 99! + 100!$

Find the last two digits of 'm'



39

Given, $m = 1! + 2! + 3! + 4! + \dots + 99! + 100!$

Find the remainder, when 'm' is divided by 168.

40



Given, $m = 1! + 2! + 3! + 4! + \dots + 99! + 100!$

If N is a natural number such that $10^{12} < N < 10^{13}$ and the sum of the digits of n is 2 , then the number of values n take is :

41

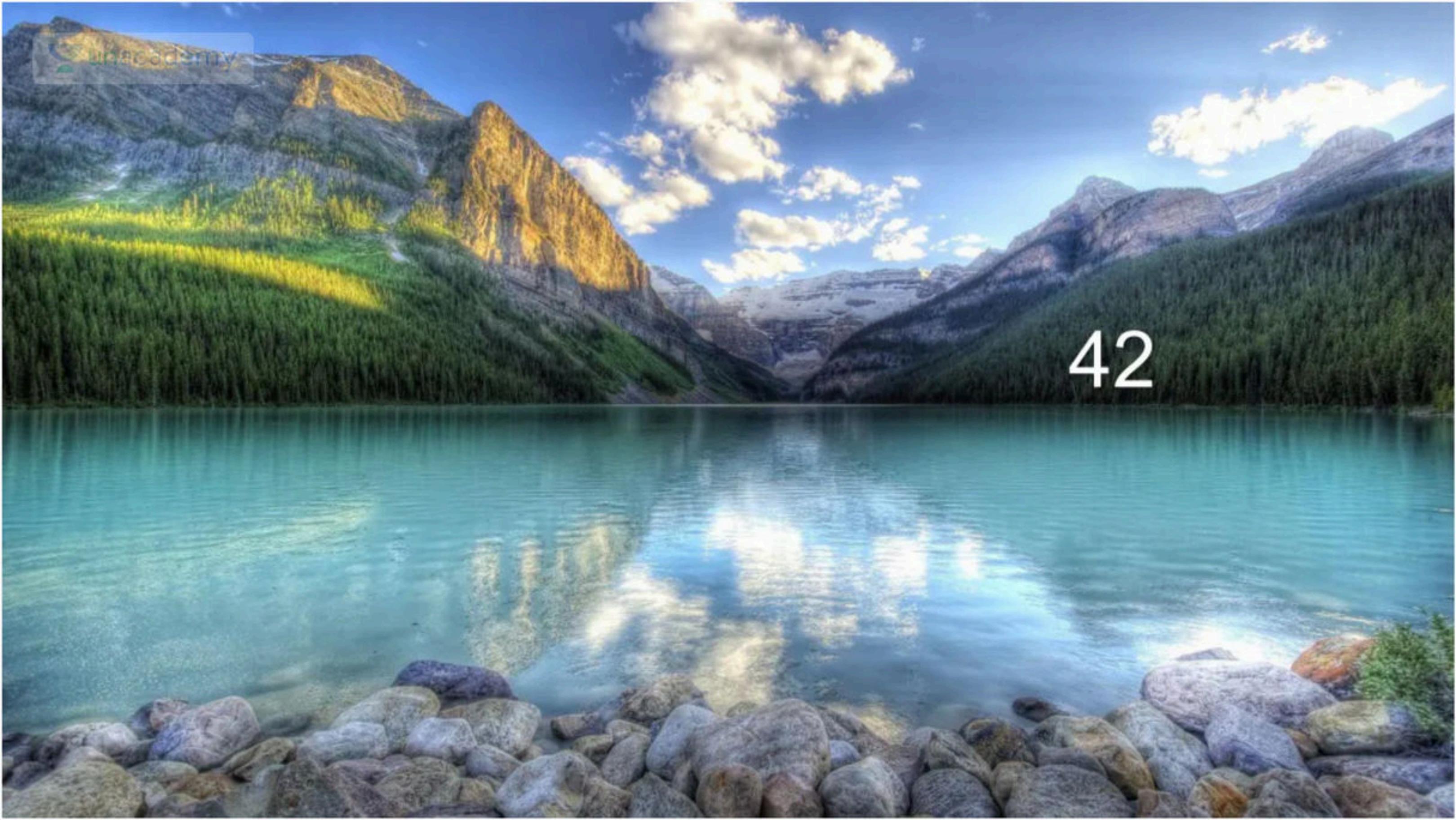




Which among $2^{1/2}$, $3^{1/3}$, $4^{1/4}$, $6^{1/6}$ and $12^{1/12}$ is the largest ?

- (A) $2^{1/2}$
- (C) $4^{1/4}$

- (B) $3^{1/3}$
- (D) $6^{1/6}$

A wide-angle photograph of a mountainous landscape. In the foreground, a clear, turquoise-colored lake reflects the surrounding environment. The lake's edge is bordered by a rocky shoreline. In the background, several rugged mountains rise against a bright blue sky dotted with wispy white clouds. The sunlight illuminates the peaks, casting long shadows and highlighting the textures of the rock faces and the dense green forests at their bases.

42



If $\frac{a}{b} = \frac{1}{3}$, $\frac{b}{c} = 2$, $\frac{c}{d} = \frac{1}{2}$, $\frac{d}{e} = 3$ and $\frac{e}{f} = \frac{1}{4}$, then what is the value of $\frac{abc}{def}$?

- (A) $\frac{3}{8}$
- (B) $\frac{27}{8}$
- (C) $\frac{3}{4}$
- (D) $\frac{27}{4}$

(2006)



43



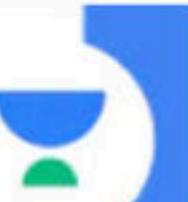
S is a 6 digit number beginning with 1 . If the digit 1 is moved from the leftmost place to the rightmost place the number obtained is three times of S . Then the sum of the digits of S is-



If $N = 15 \times 30 \times 45 \times 60 \times \dots \times 1500$, what will be the number of zeroes at the end of N?

- (A) 63
- (B) 55
- (C) 97
- (D) 124

[GATE 2016 : IISc Bangalore (CE Set – 2)]



Let x , y and z be distinct integers, that are odd and positive. Which one of the following statements cannot be true?

- (A) xyz^2 is odd
- (B) $(x-y)^2z$ is even
- (C) $(x+y-z)(x+y)$ is even
- (D) $(x-y)(y+z)(x+y-z)$ is odd
- (E) None of these