Number System - VII

Complete Course on General Aptitude for GATE 2023/2024

Saurabh Thakur • Lesson 10 • Oct 26, 2022

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Number System

01

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

(A) 1

(B) 3

(C) 5

(D) 6

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.

02

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

(A) 200 (B) 600

(C) 492 (D) 372

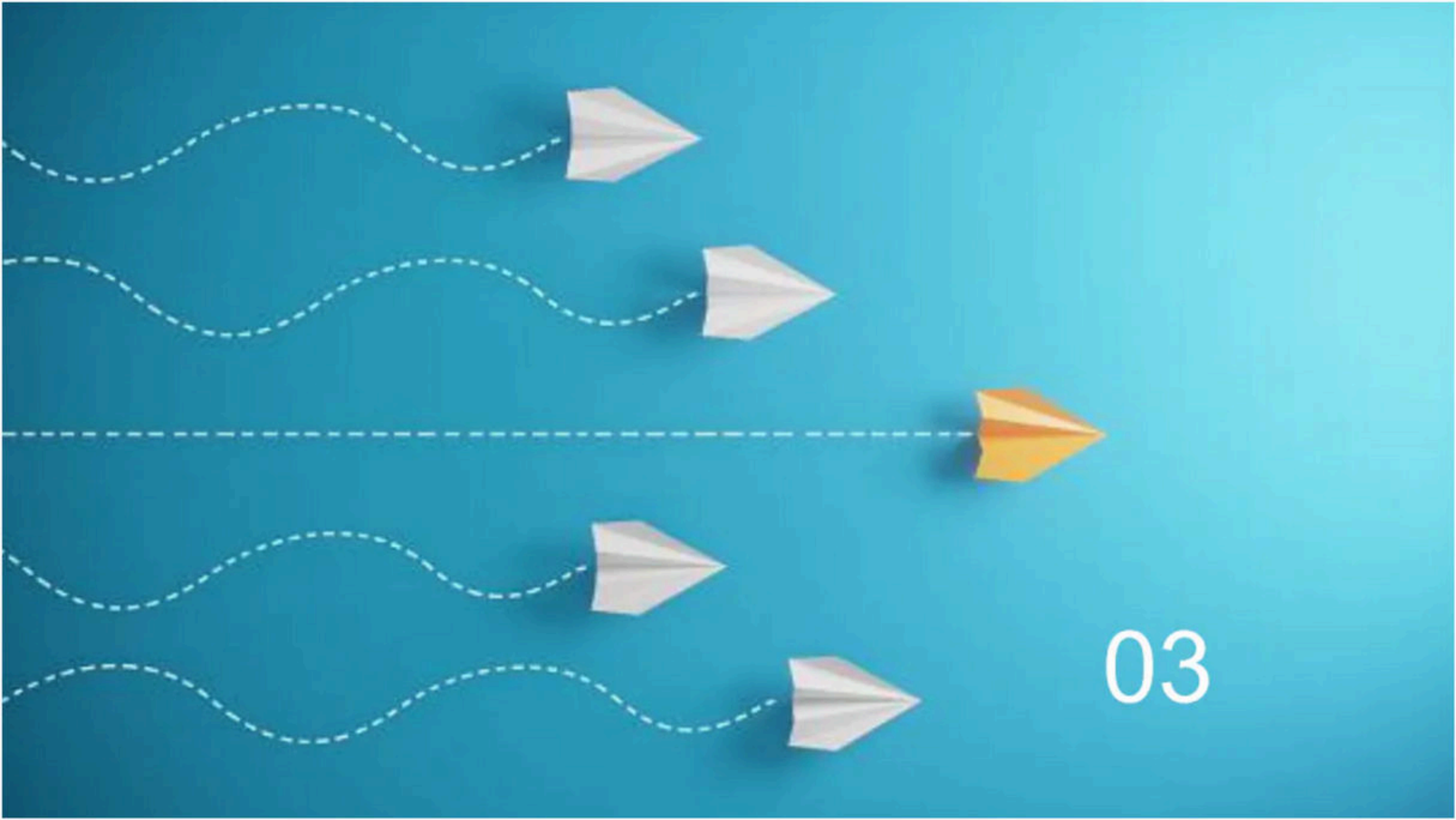
ANS.- (C) Total number of pages = 200

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 = $303 + 180 + 9 = 492$


03

If $A * B = (A + B)(A \times B - A^2 + B^2)$, then the value of $7 * 5$ will be

(A) 132 (B) 284

(C) 148 (D) 389

ANS.- (A) $A * B = (A + B)(A \times B - A^2 + B^2)$

$7 * 5 = (7 + 5)(35 - 7^2 + 5^2)$

$= (12)(35 - 49 + 25)$

$= 132$

04

If X381 is divisible by 11 and 381Y is divisible by 9, find the smallest values of X and Y.

(A) 6, 5

(B) 7, 6

(C) 6, 8

(D) 7, 5

ANS.- (B)

(i) X381 is the number given to us. If this number is divisible by 11, then the divisibility rule for 11 must be satisfied. i.e. (X + 8) - (3 + 1) = (X + 4) is multiple of 11 and the smallest value of X for which X + 4 is divisible by 11 is 7. Hence, X = 7

(ii) 381Y is the number given to us. If this number is divisible by 9, then the divisibility rule for 9 must be satisfied. i.e. (3 + 8 + 1 + Y) = Y + 12 must be divisible by 9. And smallest value of Y for which Y + 12 is divisible by 9 is 6. Hence, Y = 6

05

If the sum of any two positive quantities is constant, then their product is maximum when the two quantities

(A) are reciprocals of each other
(B) are a number and its root
(C) are equal to each other
(D) are not equal to each other

ANS.- (C) If the sum of two quantities is constant, then their product is maximum when they are equal.

Alternative Method:

Let $X + Y = K$

$(X + Y)^2 - (X - Y)^2 = 4XY$

$K^2 - (X - Y)^2 = 4XY$

$\Rightarrow 4XY < K^2$ except when $X - Y = 0$.

Or $X = Y$

$\Rightarrow 4XY$ is maximum when $X = Y$.

$\Rightarrow XY$ is maximum when $X = Y$ $(= K/2)$ and thus, maximum value of $XY = (K^2/4)$.

06

If p, q, r, s and t are integers, which of the following must be even for the expression $p^2\{q^3(r - s) + t\}$ to be an even number?

(A) p

(B) q

(C) r

(D) s

ANS.- (A)

The expression is of the form p^2X, where $X = \{q^3(r - s) + t\}$.

So, whenever p is even, the product will be even, irrespective of whether the second number X is odd or even. So, p must be even.

07

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

(A) 7

(B) 5

(C) 6

(D) 14

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.

08

Two positive whole numbers are such that the sum of the first and twice the second is 8 and the difference between the numbers is 2. The numbers are:

(A) 4, 2

(B) 6, 4

(C) 7, 9

(D) 7, 5

ANS.- (A) Let the first number be x and the second number be y.

Then, $x + 2y = 8$ and $x - y = 2$

$x + 2(x - 2) = 8$

$x + 2x - 4 = 8$

$3x = 12$

$x = 4$

Since $x - y = 2$, this implies that $y = 2$.

09

Which of the following options is correct about the number $\sqrt{3}$?

(A) A rational number
(B) An infinitely long non–repeating decimal
(C) Exactly equal to 1.7320508
(D) n infinitely long repeating decimal

ANS.- (B) $\sqrt{3}$ is an irrational number and hence an infinitely long non–repeating decimal.

10

A lady says that her age will be 18 years if only weekend days are counted. What is her actual age?

(A) 48 years

(B) 56 years

(C) 63 years

(D) 72 years

ANS.- (C) If only weekend days are counted, only $\frac{2}{7}$ portion of the whole week is calculated to arrive at her age.

So, 18 years of age = $\frac{2}{7}$ (Actual age)

$\Rightarrow$ Actual age = 63 years

11

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

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.

12

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

(A) 9 (B) 7

(C) 1 (D) 3

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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01

Which of the following numbers will replace the question mark (?) in the series given below?

25, 336, 24, ?, 23, 120, 22, 60

- 108
- 210
- 216
- 196

ANS.- (B)

The given series is an alternate series.

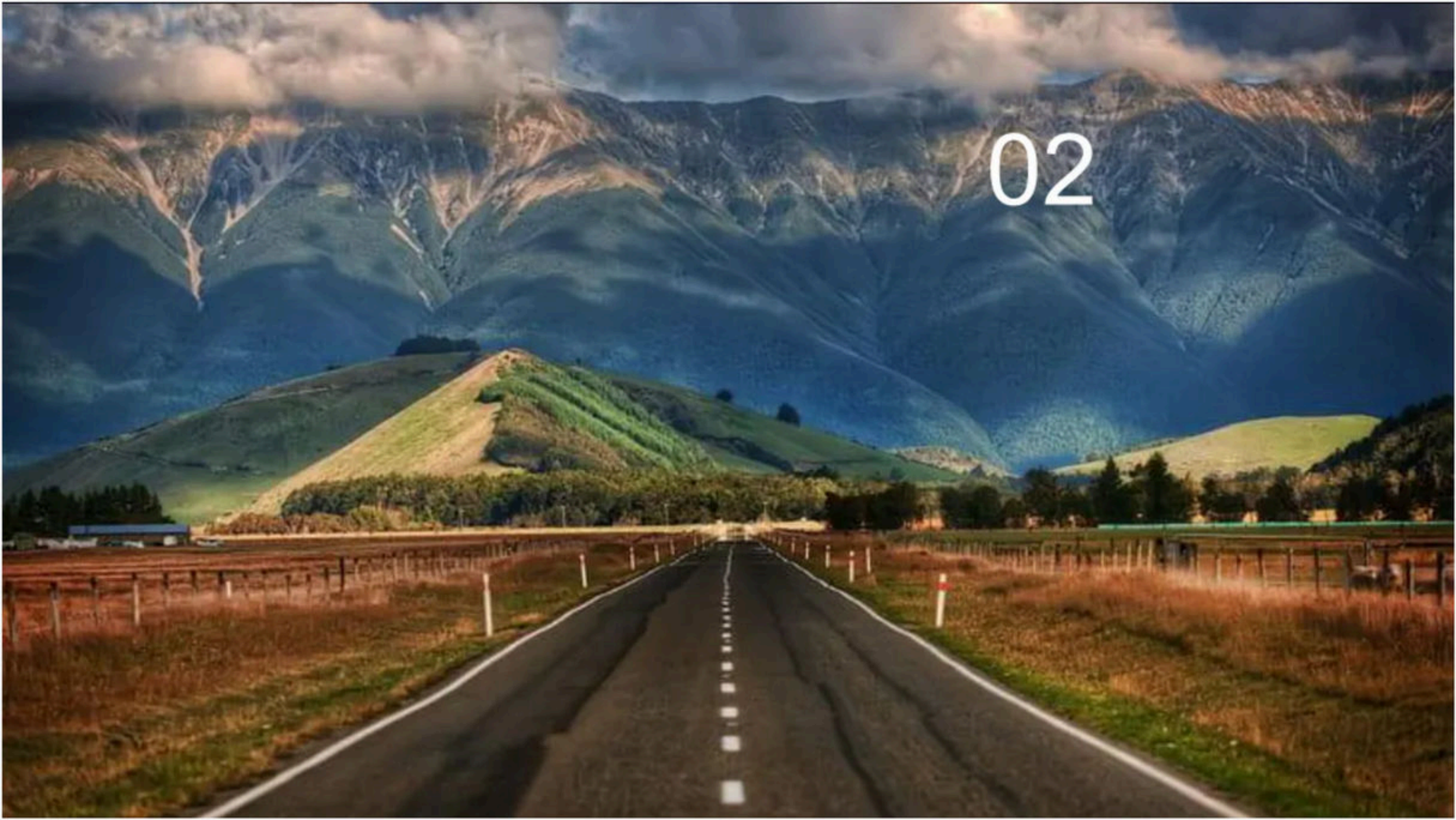
Odd series, i.e. first series is with the numbers decreasing, i.e. 25, 24, 23.

In the even series, i.e. second series, the pattern is as given below:

$7^3 - 7 = 343 - 7 = 336$

So, the answer will be:

$6^3 - 6 = 216 - 6 = 210$


02

Which of the following will replace the question mark (?) in the series given below?

9999, 8099, 6399, 4899, ?, 2499

- 3999
- 3499
- 3599
- 2999

ANS.- (B)

The series is of pattern $n^2 - 1$. n starts from 100 and then, decreases by 10 for the next term.

$100^2 - 1 = 9999$

$90^2 - 1 = 8099$

$80^2 - 1 = 6399$

$70^2 - 1 = 4899$

$60^2 - 1 = 3599$

$50^2 - 1 = 2499$

So, the answer is 3599.

03

Which of the following numbers will replace the question mark (?) in the series given below?

0, 1, 5, 23, 119, 719, ?

- 2499
- 5040
- 2500
- 5039

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ANS.- (D) The series is as given below.

$(1 \times 1) - 1 = 0$

$(1 \times 2) - 1 = 1$

$(1 \times 2 \times 3) - 1 = 5$

$(1 \times 2 \times 3 \times 4) - 1 = 23$

$(1 \times 2 \times 3 \times 4 \times 5) - 1 = 119$

$(1 \times 2 \times 3 \times 4 \times 5 \times 6) - 1 = 719$

$(1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7) - 1 = 5039$

04

Which of the following numbers will replace the question mark (?) in the series given below?

11, 2, 13, 4, 17, 8, 19, 16, 23, 32, 29, ?

- 64
- 60
- 32
- 30

ANS.- (A)

The given series is an alternate series.

Odd series, i.e. first series starts with prime numbers, starting from 11 and so on.

Even series, i.e second series follows the pattern given below:

$2 \times 2 = 4$

$4 \times 2 = 8$

$8 \times 2 = 16$

$16 \times 2 = 32$

$32 \times 2 = 64$

05

Choose the option that will replace the question mark (?) in the series given below.

5, 40, 15, ?, 25, 120, 35, 160, 45

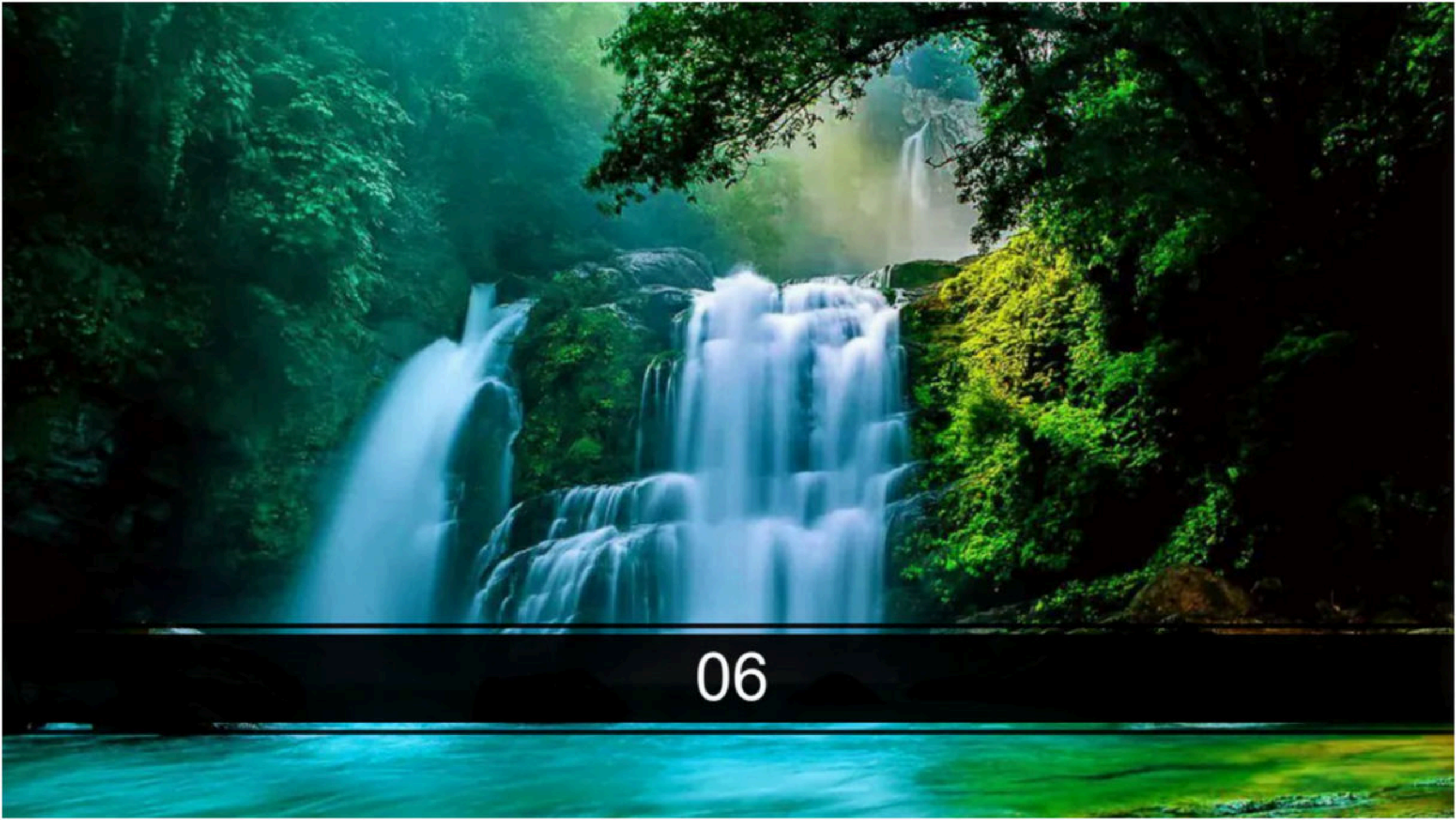
- 70
- 20
- 60
- 80

ANS.- (D) The given series has two sub series:

First series: $5 \times 1, 5 \times 3, 5 \times 5, 5 \times 7, 5 \times 9$

Second series: $40 \times 1, 40 \times 2, 40 \times 3, 40 \times 4$

Therefore, missing number is $40 \times 2 = 80$



06

Which of the following options will replace the question mark (?) in the series given below?

321, 14, 322, 17, 323, ?, 324, 29

- 20
- 21
- 22
- 25

ANS.- (C) $321 = 3^2 + 2^2 + 1^2 = 14$

$322 = 3^2 + 2^2 + 2^2 = 17$

$323 = 3^2 + 2^2 + 3^2 = 22$

$324 = 3^2 + 2^2 + 4^2 = 29$

07

Which of the following will replace the question mark (?) in the series given below?

10, 122, 11, 145, 12, 170, 13, 197, 14, ?

- 226
- 225
- 220
- 221

ANS.- (A)

The given series is an alternate series. The first series is 10, 11, 12 ... and the second series follows the pattern given below.

$(10 + 1)^2 + 1 = 122$

$(11 + 1)^2 + 1 = 145$

$(12 + 1)^2 + 1 = 170$

$(13 + 1)^2 + 1 = 197$

$(14 + 1)^2 + 1 = 226$

08

Which of the following will replace the question mark (?) in the series given below?

1, 1, 2, 4, 8, 3, 9, 27, 5, 16, 64, ?

- 6
- 7
- 8
- 25

ANS.- (B)

Here, the first two numbers are 1^2 and 1^3 and then, prime numbers follow.

$(1)^2$ and $(1)^3$, then prime number 2, then $(2)^2$ and $(2)^3$ is followed by prime number 3, then $(3)^2$ and $(3)^3$ is followed by prime number 5 and then, $(4)^2$ and $(4)^3$.

So, the next prime number will be 7.

09

Which of the following will replace the question mark (?) in the series given below?

9, 35, 91, 189, 341, ?

- 592
- 541
- 512
- 559

ANS.- (D) $1^3 + 2^3 = 9$

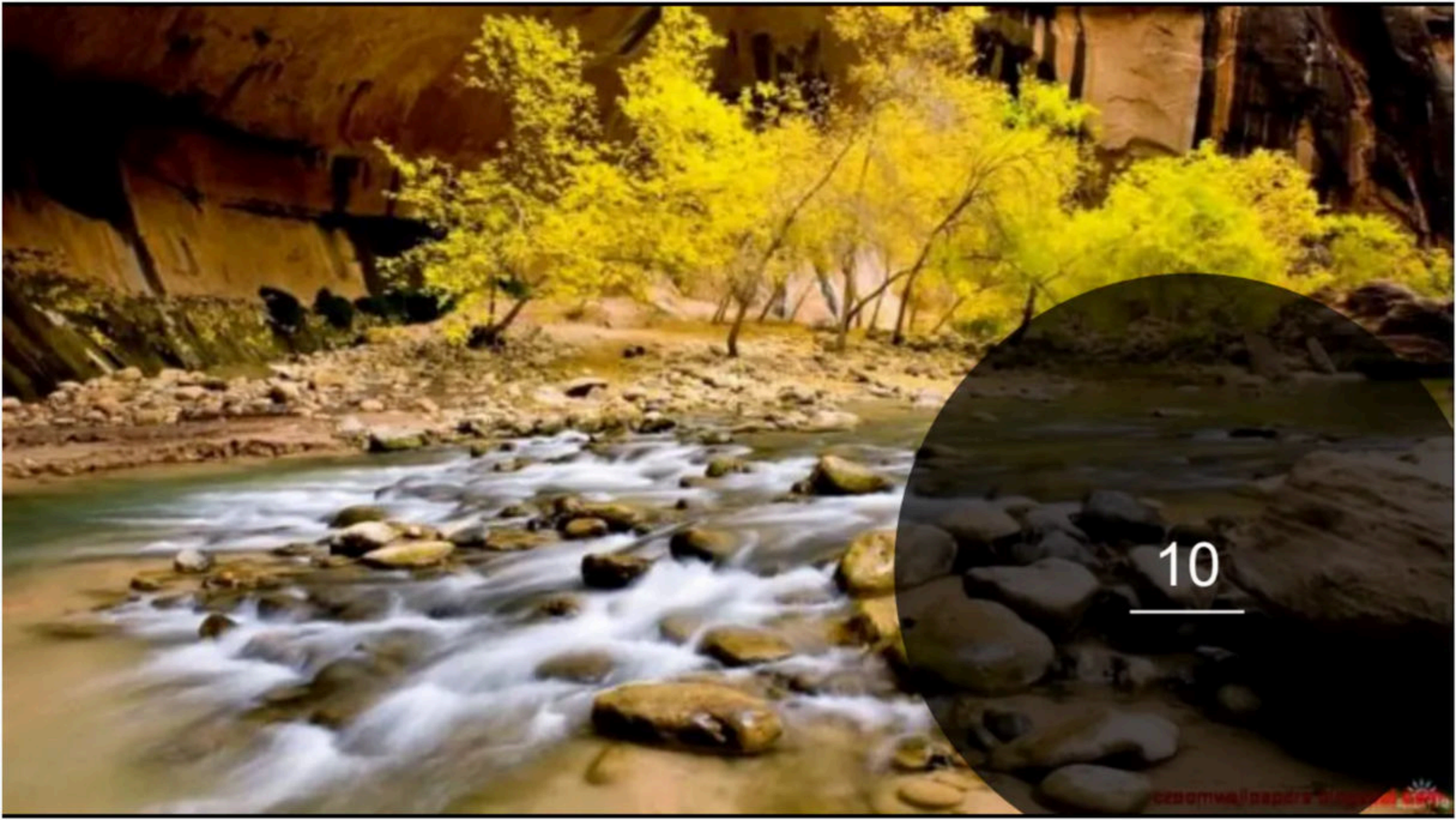
$2^3 + 3^3 = 35$

$3^3 + 4^3 = 91$

$4^3 + 5^3 = 189$

$5^3 + 6^3 = 341$

$6^3 + 7^3 = 559$


10

Find the wrong number in the series given below.

4, 18, 48, 100, 180, 294, 442

- 48
- 100
- 180
- 294
- 442

ANS.- (E) $2^3 - 2^2 = 8 - 4 = 4$

$3^3 - 3^2 = 27 - 9 = 18$

$4^3 - 4^2 = 64 - 16 = 48$

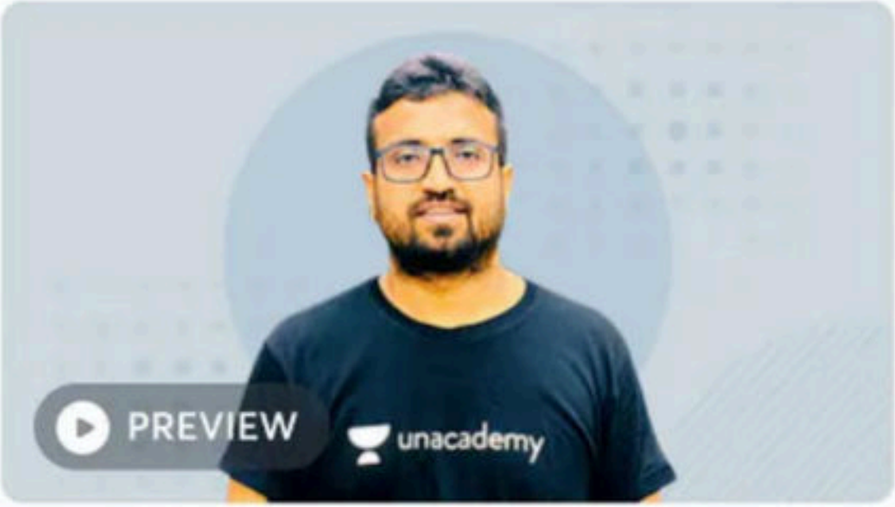
$5^3 - 5^2 = 125 - 25 = 100$

$6^3 - 6^2 = 216 - 36 = 180$

$7^3 - 7^2 = 343 - 49 = 294$

$8^3 - 8^2 = 512 - 64 = 448$

So, the wrong number is 442, which should have been 448.



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01

NUMBER SYSTEM

NOTE

$0.\overline{4} = 4/9$

$0.1234 = \frac{1234}{10000}$

$0.\overline{1234} = \frac{1234}{9999}$

$0.\overline{1234} = \frac{(1234-1)}{9999}$

$0.12\overline{34} = \frac{(1234-12)}{9900}$

$0.1\overline{234}$

$= \frac{(1234-123)}{9000}$

$$0.\overline{444}\ldots = 0.444\ldots$$

$$= 0.4 + 0.04 + 0.004 + \ldots \infty$$

$$= \boxed{4/10} + 4/10^2 + 4/10^3 + \ldots \infty$$

$$\boxed{\underset{(GP)}{S_\infty} = \frac{a}{1-r}} = \frac{4/10}{1-1/10}$$

$$r = \frac{1/10^2}{1/10} = 1/10$$

$$= 4/10 \cdot 10/9 = 4/9$$

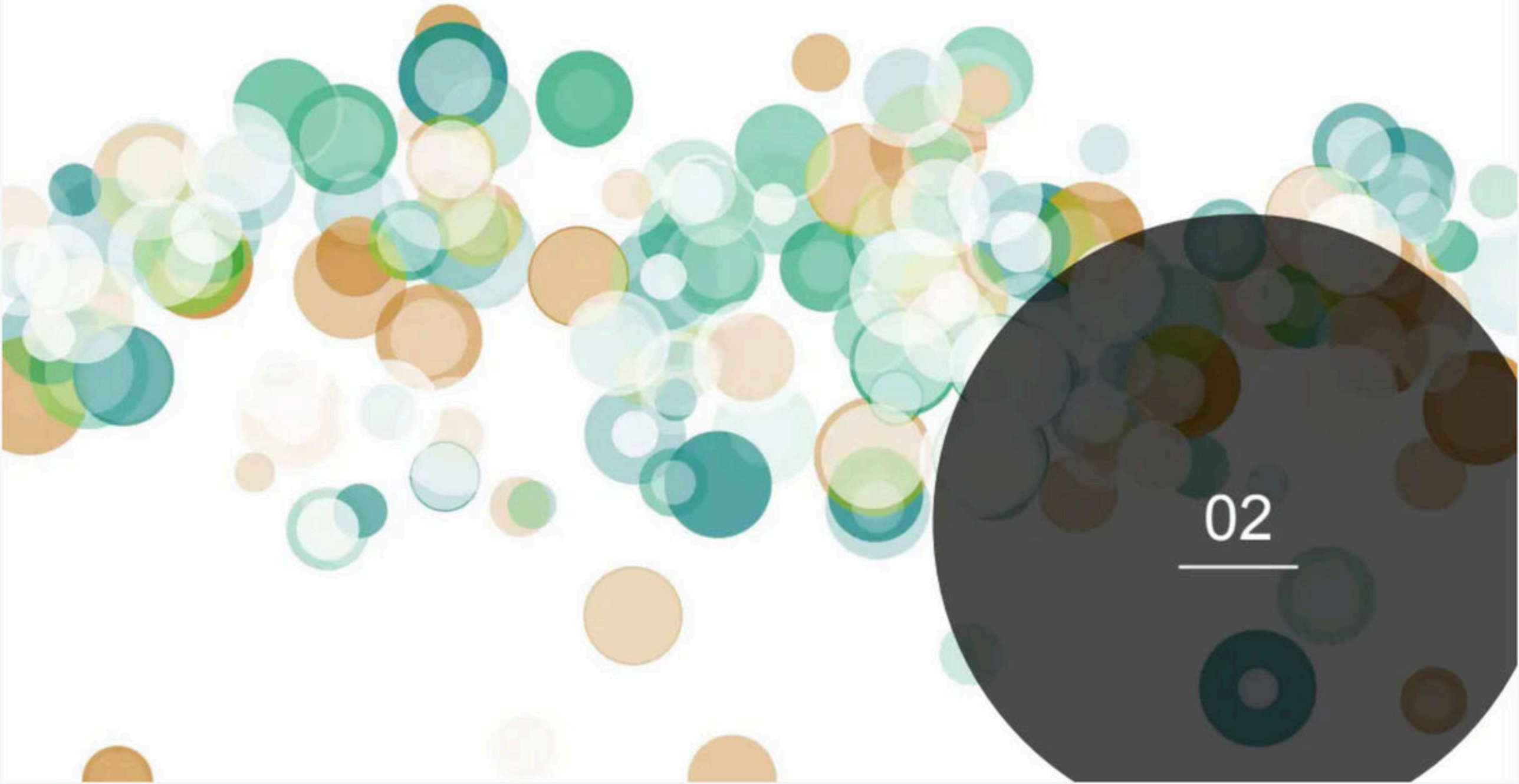
NOTE:

AP	GP
2, 4, 6, 8	2, 4, 8, 16
1 $+2 \Rightarrow$ 4, 6, 8, 10 ✓	4, 6, 10, 18 ✗
2 $-2 \Rightarrow$ 0, 2, 4, 6 ✓	0, 2, 6, 14 ✗
3 $\times 2 \Rightarrow$ 4, 8, 12, 16 ✓	4, 8, 16, 32 ✓
4 $\div 2 \Rightarrow$ 1, 2, 3, 4 ✓	1, 2, 4, 8 ✓
5 Perf. sq. $\Rightarrow$ 4, 16, 36, 64 ✗	4, 16, 64, 256 → ✓
6 Perf cube → 8, 64, 216, 512 ✗	→ 8, 64, 512, 4096 ✓

Miscellaneous

01

$$\log_2 32$$


02

$$\log_3 \frac{1}{243}$$

03

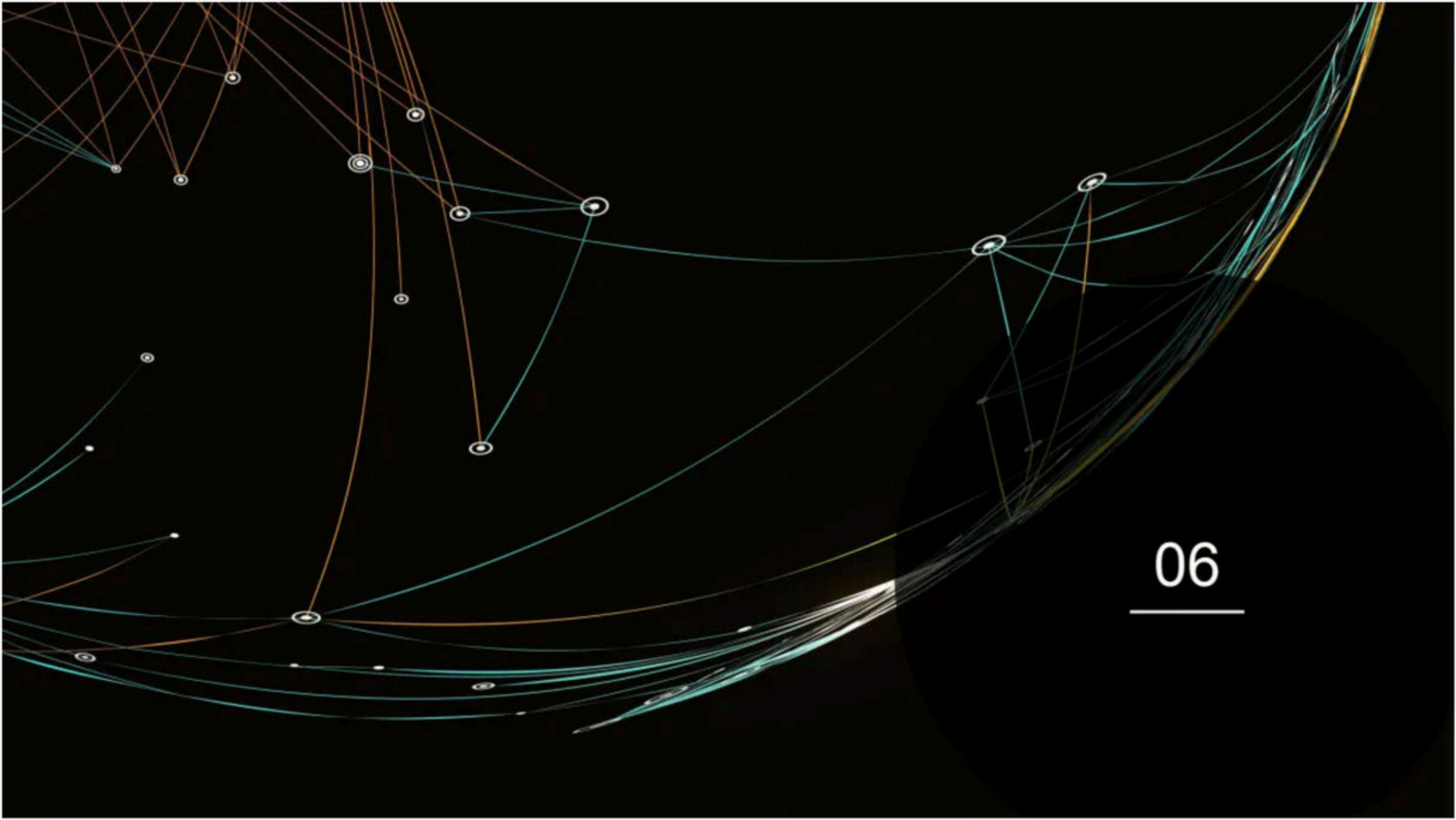
$$\log_{5\sqrt{5}} 5$$

04

$$\log_{100} 0.1$$

05

$$\log_3 5 \log_{25} 27$$



06

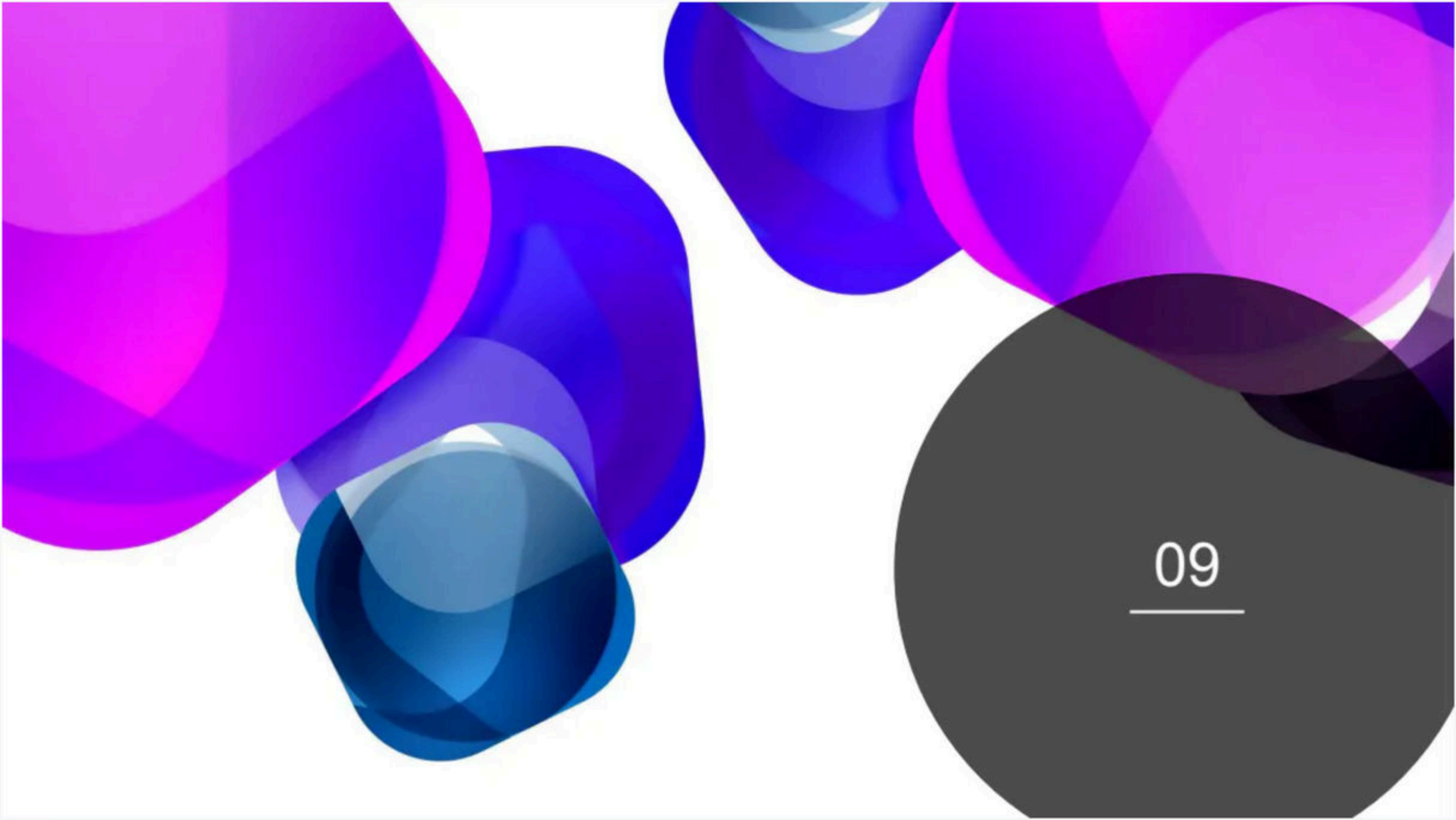
$$\log_9 27 - \log_{27} 9$$

07

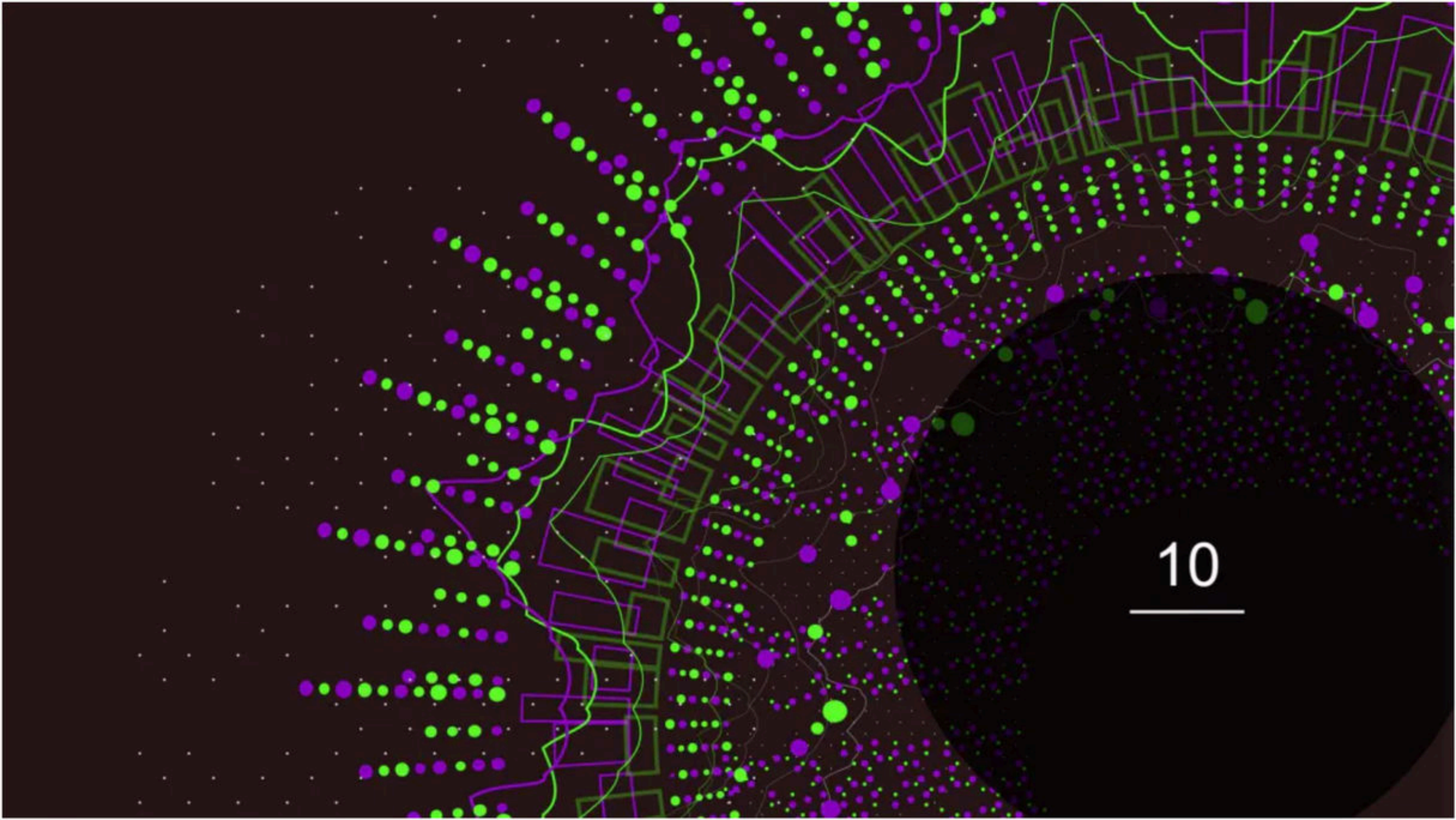
$$\log_6\left(216\sqrt{6}\right)$$

08

$$\log_2 \log_2 \log_4 256 + 2\log_{\sqrt{2}} 2$$


09

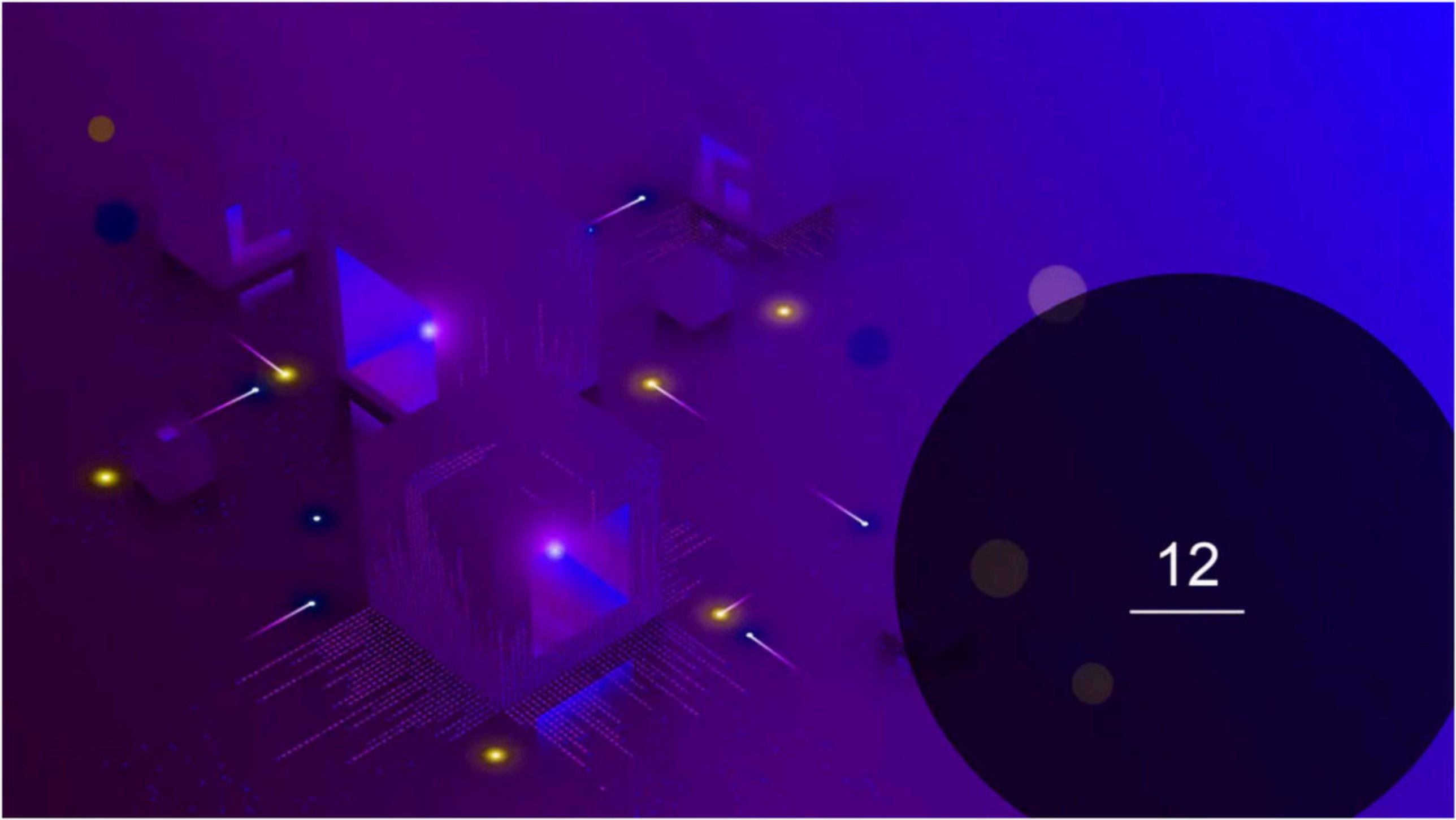
$$3^{-\frac{1}{2}\log_3 9}$$


10

$$10\ 2^{2-\log_2 5}$$

11

$$10^{\log_{10} m + \log_{10} n}$$



12

$$2^{\log_{(2\sqrt{2})} 15}$$

13

$$(5.8)^{\log_{5.8} 10+1}$$

14

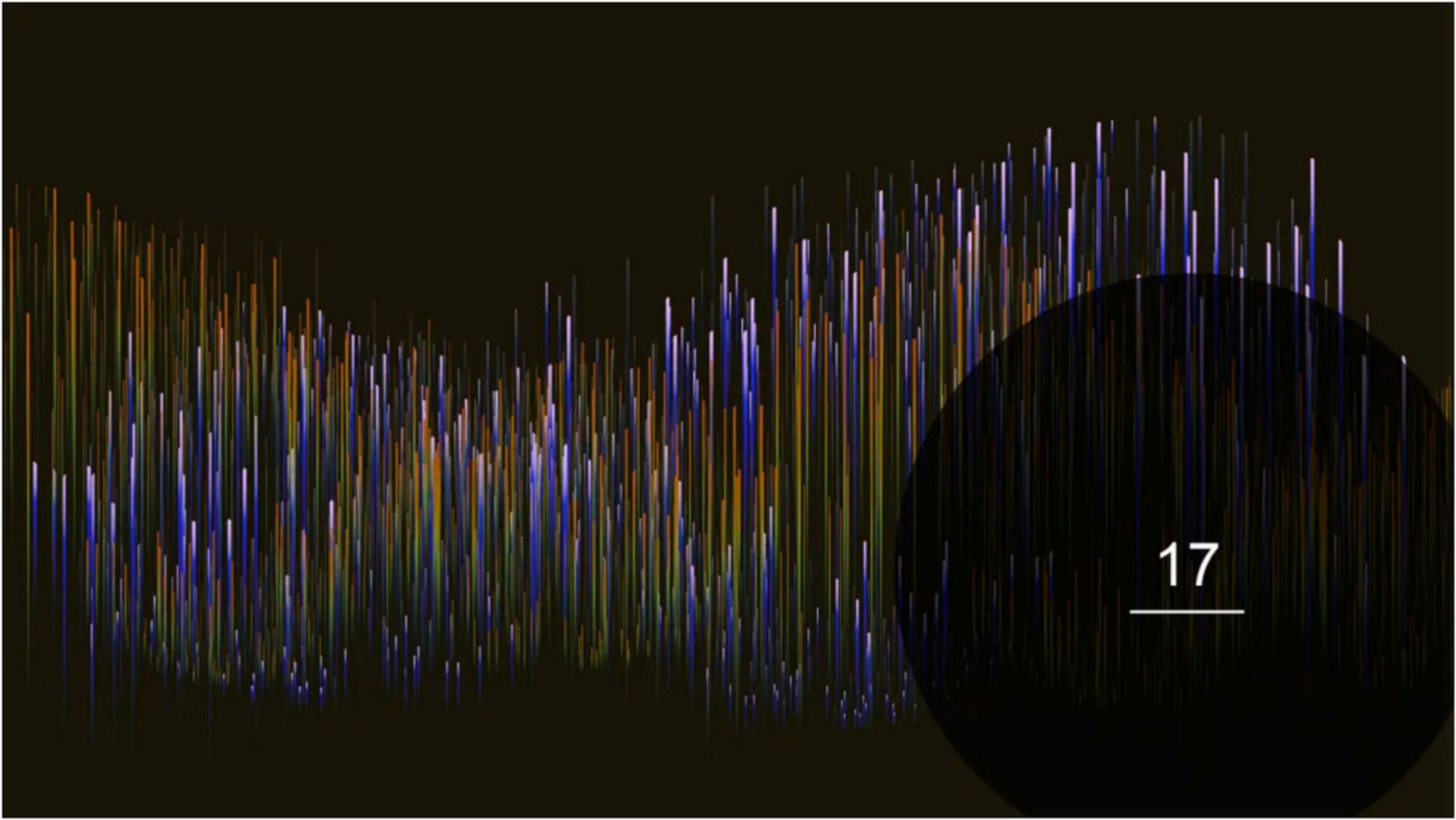
$$8^{\log_2 \sqrt[3]{121}+\frac{1}{3}}$$

15

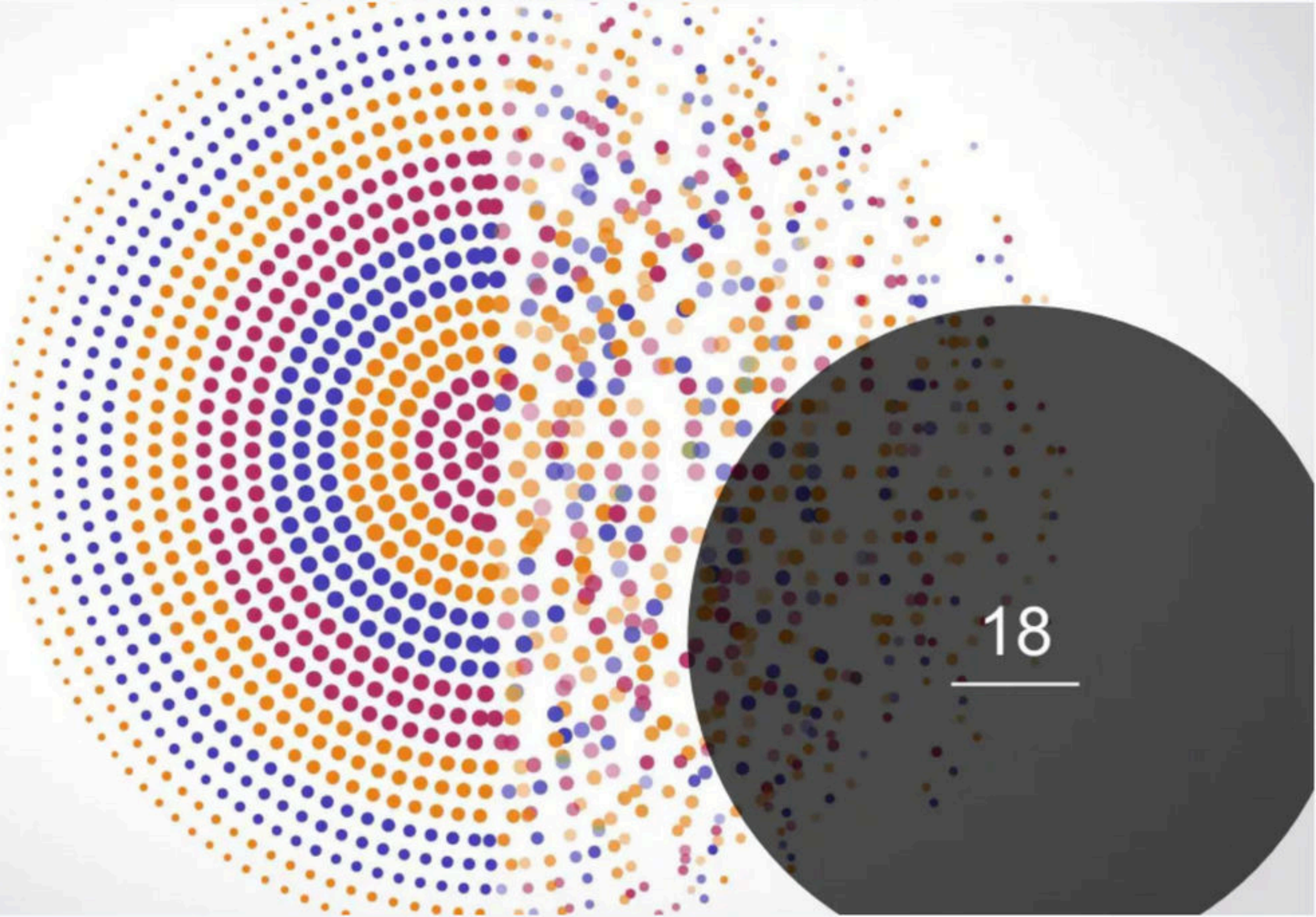
$$\log_2(\log_3 81)$$

16

$$\log_{\pi}\tan(0.25\pi)$$


17

$\log_{10}\log 40° \log_{10}\log 41° \ldots\ldots \log_{10}\log 50°$



18

$$\log\tan 1 + \log\tan 2 + \ldots\ldots + \log\tan 89$$

(A) 1 (B) $\frac{1}{2^{1/2}}$

(C) 0 (D) -1

[GATE 2015 : IIT Kanpur (EC Set - 3, ME Set - 2)]

19

$\log_3 4 \ \log_4 5 \ \log_5 6 \ \log_6 7 \ \log_7 8 \ \ \log_8 9$

20

$$\log_3 2 \log_4 3 \log_5 4 \ldots \ldots \log_{15} 14 \log_{16} 15$$

21

$$\sqrt{\log_{0.5}^{2} 4}$$

22

$$81^{(1/\log_5 3)} + 27^{\log_9 36} + 3^{4/\log_7 9}$$

23

$$(0.16)^{\log_{2.5}\left(\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+\ldots\infty\right)}$$

24

If, $\log_x\left(\frac{5}{7}\right) = -\frac{1}{3}$ then the value of is,

(A) $\frac{343}{125}$ (B) $\frac{125}{343}$

(C) $-\frac{25}{49}$ (D) $-\frac{49}{25}$

[GATE 2015 : IIT Kanpur (EC Set-1)]

25

If $\log_7 \log_5\left(\sqrt{x+5}+\sqrt{x}\right)=0$, find the value of x.

(A) 1 (B) 0

(C) 2 (D) None of these

26

For non-negative integers, a, b, c, what would be the value of

$a + b + c$ if $\log a + \log b + \log c = 0$?

(A) 3 (B) 1

(C) 0 (D) -1

[GATE 2018 : IIT Guwahati (CE Set – 2)]

27

For integers and c what would be the minimum & maximum value respectively of $a + b + c$ if $\log|a| + \log|b| + \log|c| = 0$?

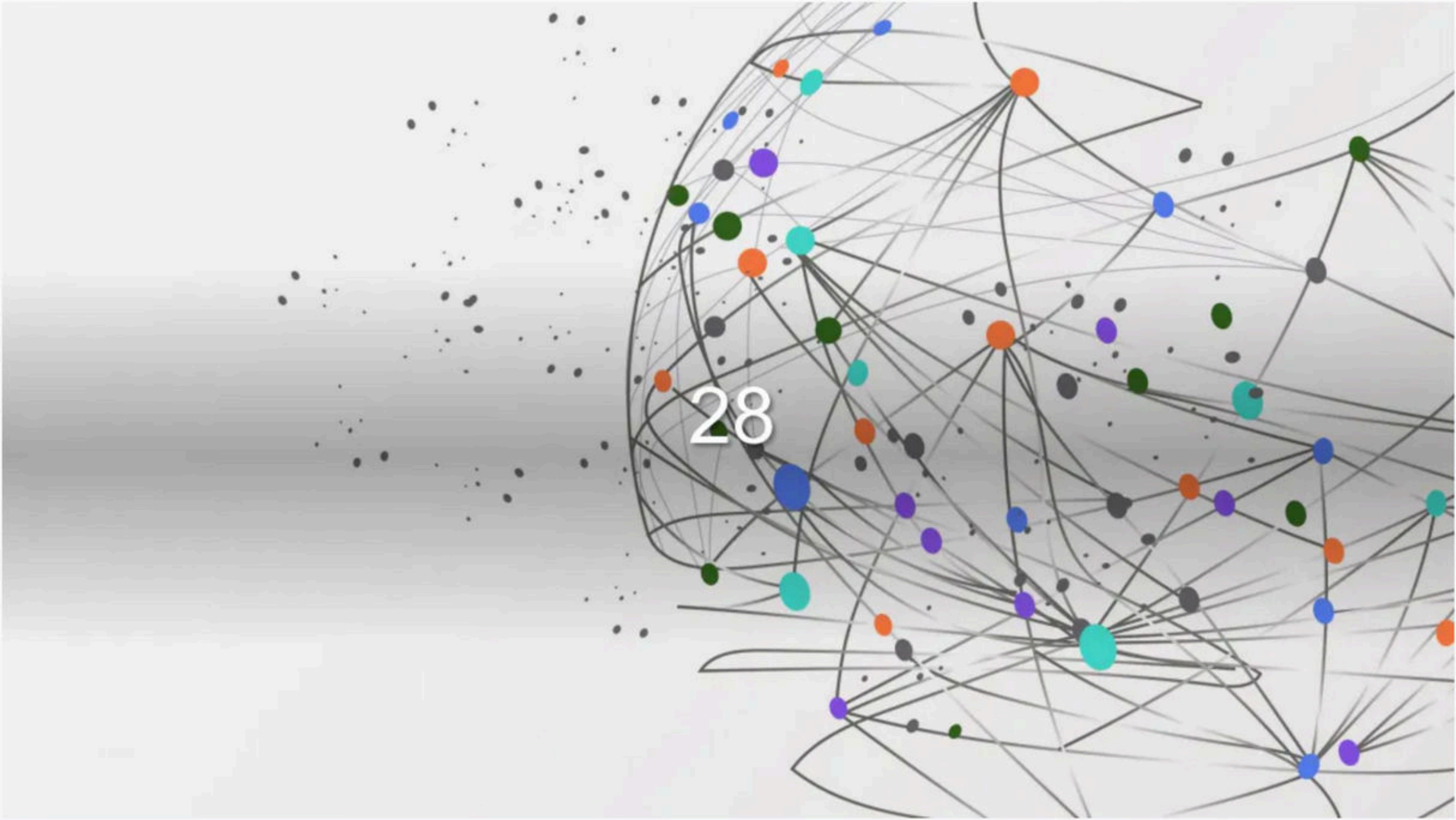
(A) -3 & 3

(B) -1 & -1

(C) -1 & 3

(D) 1 & 3

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


28

Find the odd one from the following group:

W,E,K,O I,Q,W,A

F, N,T,X N,V,B,D

(A) W,E,K,O (B) I,Q,W,A

(C) F, N,T,X (D) N,V,B,D

[GATE 2014 : IIT Kharagpur (EC Set-1, ME Set-1)]

29

Find the odd one in the following group

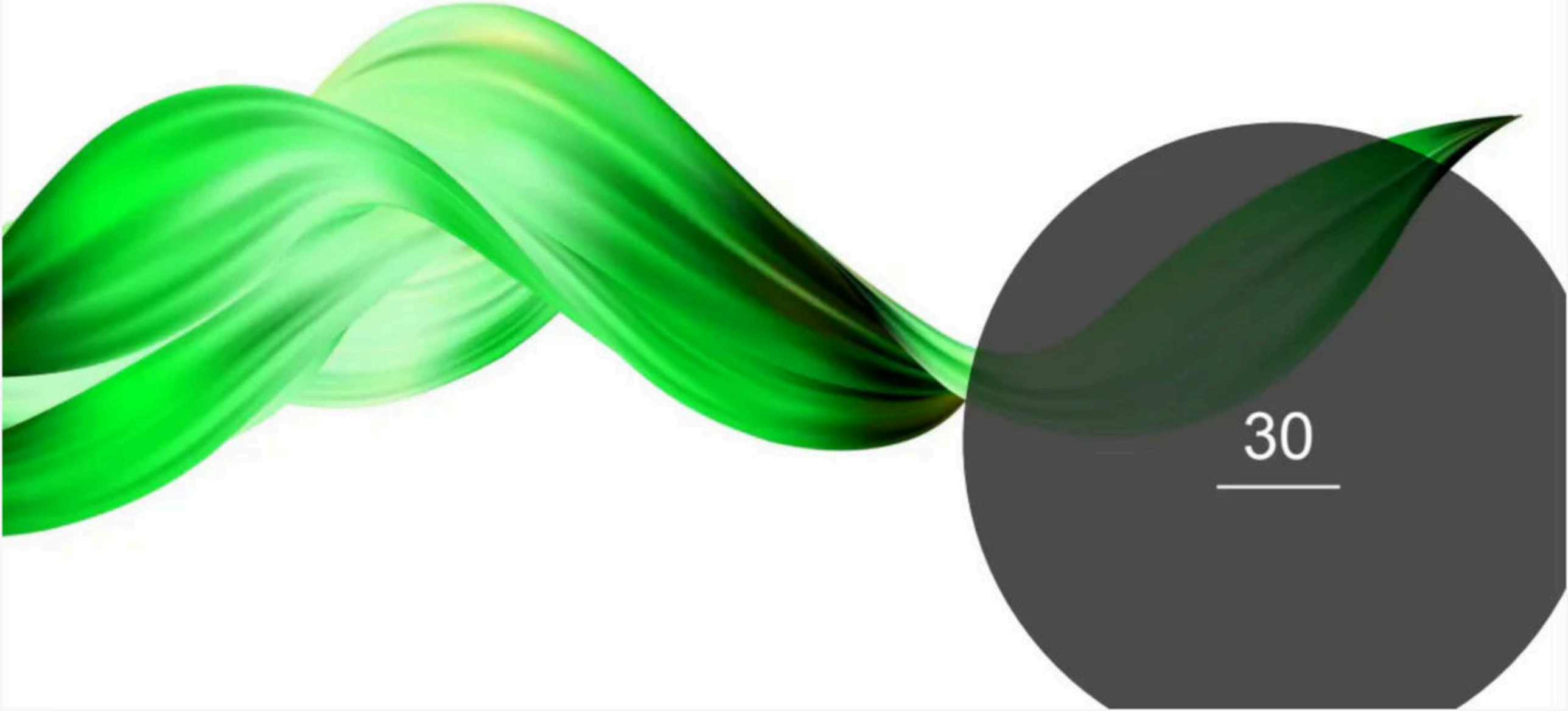
Q,W,Z,B B,H,K,M

W,C,G,J M,S,V,X

(A) Q, W, Z, B (B) B, H, K, M

(C) W, C, G, J (D) M, S, V, X

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


30

If ROAD is written as URDG, then SWAN should be written as:

(A) VXDQ (B) VZDQ

(C) VZDP (D) UXDQ

[GATE 2015 : IIT Kanpur
(CE Set - 1, CSE Set - 3)]

31

Pick the odd one out in the following : 13, 23, 33, 43, 53

(A) 23 (B) 33

(C) 43 (D) 53

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

32

Which number does not belong in the series below :

2, 5, 10, 17, 26, 37, 50, 64

(A) 17 (B) 37

(C) 64 (D) 26

[GATE 2014 : IIT Kharagpur (EE Set - 3, CSE Set - 3)]

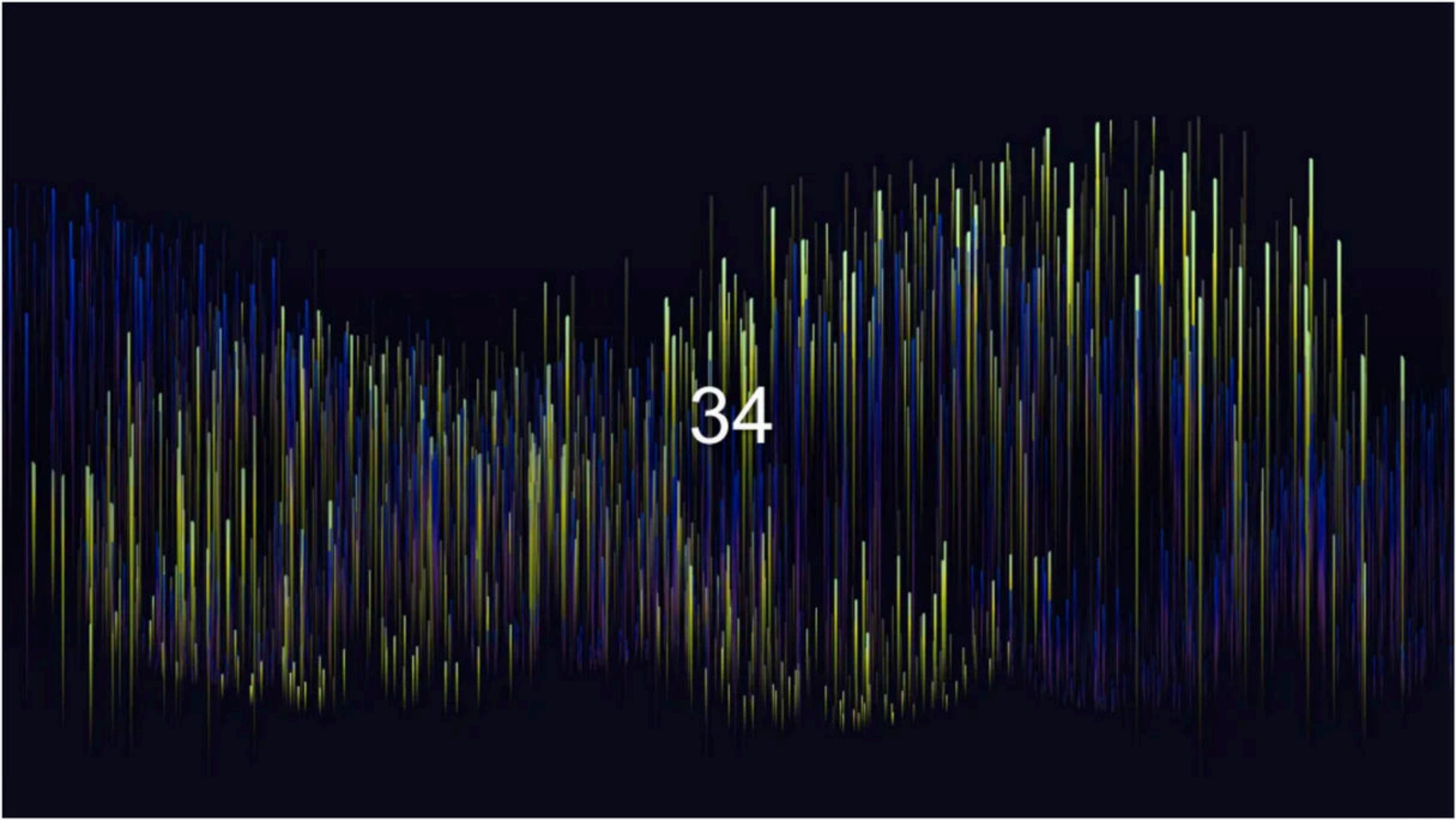
33

The number that least fits this set: (324, 441, 97 and 64) is _____.

(A) 324 (B) 441

(C) 97 (D) 64

[GATE 2016 : IISc Bangalore (IN)]


34

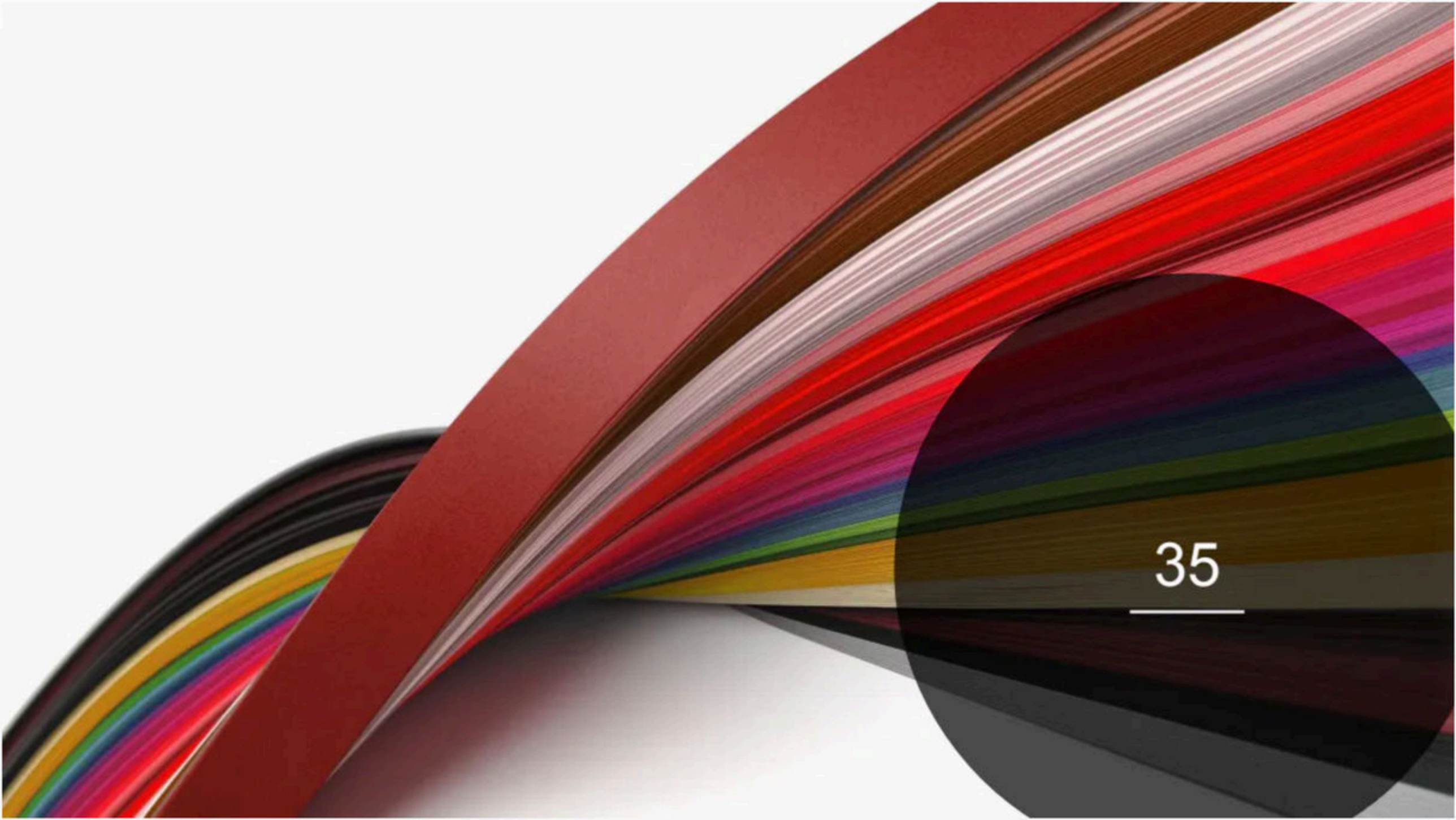
Find the missing group of letters in the following series :

BC, FGH, LMNO, _____.

(A) UVWXY (B) TUVWX

(C) STUVW (D) RSTUV

[GATE 2018 : IIT Guwahati (ME Set – 2)]



35

Fill in the missing number in the series :

2 3 6 15 _____ 157.5 630.

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

36

Find the missing sequence in the letter series below:

A, CD, GHI,?, UVWXY

(A) LMN (B) MNO

(C) MNOP (D) NOPQ

[GATE 2015 : IIT Kanpur (EC Set - 3, ME Set - 2)]

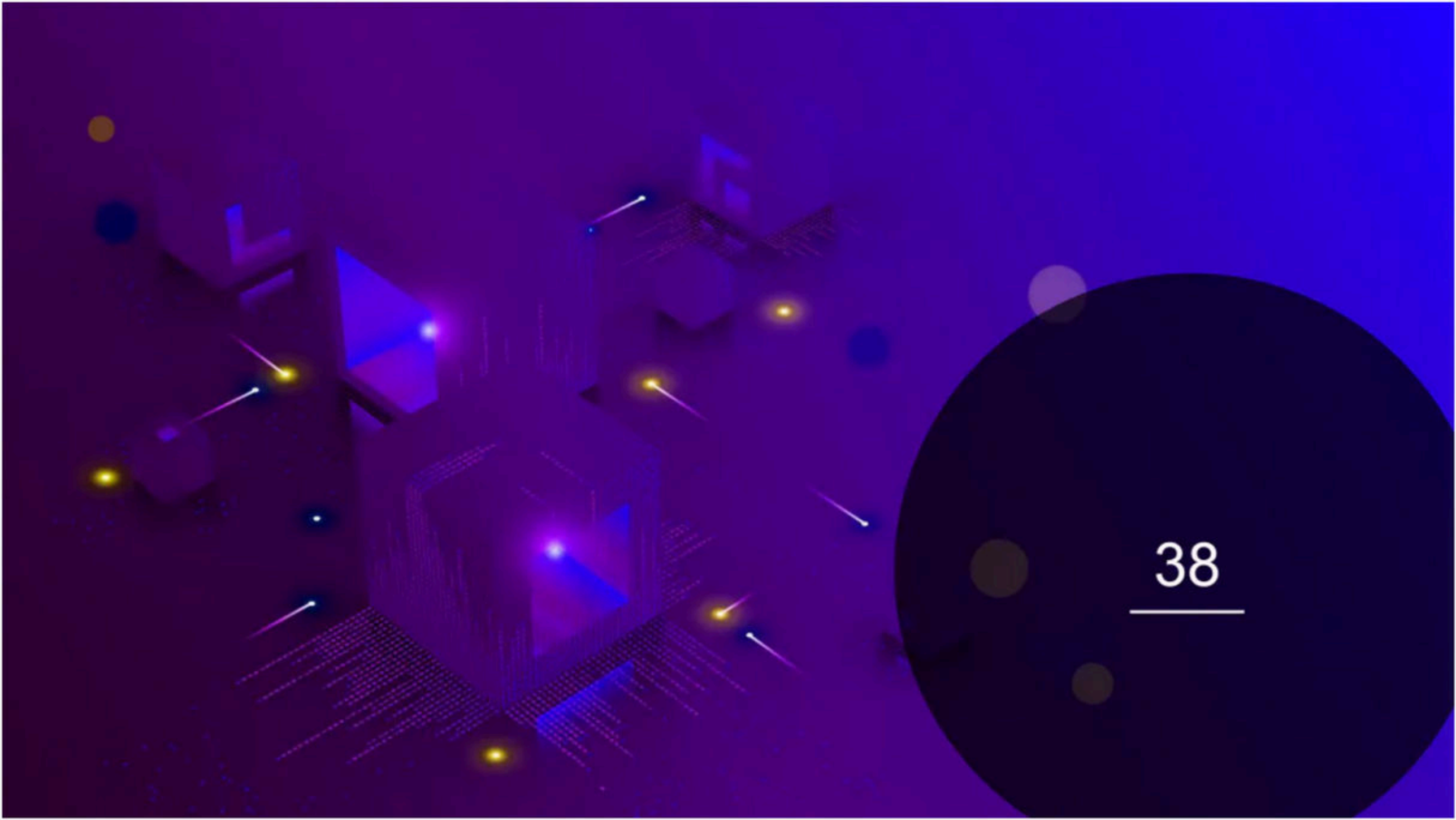
37

Find the next term in the sequence: 7G, 11K, 13M, _____.

(A) 15Q (B) 17Q

(C) 15P (D) 17P

[GATE 2014 : IIT Kharagpur (EC Set - 3, ME Set - 3)]



Find the next term in the sequence: 13M, 17Q, 19S, _____.

(A) 21W (B) 21V

(C) 23W (D) 23V

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

39

What is the next number in the series :

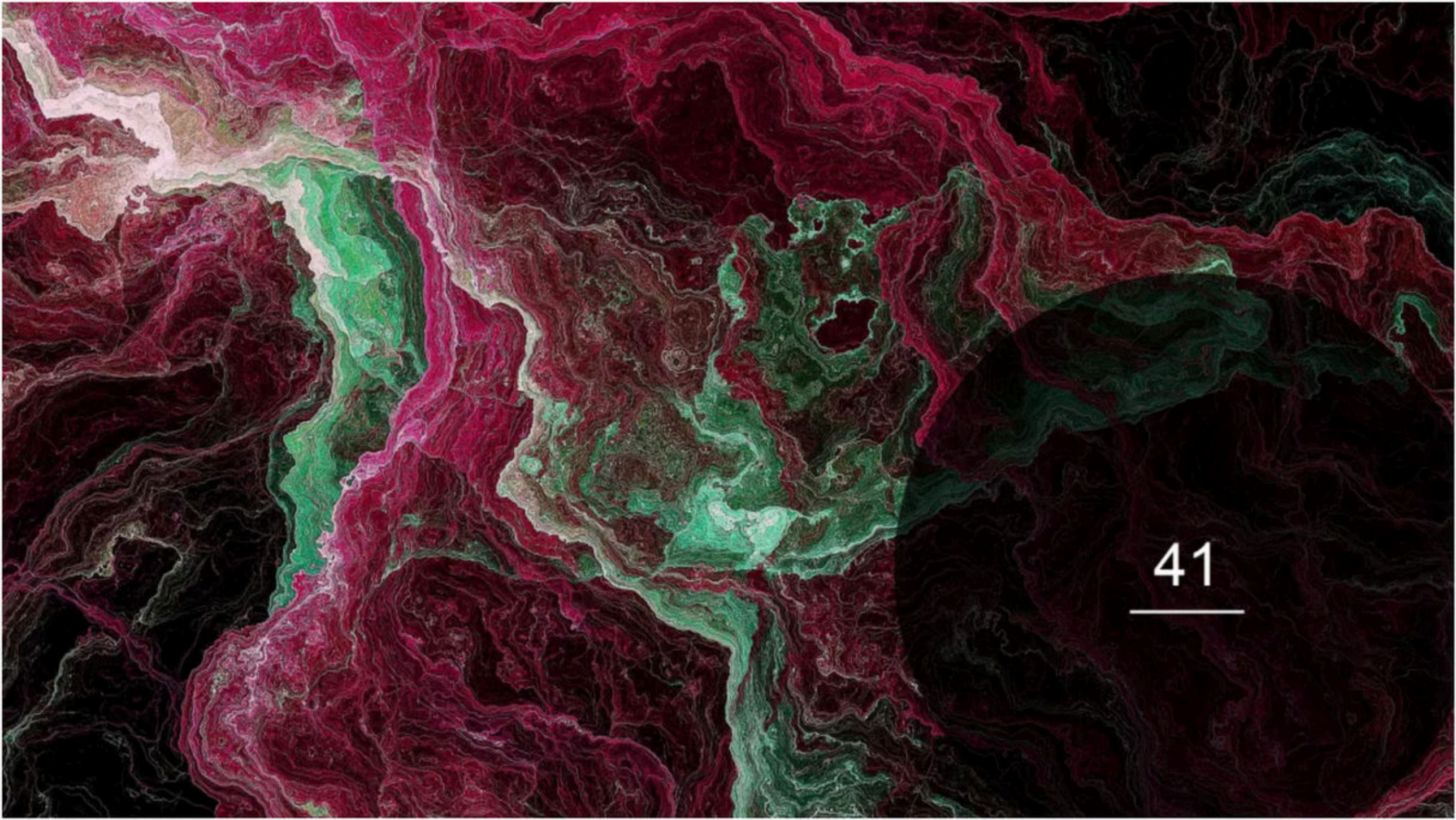
12 35 81 173 357 _____

[GATE 2014 : IIT Kharagpur
(EC Set - 1, ME Set - 1)]

40

The next term in the series 81, 54, 36, 24 … is _____

[GATE 2014 : IIT Kharagpur
(EC Set - 3, ME Set - 3)]

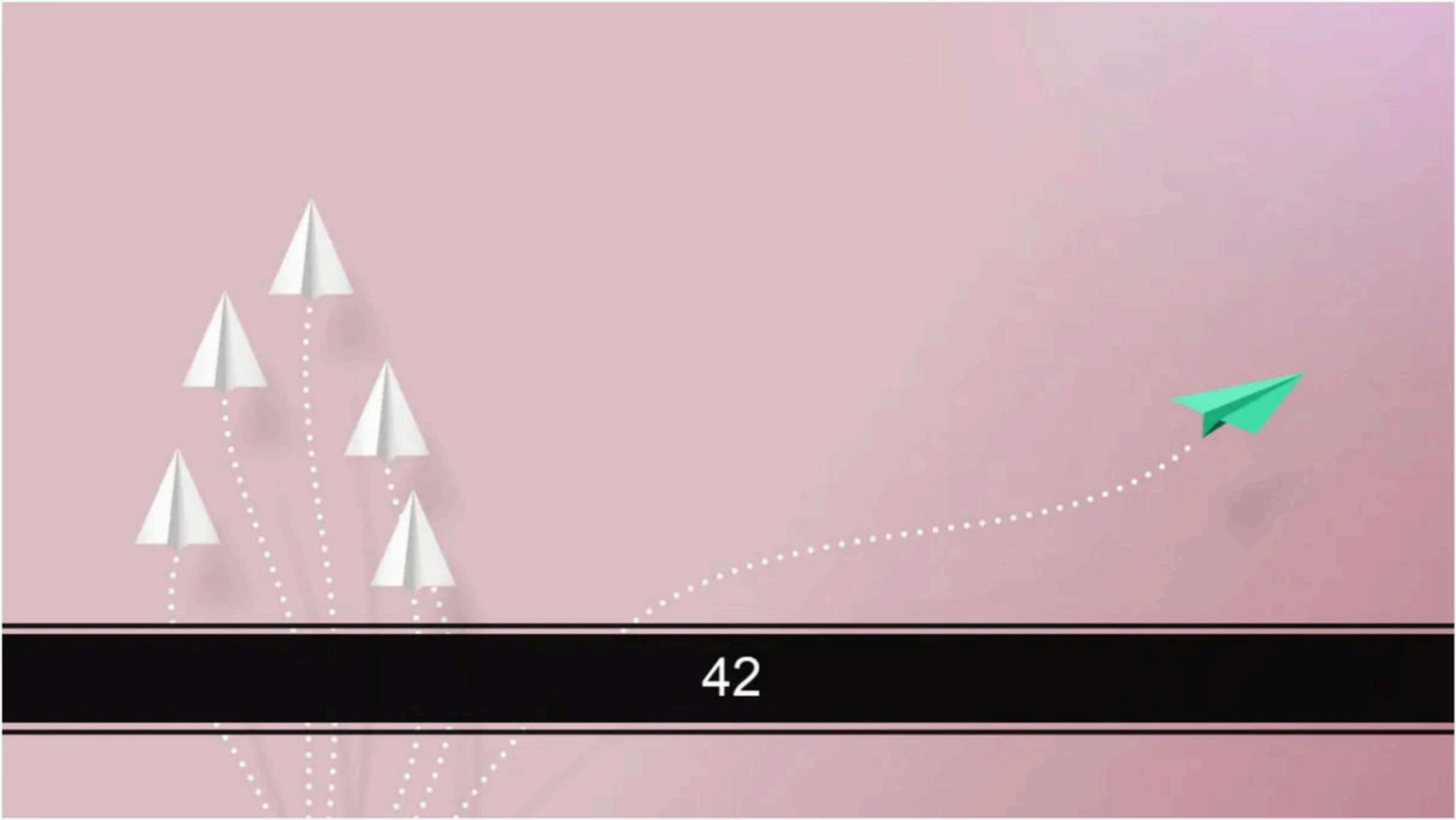


Given the sequence of terms, AD CG FK JP, the next term is

(A) OV (B) OW

(C) PV (D) PW

[GATE 2012 : IIT Delhi (ME, CE, CSE)]



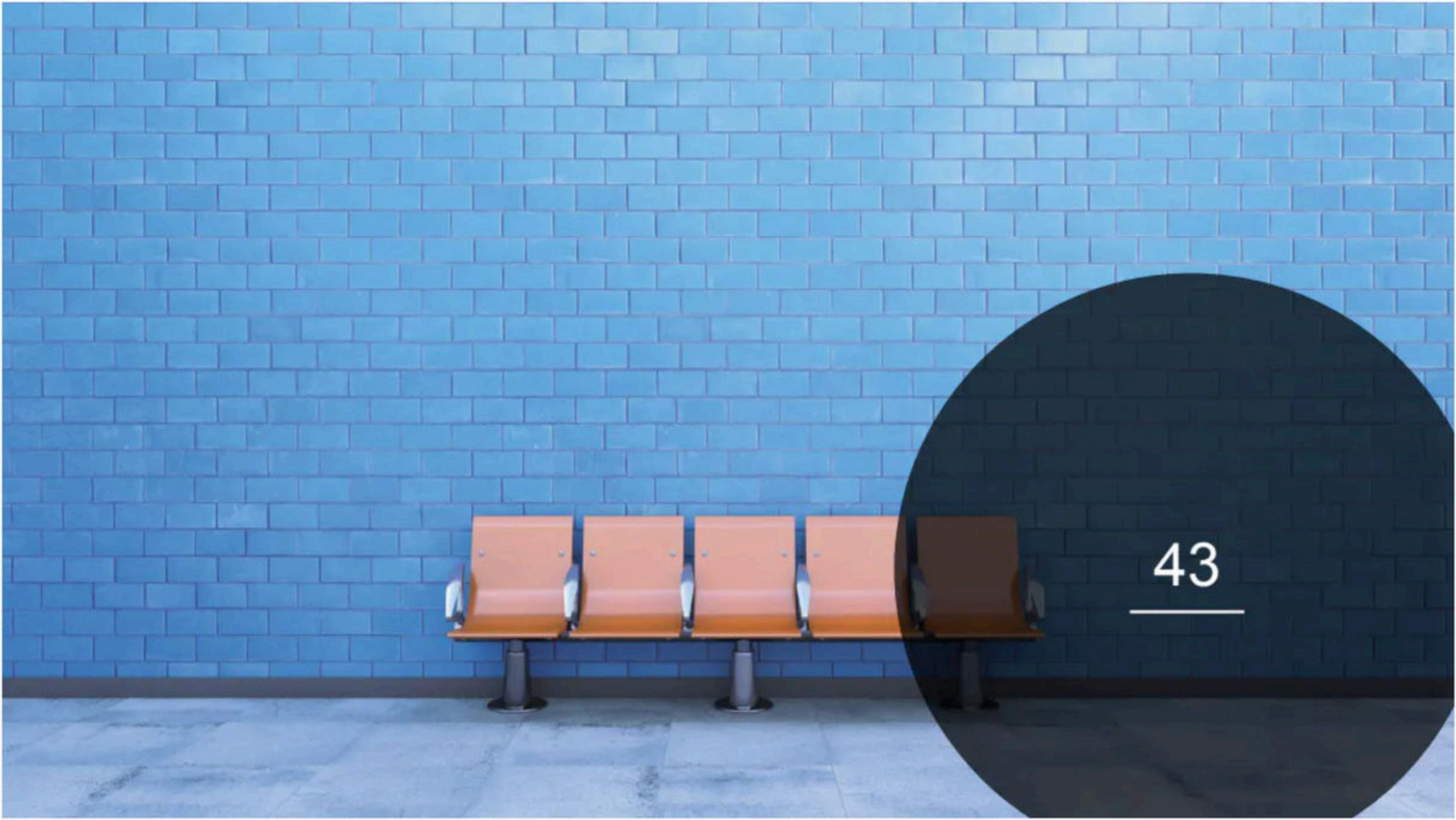
42

If ROAD is written as URDG, then SWAN should be written as:

(A) VXDQ (B) VZDQ

(C) VZDP (D) UXDQ

[GATE 2015 : IIT Kanpur (CE Set - 1, CSE Set - 3)]


43

In a certain code, AMCF is written as EQGJ and NKUF is written as ROYJ. How will DHLP be written in that code?

(A) RSTN (B) TLPH

(C) HLPT (D) XSVR

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

44

The missing number m the given sequence 343, 1331, _____, 4913 is

(A) 4096 (B) 2744

(C) 2197 (D) 3375

[GATE 2019 : IIT Madras (EE]

45

M has a son Q and a daughter R. He has no other children. E is the mother of P and daughter-in-law of M. How is P related to M?

(A) P is the son-in-law of M.
(B) P is the grandchild of M.
(C) P is the daughter-in law of M.
(D) P is the grandfather of M.

[GATE 2016 : IISc Bangalore (IN)]

46

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

(A) 0 (B) 2

(C) 5 (D) 6

7 1 5 ? 4 2 3

3

7 1 5 8 4 2 3

9

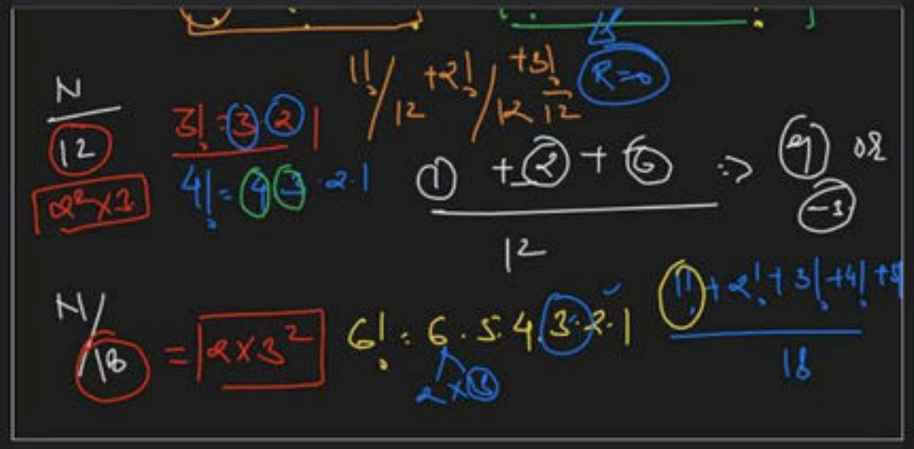
[GATE 2018 : IIT Guwahati (EC Set – 1)]

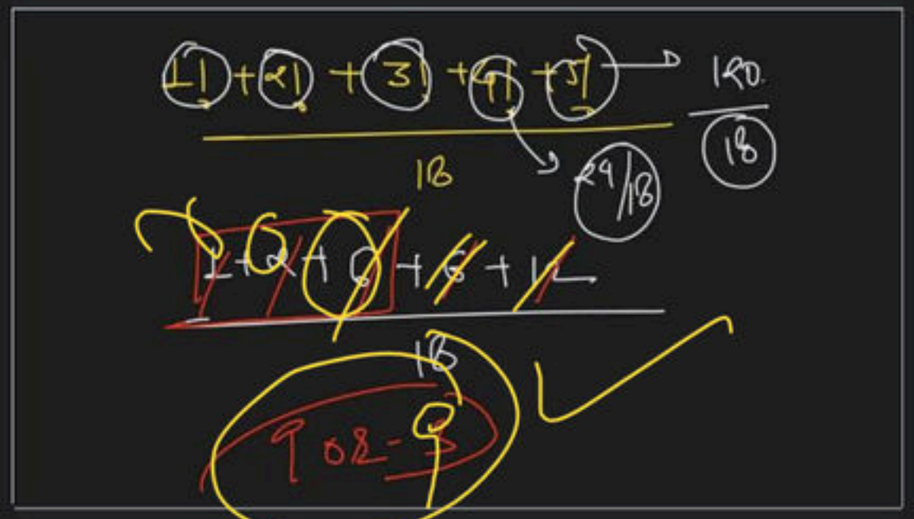
unacademy

▲ 3 • Asked by Bhabagrahi

Sir 9 or -9 hoga na -3 kesse

Number System - V





NOTE 9 11

H

23 × 11

2 5 3

39 × 11

3 7 4

53 × 11

5 8 3

98 × 11

9 1 7 8

98 × 11

1

9 7 8

1078

$N = abcdef$

$e\ o\ e\ o\ e\ o$

$Sum_{odd} \sim Sum_{even}$

$= \boxed{0 \mid 11n}$

121

1331

4 4 2

7/13

$$N = \underbrace{abc}_{\text{odd}}\underbrace{def}_{e}\underbrace{ghi}_{\text{odd}}$$

$$\text{Sum}_{\text{odd}} \sim \text{Sum}_{\text{even}}$$

$$(abc + ghi) \sim (def) = 0/7n$$

210 | 007

210 ~ 007

$\frac{203}{7}$

140 | 210 | 007

odd

odd

(140 + 007) ~ 210

147 ~ 210

$\frac{63}{7}$

~ | — |

014007

even odd

14 ~ 007 ⟹ 7.

TEST

1 350 007 ⇒ 350 ~ 007

AND

28 = 2 × 7

2 630 140 700

14 = 2 × 7

Prime factors

1330
− 140
1190

15

$$XI = \underbrace{abc}_{odd}\,\underbrace{def}_{e}\,\underbrace{ghi}_{odd}$$

Sum odd ~ Sum even

triples.

$$(abc + ghi) \sim (def)$$

260 013.

$$\begin{array}{r} 260 \\ -\ 013. \\ \hline 247 \end{array}$$

390 260 130

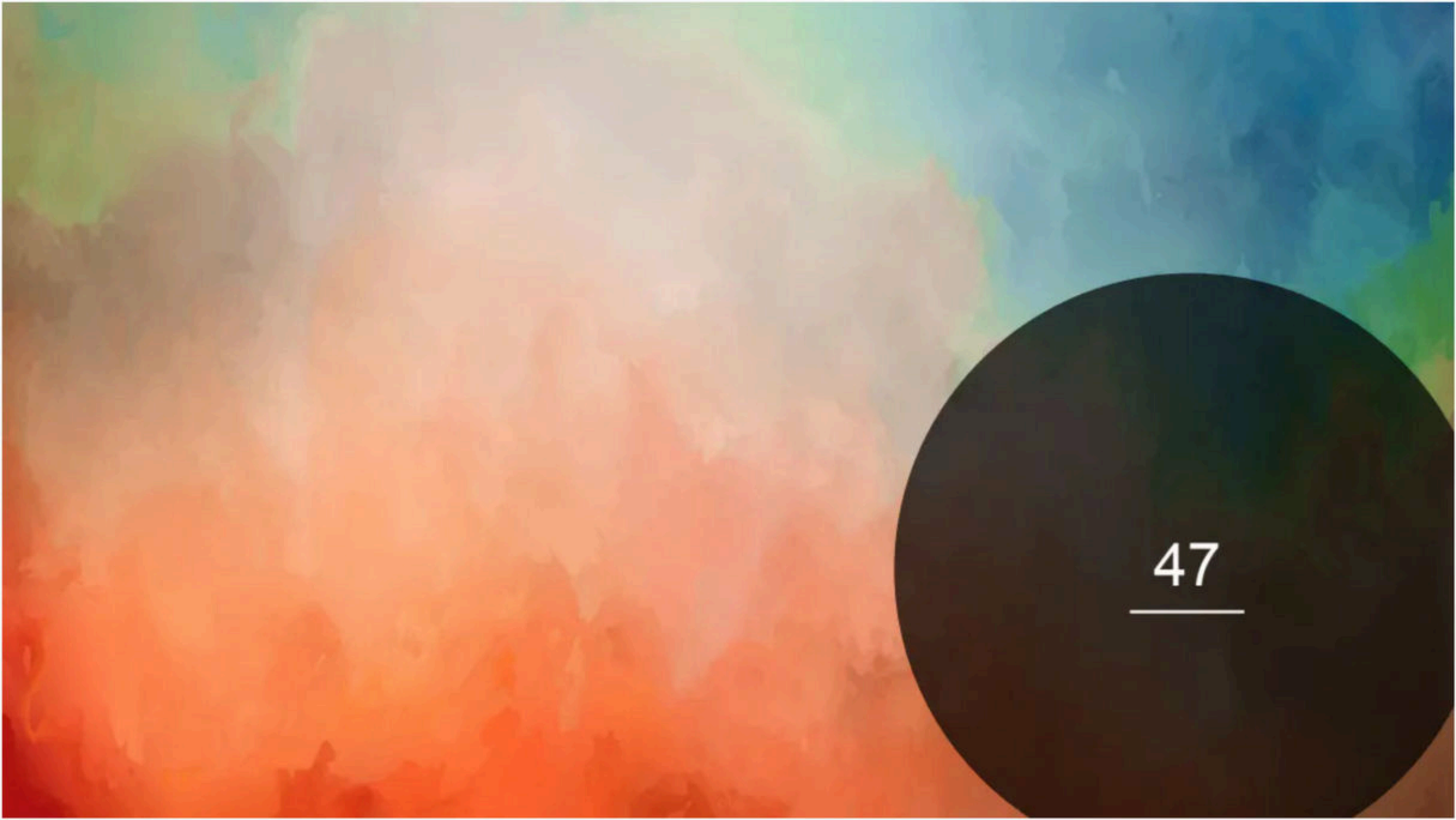
odd e odd

26 = 2 × 13

(390 + 130) ~ 260

520 ~ 260

260


47

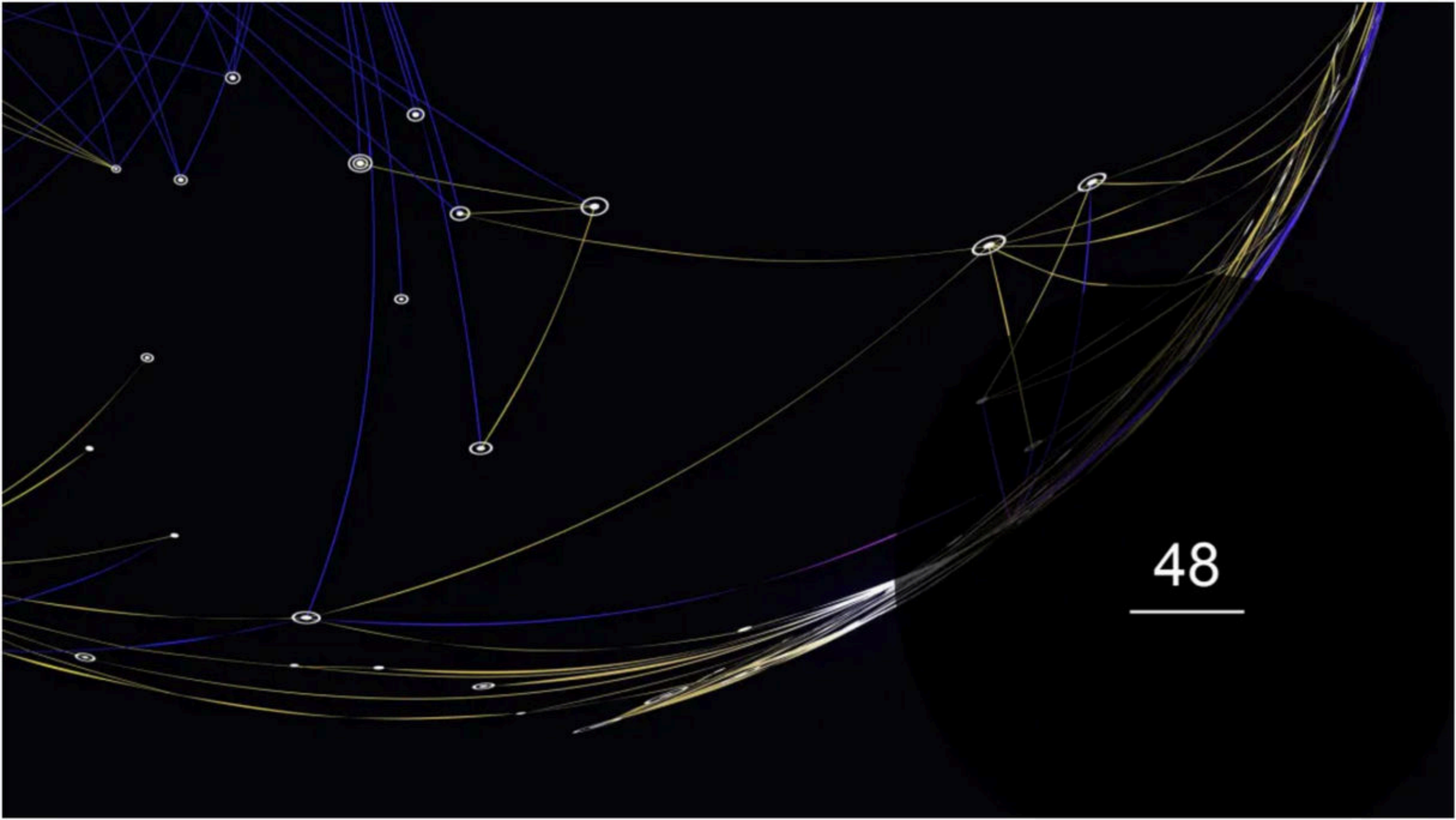
What is the value of $\overset{a}{1} + \frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \frac{1}{256} + \ldots$?

(A) 2 (B) $\frac{7}{4}$

(C) $\frac{3}{2}$ (D) $\frac{4}{3}$

$$S_\infty = \frac{a}{1-r} = \frac{1}{1-1/4} = \boxed{4/3}$$

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



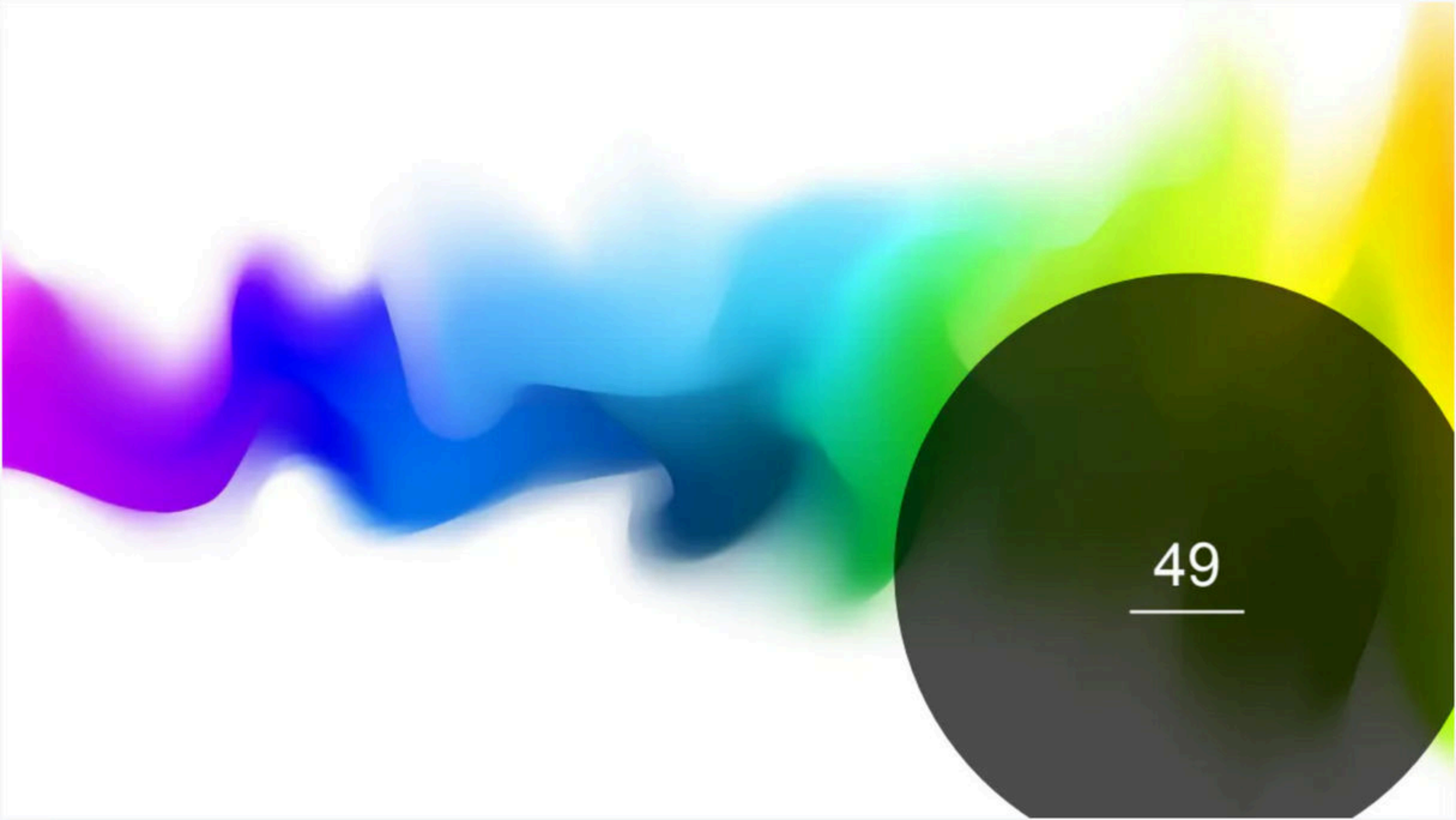
48

There are eight bags of rice looking alike, seven of which have equal weight and one is slightly heavier. The weighing balance is of unlimited capacity. Using this balance, the minimum number of weighing required to identify the heavier bag is

(A) 2 (B) 3

(C) 4 (D) 8

[GATE 2012 : IIT Delhi (EC, EE)]


49

If the list of letters, P,R,S,T,U is an arithmetic sequence, which of the following are also in arithmetic sequence?

I. 2P, 2R, 2S, 2T, 2U

II. P- 3,R-3,S- 3,T- 3,U- 3

III. ~~P2 , R2 , S2 ,T2 ,U2~~ P^2, R^2, S^2, T^2, U^2

(A) I only (B) I and II

(C) II and III (D) I and III

[GATE 2015 : IIT Kanpur (EE Set - 2, CSE Set - 2)]

$$S_\infty = \frac{a}{1-r}$$

GP

$$1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \cdots \infty$$

$$S_\infty = \frac{a}{1-r} = \frac{1}{1-\frac{1}{2}} = 2$$

$$\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \frac{1}{3^4} + \cdots \infty$$

$$= \frac{a}{1-r} = \frac{\frac{1}{3}}{1-\frac{1}{3}} = \frac{1}{3} \cdot \frac{3}{2}$$

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

Brain | Br cale — 2018

Divisibility Rule

8871383926

$\boxed{1}$ 2 | 4 | 8 | 16

$2^{\boxed{1}} = \boxed{2}$ 9765431 6

$2^{2} = 4$ 9987687 $\boxed{24}$

$2^{3} = 8$ 1234 $\boxed{572}$

$2^{4} = 16$ 1234567 $\boxed{4096}$

$$\frac{98765 - 140}{4}$$

$$\frac{1\,85\,497\,375}{12\,5}$$

$\boxed{2}$ 5 | 25 | 125

$5^1 = 5 \longrightarrow 98765$

$5^2 = \boxed{25} \Rightarrow 143\boxed{75},3457\boxed{00}$

$5^3 = 125 \Longrightarrow 1298765\boxed{00}$

99876125

TEST

PIN

1. 1375-36 → 2

2. 98764 68 → 4

3. 12785 7500 → 125

4. 98765 75 → 25

5. 98767 → 8

6. 12345 02 → 125

$\boxed{5}$ 3/9

123

$\frac{DS}{3}$ ✓

$\frac{\times 1}{3}$ ✓

DS/9 ✓

×1/9 ✓

DS = 1+2+3 = 6

6/3 ✓

9 7 5 4 3 0 1 2 8 7 6 5 1 2

3

1 2 3 4 9 8 7 6 5 2 3 0 2

9

8

50

The value of $\sqrt{12+\sqrt{12+\sqrt{12+\ldots}}}$ is

(A) 3.464 (B) 3.932
(C) 4.000 (D) 4.444

[GATE 2014 : IIT Kharagpur
(EE Set - 2, CSE Set - 2)]

51

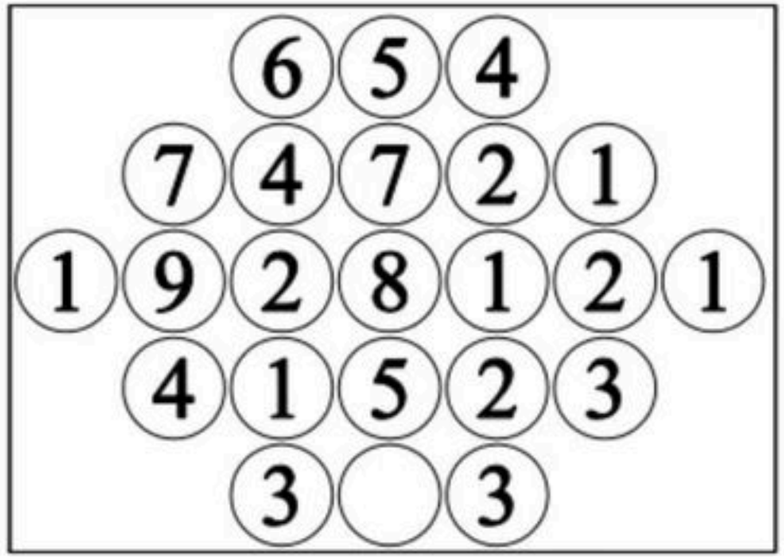
What will be the maximum sum of 44, 42, 40, ... ?

(A) 502 (B) 504
(C) 506 (D) 500

[GATE 2013 : IIT Bombay (ME, CSE)]

52

Fill in the missing value



[GATE 2015 : IIT Kanpur (EC Set - 1)]

53

Find the sum of the expression

$$\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4+\ldots\ldots+}}\frac{1}{\sqrt{80}+\sqrt{81}}$$

(A) 7 (B) 8

(C) 9 (D) 10

[GATE 2013 : IIT Bombay (ME, CSE)]

54

What is the sum of the series:

$$\frac{1}{(1\times2)}+\frac{1}{(2\times3)}+\frac{1}{(3\times4)}+\ldots\ldots+\frac{1}{(100\times101)}$$

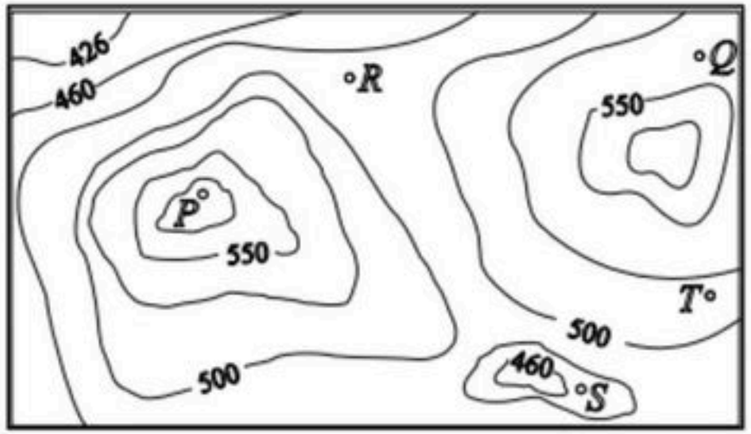
(A) Ignored (B) Appreciated

(C) Twisted (D) Returned

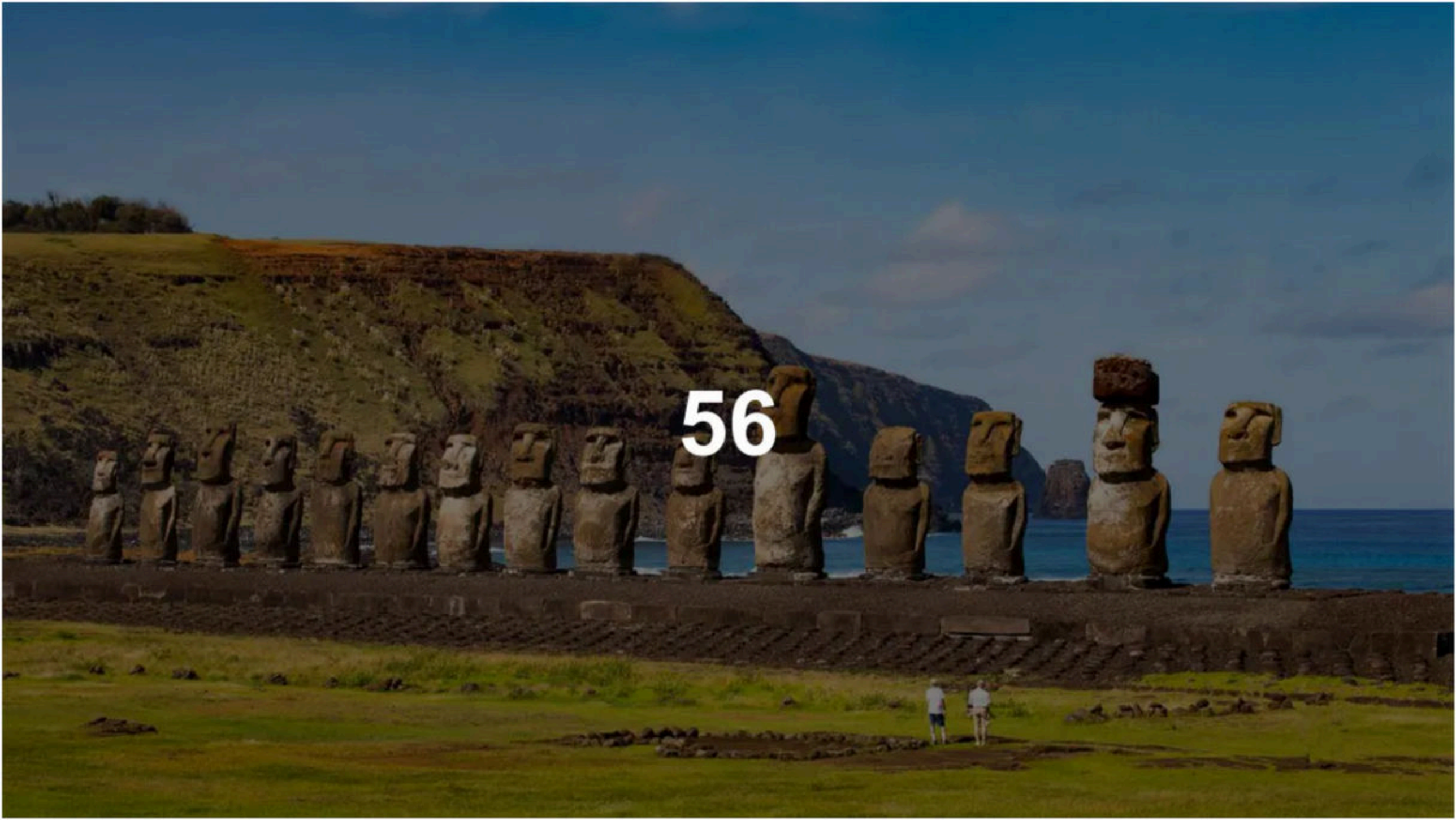
55

A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot. If in a flood the water level rises to 525 m, which of the villages P, Q, R, S, T gets submerged?

(A) P, Q
(B) P, Q, T
(C) R, S, T
(D) Q, R, S



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


56

A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot.

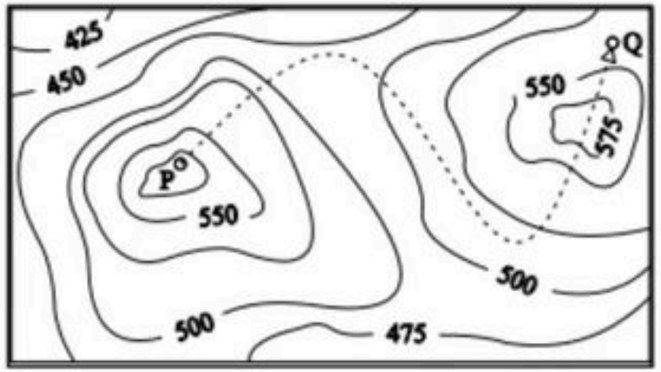
The path from P to Q is best described by

(A) Up-Down-Up-Down

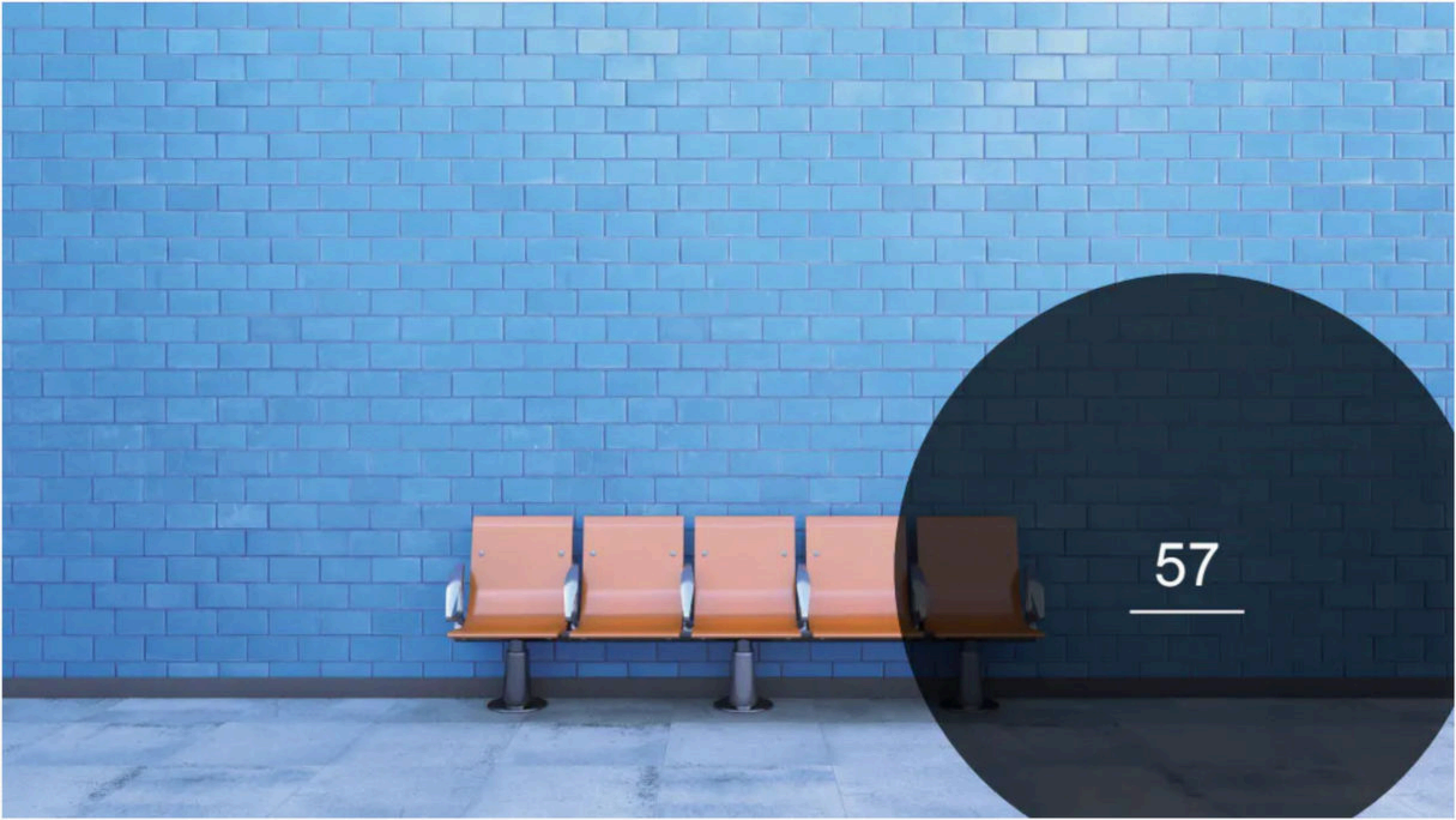
(B) Down-Up-Down-Up

(C) Down-Up-Down

(D) Up-Down-Up

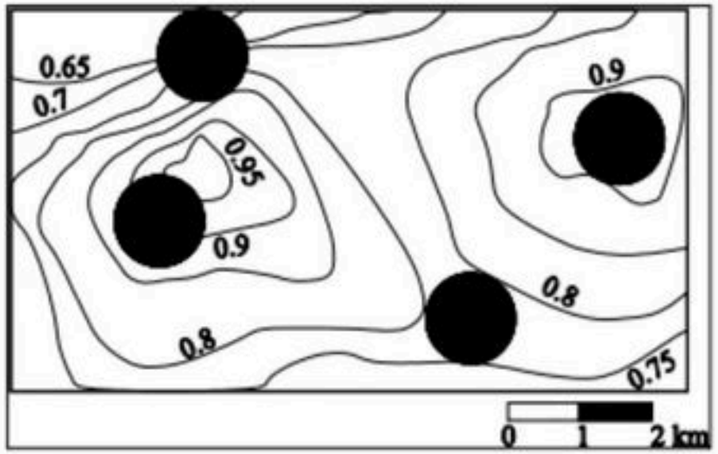


[GATE 2017 : IIT Roorkee (EC, BT, PI Set – 1)]


57

An air pressure contour line joins locations in a region having the same atmospheric pressure. The following is an air pressure contour plot of a geographical region. Contour lines are shown at 0.05 bar intervals in this plot.

If the possibility of a thunderstorm is given by how fast air pressure rises or drops over a region, which of the following regions is most likely to have a thunderstorm?



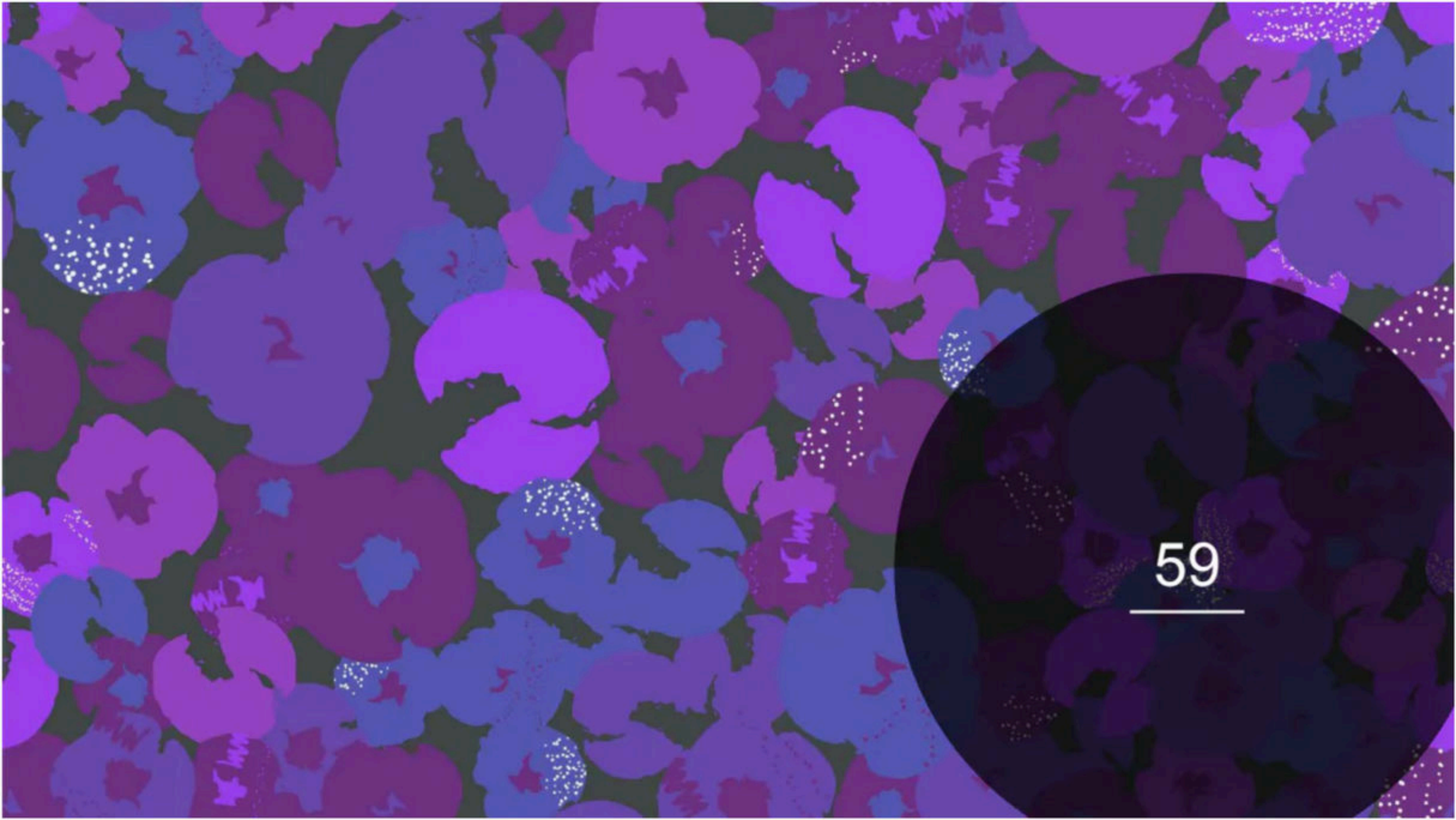
(A) P (B) Q

(C) R (D) S

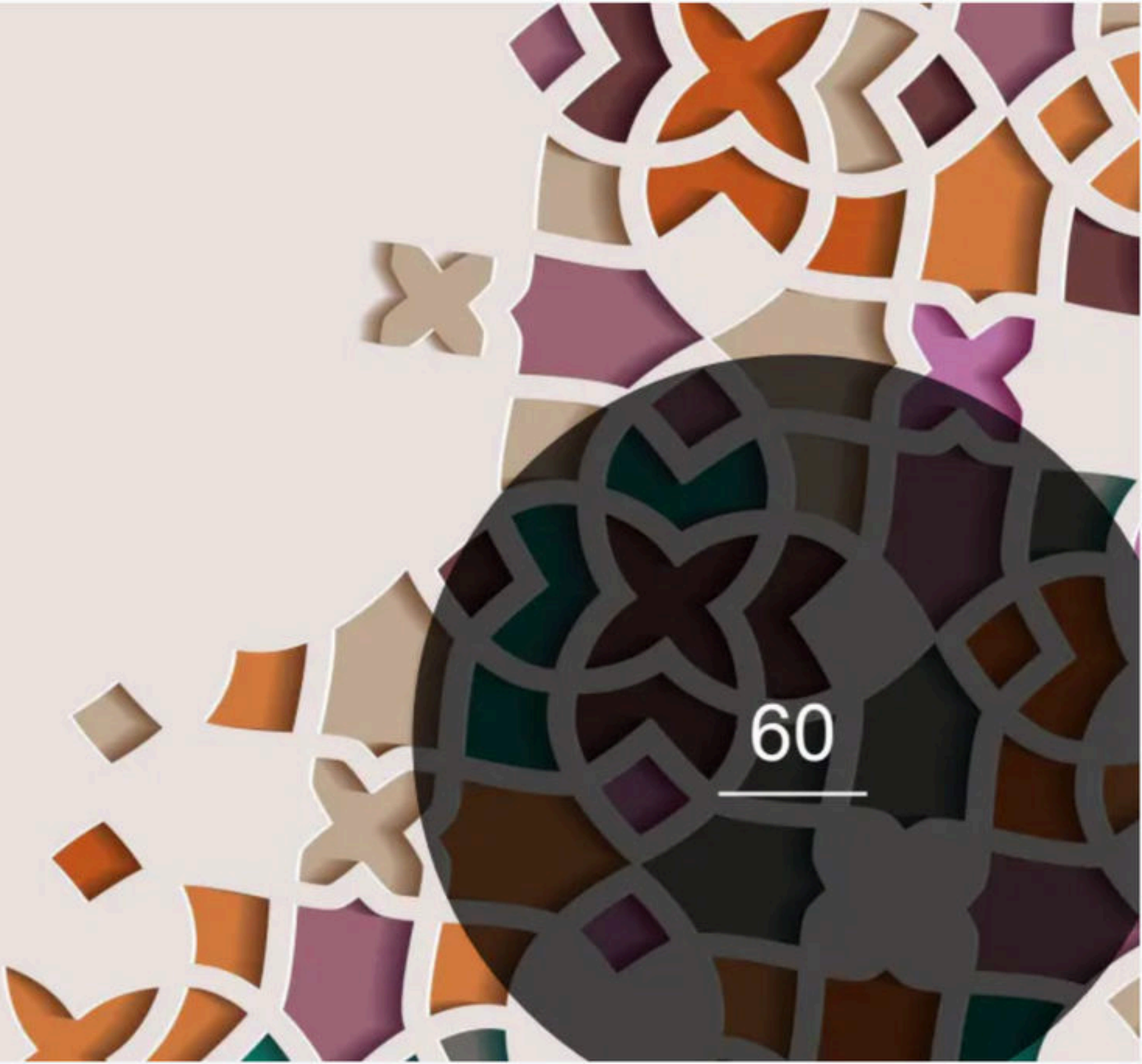
[GATE 2017 : IIT Roorkee (EE, CS Set – 2)]

58

Find the sum of the series : $\frac{1}{3} + \frac{2}{3^2} + \frac{3}{3^3} + \frac{4}{3^4} + \ldots \infty$


59

Find the sum of the series : $\frac{1}{3}+\frac{4}{3^2}+\frac{9}{3^3}+\frac{16}{3^4}+\ldots\infty$

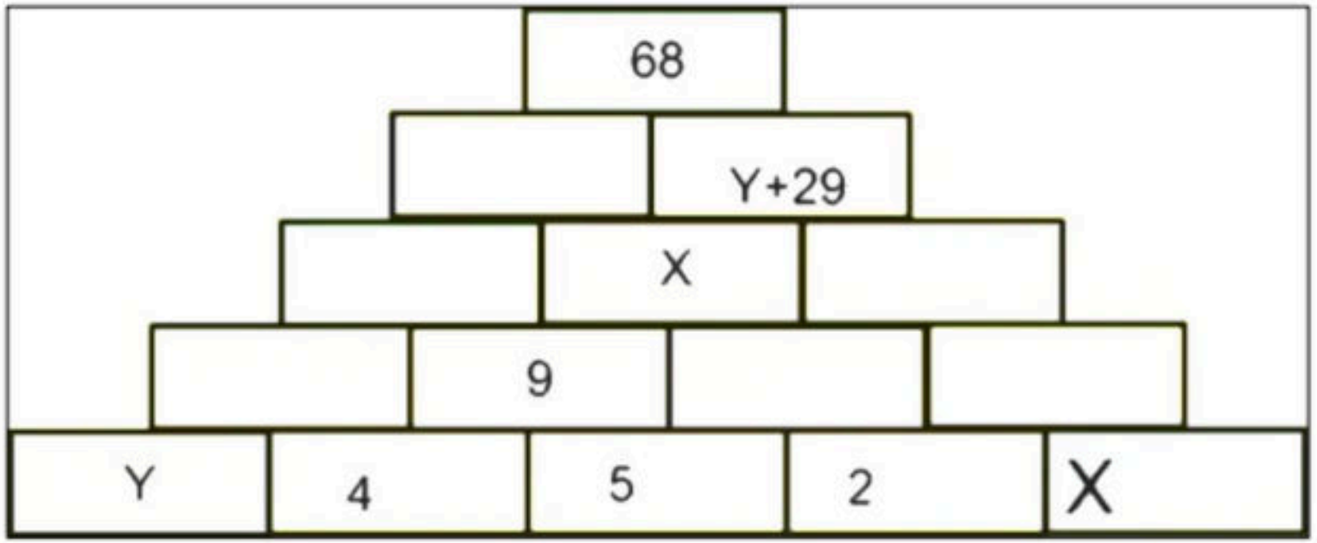


60

In the figure, number in any cell is obtained by adding two numbers in the cells directly below it. For example, 9 in the second row is obtained by adding the two numbers 4 and 5 directly below it. The value of X – Y is

(A) 2 (B) 3

(C) 4 (D) 5



61

Saira, Mumtaz and Zeenat have a ball, a pen and a pencil, and each girl has just one object in hand.

Among the following statements, only one is true and the other two are false

I. Saira has a ball.

II. Mumtaz does not have the ball.

III. Zeenat does not have the pen.

Who has the ball?

(A) Saira (B) Mumtaz

(C) Zeenat (D) Cannot be determined

62

TEES AND ELS

Of Annette, Bernice, and Cynthia:

A. Each belongs either to the Tee family whose members always tell the truth or to the E1 family whose members always lie.

B. Annette says "Either I belong or Bernice belongs to a different family from the other two.'

Whose family do you know the name of?

63

On 19th September 2007 somebody stole a mobile phone from an electronics shop. The police arrested five suspects Vivek, Kartik Rajat, Pranav and Ritam. They gave their statements to the police officer. Given below is a summary of their statements:

Kartik : It was not Vivek, it was Ritam.

Ritam : It was not Pranav. It was not Vivek.

Pranav : It was Vivek. It was not Kartik.

Rajat : It was Pranav. It was Ritam.

Vivek : It was Rajat. It was not Kartik.

It was known that each suspect told exactly one lie. Who stole the mobile phone?

(A) Kartik (B) Ritam (C) Pranav

(D) Rajat (E) Vivek

64

There are three boxes. One contains apples, another contains oranges and the last one contains both apples and oranges. All three are known to be incorrectly labelled. If you are permitted to open just one box and then pull out and inspect only one fruit, which box would you open to determine the contents of all three boxes?

(A) The box labelled 'Apples'

(B) The box labelled 'Apples and Oranges'

(C) The box labelled 'Oranges'

(D) Cannot be determined

[GATE 2017 : IIT Roorkee (EE, CS Set – 2)]

65

AFTER – DINNER DRINK :

Abigail , Bridget and Claudia often eat dinner out :

A. Each orders either coffee or tea after dinner.

B. If Abigail orders coffee, then Bridget orders the drink that Claudia order.

C. If Bridget orders coffee, then Abigail orders the drink that Cludia doesn't order.

D. If Claudia orders tea, then Abigail orders the drink that Bridget orders.

Who do you know always orders the same drink after dinner ?

66

P, Q and R talk about S's car collection. P states that S has at least 3 cars. Q believes that S has less than 3 cars. R indicates that to his knowledge, S has at least one car. Only one of P, Q and R is right. The number of cars owned by S is

(A) 0 (B) 1

(C) 3 (D) Cannot be determined

67

THE TENNIS PLAYERS :

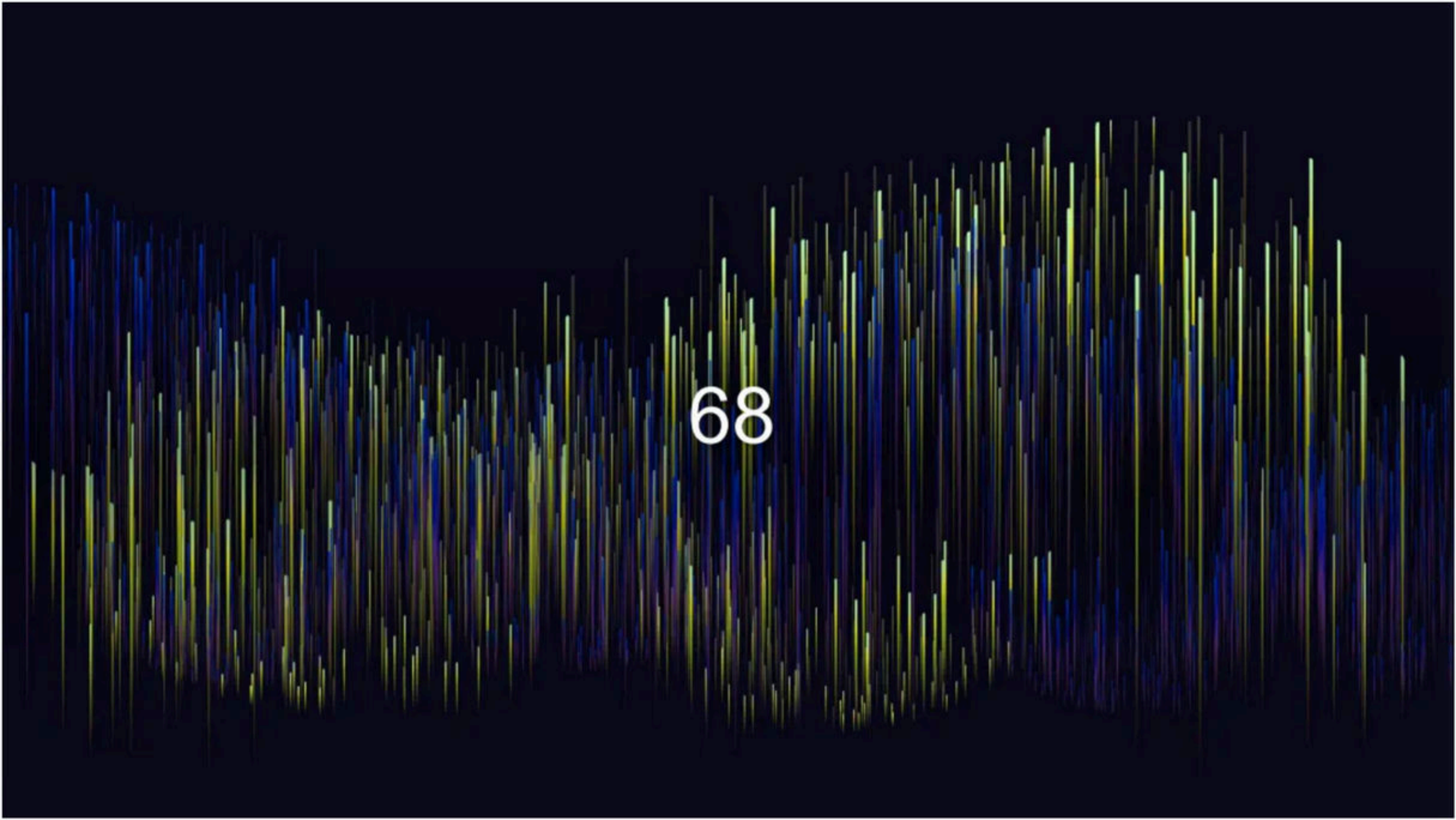
Zita , her brother , her daughter and her son are tennis players. As a game of doubles is about to begin :

A. Zita's brother is directly across the net from her daughter.

B. Her son is diagonally across the net from the worst player's sibling.

C. The best player and the worst player are on the same side of the net.

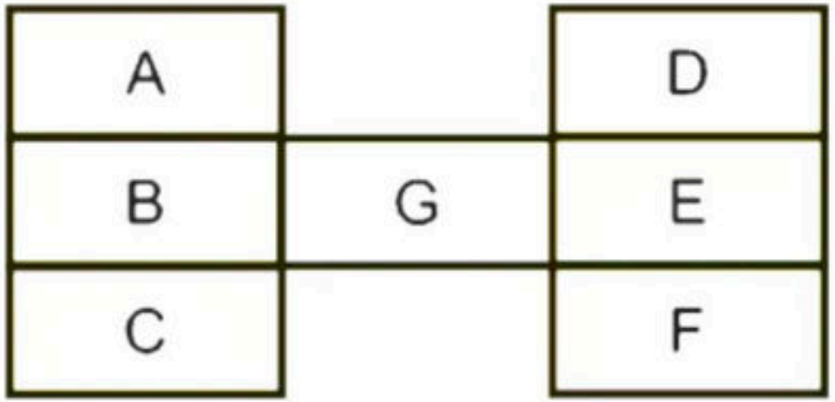
Who is the best player?


68

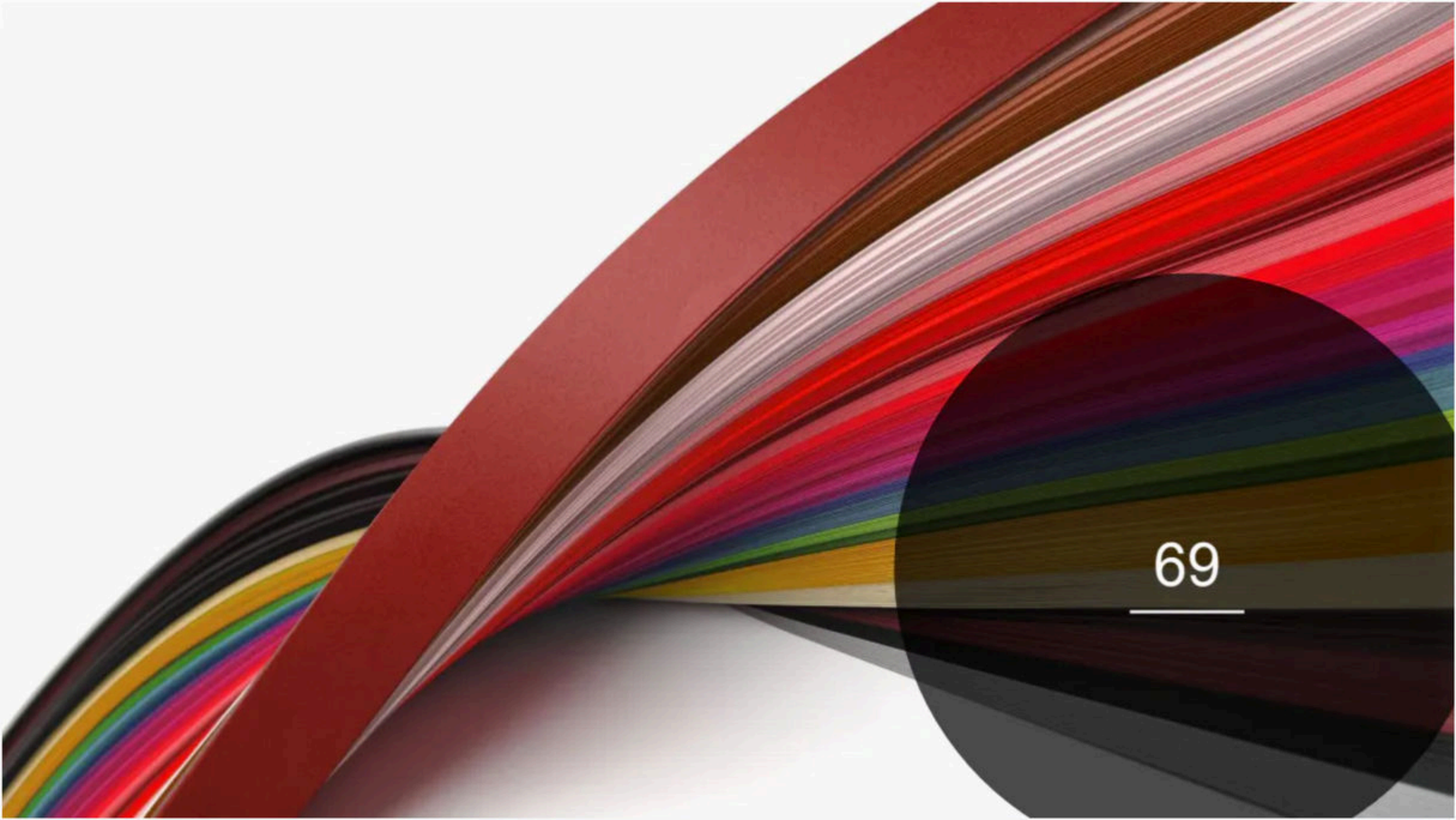
Each of the letters arranged as below represents a unique integer from 1 to 9. The letters are positioned in the figure such that and are equal. Which integer among the following choices cannot be represented by the letters A, B, C, D, E, F and G?

(A) 4 (B) 5

(C) 6 (D) 9



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



69

RELATIONS :

Lee , Dale and Terry are related to each other.

A. Among the three are Lee's legal Spouse , Dale's sibling and Terry's Sister-in-law.

B. Lee's legal spouse and Dale's sibling are of the same sex.

Who do you know is married man?

70

P looks at Q while Q looks at R. P is married, R is not. The number of pairs of people in which a married person is looking at an unmarried person is

(A) 0 (B) 1

(C) 2 (D) Cannot be determined

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

71

EQUAL PRODUCTS :

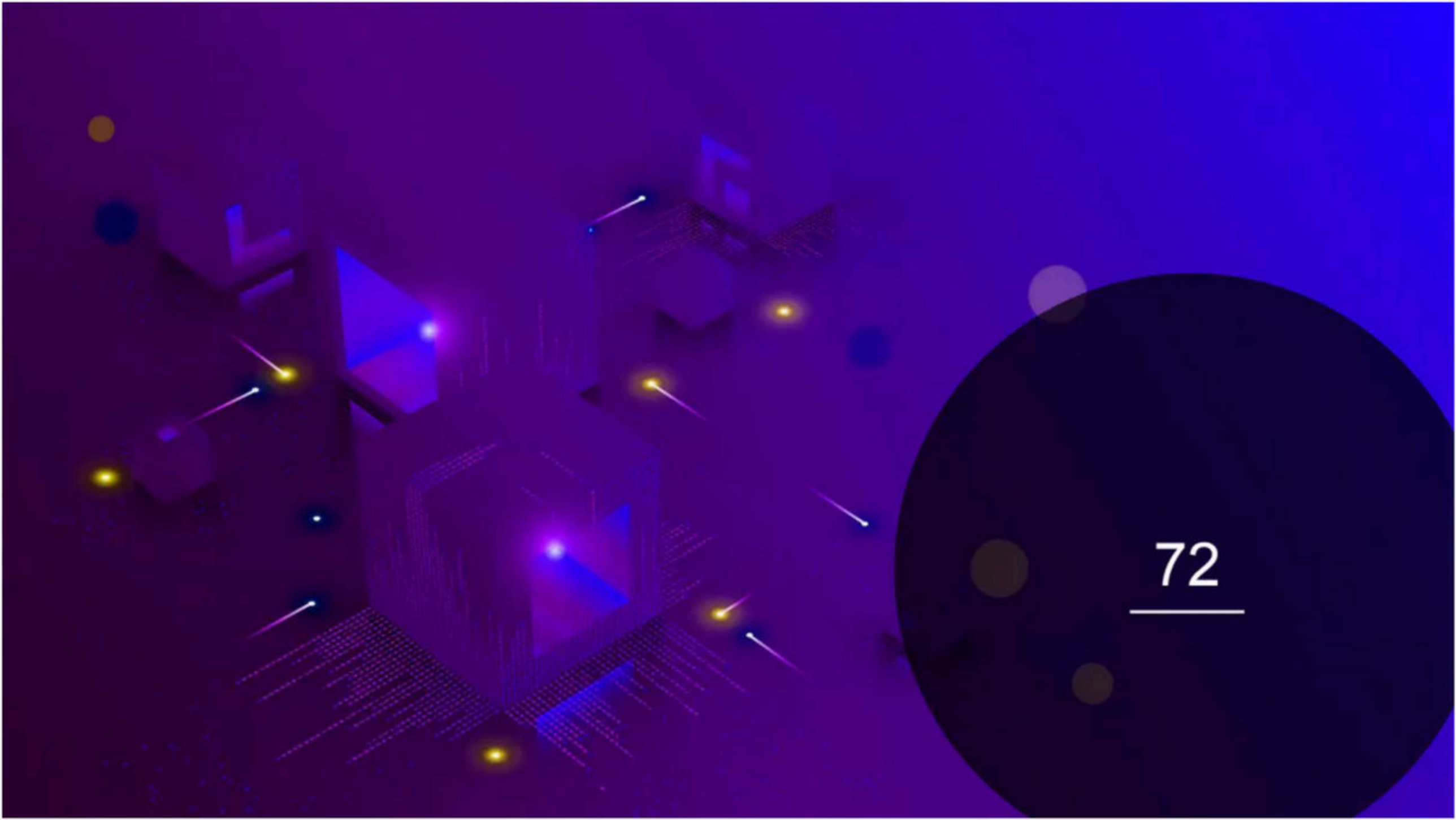
A	D
B	E
C	F
	G

Each of the seven digits from 0,1,2,3,4,5,6,7,8 and 9 is :

A. Represented by a different letter in the figure.

B. Positioned in the figure above so that $A \times B \times C$, $B \times G \times E$ and $D \times E \times F$ are equal.

Which digit does G represent ?



X AND 0

The game of Tic-tac-toe is played in a large square divided into nine small squares.

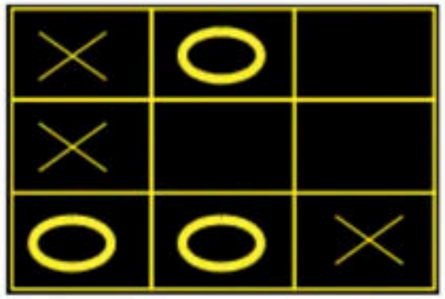
1. Each of two players in turn places his or her mark – usually X or O – in a small square.
2. The player who first gets three marks in a horizontal, vertical, or diagonal line wins.
3. A player will always place his or her mark in a line that already contains

(a) two of his or her own marks or (b) two of his her opponent's marks – giving]

(a) priority over

(b) only the last mark to be placed in the game shown above is not given.

Which mark – X or O – wins the game?



73

THE GUARDS

Art, Bob, Cab and Ida are guards in a museum.

A. Each of Art, Bob, and Cab stands guard on exactly four days every week.

B. Exactly two persons stand guard together every day.

C. No person stands guard three days in a row.

D. Here is a partial listing that shows when they stands guard every week:

Who does not guard with Ida?

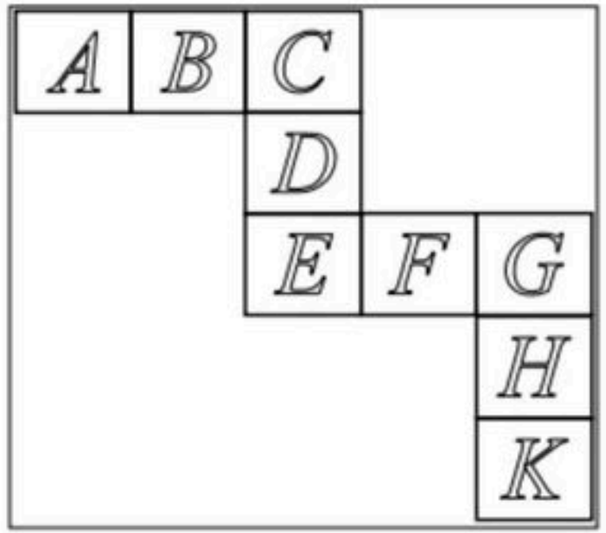
Sun	Art	Bob
Mon	Cab	?
Tue	Ida	?
Wed	Art	?
Thurs	Bob	?
Fri	Cab	?
Sat	Ida	?

74

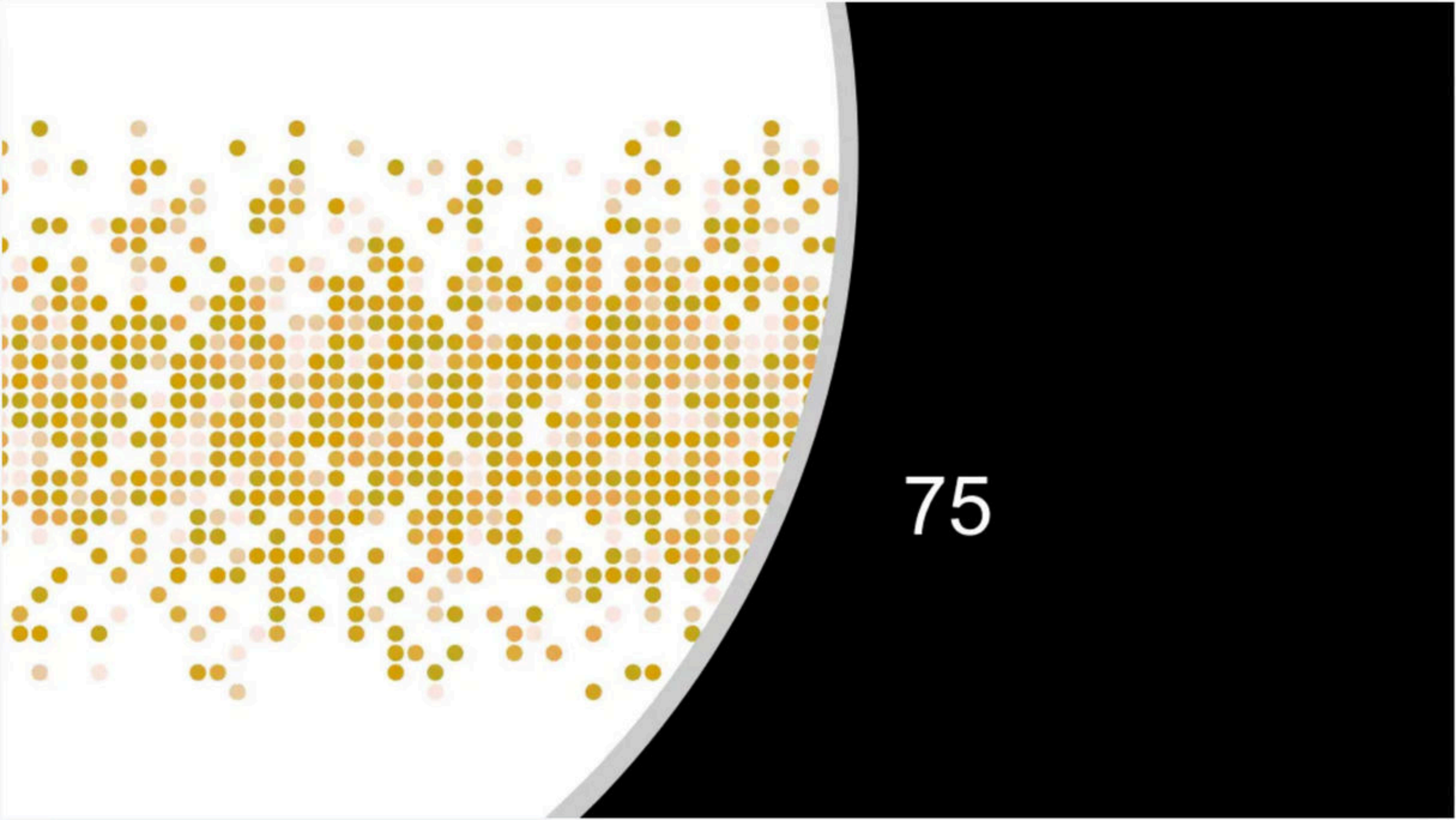
Each of the letters in the figure below represents a unique integer from 1 to 9. The letters are positioned in the figure such that each of and is equal to 13. Which integers does E represent?

(A) 1 (B) 4

(C) 6 (D) 7



[GATE 2018 : IIT Guwahati (CE Set – 2)]


75

THE JUDGE'S WIFE :

Edwin is a judge and a numerologist. He is married to a woman whose name :

1. Has a " product " that is the same as that for JUDGE.; using the correspondence of letters and numbers above , this product is $10 \times 21 \times 4 \times 7 \times 5$.

2. Has no letter in common with JUDGE.(To find a woman whose name satisfied the conditions above in relation to EDWIN would have been impossible.)

3. Has no third letter of the alphabet because 3 is his unlucky number.

5. Has its letter in alphabetical order when the first letter and the second letter are interchanged.

What is the name of the judge's wife ?

A	1	O	15
B	2	P	16
C	3	Q	17
D	4	R	18
E	5	S	19
F	6	T	20
G	7	U	21
H	8	V	22
I	9	W	23
J	10	X	24
K	11	Y	25
L	12	Z	26
M	13		
N	14		

76

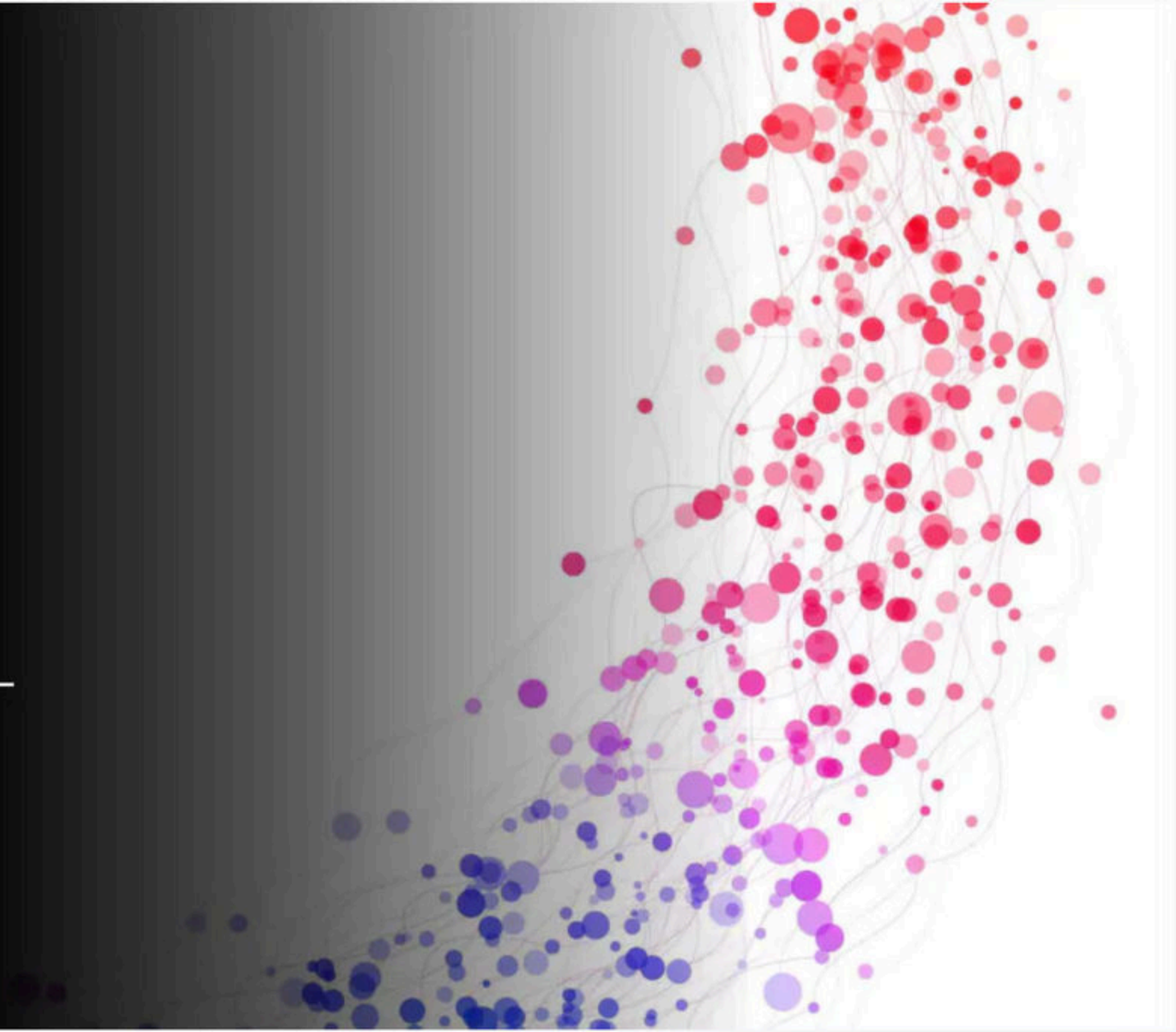
AFTER – DINNER DRINK :

Abigail , Bridget and Claudia often eat dinner out :

1. Each orders either coffee or tea after dinner.
2. If Abigail orders coffee, then Bridget orders the drink that Claudia order.
3. If Bridget orders coffee, then Abigail orders the drink that Claudia doesn't order.
4. If Claudia orders tea, then Abigail orders the drink that Bridget orders.

Who do you know always orders the same drink after dinner ?

77



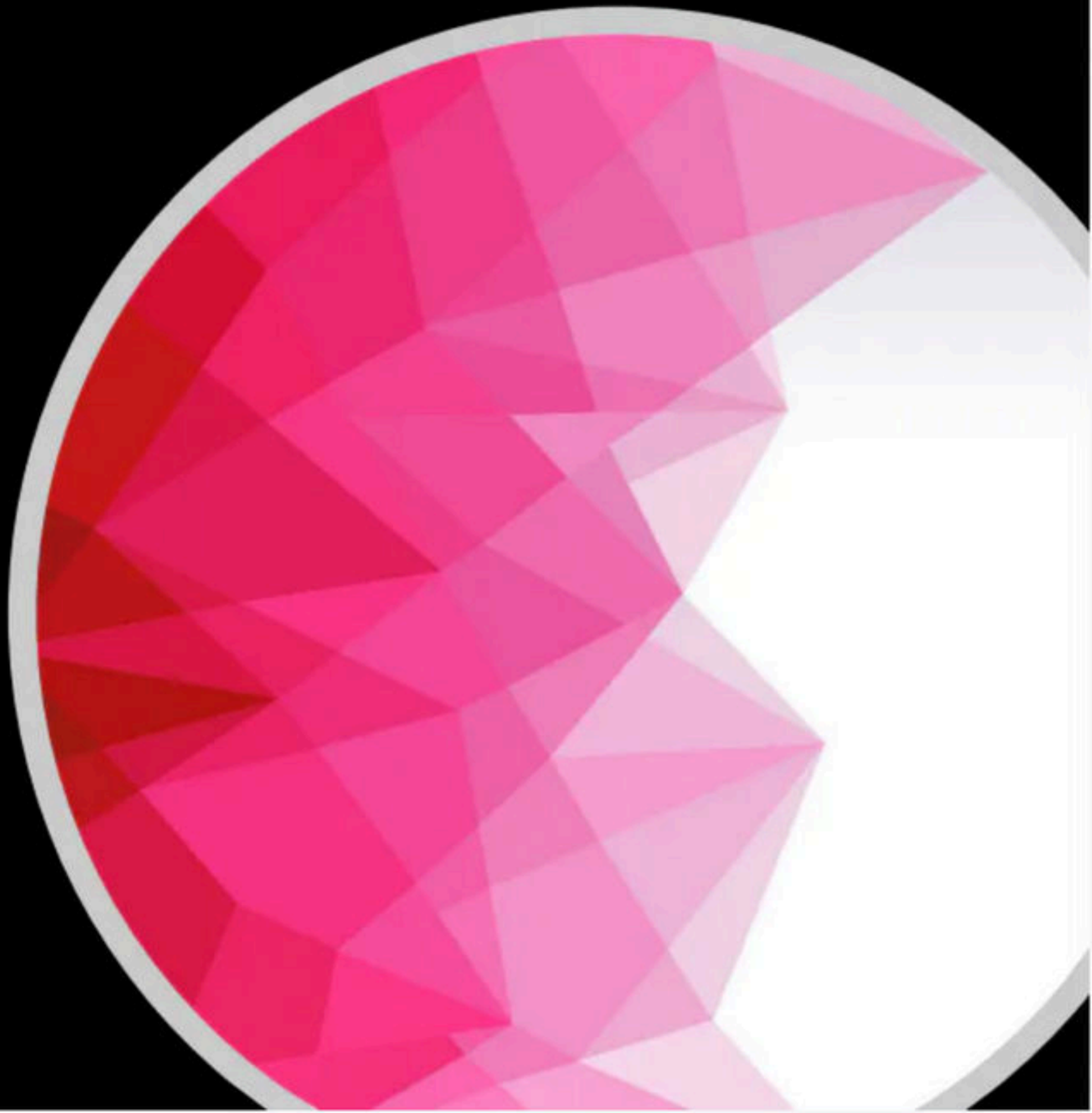
The sum of the digits of a two-digit number is 12. If the new number formed by reversing the digits is greater than the original number by 54, find the original number.

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

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

Ratan, Anil, Pinku and Gaurav are brothers of Rakhi, Sangeeta, Pooja and Saroj, not necessarily in that order. Each boy has one sister and the names of brothers and sisters do not begin with the same letter. Pinku and Gaurav are not Saroj's or Sangeeta's brothers. Saroj is not Ratan's sister.

78



Pooja's brother is

(A) Ratan
(B) Anil
(C) Pinku
(D) Gaurav
(E) Cannot be determined

Ratan, Anil, Pinku and Gaurav are brothers of Rakhi, Sangeeta, Pooja and Saroj, not necessarily in that order. Each boy has one sister and the names of brothers and sisters do not begin with the same letter. Pinku and Gaurav are not Saroj's or Sangeeta's brothers. Saroj is not Ratan's sister.

79

Which of the following are brother and sister?

(A) Ratan and Pooja

(B) Anil and Saroj

(C) Pinku and Sangeeta

(D) Gaurav and Rakhi

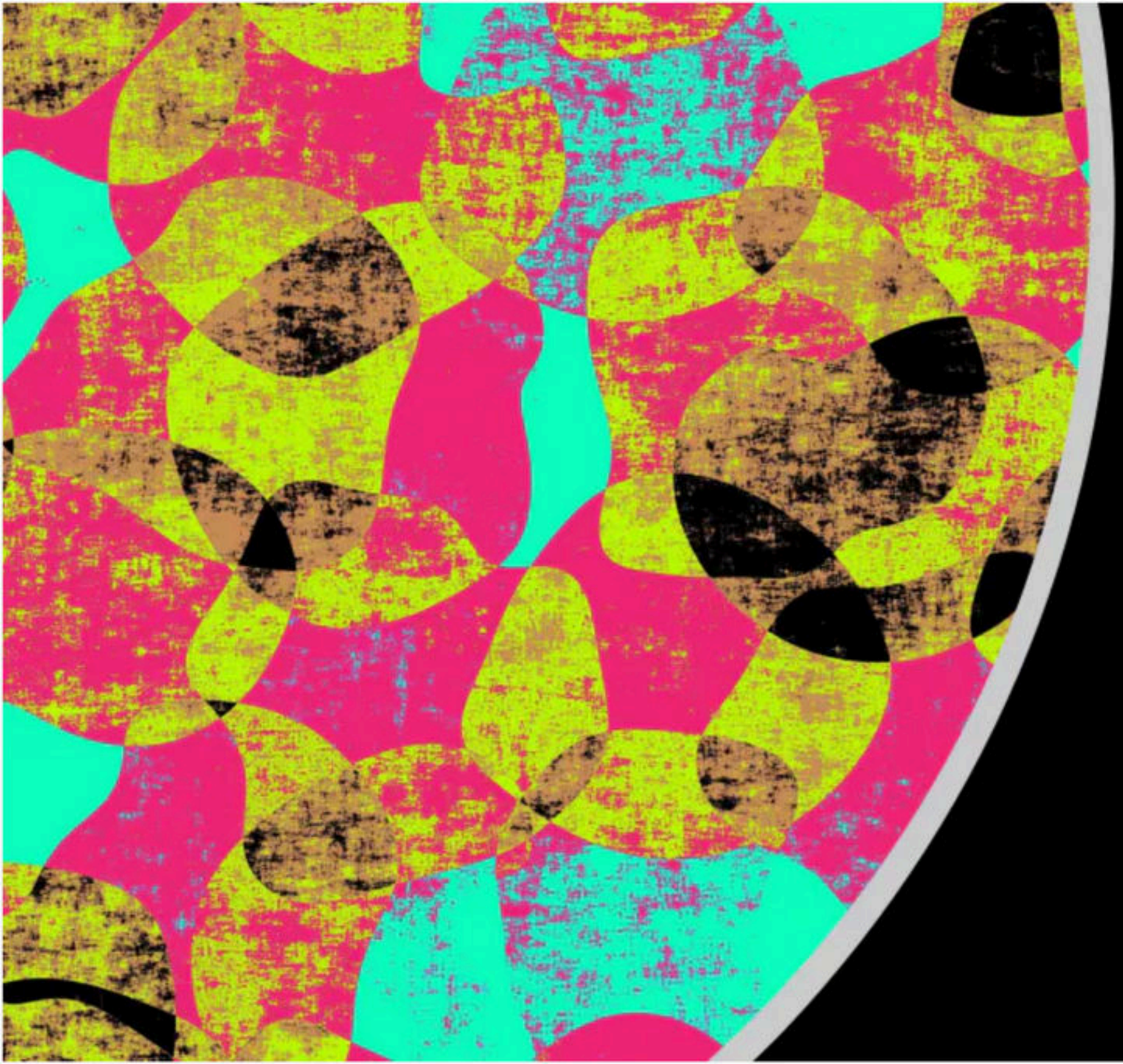
(E) Gaurav and Pooja

80

Each of P, Q, R, S, W, X, Y and Z has been married at most once. X and Y married and have two children P and Q, Z is grandfather of the daughter 'S' of P. Further Z and W married and are parents of R. Which one of the following must necessarily be FALSE?

(A) X is the mother in law to R
(B) P and R are not married to each other
(C) P is son of X and Y
(D) Q cannot be married to R

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



81

Rahul, Murali, Srinivas and Arul are seated around a square table. Rahul is sitting to the left of Murali, Srinivas is sitting to the right of Arul. Which of the following pairs are seated opposite each other?

(A) Rahul and Murali

(B) Srinivas and Arul

(C) Srinivas and Murali

(D) Srinivas and Rahul

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

Questions 82 to 87

Read the given information carefully and answer the questions that follow.

Four persons A, B, C and D are camping at four campsites E, F, G and H, not necessarily in that order. The campsites are located on four different lakes I, J, K and L (not necessarily in that order) which are in four different states M, N, O and P (not necessarily in that order).

I. B is camping on K.

II. H is on J, which is in N.

III. The person at I, a native of P, camps only in that state.

IV. D is at F.

V. A is camping in O

82

Where is B camping?

(A) At E
(B) In M
(C) On L
(D) At F
(E) In P

83

I is where

(A) F is located
(B) A is camping
(C) the campsite in which O is located
(D) the campsite G is located
(E) None of these

84

On the basis of the information given, it is possible to deduce that

I. A is not at H

II. C is in P

III. D is not at E

(A) I only

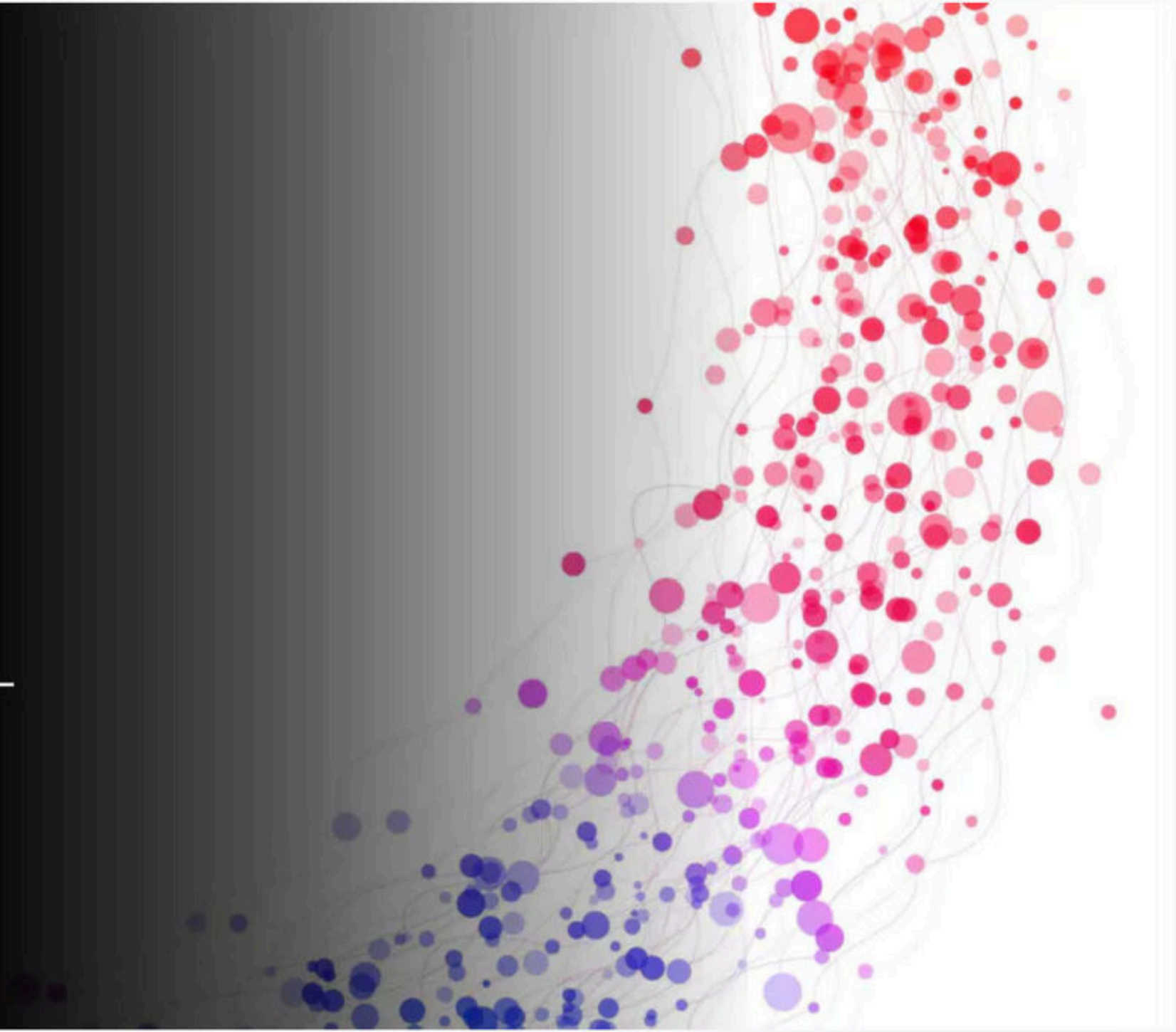
(B) II only

(C) III only

(D) I and III only

(E) II and III only

85



Is where

I. L is located

II. F is located

(A) I only

(B) II only

(C) I and II both

(D) I or II but not both

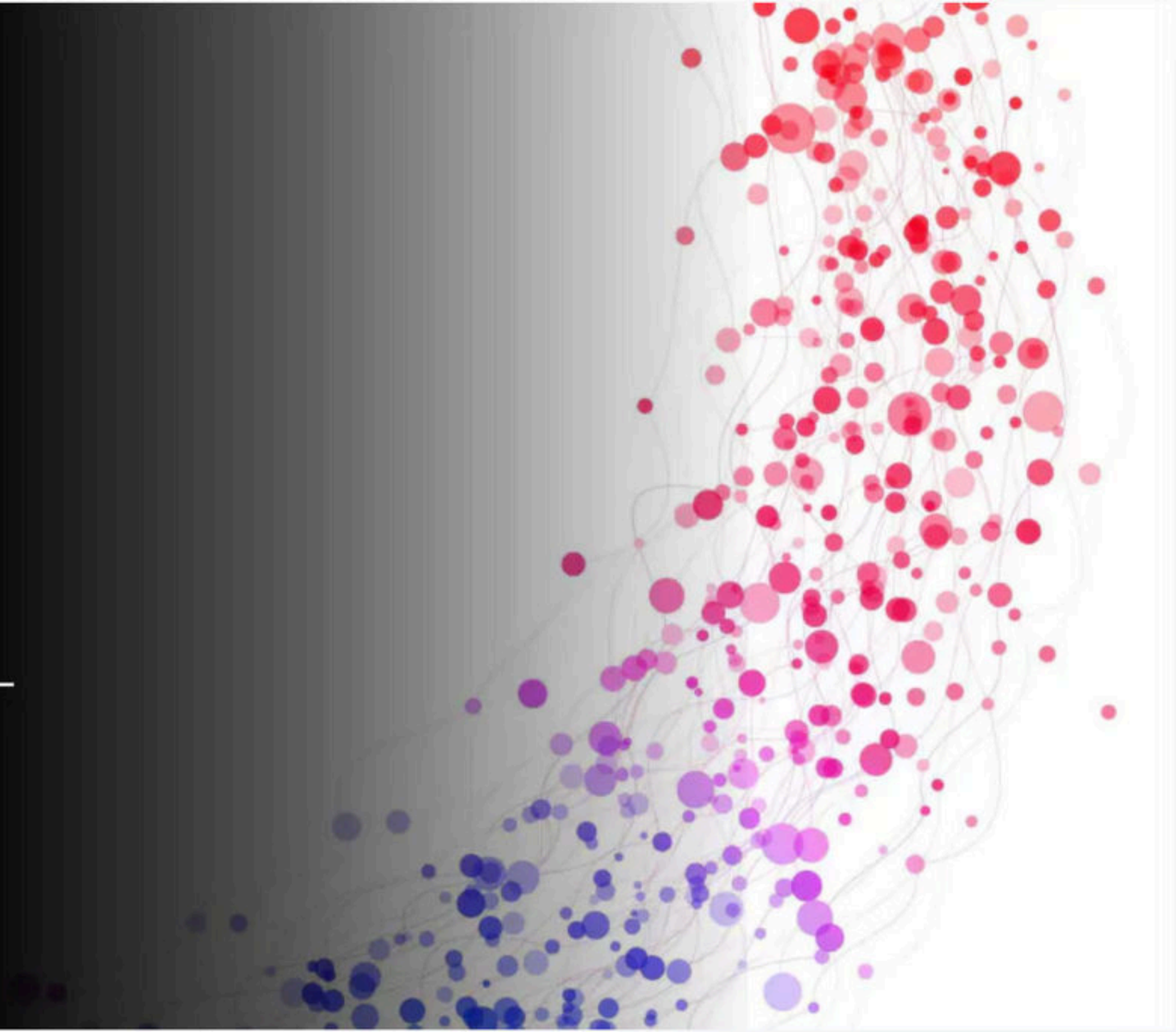
(E) None of these

86

Which of the following is true of L?

(A) C is camping there
(B) D is camping there
(C) It is in M
(D) A is camping there
(E) None of these

87



Which of the following cannot be determined on the basis of the information given?

(A) Which state is K in?
(B) Who is camping at E?
(C) Which campsite is in P?
(D) Who is camping in N?
(E) None of these

88

The head of a newly formed government desires to appoint five of the six selected members P,Q, R, S, T and U to portfolios of Home, Power, Defense, Telecom, and Finance. U does not want any portfolio if S gets one of the five. Rants either Home or Finance or no portfolio says that if S gets either Power or Telecom, then she must get the other one. T insists on a portfolio if P gets one.

Which is the valid distribution of portfolios?

(A) P-Home, Q-Power, R-Defense, S-Telecom, T-Finance

(B) R-Home, S-Power, P-Defense, Q-Telecom, T-Finance

(C) P-Home, Q-Power, T-Defense, S-Telecom, U-Finance

(D) Q-Home, U-Power, T-Defense, R-Telecom, P-Finance

[GATE 2015 : IIT Kanpur (CE Set - 1, CSE Set - 3)]

89

There are five buildings called V, W, X, Y and Z in a row (not necessarily in that order). V is to the West of W, Z is to the East of X and the West of V, W is to the West of Y. Which is the building in the middle?

(A) V
(B) W
(C) X
(D) Y

[GATE 2017 : IIT Roorkee (EE, CS Set – 2)]

Directions for questions 90 and 91 : Read the following information and answer the questions that follow.

ABCABC is a six – digit number. (Therefore, both the As, both the Bs and both the Cs are the same.) C is an even digit.

ABC ABC

0

7

ABCABC

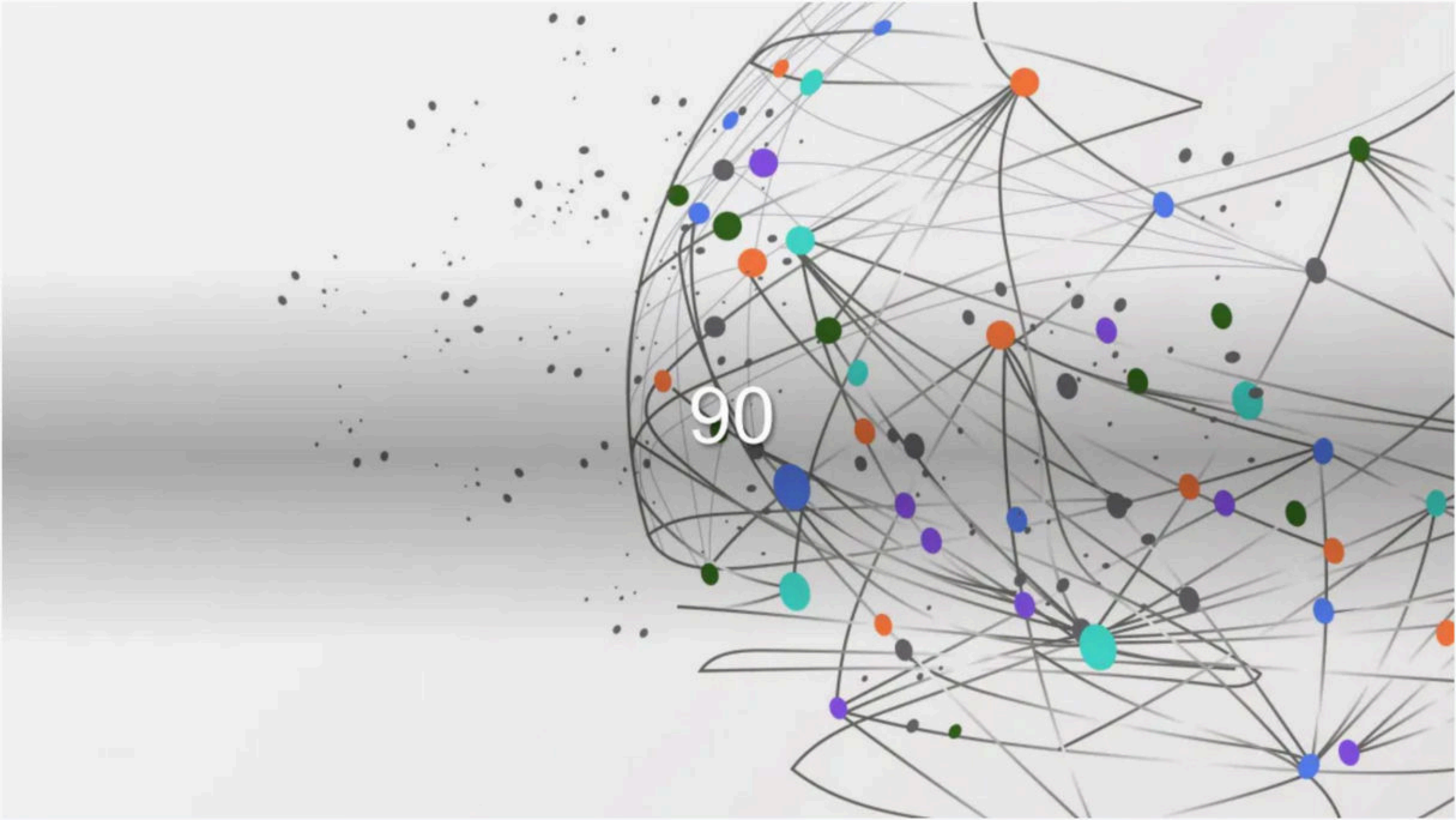
14

ABCABC

20

ABCABC

13


90

Is ABCABC divisible by 14? $= 2 \times 7$

(A) Yes

(B) No

(C) Divisible if A is even

(D) divisible if B is even

(E) None of these

91

Is ABCABC divisible by 13?

(A) Yes
(B) No
(C) Divisible if A = 2
(D) Divisible if B = 5
(E) None of these

TEST

1. $0.777\ldots = 0.\overline{7} = \boxed{7/9}$

2. $0.545454\ldots = 0.\overline{54} = 54/99$

3. $0.3\overline{4} = \dfrac{(34-3)}{90} = 31/90$

4. $0.95 = 95/100 = 19/20$

TEST

NTPC
SA3L

0.5

simplest form

$0.5 = 5/10 = 1/2$

A. $5/10$

B. $5/9$

C. $1/2$

D. All

1. Practice / Practise

2. Advice / Advise

3. Prophecy / Prophesy

Root

n/v

n / v /

Resume

cv

CAT

TEST

$N = 0.ababab\ldots$

$= 0.\overline{ab} \Rightarrow \boxed{N = \frac{ab}{99}}$

$N \times \boxed{} =$ Integral value

A. $\cancel{99} \times \frac{ab}{99} = ab$

2

B. $\cancel{198} \times \frac{ab}{99} = 2ab$

3

C. $\cancel{297} \times \frac{ab}{99} = 3ab$

D. All

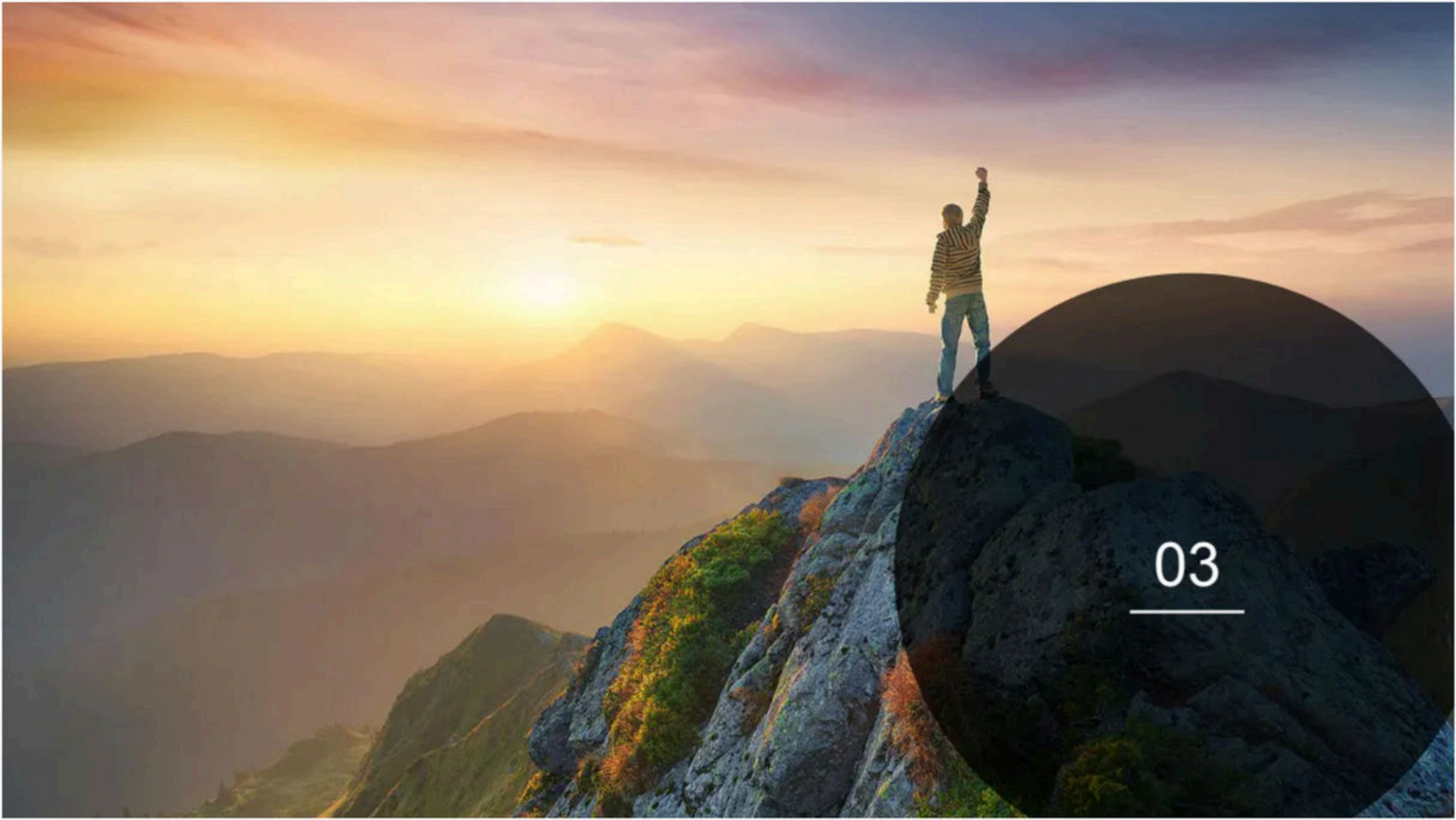
$N \times ___$

$\frac{ab}{99}$

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

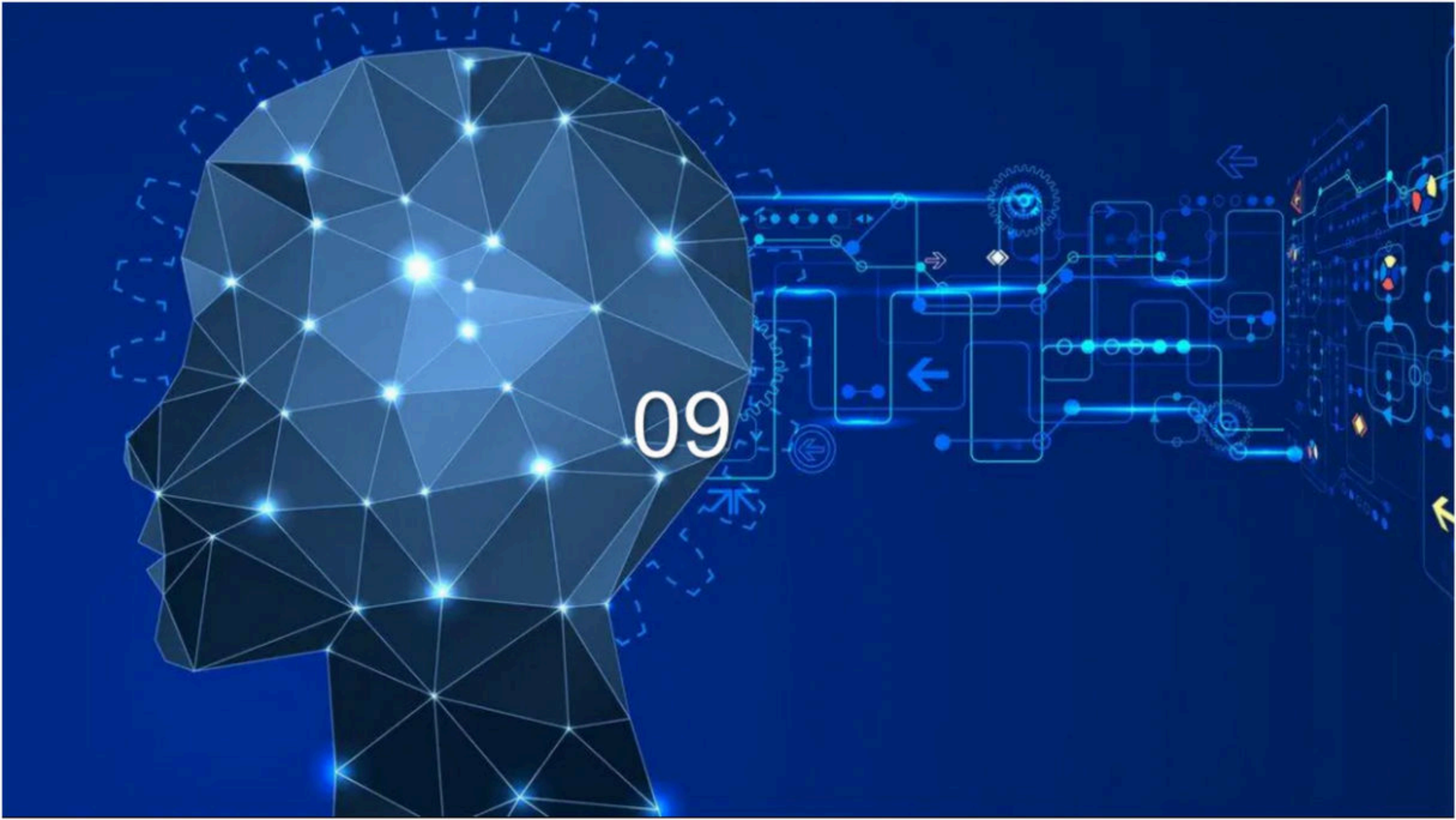
The last digit of

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

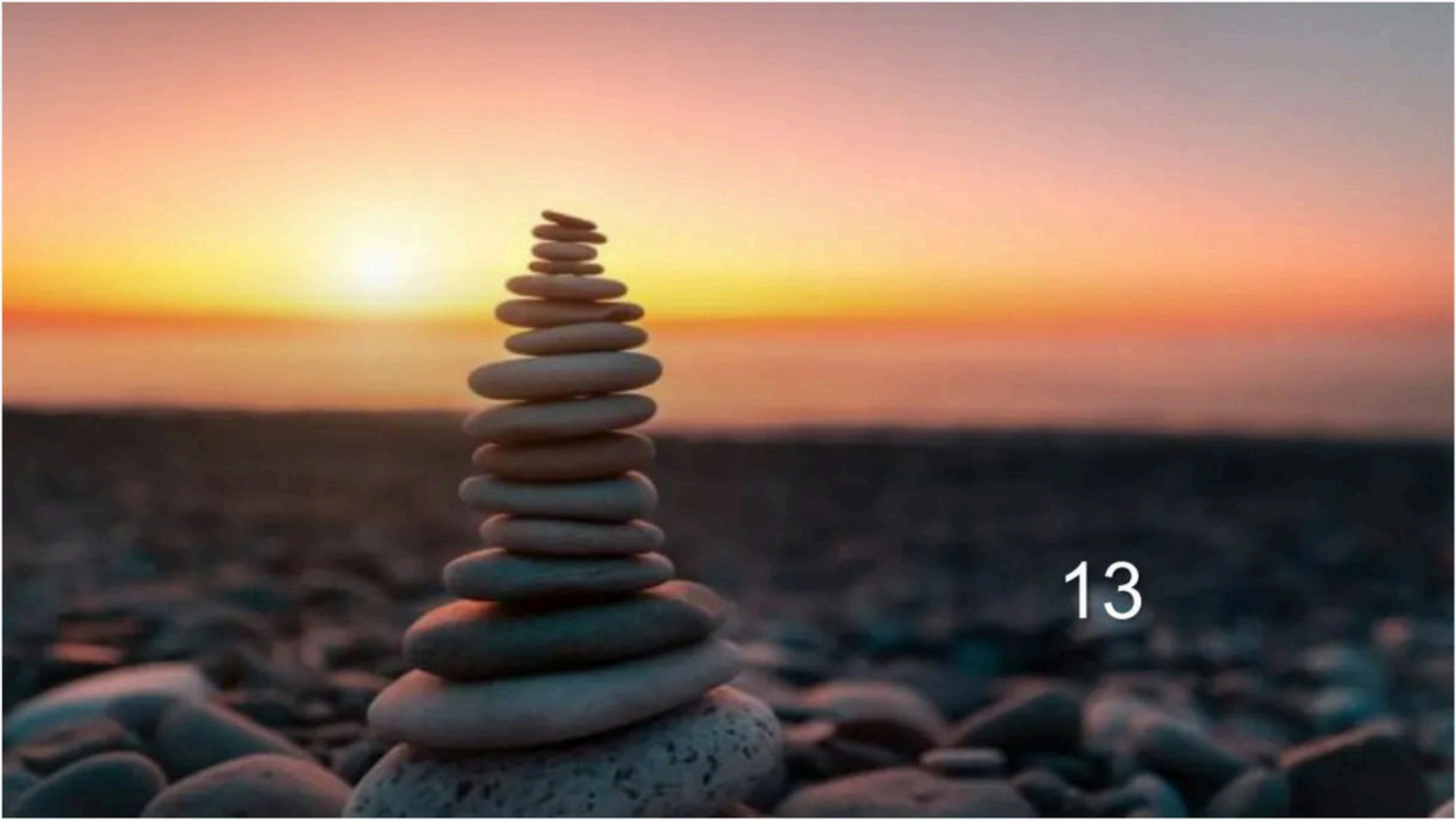
$3^{53}, 7^{53}, 9^{93}$

11

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

12

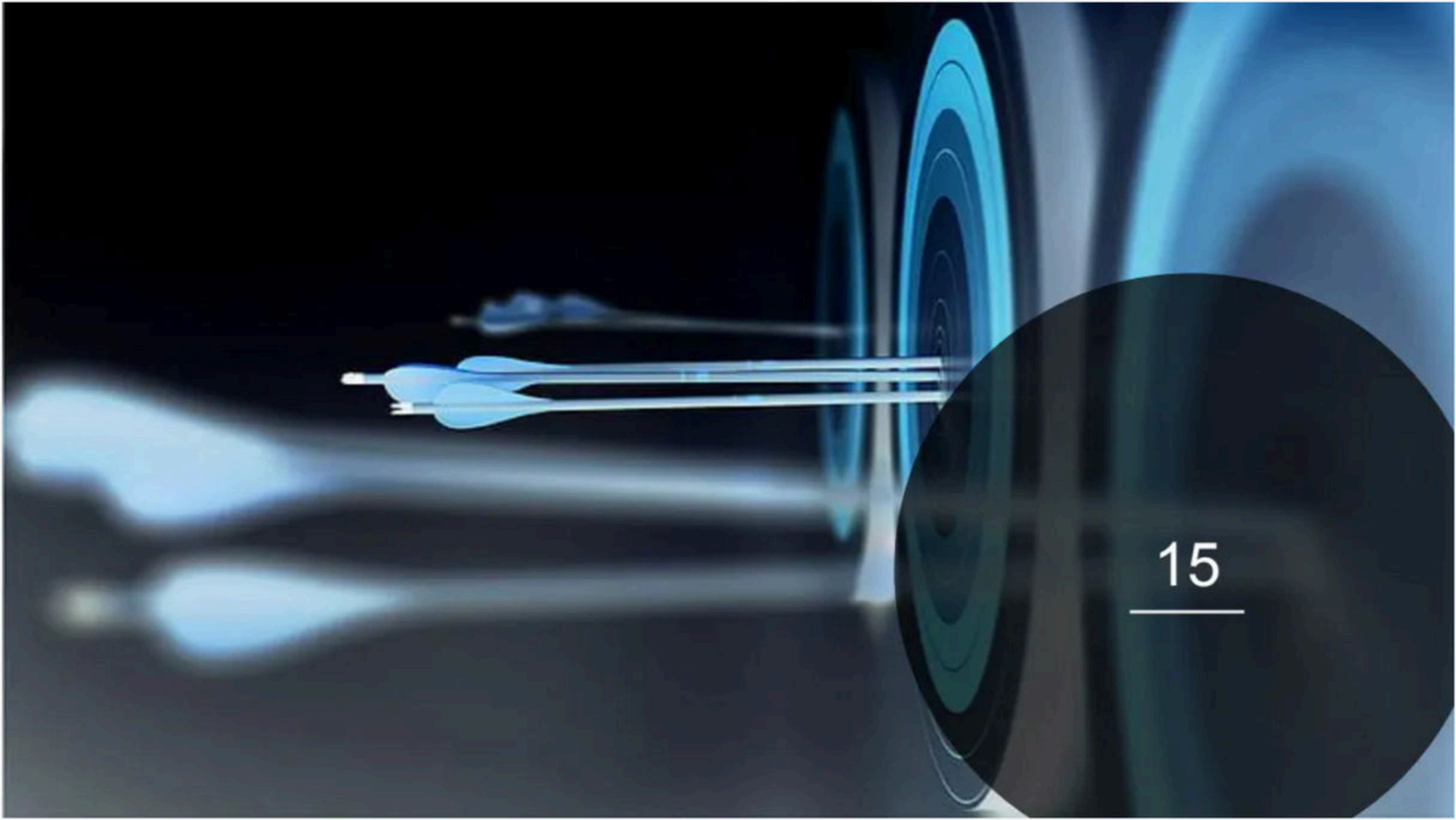
$$\frac{(123\ 1234)}{15}$$


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

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 eve

[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

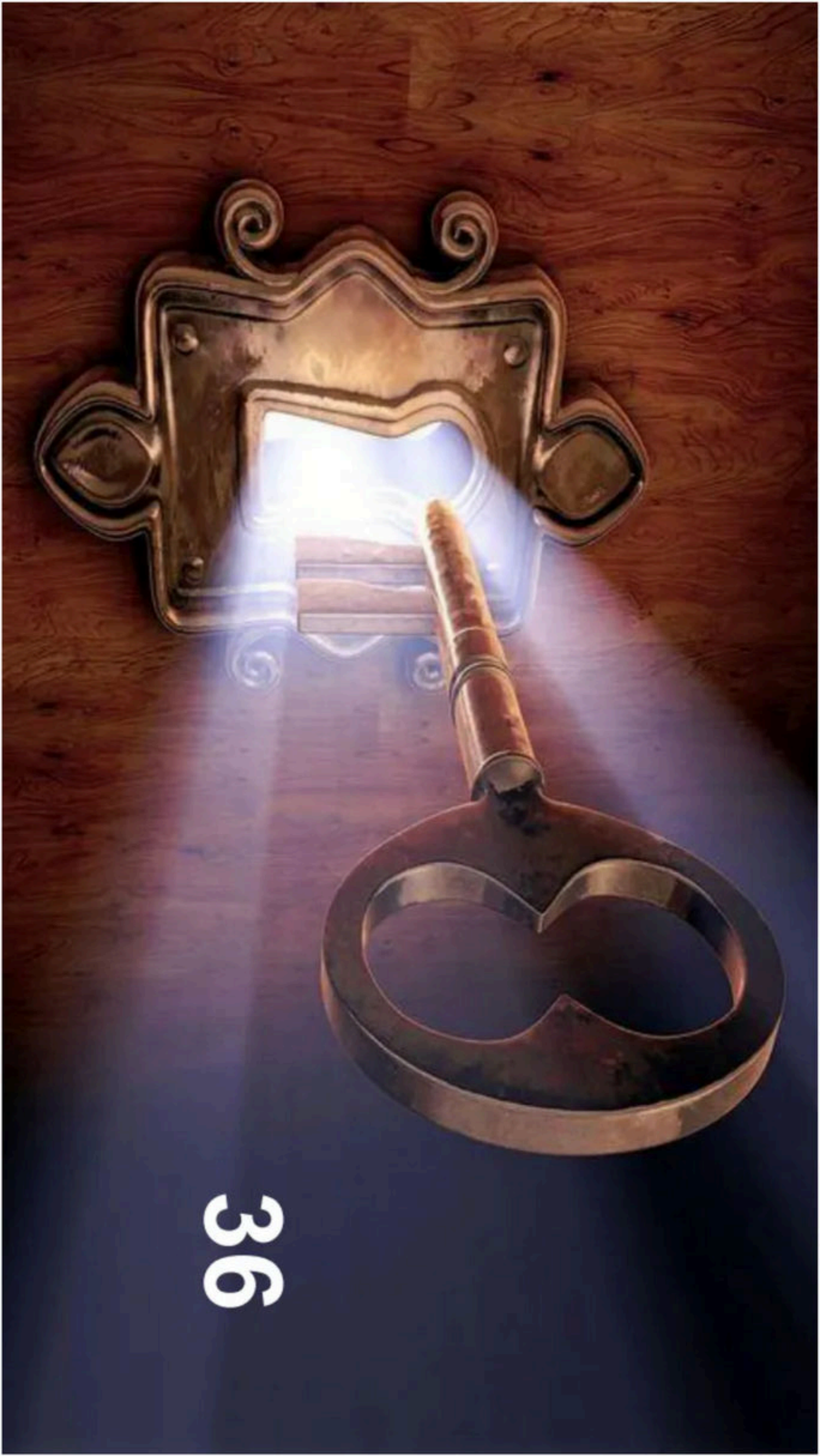
A number consists of two digits, the sum of digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number?

(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)]

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