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Doubt Clearing Session

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

Saurabh Thakur • Lesson 9 • May 16, 2023

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UNACADEMY
PLUS CLASS
COMPLETE COURSE ON
GENERAL APTITUDE FOR
GATE 2024/25
BRANCH : CS & IT
USE CODE : ST26
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DATE : 7TH MAY
SAURABH SIR

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01

What is the minimum value of n (n ≠ 0), such that n! is divisible by (n + 1)?

(A) 1

(B) 3

(C) 5

(D) 6

$\frac{n!}{(n+1)}$

$5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

$\frac{5!}{6}$

2×3

$\frac{11!}{2}$

$\frac{3! = 3 \cdot 2 \cdot 1}{4 = 2^2}$

$$N = \frac{1! + 2! + 3!}{3}$$

$$\boxed{N/3} = 1!/3 + 2!/3 + 3!/3$$

0

$$\frac{1 + 0}{3} \rightarrow 0$$

$$N = 1! + 2! + 3! + 4! + 5!$$

$$\boxed{1/6}$$

(2×3)

$$= \boxed{1!/6 + 2!/6} + \underbrace{3!/6 + 4!/6 + 5!/6 + 6!/6}_{R=0}$$

6

$3\cdot2\cdot1$

$$3/6$$

$$\frac{1}{2}$$

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$$N = 1! + 2! + 3! + \dots + 10!$$

1

$$N = 1! + 2! + 3! + \dots + 10! \Rightarrow$$

3

$$= 1!/3 + 2!/3 + \underbrace{3!/3 + 4!/3 + \dots + 10!/3}$$

$3 \cdot 2 \cdot 1$ $\quad$ $4 \cdot 3 \cdot 2 \cdot 1$

$3/3 \rightarrow 0 \rightarrow r = 0$

$\boxed{r = 0}$

$\boxed{x!} = 1! + 2! + 3! + \dots + 9! + 10!$

$5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

$x/9$

(3)

$= 1!/9 + 2!/9 + 3!/9 + 4!/9 + 5!/9$

$6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

2×3

$+ 6!/9 + \dots + 10!/9$

$R = 0$

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$$\frac{1!}{9} + \frac{2!}{9} + \frac{3!}{9} + \frac{4!}{9} + \frac{5!}{9}$$

24

120

$$\cancel{1} + \cancel{2} + \cancel{6} + \boxed{6 + 3}$$

$R = 0$

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$$\frac{4!+2!+\dots+10!}{12!}$$

$12!$

$\boxed{2 \times 3}$

$1 \quad 2 \quad 3 \quad 4 \cdot 3 \cdot 2 \cdot 1$

$$\frac{1!}{12!}+\frac{2!}{12!}+\frac{3!}{12!}+\boxed{\frac{4!}{12!}+\dots+\frac{10!}{12!}}$$

0

$$\frac{9!}{12!} \Rightarrow 9 \text{ or } -3$$

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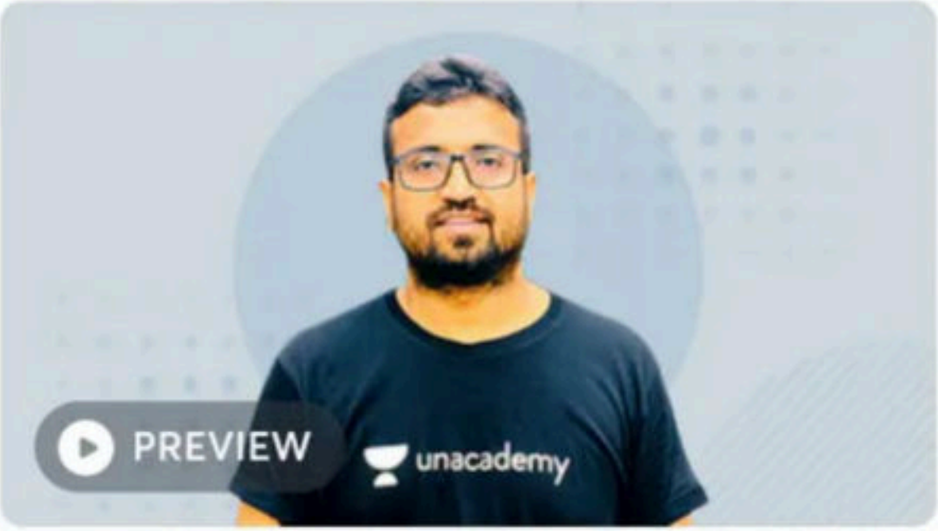

HINDI GA,GS AND MATHEMATICS

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

Saurabh Thakur

Starts on May 7, 2:15 PM

May 7 - Aug 13 • 15 weeks

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01

$100!, 150!, 250!$

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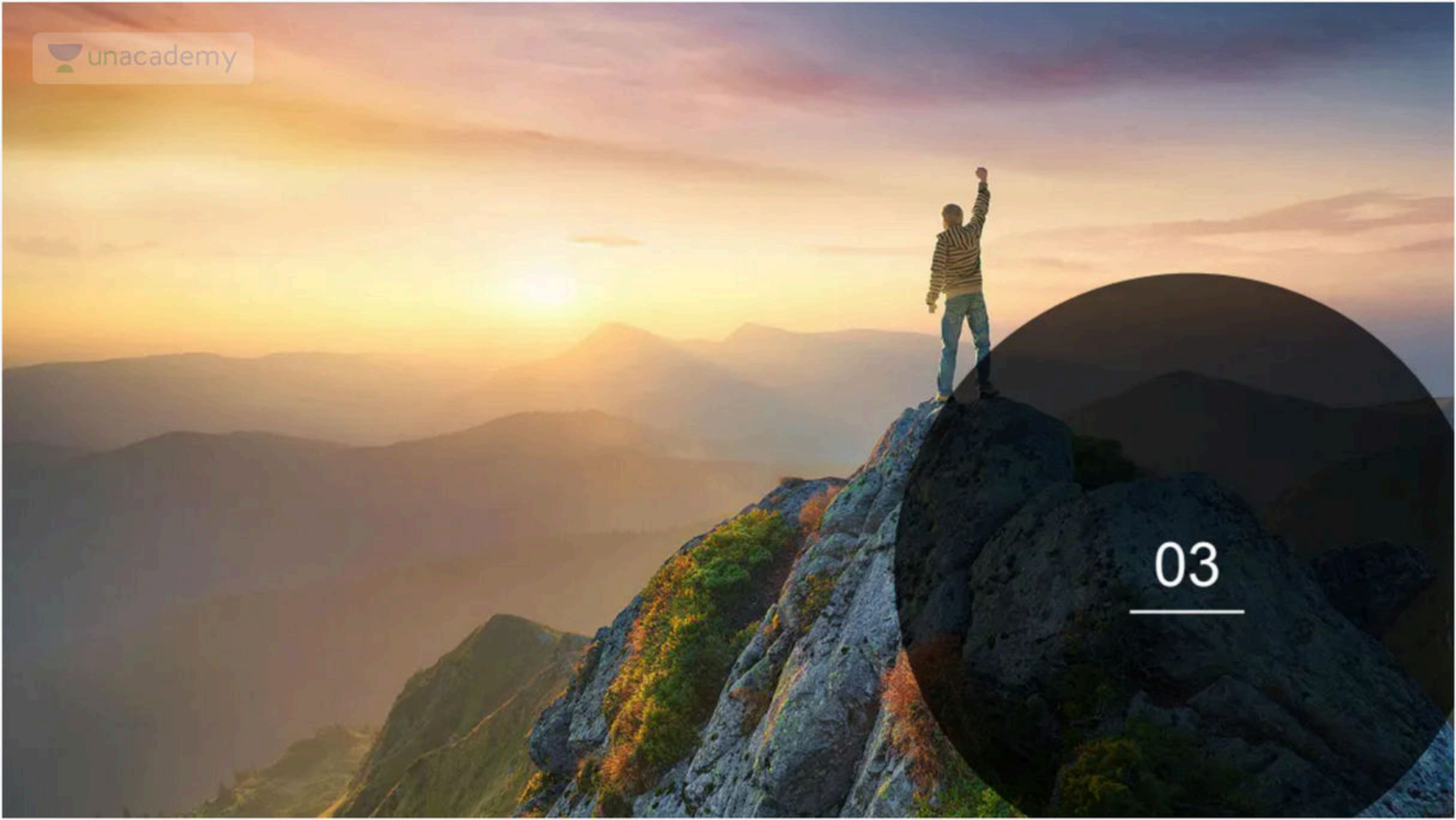
05

$$2^{23}, 2^{51}, 3^{59}, 4^{99}, 3^{171}, 7^{208}$$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03

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

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04

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

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05

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

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06

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

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07

The numeral in the units position of

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

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

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08

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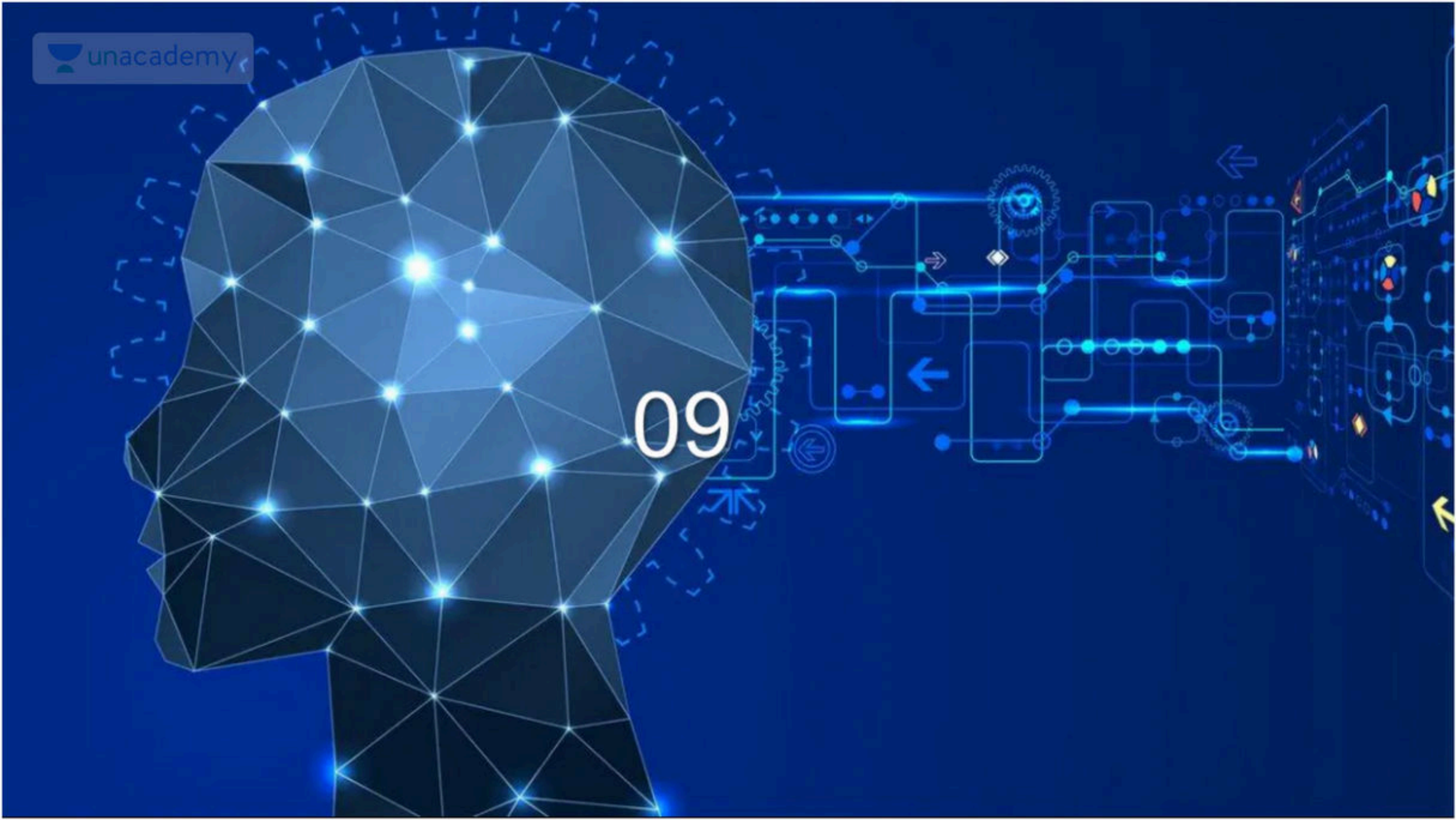
The last digit of

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

(A) 2 (B) 4

(C) 6 (D) 8

[GATE 2017 : IIT Roorkee (CH, CE, Set - 1)]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09

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

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10

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

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11

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

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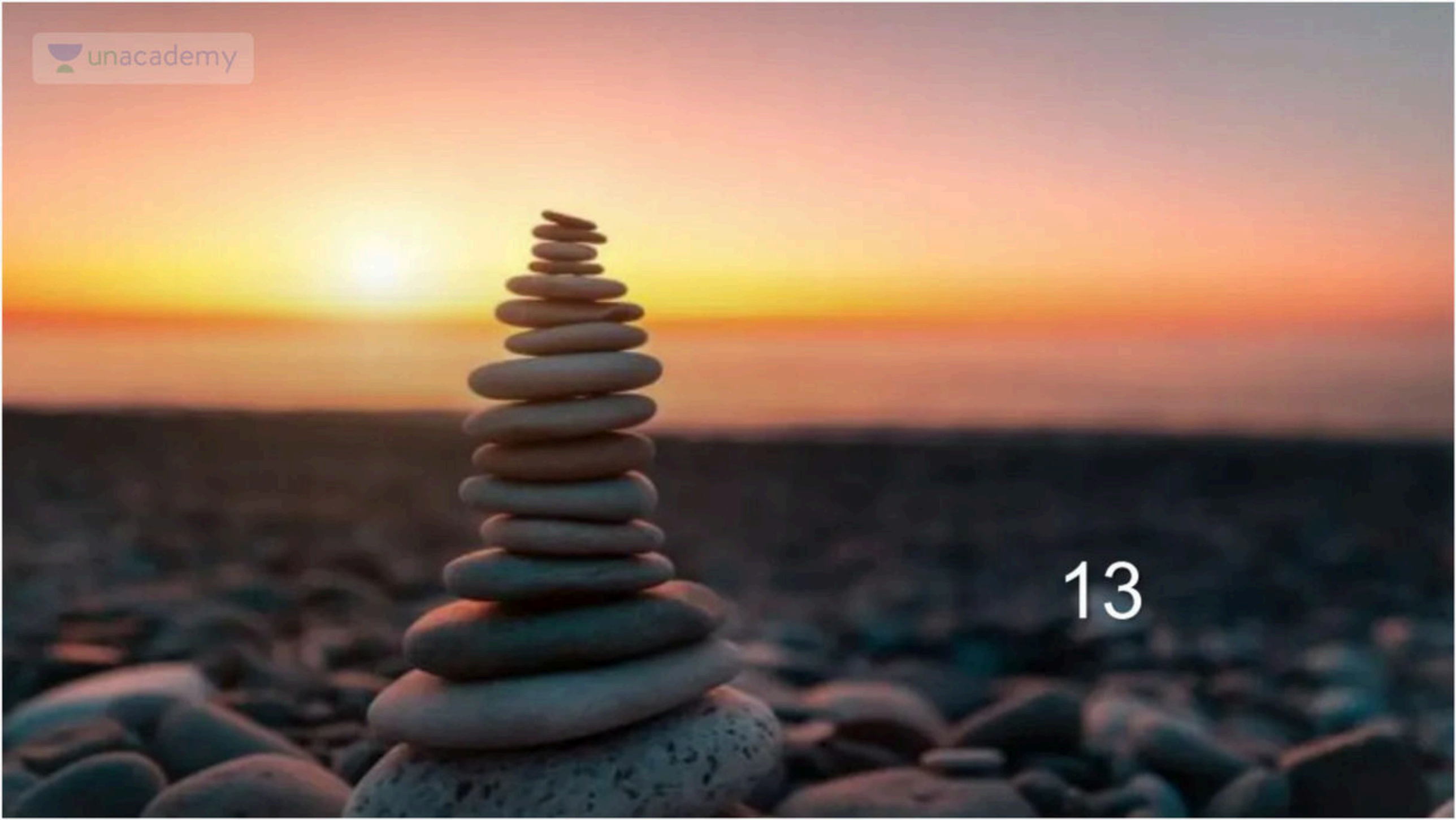
1
12

$$\frac{(123\ 1234)}{15}$$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$$(1218 \times 1220 \times 1222 \times 1224) \div 9$$

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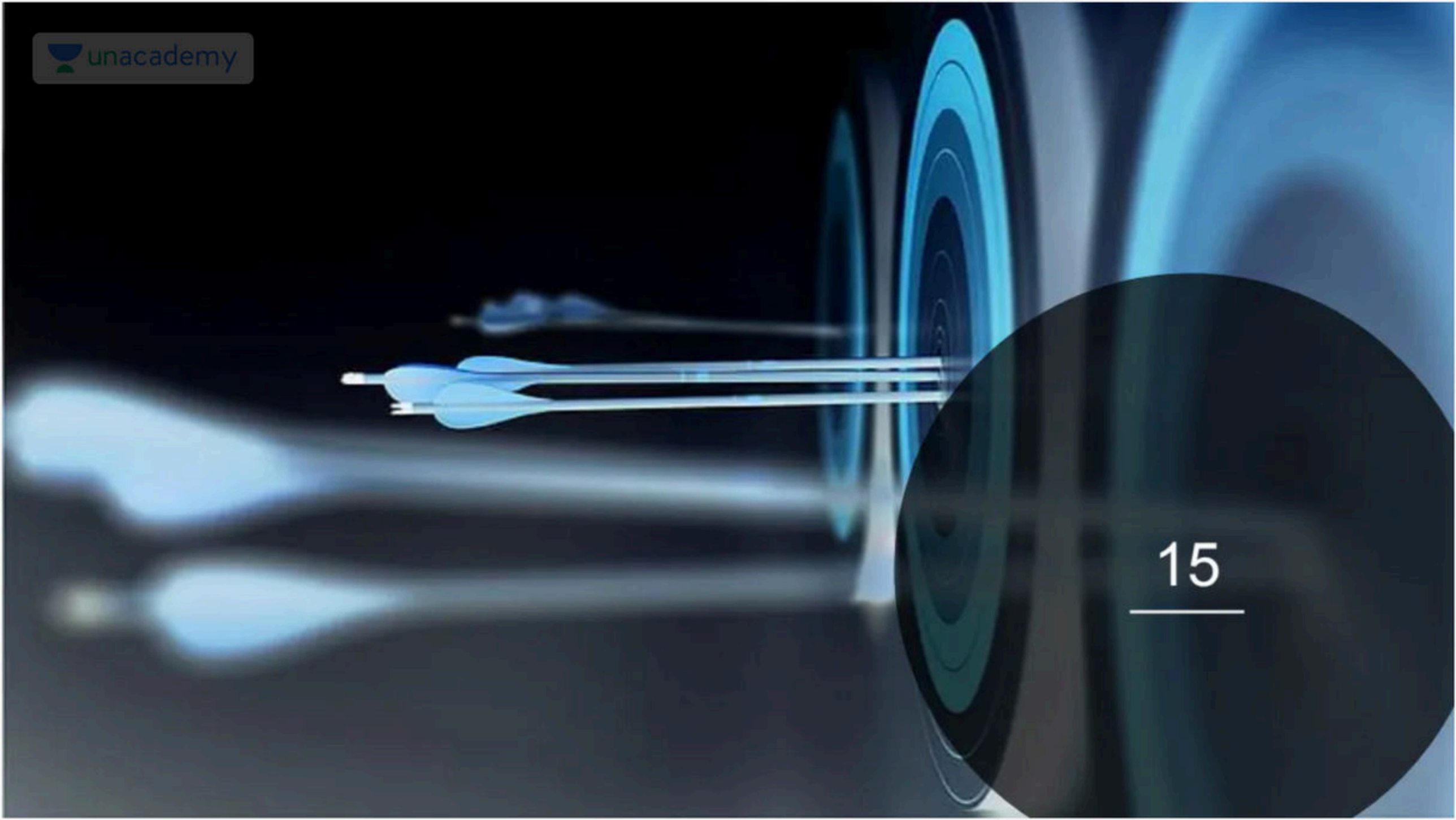
$$(1719 \times 1721 \times 1723 \times 1725 \times 1727) \div 18$$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The remainder when S is divided by $\boxed{20}$, $= 2^2 \times 5$

where $S = 1! + 2! + 3! + 4! + \boxed{5! + 6! + \ldots\ldots\ldots + 19! + 20!} \rightarrow 0$

20

20

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

$1 + 2 + 6 + 24$

13

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

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

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

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19

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

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20

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

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21

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

12, 24, 288.

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

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

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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)]

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25

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

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

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

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27

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)]

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

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

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29

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)]

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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 eve

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

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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

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32

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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

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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

[GATE 2013 : IIT Bombay (CE)]

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34

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

(A) 63
(B) 72
(C) 81
(D) 90

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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)]

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

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37
MALIK

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

Find the unit digit of "m"

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38

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

Find the last two digits of ‘m’

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39

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

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

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

$7! = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

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1-9 ⟶ 9 × 1 = 09 DIGITS.

10-99 ⟶ 90 × 2 = 180 DIGITS.

1 2 3 4 5 6 7 8 9.

09 DIGITS

10 11 12 13 . . . 98 99

90 × 2 = 180 DIGITS

100 101 102 — 999

900 × 3

= 2700.

09 + 180 = 189 DIGITS

09 + 180 + 2700 = 2889 DIGITS.

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1-9 → 9×1 = 09 DIGITS.

10-99 → 90×2 = 180 DIGITS.

123456789 | 10 11 12 13 ... 98 99 | 100 101 102 — 999

09 DIGITS | 90×2 = 180 DIGITS | 900×3 = 2700.

09 + 180 = 189 DIGITS

09 + 180 + 2700 = 2889 DIGITS.

SD

9×1 = 9

41×2 = 82

91 DIGITS

30 digits → 9×1 ⇒ 09 DIGITS

21×2 = 42 DIGITS.

51 DIGITS.

1-9 → 9×1 = 09 DIGITS.

10-99 → 90×2 = 180 DIGITS.

1 2 3 4 5 6 7 8 9

09 DIGITS

10 11 12 13 ... 98 99

90×2 = 180 DIGITS

100 101 102 — 999

900×3 = 2700.

09 + 180 = 189 DIGITS

09 + 180 + 2700 = 2889 DIGITS.

120 pages

9×1 = 09 DIGITS

90×2 = 180 D.IGITS

21×3 = 63

252

90 Pages

9×1 = 09

81×2 = 162

171

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40

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

If N is a natural number such that $10^{12} < N < 1013$ and the sum of the digits of n is 2 , then the number of values n take is :

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41

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

(A) $2^{1/2}$
(B) $3^{1/3}$
(C) $4^{1/4}$
(D) $6^{1/6}$

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)

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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-

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44

If $N = 15 \times 30 \times 45 \times 60 \times \ldots\ldots \times 1500$, 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)]

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45

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) isodd
(E) None of these

ANS.- (C) $1! = 1$, which is not divisible by 2.

$3! = 6$, which is not divisible by 4

$5! = 120$, which is divisible by 6. So, the minimum value of n is 5.

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02

How many digits are required to number a book containing 200 pages?

(A) 200

(B) 600

(C) 492

(D) 372

$1-9 \longrightarrow 9 \times 1 = 09$

$10-99 \longrightarrow 90 \times 2 = 180$

$100-200 \longrightarrow 101 \times 3 = 303.$

492

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ANS.- (C) Total number of pages = 200

Number of digits required to number the book from page 1 to 9 = 9

Number of digits required to number the book from page 10 to 99 = $2 \times 90 = 180$

Number of digits required to number the book from page 100 to 200 = $3 \times 101 = 303$

Therefore, total number of digits = $303 + 180 + 9 = 492$

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03

O E O

1 | 2 | 3

If P, Q and R are three consecutive integers, then which of the following is always true?

2 | 3 | 4 E | O | E

(A) ~~P + Q + R is always even.~~
(B) ~~P + Q + R is always odd.~~
(C) P + 2Q + R is always even.
(D) P + 2Q + R is always odd.

1 + 2 + 3 — even

2 + 3 + 4 — odd

1 + 2.2 + 3 — even

2 + 2.3 + 1 ⟹ even

ANS.- (C) The sum of two extreme numbers (whether both odd/even) and twice the 3rd number is always even. Therefore, their sum is always even.

Alternative:

If P and R are odd and Q is even, then P + R is even and 2Q is even.

P + 2Q + R is even

If P and R is even and Q is odd, then P + R is even and 2Q is even.

P + 2Q + R is even.

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04

By which of the following numbers must 34300 be multiplied in order to make it a perfect square?

Powers = even

(A) 7

(B) 5

(C) 6

(D) 14

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

ANS.- (A) $34300 = 7 \times 7 \times 7 \times 5 \times 5 \times 2 \times 2 = 7^3 \times 5^2 \times 2^2$

To make 34300 a perfect square, multiply it by 7.

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05

Find the last digit of $(100008)^{12500}$

(A) 8 (B) 6

(C) 4 (D) 2

8^{12500}

(8^4)

6

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ANS.- (B) There will be a cycle of last digits, i.e. 8, 4, 2, 6,... and this cycle consists of 4 numbers.
To find the last digit, divide the required power by 4 and find the remainder.
The last digits corresponding to remainders 1, 2, 3 and 0 are 8, 4, 2 and 6, respectively.
So, when 12,500 is divided by 4, it gives 0 as the remainder. Therefore, the last digit required would be 6.

06

Let $N = 10^3 + 10^4 + 10^5 + 10^6 + 10^7 + 10^8 + 10^9$. Find the sum of the digits of N.

(A) 12 (B) 9

(C) 8 (D) 7

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$$\left[\, 1\,\boxed{0} + 1\,00 + 1\,000 \,\right] \longrightarrow 1110$$

ANS - (D) Since N is written as a sum of powers of 10; N can be written as 1111111000.

So, the sum of the digits is 7.

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07

How many zeros are there at the end of the product 33 × 175 × 180 × 12 × 44 × 80 × 66?

(A) 2 (B) 4

(C) 6 (D) 6

ANS - (B)

$33 = 3 \times 11$

$44 = 2^2 \times 11$

$175 = 5^2 \times 7$

$80 = 2^4 \times 5$

$180 = 5 \times 2^2 \times 3^2$

$66 = 2 \times 3 \times 11$

$12 = 2^2 \times 3$

Multiplying all, we get

$2^{11} \times 5^4 \times 3^5 \times 7 \times 11^3 = 10^4 \times 2^7 \times 3^5 \times 7 \times 11^3$

Look out for the number of tens, making total number of zeros.

Number of zeros = 4

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08

Find the last digit of $(173)^{99}$.

(A) 9 (B) 7

(C) 1 (D) 3

3^{99}

$=$

(3^3)

7

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ANS.- (B)

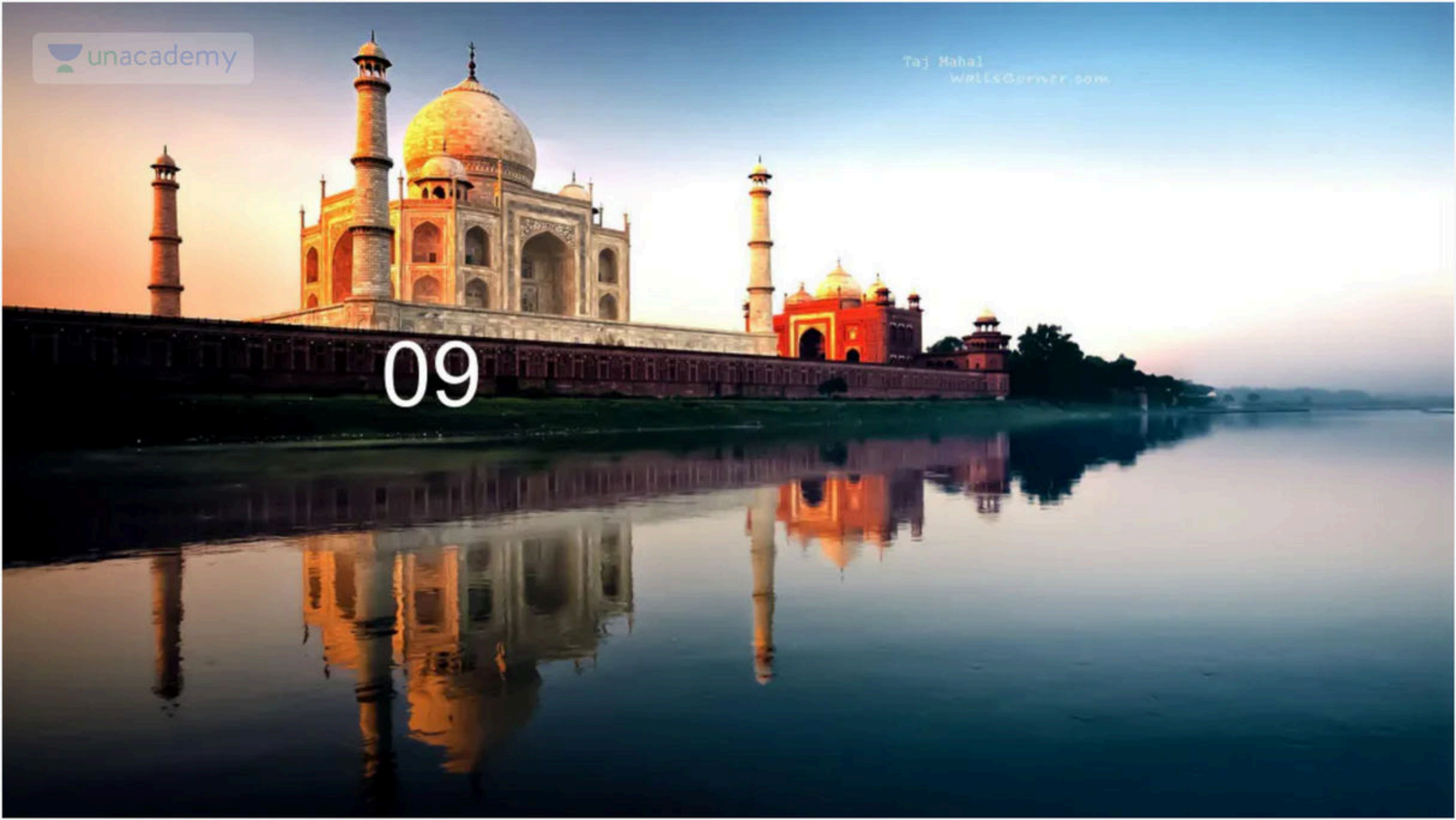
$3^1 = 3$, $3^2 = 9$, $3^3 = 27$, $3^4 = 81$ and $3^5 = 81 \times 3 = 243$.

Use the concept of power cycle (units digit repeats after the power of 4 and then after all powers that are multiples of 4).

Now, $99 = 24 \times 4 + 3$

Thus, 99 has 24 complete cycles of 4 and 3 is left as the remainder.

So, units digit of $(173)^{99}$ will be units digit of 3^3, which is 7.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Taj Mahal
09

Find the units digit of 51 × 52 × 53 × ... × 59.

(A) 4 (B) 3

(C) 2 (D) 0

$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 9$

0

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Jews

B

A

NF

Rubin Carter

200

20 yr

Man's search for Meaning

(2)

(1) Love

(2) Work

(3) Pain

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ANS.- (D)

This is a product of all the integers from 51 to 59. In this product, there is one 5 (at units place of 55) and at least one even number (at units place of 52, 54, 56 or 58). When 5 is multiplied with any even number, it always ends with 0. So, the units digit is 0.

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10

Find the last digit of the following sum.

$1! + 2! + 3! + 4! + \ldots + 100!$

(A) 0 (B) 3

(C) 5 (D) 7

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

$= 120$

$1! + 2! + 3! + 4! + \boxed{5! + \ldots + 100!}$

$\cancel{1} + \cancel{2} + \cancel{6} + \cancel{4}$

3

0

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ANS.- (B)

$1! = 1$ (Units digit = 1)

$2! = 2 \times 1 = 2$ (Units digit = 2)

$3! = 3 \times 2 \times 1 = 6$ (Units digit = 6)

$4! = 4 \times 3 \times 2 \times 1 = 24$ (Units digit = 4)

$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$ (Units digit = 0)

$6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$ (Units digit = 0)

So, we can see that the units digit of all the factorials from 5! onwards is 0.

So, the units digit of the given sum depends upon the sum of the units digits of 1!, 2!, 3! and 4!, which is 3 (6 + 4 + 2 + 1).