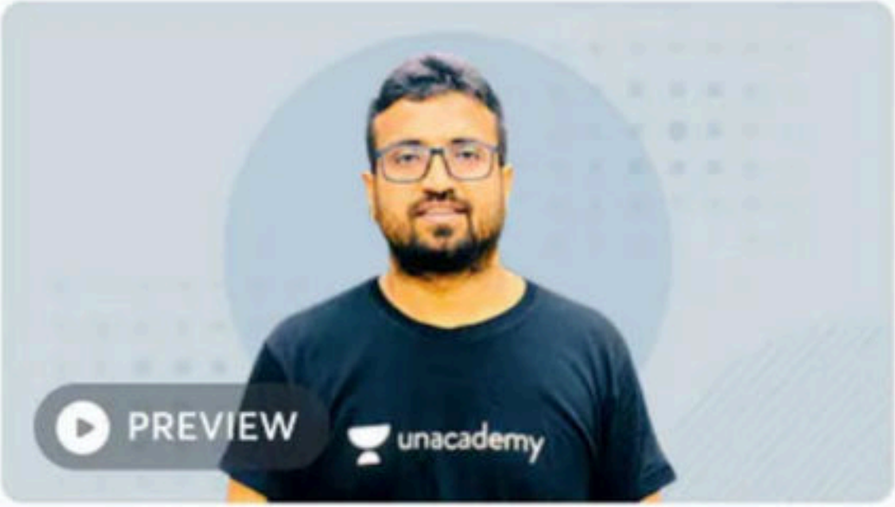
Number System - II

Complete Course on General Aptitude for GATE 2023/2024

Saurabh Thakur • Lesson 3 • Oct 17, 2022



HINDI GA,GS AND MATHEMATICS

Complete Course on General Aptitude for GATE 2023/2024

Saurabh Thakur

Ends on Jan 29, 2023

Oct 14 - Jan 29 • 16 weeks

25M+
WATCH MINUTE
12+
YEARS TEACHING EXPERIENCE
SUBSCRIPTION
CODE : ST26
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NUMBERS.

→ Integers | Natural No. | Prime | Comp. | Perfect Sq.

→ E + E = E E − E = E E × E = E

E + O = Odd E − O = Odd E × O = E

O + O = E O − O = E O × O = Odd.

→ GATE — 2 ✓

CAT / GMAT

Mens rea = ज्ञान + Action

Q1 To find the number of 0's at the end.

R + DRDO ⟹

APJ sir.

BM

CM

P ✓
A ✓

T ✓
M ✓
A ✓

BrahMos.

ICBM

101! ⟶ 3's (Max.)

101! = 10 · 9 · 8 · 7 · 6 · 5 · 4 · 3 · 2 · 1

3^2 (2 × 3)

3's ⟶ 04

1

$N! = 10!$

1 Prime No.

5's.

2 Composite No.

Prime No.

$\left[\frac{10}{3}\right] + \left[\frac{10}{3^2}\right] + \left[\frac{10}{3^2}\right]$

3 + 1

04

Conditions

1 Prime No.

2 $N \geq D$.

3 Integer $\Rightarrow$

$\boxed{2}$ 25!

$\boxed{1}$ 25!

$$\boxed{\left[\frac{25}{2}\right] + \left[\frac{25}{2^2}\right] + \left[\frac{25}{2^3}\right] + \left[\frac{25}{2^4}\right] + \cancel{\left[\frac{25}{2^5}\right]}}$$

$$12 + 6 + 3 + 1$$

$$\boxed{22}$$

$$12 + 6 + 3 + 1$$

$$22$$

$\boxed{2's} \Rightarrow 12 + 6 + 3 + 1 = \boxed{22}$

$16\,(2^4)$

$\frac{22}{4}$

5

$\hookrightarrow 4\,(2^2)$

$8\,(2^3)$

$15's\,(3 \times 5) = 3^{10} \times 5^{6}$

$2's$

$\boxed{3's} \Rightarrow 8 + 2 = \boxed{10}$

$\frac{22}{2}$

11

$22/3$

7

$\boxed{5's} = 5 + 1 = \boxed{06}$

$\boxed{7's} = \boxed{3}$

$G's = 2 \times 3$

$2^{22} \times 3^{10}$

G^{10}

$21 = 3 \times 7 \Longrightarrow 3^{10} \times 7^{3}$

TEST

4's (2^2) $47/2 = 23$.

8's (2^3) $47/3 = 15$

16's (2^4) $47/4 = 11$

$\boxed{1}$

$\boxed{2\text{'s}} = 25 + 12 + 6 + 3 + 1 = \boxed{47}$

50 → 3's ⇒ $16 + 5 + 1 = \boxed{22}$

6's

$2^{47} \times 3^{22}$

5's $= 10 + 2 = \boxed{12}$

7's $= 7 + 1 = \boxed{08}$.

divide

TEST

$\boxed{4's}$ (2^1) $97/2 \Rightarrow 48$

$\boxed{8's}$ (2^3) $97/3 \rightarrow 32$

$\boxed{9's}$ (3^2) $48/2 = 24$

$100!$

$\boxed{1}$ $2's = 50 + 25 + 12 + 6 + 3 + 1 = 97$

$\boxed{2}$ $3's = 33 + 11 + 3 + 1 = 48$

$\boxed{3}$ $\boxed{5's = 20 + 4} = \boxed{24}$ $\boxed{25's}$ (5^2)

$24/2 = 12$

$\boxed{4}$ $7's = 14 + 2 = 16$

$\boxed{49's}$ (7^2) $16/2 = 08$

$\frac{6's}{2^{97} \times 3^{48}}$

$2 \times 3 = 6$

$2^{2} \times 3^{2} = 6^{2}$

$2^{10} \times 3^{10} = 6^{10}$

$2^{1} \times 3^{10} = 6^{1} \times 3^{9}$

$2^{100} \times 3^{10} = 6^{10} \times 2^{90}$

Composite No. = Prime No.

$6 = \boxed{2 \times 3}$

$15 = \boxed{3 \times 5}$

$21 = \boxed{3 \times 7}$

$10 = 2 \times 5$

$25! = 2^{22} \times 5^{6}$

$50! = 2^{47} \times 5^{12}$

$100! = 2^{97} \times 5^{24}$

$N!$ 0's at the end $\Rightarrow$ 5's.

0's

N!

$$\boxed{0's \Longrightarrow 5's.}$$

1. 100! $\longrightarrow$ 20 + 4 = 24

2. 150! $\Rightarrow$ 30 + 6 + 1 = 37

3. 1000! $\Rightarrow$ 200 + 40 + 8 + 1 = 249

$$\underline{\underline{25!}} \Rightarrow 2^{\boxed{22}} \times 3^{10}$$

① $\boxed{12^{1}s} = (2^2 \times 3) \Rightarrow (2^2)^{11} \times 3^{10}$

②

100! ⇒ 2^{97}, 3^{48}, 5^{24}

① 4's (2^2) → 97/2 = 48

② 9's (3^2) - 48/2 = 24

③ 6's (2×3) $2^{97} \times 3^{48}$

④ 0's (5's) = 5^{-24} → 24

⑤ 12's (2×3) (2^2) 48 × 3 = 48

48 =

$$4 = 2^2$$

$$8 = 2^3$$

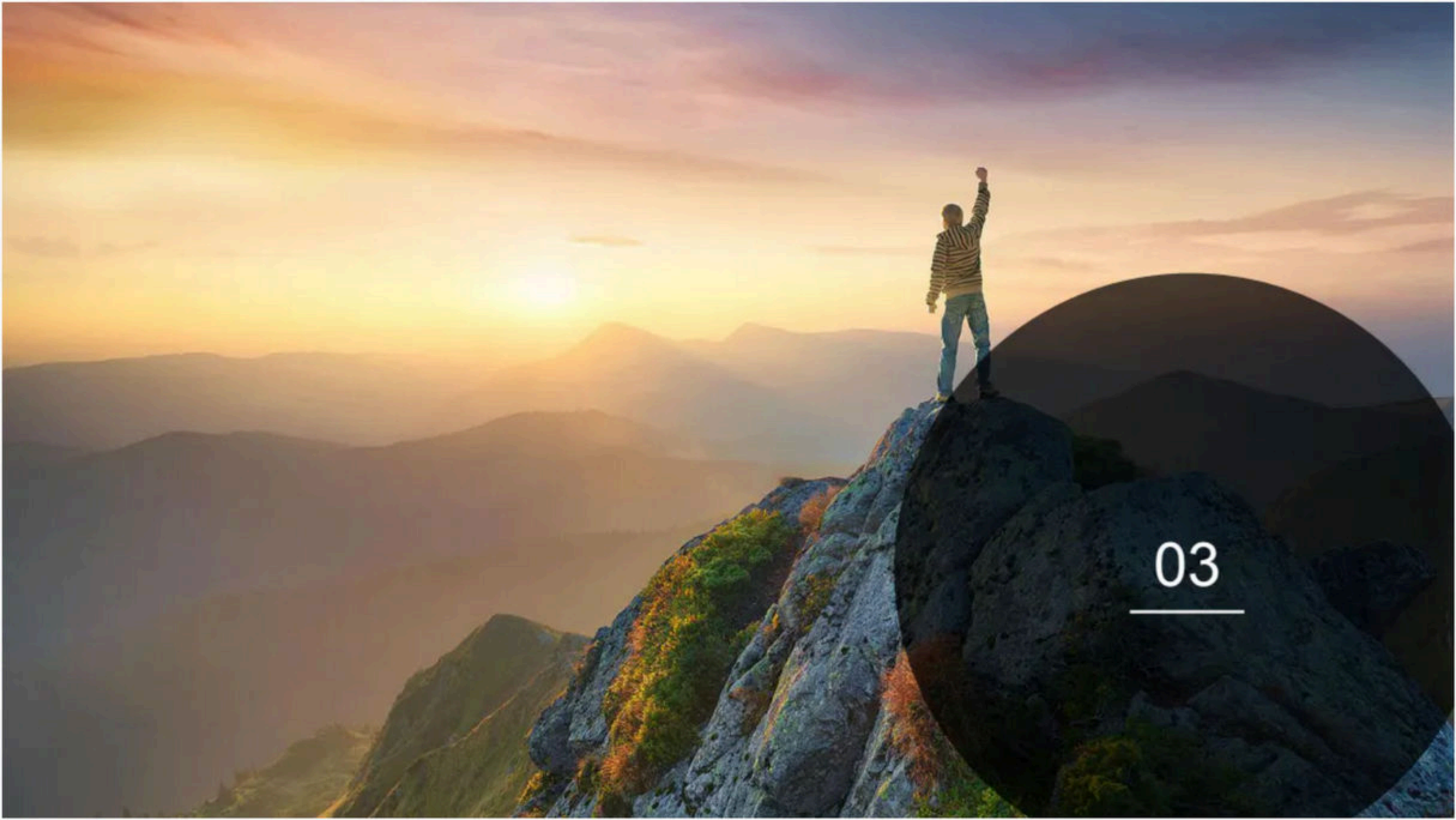
$$16 = 2^4$$

01

100!,150!, 250!

05

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



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

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

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)]

08

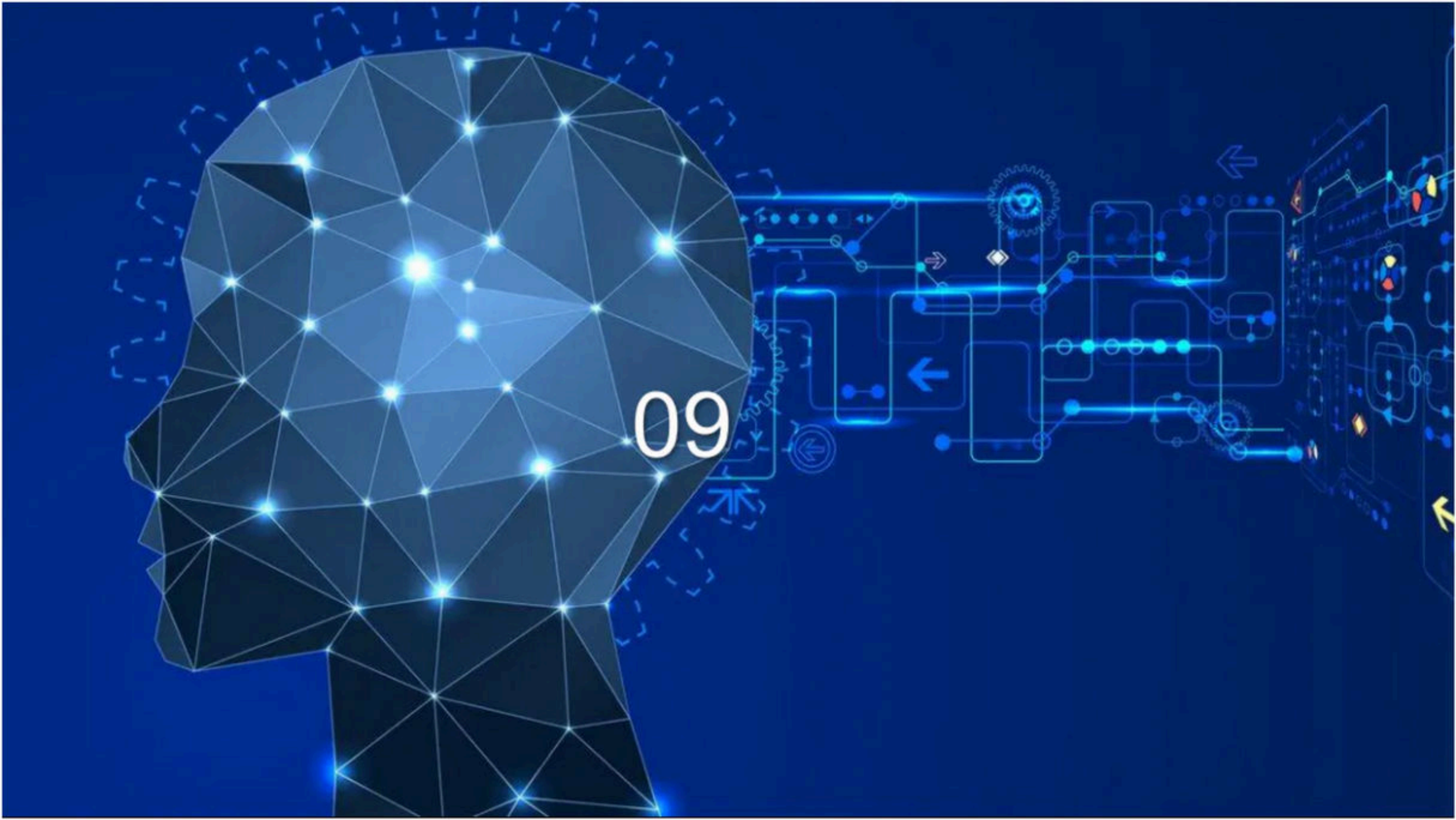
The last digit of

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

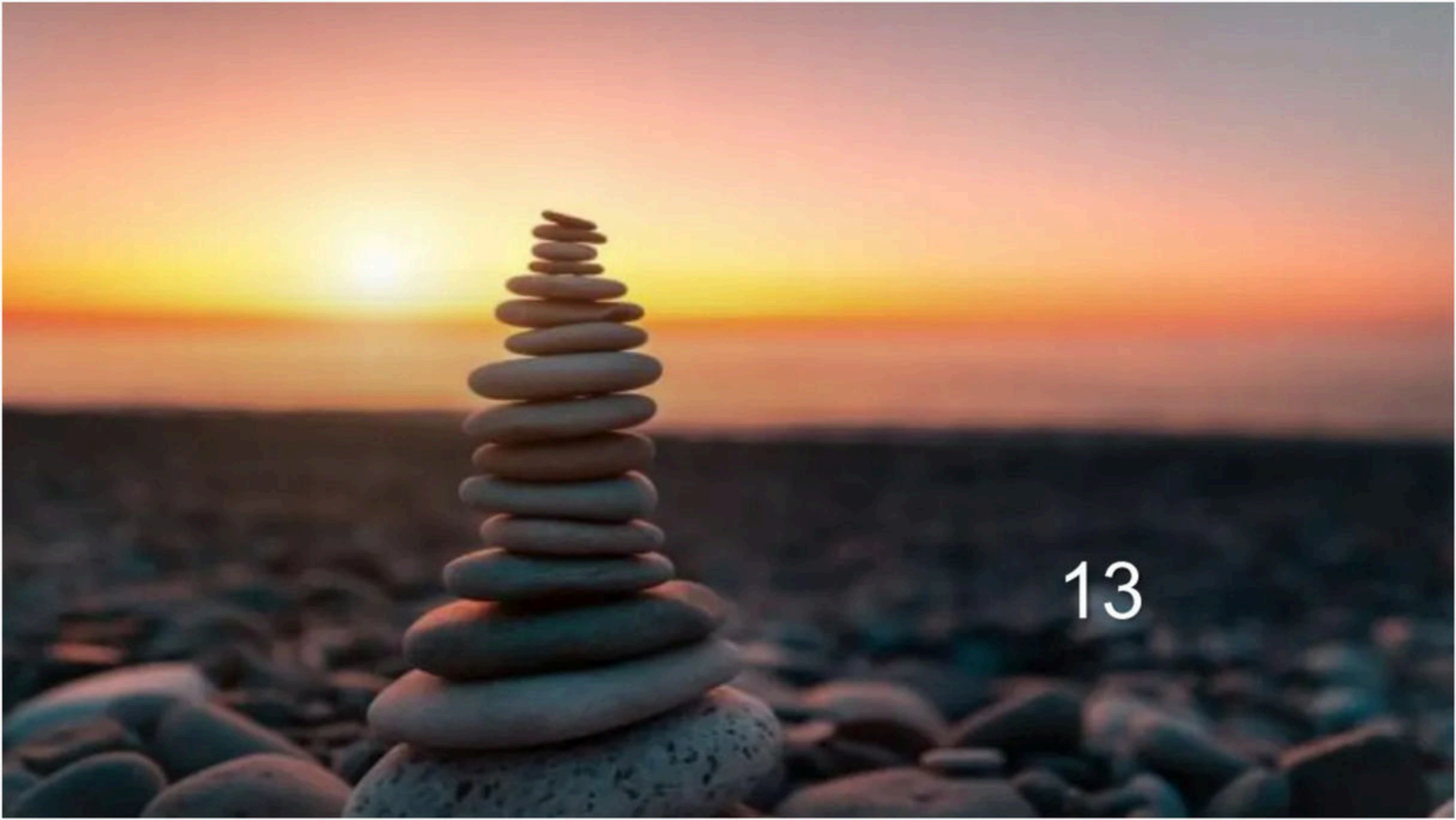
$3^{53}, 7^{53}, 9^{93}$

11

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

12

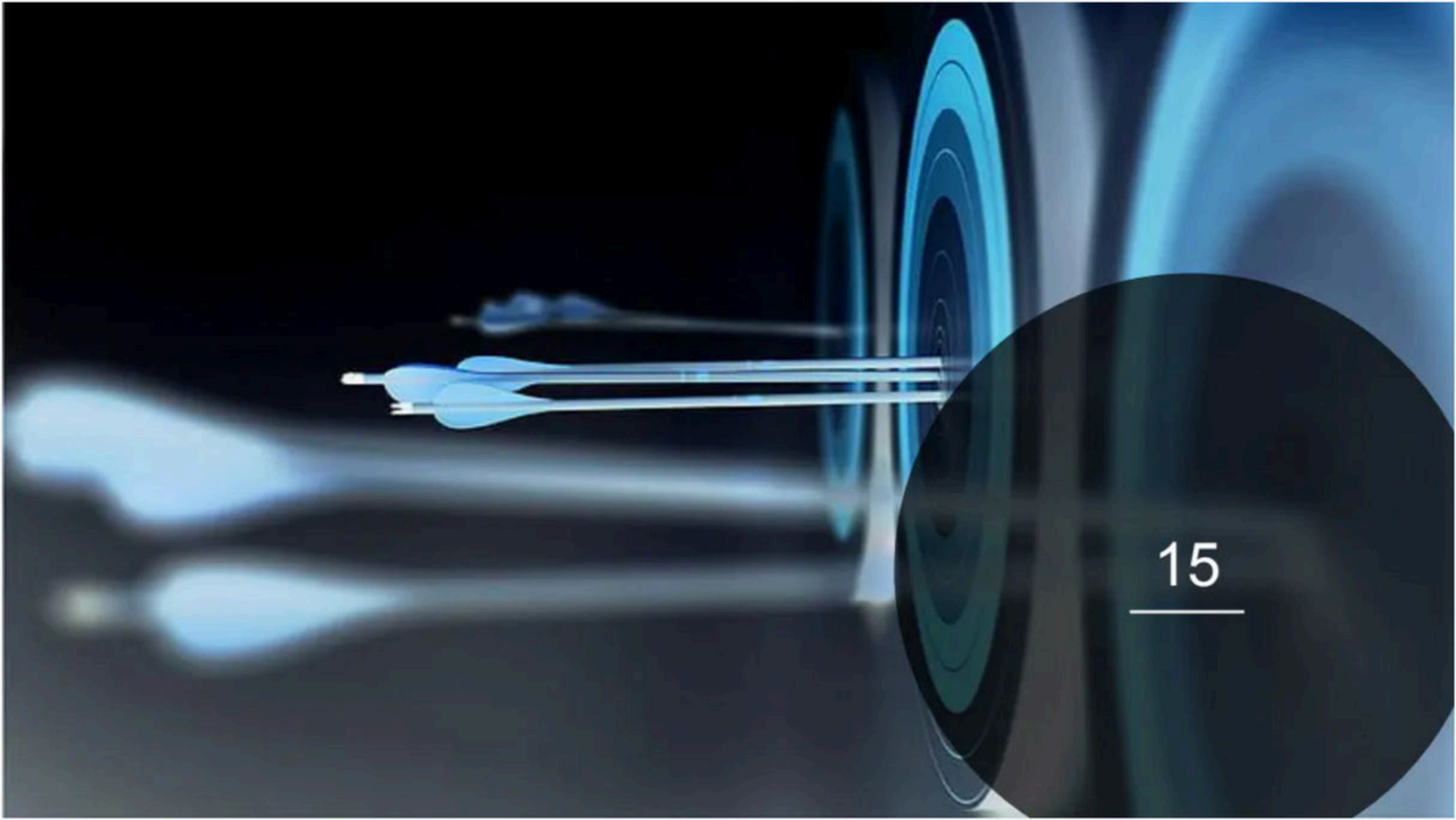
$$\frac{(123\ 1234)}{15}$$


13

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

14

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


15

The remainder when S is divided by 20 ,

where $S = 1! + 2! + 3! + 4! + 5! + 6! + \ldots\ldots\ldots + 19! + 20!$

16

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

17

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

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

19

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

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

21

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

12, 24, 288.

22

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

23

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)]

25

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

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)]

28

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

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

29

A|D

0, ±1, ±2 ...

A|D — Trap

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

E × E ✓

(A) ab — O × O ✗

(B) $a^2 + b^2 + 1$

E + E + 1 = odd

(C) $a^2 + b + 1$

E + E + 1 = odd

(D) ab - b

a - b = EVEN

① E - E ✓

② O - O ✓

① Must (Always) = EVEN

E · E − E = E

O · O − O = E

② Could — A|D ✓

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

True, Except = False

False, except = True

False

AIIMS – Methane

A. CH_4

B. $-CH_3$

C. $-CH_2$

D. All

30

$0, \pm 1, \pm 2 \ldots$

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

$a + a^2 \cdot b^3$

	a	b	
(A) a and b are both odd	1	1	$1 + 1 \cdot 1 = 5$ ✗
(B) a and b are both even	2	2	$2 + 2 \cdot 2 =$ ✗
(C) a is even and b is odd	2	1	$2 + 4 \cdot 1 =$ ✗
(D) a is odd and b is even	1	2	$1 + 1 \cdot 8 = 9$ odd

[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

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)]

34

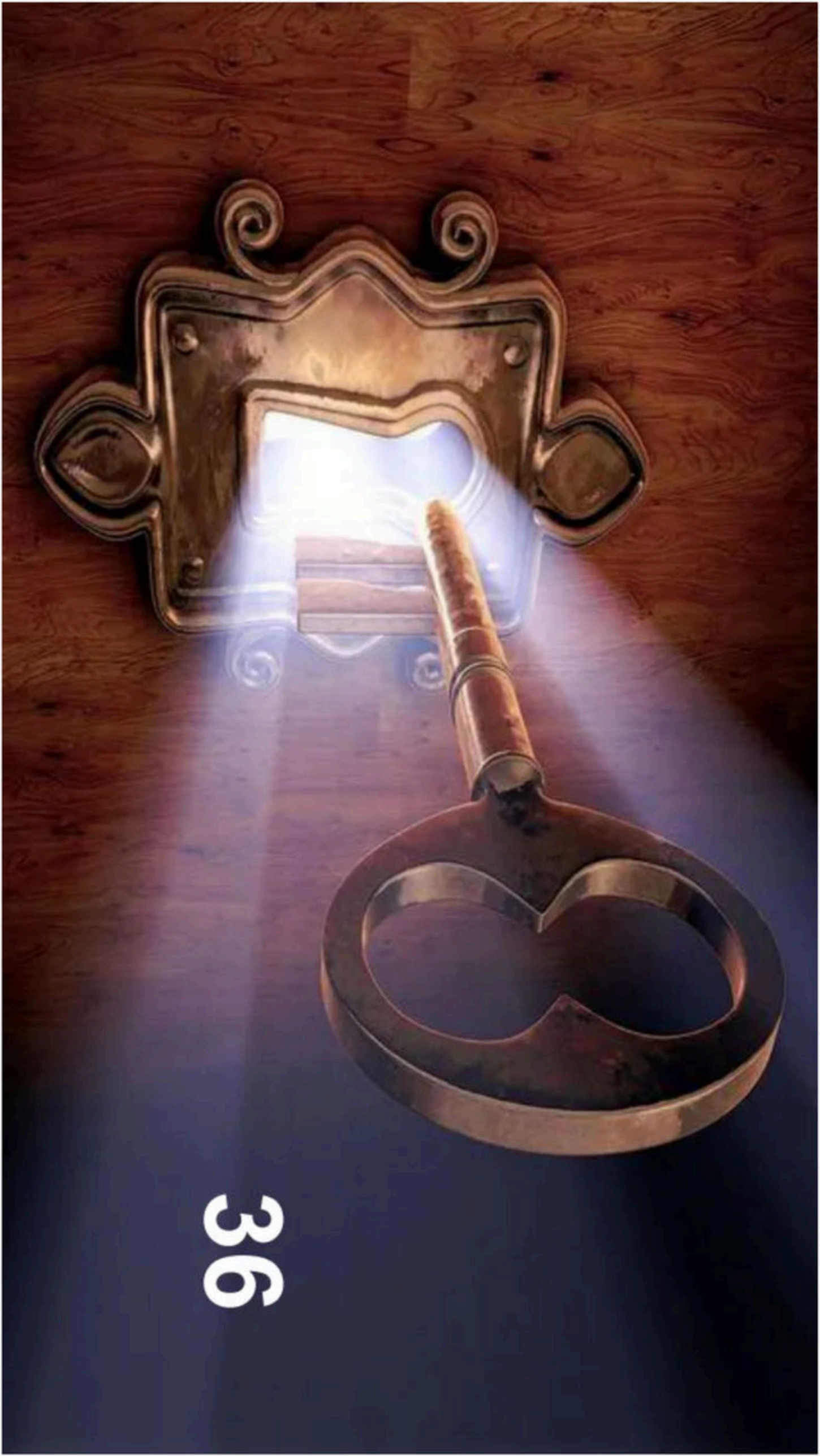
A number consists of two digits, the sum of digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number?

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

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

37
MALIK

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

Find the unit digit of “m”

38

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

Find the last two digits of ‘m’

39

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

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

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 :

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)

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 × 30 × 45 × 60 × .....× 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)]

SD. ⇒ Student Dharma

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