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1 Discrete Mathematics: Combinatory (58)

Syllabus: Combinatorics: Counting, Recurrence relations, Generating functions.

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	2	1	0	0	1	0	0	0.7	1
2 Marks Count	0	1	0	1	2	1	0	0.8	2
Total Marks	2	3	0	2	5	2	0	2.3	5

1.1 Balls In Bins (7)

1.1.1 Balls In Bins: GATE2002-13

https://gateoverflow.in/866

a. In how many ways can a given positive integer $n \geq 2$ be expressed as the sum of 2 positive integers (which are not necessarily distinct). For example, for $n = 3$ the number of ways is 2, i.e., $1 + 2, 2 + 1$. Give only the answer without any explanation.
b. In how many ways can a given positive integer $n \geq 3$ be expressed as the sum of 3 positive integers (which are not necessarily distinct). For example, for $n = 4$, the number of ways is 3, i.e., $1 + 2 + 1, 2 + 1 + 1$. Give only the answer without explanation.
c. In how many ways can a given positive integer $n \geq k$ be expressed as the sum of k positive integers (which are not necessarily distinct). Give only the answer without explanation.

gate2002 permutation-and-combination normal descriptive balls-in-bins

1.1.2 Balls In Bins: GATE2003-34

https://gateoverflow.in/924

m identical balls are to be placed in n distinct bags. You are given that $m \geq kn$, where k is a natural number ≥ 1. In how many ways can the balls be placed in the bags if each bag must contain at least k balls?

A. $\binom{m-k}{n-1}$
B. $\binom{m-kn+n-1}{n-1}$
C. $\binom{m-1}{n-k}$
D. $\binom{m-kn+n+k-2}{n-k}$

gate2003 permutation-and-combination balls-in-bins normal

1.1.3 Balls In Bins: GATE2004-IT-35

https://gateoverflow.in/3678

In how many ways can we distribute 5 distinct balls, $B_1, B_2, \ldots, B_5$ in 5 distinct cells, $C_1, C_2, \ldots, C_5$ such that Ball B_i is not in cell $C_i, \forall i = 1, 2, \ldots 5$ and each cell contains exactly one ball?

A. 44
B. 96
C. 120
D. 3125

gate2004-it permutation-and-combination normal balls-in-bins

1.1.4 Balls In Bins: TIFR2012-A-7

https://gateoverflow.in/21004

It is required to divide the $2n$ members of a club into n disjoint teams of 2 members each. The teams are not labelled. The number of ways in which this can be done is:

A. $\frac{(2n)!}{2^n}$
B. $\frac{(2n)!}{n!}$
C. $\frac{(2n)!}{2^n.n!}$
D. $\frac{n!}{2}$
E. None of the above.

tifr2012 permutation-and-combination balls-in-bins

1.1.5 Balls In Bins: TIFR2013-A-9

https://gateoverflow.in/25431

There are n kingdoms and $2n$ champions. Each kingdom gets 2 champions. The number of ways in which this can be done is:

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A. $\frac{(2n)!}{2^n}$ B. $\frac{(2n)!}{n!}$ C. $\frac{(2n)!}{2^n.n!}$ D. $\frac{n!}{2}$ E. None of the above.

tifr2013 permutation-and-combination discrete-mathematics normal balls-in-bins

1.1.6 Balls In Bins: TIFR2015-A-8

https://gateoverflow.in/29571

There is a set of $2n$ people: n male and n female. A good party is one with equal number of males and females (including the one where none are invited). The total number of good parties is.

A. 2^n B. n^2 C. $\binom{n}{\lfloor n/2 \rfloor}^2$ D. $\binom{2n}{n}$ E. None of the above.

tifr2015 permutation-and-combination discrete-mathematics normal balls-in-bins

1.1.7 Balls In Bins: TIFR2017-A-5

https://gateoverflow.in/94953

How many distinct ways are there to split 50 identical coins among three people so that each person gets at least 5 coins?

A. 3^{35} B. $3^{50} - 2^{50}$ C. $\binom{35}{2}$ D. $\binom{50}{15} \cdot 3^{35}$ E. $\binom{37}{2}$

tifr2017 permutation-and-combination discrete-mathematics normal balls-in-bins

1.2 Generating Functions (6)

1.2.1 Generating Functions: GATE1987-10b

https://gateoverflow.in/82451

What is the generating function $G(z)$ for the sequence of Fibonacci numbers?

gate1987 permutation-and-combination generating-functions descriptive

1.2.2 Generating Functions: GATE2005-50

https://gateoverflow.in/1175

Let $G(x) = \frac{1}{(1-x)^2} = \sum_{i=0}^{\infty} g(i)x^i$, where $|x| < 1$. What is $g(i)$?

A. i B. $i+1$ C. $2i$ D. 2^i

gate2005 normal generating-functions

1.2.3 Generating Functions: GATE2016-1-26

https://gateoverflow.in/39693

The coefficient of x^{12} in $\left(x^3 + x^4 + x^5 + x^6 + \ldots\right)^3$ is _____.

gate2016-1 permutation-and-combination generating-functions normal numerical-answers

1.2.4 Generating Functions: GATE2017-2-47

https://gateoverflow.in/118392

If the ordinary generating function of a sequence $\{a_n\}_{n=0}^{\infty}$ is $\frac{1+z}{(1-z)^3}$, then $a_3 - a_0$ is equal to _____

.

gate2017-2 permutation-and-combination generating-functions numerical-answers normal

1.2.5 Generating Functions: GATE2018-1

https://gateoverflow.in/204075

Which one of the following is a closed form expression for the generating function of the sequence $\{a_n\}$, where $a_n = 2n + 3$ for all $n = 0, 1, 2, \ldots$?

A. $\frac{3}{(1-x)^2}$ B. $\frac{3x}{(1-x)^2}$ C. $\frac{2-x}{(1-x)^2}$ D. $\frac{3-x}{(1-x)^2}$

gate2018 generating-functions normal permutation-and-combination

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1.2.6 Generating Functions: TIFR2010-A-12

https://gateoverflow.in/18391

The coefficient of x^3 in the expansion of $(1+x)^3(2+x^2)^{10}$ is.

A. 2^{14}
B. 31
C. $\binom{3}{3}+\binom{10}{1}$
D. $\binom{3}{3}+2\binom{10}{1}$
E. $\binom{3}{3}\binom{10}{1}2^9$

tifr2010 generating-functions

1.3 Modular Arithmetic (3)

1.3.1 Modular Arithmetic: GATE2016-2-29

https://gateoverflow.in/39588

The value of the expression $13^{99} \pmod{17}$ in the range 0 to 16, is _____.

gate2016-2 modular-arithmetic normal numerical-answers

1.3.2 Modular Arithmetic: GATE2019-21

https://gateoverflow.in/302827

The value of $3^{51} \bmod 5$ is _____

gate2019 numerical-answers permutation-and-combination modular-arithmetic

1.3.3 Modular Arithmetic: TIFR2018-B-1

https://gateoverflow.in/179285

What is the remainder when 4444^{4444} is divided by 9?

A. 1
B. 2
C. 5
D. 7
E. 8

tifr2018 modular-arithmetic permutation-and-combination

1.4 Permutation And Combination (28)

1.4.1 Permutation And Combination: GATE1989-4-i

https://gateoverflow.in/87874

Provide short answers to the following questions:

How many substrings (of all lengths inclusive) can be formed from a character string of length n? Assume all characters to be distinct, prove your answer.

gate1989 descriptive permutation-and-combination discrete-mathematics normal

1.4.2 Permutation And Combination: GATE1990-3-iii

https://gateoverflow.in/84060

Choose the correct alternatives (More than one may be correct).

The number of rooted binary trees with n nodes is,

A. Equal to the number of ways of multiplying $(n+1)$ matrices.
B. Equal to the number of ways of arranging n out of $2n$ distinct elements.
C. Equal to $\frac{1}{(n+1)}\binom{2n}{n}$.
D. Equal to $n!$.

gate1990 normal permutation-and-combination catalan-number

1.4.3 Permutation And Combination: GATE1990-3-ix

https://gateoverflow.in/84841

Choose the correct alternatives (More than one may be correct).

The number of ways in which 5 A's, 5 B's and 5 C's can be arranged in a row is:

A. $15!/(5!)^3$
B. $15!$
C. $\binom{15}{5}$
D. $15!(5!3!)$.

gate1990 normal permutation-and-combination

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1.4.4 Permutation And Combination: GATE1991-02-iv

https://gateoverflow.in/514

Match the pairs in the following questions by writing the corresponding letters only.

$A.$	The number of distinct binary tree with n nodes.	$P.$	$\frac{n!}{2}$
$B.$	The number of binary strings of the length of 2n	$Q.$	$\binom{3n}{n}$ with an equal number of 0's and 1's
$C.$	The number of even permutation of n objects.	$R.$	$\binom{2n}{n}$
$D.$	The number of binary strings of length 6n which are	$S.$	$\frac{1}{1+n}\binom{2n}{n}$ palindromes with 2n 0's.

gate1991 permutation-and-combination normal match-the-following

1.4.5 Permutation And Combination: GATE1991-16,a

https://gateoverflow.in/543

Find the number of binary strings w of length $2n$ with an equal number of $1's$ and $0's$ and the property that every prefix of w has at least as many $0's$ as $1's$.

gate1991 permutation-and-combination normal descriptive catalan-number

1.4.6 Permutation And Combination: GATE1994-1.15

https://gateoverflow.in/2458

The number of substrings (of all lengths inclusive) that can be formed from a character string of length n is

A. n B. n^2 C. $\frac{n(n-1)}{2}$ D. $\frac{n(n+1)}{2}$

gate1994 permutation-and-combination normal

1.4.7 Permutation And Combination: GATE1998-1.23

https://gateoverflow.in/1660

How many sub strings of different lengths (non-zero) can be formed from a character string of length n?

A. n B. n^2 C. 2^n D. $\frac{n(n+1)}{2}$

gate1998 permutation-and-combination normal

1.4.8 Permutation And Combination: GATE1999-1.3

https://gateoverflow.in/1457

The number of binary strings of n zeros and k ones in which no two ones are adjacent is

A. ${}^{n-1}C_k$ B. ${}^{n}C_k$ C. ${}^{n}C_{k+1}$ D. None of the above

gate1999 permutation-and-combination normal

1.4.9 Permutation And Combination: GATE1999-2.2

https://gateoverflow.in/1480

Two girls have picked 10 roses, 15 sunflowers and 15 daffodils. What is the number of ways they can divide the flowers among themselves?

A. 1638 B. 2100 C. 2640 D. None of the above

gate1999 permutation-and-combination normal

1.4.10 Permutation And Combination: GATE2000-5

https://gateoverflow.in/676

A multiset is an unordered collection of elements where elements may repeat any number of times. The size of a multiset is the number of elements in it, counting repetitions.

a. What is the number of multisets of size 4 that can be constructed from n distinct elements so that at least one element occurs exactly twice?
b. How many multisets can be constructed from n distinct elements?

gate2000 permutation-and-combination normal descriptive

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1.4.11 Permutation And Combination: GATE2001-2.1

https://gateoverflow.in/719

How many 4-digit even numbers have all 4 digits distinct

A. 2240 B. 2296 C. 2620 D. 4536

gate2001 permutation-and-combination normal

1.4.12 Permutation And Combination: GATE2003-4

https://gateoverflow.in/895

Let A be a sequence of 8 distinct integers sorted in ascending order. How many distinct pairs of sequences, B and C are there such that

i. each is sorted in ascending order,
ii. B has 5 and C has 3 elements, and
iii. the result of merging B and C gives A

A. 2 B. 30 C. 56 D. 256

gate2003 permutation-and-combination normal

1.4.13 Permutation And Combination: GATE2003-5

https://gateoverflow.in/896

n couples are invited to a party with the condition that every husband should be accompanied by his wife. However, a wife need not be accompanied by her husband. The number of different gatherings possible at the party is

A. ${}^{2n}\mathrm{C}_n \times 2^n$
B. 3^n
C. $\frac{(2n)!}{2^n}$
D. ${}^{2n}\mathrm{C}_n$

gate2003 permutation-and-combination normal

1.4.14 Permutation And Combination: GATE2004-75

https://gateoverflow.in/1069

Mala has the colouring book in which each English letter is drawn two times. She wants to paint each of these 52 prints with one of k colours, such that the colour pairs used to colour any two letters are different. Both prints of a letter can also be coloured with the same colour. What is the minimum value of k that satisfies this requirement?

A. 9 B. 8 C. 7 D. 6

gate2004 permutation-and-combination

1.4.15 Permutation And Combination: GATE2005-IT-46

https://gateoverflow.in/3807

A line L in a circuit is said to have a $stuck-at-0$ fault if the line permanently has a logic value 0. Similarly a line L in a circuit is said to have a $stuck-at-1$ fault if the line permanently has a logic value 1. A circuit is said to have a multiple $stuck-at$ fault if one or more lines have stuck at faults. The total number of distinct multiple $stuck-at$ faults possible in a circuit with N lines is

A. 3^N B. 3^N-1 C. 2^N-1 D. 2

gate2005-it permutation-and-combination normal

1.4.16 Permutation And Combination: GATE2007-84

https://gateoverflow.in/1275

Suppose that a robot is placed on the Cartesian plane. At each step it is allowed to move either one unit up or one unit right, i.e., if it is at (i,j) then it can move to either $(i+1,j)$ or $(i,j+1)$.

How many distinct paths are there for the robot to reach the point $(10,10)$ starting from the initial position $(0,0)$?

A. ${}^{20}\mathrm{C}_{10}$ B. 2^{20} C. 2^{10} D. None of the above

gate2007 permutation-and-combination

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1.4.17 Permutation And Combination: GATE2007-85

https://gateoverflow.in/43509

Suppose that a robot is placed on the Cartesian plane. At each step it is allowed to move either one unit up or one unit right, i.e., if it is at (i, j) then it can move to either $(i+1, j)$ or $(i, j+1)$.

Suppose that the robot is not allowed to traverse the line segment from $(4,4)$ to $(5,4)$. With this constraint, how many distinct paths are there for the robot to reach $(10,10)$ starting from $(0,0)$?

A. 2^9
B. 2^{19}
C. ${}^{8}\mathrm{C}_4 \times {}^{11}\mathrm{C}_5$
D. ${}^{20}\mathrm{C}_{10} - {}^{8}\mathrm{C}_4 \times {}^{11}\mathrm{C}_5$

gate2007 permutation-and-combination normal discrete-mathematics

1.4.18 Permutation And Combination: GATE2008-IT-25

https://gateoverflow.in/3286

In how many ways can b blue balls and r red balls be distributed in n distinct boxes?

A. $\frac{(n+b-1)!\,(n+r-1)!}{(n-1)!\,b!\,(n-1)!\,r!}$
B. $\frac{(n+(b+r)-1)!}{(n-1)!\,(n-1)!\,(b+r)!}$
C. $\frac{n!}{b!\,r!}$
D. $\frac{(n+(b+r)-1)!}{n!\,(b+r-1)}$

gate2008-it permutation-and-combination normal

1.4.19 Permutation And Combination: GATE2014-1-49

https://gateoverflow.in/1929

A pennant is a sequence of numbers, each number being 1 or 2. An $n-$pennant is a sequence of numbers with sum equal to n. For example, $(1,1,2)$ is a $4-$pennant. The set of all possible $1-$pennants is (1), the set of all possible $2-$pennants is $(2),(1,1)$ and the set of all $3-$pennants is $(2,1),(1,1,1),(1,2)$. Note that the pennant $(1,2)$ is not the same as the pennant $(2,1)$. The number of $10-$pennants is_____

gate2014-1 permutation-and-combination numerical-answers normal

1.4.20 Permutation And Combination: GATE2015-3-5

https://gateoverflow.in/8399

The number of 4 digit numbers having their digits in non-decreasing order (from left to right) constructed by using the digits belonging to the set $\{1,2,3\}$ is _____.

gate2015-3 permutation-and-combination normal numerical-answers

1.4.21 Permutation And Combination: GATE2018-46

https://gateoverflow.in/204121

The number of possible min-heaps containing each value from $\{1,2,3,4,5,6,7\}$ exactly once is _____

gate2018 permutation-and-combination numerical-answers

1.4.22 Permutation And Combination: GATE2019-5

https://gateoverflow.in/302843

Let $U = \{1,2,\ldots,n\}$ Let $A = \{(x,X) \mid x \in X, X \subseteq U\}$. Consider the following two statements on $|A|$.

I. $|A| = n2^{n-1}$

II. $|A| = \Sigma_{k=1}^{n} k \binom{n}{k}$

Which of the above statements is/are TRUE?

A. Only I
B. Only II
C. Both I and II
D. Neither I nor II

gate2019 engineering-mathematics discrete-mathematics permutation-and-combination

1.4.23 Permutation And Combination: TIFR2011-A-2

https://gateoverflow.in/19829

In how many ways can the letters of the word ABACUS be rearranged such that the vowels always appear together?

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A. $\frac{(6+3)!}{2!}$

B. $\frac{6!}{2!}$

C. $\frac{3!3!}{2!}$

D. $\frac{4!3!}{2!}$

E. None of the above.

tifr2011 permutation-and-combination

1.4.24 Permutation And Combination: TIFR2012-A-10

https://gateoverflow.in/25014

In how many different ways can r elements be picked from a set of n elements if

i. Repetition is not allowed and the order of picking matters?
ii. Repetition is allowed and the order of picking does not matter?

A. $\frac{n!}{(n-r)!}$ and $\frac{(n+r-1)!}{r!(n-1)!}$, respectively.

B. $\frac{n!}{(n-r)!}$ and $\frac{n!}{r!(n-1)!}$, respectively.

C. $\frac{n!}{r!(n-r)!}$ and $\frac{(n-r+1)!}{r!(n-1)!}$, respectively.

D. $\frac{n!}{r!(n-r)!}$ and $\frac{n!}{(n-r)!}$, respectively.

E. $\frac{n!}{r!}$ and $\frac{r!}{n!}$, respectively.

tifr2012 permutation-and-combination discrete-mathematics normal

1.4.25 Permutation And Combination: TIFR2015-A-7

https://gateoverflow.in/29568

A 1×1 chessboard has one square, a 2×2 chessboard has five squares. Continuing along this fashion, what is the number of squares on the regular 8×8 chessboard?

A. 64 B. 65 C. 204 D. 144 E. 256

tifr2015 permutation-and-combination

1.4.26 Permutation And Combination: TIFR2016-A-15

https://gateoverflow.in/97624

In a tournament with 7 teams, each team plays one match with every other team. For each match, the team earns two points if it wins, one point if it ties, and no points if it loses. At the end of all matches, the teams are ordered in the descending order of their total points (the order among the teams with the same total are determined by a whimsical tournament referee). The first three teams in this ordering are then chosen to play in the next round. What is the minimum total number of points a team must earn in order to be guaranteed a place in the next round?

A. 13 B. 12 C. 11 D. 10 E. 9

tifr2016 permutation-and-combination discrete-mathematics normal

1.4.27 Permutation And Combination: TIFR2017-A-6

https://gateoverflow.in/95033

How many distinct words can be formed by permuting the letters of the word $ABRACADABRA$?

A. $\frac{11!}{5!\,2!\,2!}$ B. $\frac{11!}{5!\,4!}$ C. $11!\,5!\,2!\,2!$ D. $11!\,5!\,4!$ E. $11!$

tifr2017 permutation-and-combination discrete-mathematics easy

1.4.28 Permutation And Combination: TIFR2019-B-13

https://gateoverflow.in/280482

A row of 10 houses has to be painted using the colours red, blue, and green so that each house is a single colour, and any house that is immediately to the right of a red or a blue house must be green. How many ways are there to paint the houses?

A. 199 B. 683 C. 1365 D. $3^{10} - 2^{10}$ E. 3^{10}

tifr2019 engineering-mathematics discrete-mathematics permutation-and-combination

1.5 Pigeonhole Principle (4)

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1.5.1 Pigeonhole Principle: GATE2000-1.1

https://gateoverflow.in/624

The minimum number of cards to be dealt from an arbitrarily shuffled deck of 52 cards to guarantee that three cards are from same suit is

A. 3 B. 8 C. 9 D. 12

gate2000 easy pigeonhole-principle permutation-and-combination

1.5.2 Pigeonhole Principle: GATE2005-44

https://gateoverflow.in/1170

What is the minimum number of ordered pairs of non-negative numbers that should be chosen to ensure that there are two pairs (a, b) and (c, d) in the chosen set such that, $a \equiv c \mod 3$ and $b \equiv d \mod 5$

A. 4 B. 6 C. 16 D. 24

gate2005 set-theory&algebra normal pigeonhole-principle

1.5.3 Pigeonhole Principle: TIFR2014-A-5

https://gateoverflow.in/25990

The rules for the University of Bombay five-a-side cricket competition specify that the members of each team must have birthdays in the same month. What is the minimum number of mathematics students needed to be enrolled in the department to guarantee that they can raise a team of students?

A. 23 B. 91 C. 60 D. 49 E. None of the above.

tifr2014 permutation-and-combination discrete-mathematics normal pigeonhole-principle

1.5.4 Pigeonhole Principle: TIFR2018-A-6

https://gateoverflow.in/179275

What is the minimum number of students needed in a class to guarantee that there are at least 6 students whose birthdays fall in the same month ?

a. 6 b. 23 c. 61 d. 72 e. 91

tifr2018 pigeonhole-principle permutation-and-combination

1.6 Recurrence (7)

1.6.1 Recurrence: GATE1996-9

https://gateoverflow.in/2761

The Fibonacci sequence $\{f_1, f_2, f_3 \ldots f_n\}$ is defined by the following recurrence:

$$f_{n+2} = f_{n+1} + f_n, n \geq 1; f_2 = 1 : f_1 = 1$$

Prove by induction that every third element of the sequence is even.

gate1996 set-theory&algebra recurrence proof

1.6.2 Recurrence: GATE2004-IT-34

https://gateoverflow.in/3677

Let $H_1, H_2, H_3,$ ... be harmonic numbers. Then, for $n \in Z^+$, $\sum_{j=1}^{n} H_j$ can be expressed as

A. $nH_{n+1} - (n+1)$
B. $(n+1)H_n - n$
C. $nH_n - n$
D. $(n+1)H_{n+1} - (n+1)$

gate2004-it recurrence permutation-and-combination normal

1.6.3 Recurrence: GATE2007-IT-76

https://gateoverflow.in/3528

Consider the sequence $\langle x_n \rangle$, $n \geq 0$ defined by the recurrence relation $x_{n+1} = c.x_n^2 - 2$, where $c > 0$. Suppose there exists a ***non-empty, open*** interval (a, b) such that for all x_0 satisfying $a < x_0 < b$, the sequence converges to a limit. The sequence converges to the value?

A. $\frac{1+\sqrt{1+8c}}{2c}$ B. $\frac{1-\sqrt{1+8c}}{2c}$ C. 2 D. $\frac{2}{2c-1}$

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gate2007-it permutation-and-combination normal recurrence

1.6.4 Recurrence: GATE2016-1-2

https://gateoverflow.in/39636

Let a_n be the number of n-bit strings that do **NOT** contain two consecutive $1's$. Which one of the following is the recurrence relation for a_n?

A. $a_n = a_{n-1} + 2a_{n-2}$
B. $a_n = a_{n-1} + a_{n-2}$
C. $a_n = 2a_{n-1} + a_{n-2}$
D. $a_n = 2a_{n-1} + 2a_{n-2}$

gate2016-1 permutation-and-combination recurrence easy

1.6.5 Recurrence: GATE2016-1-27

https://gateoverflow.in/39714

Consider the recurrence relation $a_1 = 8, a_n = 6n^2 + 2n + a_{n-1}$. Let $a_{99} = K \times 10^4$. The value of K is _____.

gate2016-1 permutation-and-combination recurrence normal numerical-answers

1.6.6 Recurrence: TIFR2014-A-3

https://gateoverflow.in/25988

The Fibonacci sequence is defined as follows: $F_0 = 0, F_1 = 1,$ and for all integers $n \geq 2, F_n = F_{n-1} + F_{n-2}$. Then which of the following statements is FALSE?

a. $F_{n+2} = 1 + \sum_{i=0}^{n} F_i$ for any integer $n \geq 0$
b. $F_{n+2} \geq \emptyset^n$ for any integer $n \geq 0$, where $\emptyset = \left(\sqrt{5}+1\right)/2$ is the positive root of $x^2 - x - 1 = 0$.
c. F_{3n} is even, for every integer $n \geq 0$.
d. F_{4n} is a multiple of 3, for every integer $n \geq 0$.
e. F_{5n} is a multiple of 4, for every integer $n \geq 0$.

tifr2014 recurrence easy

1.6.7 Recurrence: TIFR2017-A-7

https://gateoverflow.in/95037

Consider the sequence $S_0, S_1, S_2, \ldots$ defined as follows: $S_0 = 0,\ S_1 = 1$ and $S_n = 2S_{n-1} + S_{n-2}$ for $n \geq 2$. Which of the following statements is FALSE?

A. for every $n \geq 1$, S_{2n} is even
B. for every $n \geq 1$, S_{2n+1} is odd
C. for every $n \geq 1$, S_{3n} is multiple of 3
D. for every $n \geq 1$, S_{4n} is multiple of 6
E. none of the above

tifr2017 recurrence

1.7 Summation (3)

1.7.1 Summation: GATE1994-15

https://gateoverflow.in/2511

Use the patterns given to prove that

a. $\sum_{i=0}^{n-1} (2i+1) = n^2$
(You are not permitted to employ induction)

b. Use the result obtained in (a) to prove that $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$

gate1994 permutation-and-combination proof summation descriptive

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1.7.2 Summation: GATE2008-24

https://gateoverflow.in/422

Let $P = \sum_{\substack{1 \leq i \leq 2k \\ i\ odd}} i$ and $Q = \sum_{\substack{1 \leq i \leq 2k \\ i\ even}} i$, where k is a positive integer. Then

A. $P = Q - k$ B. $P = Q + k$ C. $P = Q$ D. $P = Q + 2k$

gate2008 permutation-and-combination easy summation

1.7.3 Summation: GATE2015-1-26

https://gateoverflow.in/8248

$\sum_{x=1}^{99} \frac{1}{x(x+1)} =$ _____.

gate2015-1 permutation-and-combination normal numerical-answers summation

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2 Discrete Mathematics: Graph Theory (74)

Syllabus: Connectivity, Matching, Coloring.

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	1	1	0	1	0	1	0	0.7	1
2 Marks Count	1	1	0	0	0	0	0	0.3	1
Total Marks	3	3	0	1	0	1	**0**	**1.3**	**3**

2.1 Counting (6)

2.1.1 Counting: GATE1994-1.6, ISRO2008-29

https://gateoverflow.in/2443

The number of distinct simple graphs with up to three nodes is

A. 15 B. 10 C. 7 D. 9

gate1994 graph-theory permutation-and-combination normal isro2008 counting

2.1.2 Counting: GATE2001-2.15

https://gateoverflow.in/733

How many undirected graphs (not necessarily connected) can be constructed out of a given set $V = \{v_1, v_2, \ldots v_n\}$ of n vertices?

A. $\frac{n(n-1)}{2}$ B. 2^n C. $n!$ D. $2^{\frac{n(n-1)}{2}}$

gate2001 graph-theory normal counting

2.1.3 Counting: GATE2004-79

https://gateoverflow.in/1073

How many graphs on n labeled vertices exist which have at least $\frac{(n^2-3n)}{2}$ edges ?

A. ${}^{\left(\frac{n^2-n}{2}\right)}C_{\left(\frac{n^2-3n}{2}\right)}$ B. $\sum_{k=0}^{\left(\frac{n^2-3n}{2}\right)} {}^{(n^2-n)}C_k$ C. ${}^{\left(\frac{n^2-n}{2}\right)}C_n$ D. $\sum_{k=0}^{n} {}^{\left(\frac{n^2-n}{2}\right)}C_k$

gate2004 graph-theory permutation-and-combination normal counting

2.1.4 Counting: GATE2005-35

https://gateoverflow.in/1371

How many distinct binary search trees can be created out of 4 distinct keys?

A. 5 B. 14 C. 24 D. 42

gate2005 graph-theory counting normal

2.1.5 Counting: GATE2012-38

https://gateoverflow.in/473

Let G be a complete undirected graph on 6 vertices. If vertices of G are labeled, then the number of distinct cycles of length 4 in G is equal to

A. 15 B. 30 C. 90 D. 360

gate2012 graph-theory normal marks-to-all counting

2.1.6 Counting: TIFR2017-B-12

https://gateoverflow.in/95819

An undirected graph is complete if there is an edge between every pair of vertices. Given a complete undirected graph on n vertices, in how many ways can you choose a direction for the edges so that there are no directed cycles?

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A. n
B. $\frac{n(n-1)}{2}$
C. $n!$
D. 2^n
E. 2^m, where $m = \frac{n(n-1)}{2}$

tifr2017 graph-theory counting

2.2 Degree Of Graph (14)

2.2.1 Degree Of Graph: GATE1987-9c

https://gateoverflow.in/82438

Show that the number of odd-degree vertices in a finite graph is even.

gate1987 graph-theory degree-of-graph descriptive

2.2.2 Degree Of Graph: GATE1991-16-b

https://gateoverflow.in/26647

Show that all vertices in an undirected finite graph cannot have distinct degrees, if the graph has at least two vertices.

gate1991 graph-theory degree-of-graph descriptive

2.2.3 Degree Of Graph: GATE1995-24

https://gateoverflow.in/2663

Prove that in finite graph, the number of vertices of odd degree is always even.

gate1995 graph-theory degree-of-graph descriptive

2.2.4 Degree Of Graph: GATE2003-40

https://gateoverflow.in/931

A graph $G = (V, E)$ satisfies $|E| \leq 3 \mid V \mid -6$. The min-degree of G is defined as $\min_{v \in V} \{\text{degree } (v)\}$. Therefore, min-degree of G cannot be

A. 3
B. 4
C. 5
D. 6

gate2003 graph-theory normal degree-of-graph

2.2.5 Degree Of Graph: GATE2006-71

https://gateoverflow.in/1850

The 2^n vertices of a graph G corresponds to all subsets of a set of size n, for $n \geq 6$. Two vertices of G are adjacent if and only if the corresponding sets intersect in exactly two elements.
The number of vertices of degree zero in G is:

A. 1
B. n
C. $n+1$
D. 2^n

gate2006 graph-theory normal degree-of-graph

2.2.6 Degree Of Graph: GATE2006-72

https://gateoverflow.in/43566

The 2^n vertices of a graph G corresponds to all subsets of a set of size n, for $n \geq 6$. Two vertices of G are adjacent if and only if the corresponding sets intersect in exactly two elements.

The maximum degree of a vertex in G is:

A. $\binom{\frac{n}{2}}{2}.2^{\frac{n}{2}}$
B. 2^{n-2}
C. $2^{n-3} \times 3$
D. 2^{n-1}

gate2006 graph-theory normal degree-of-graph

2.2.7 Degree Of Graph: GATE2009-3

https://gateoverflow.in/804

Which one of the following is **TRUE** for any simple connected undirected graph with more than 2 vertices?

A. No two vertices have the same degree.
B. At least two vertices have the same degree.
C. At least three vertices have the same degree.
D. All vertices have the same degree.

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gate2009 graph-theory normal degree-of-graph

2.2.8 Degree Of Graph: GATE2010-28

https://gateoverflow.in/1154

The degree sequence of a simple graph is the sequence of the degrees of the nodes in the graph in decreasing order. Which of the following sequences can not be the degree sequence of any graph?

I. $7, 6, 5, 4, 4, 3, 2, 1$
II. $6, 6, 6, 6, 3, 3, 2, 2$
III. $7, 6, 6, 4, 4, 3, 2, 2$
IV. $8, 7, 7, 6, 4, 2, 1, 1$

A. I and II B. III and IV C. IV only D. II and IV

gate2010 graph-theory degree-of-graph

2.2.9 Degree Of Graph: GATE2013-25

https://gateoverflow.in/1536

Which of the following statements is/are TRUE for undirected graphs?

P: Number of odd degree vertices is even.
Q: Sum of degrees of all vertices is even.

A. P only
B. Q only
C. Both P and Q
D. Neither P nor Q

gate2013 graph-theory easy degree-of-graph

2.2.10 Degree Of Graph: GATE2014-1-52

https://gateoverflow.in/1932

An ordered $n-$tuple $(d_1, d_2, \ldots, d_n)$ with $d_1 \geq d_2 \geq \ldots \geq d_n$ is called *graphic* if there exists a simple undirected graph with n vertices having degrees $d_1, d_2, \ldots, d_n$ respectively. Which one of the following 6-tuples is NOT graphic?

A. $(1, 1, 1, 1, 1, 1)$
B. $(2, 2, 2, 2, 2, 2)$
C. $(3, 3, 3, 1, 0, 0)$
D. $(3, 2, 1, 1, 1, 0)$

gate2014-1 graph-theory normal degree-of-graph

2.2.11 Degree Of Graph: GATE2017-2-23

https://gateoverflow.in/118594

G is an undirected graph with n vertices and 25 edges such that each vertex of G has degree at least 3. Then the maximum possible value of n is _____ .

gate2017-2 graph-theory numerical-answers degree-of-graph

2.2.12 Degree Of Graph: TIFR2010-B-36

https://gateoverflow.in/19248

In a directed graph, every vertex has exactly seven edges coming in. What can one always say about the number of edges going out of its vertices?

A. Exactly seven edges leave every vertex.
B. Exactly seven edges leave some vertex.
C. Some vertex has at least seven edges leaving it.
D. The number of edges coming out of vertex is odd.
E. None of the above.

tifr2010 graph-theory degree-of-graph

2.2.13 Degree Of Graph: TIFR2012-B-2

https://gateoverflow.in/25047

In a graph, the degree of a vertex is the number of edges incident (connected) on it. Which of the following is true for every graph G?

a. There are even number of vertices of even degree.

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b. There are odd number of vertices of even degree.
c. There are even number of vertices of odd degree.
d. There are odd number of vertices of odd degree.
e. All the vertices are of even degree.

tifr2012 graph-theory degree-of-graph

2.2.14 Degree Of Graph: TIFR2018-B-8

https://gateoverflow.in/179292

In an undirected graph G with n vertices, vertex 1 has degree 1, while each vertex $2, \ldots, n-1$ has degree 10 and the degree of vertex n is unknown, Which of the following statement must be TRUE on the graph G?

a. There is a path from vertex 1 to vertex n.
b. There is a path from vertex 1 to each vertex $2, \ldots, n-1$.
c. Vertex n has degree 1.
d. The diameter of the graph is at most $\frac{n}{10}$
e. All of the above choices must be TRUE

tifr2018 graph-theory degree-of-graph

2.3 Graph Coloring (11)

2.3.1 Graph Coloring: GATE2002-1.4

https://gateoverflow.in/808

The minimum number of colours required to colour the vertices of a cycle with n nodes in such a way that no two adjacent nodes have the same colour is

A. 2
B. 3
C. 4
D. $n - 2\left\lfloor \frac{n}{2} \right\rfloor + 2$

gate2002 graph-theory graph-coloring normal

2.3.2 Graph Coloring: GATE2004-77

https://gateoverflow.in/1071

The minimum number of colours required to colour the following graph, such that no two adjacent vertices are assigned the same color, is

A. 2
B. 3
C. 4
D. 5

gate2004 graph-theory graph-coloring easy

2.3.3 Graph Coloring: GATE2006-IT-25

https://gateoverflow.in/3564

Consider the undirected graph G defined as follows. The vertices of G are bit strings of length n. We have an edge between vertex u and vertex v if and only if u and v differ in exactly one bit position (in other words, v can be obtained from u by flipping a single bit). The ratio of the chromatic number of G to the diameter of G is,

A. $\frac{1}{(2^{n-1})}$
B. $\left(\frac{1}{n}\right)$
C. $\left(\frac{2}{n}\right)$
D. $\left(\frac{3}{n}\right)$

gate2006-it graph-theory graph-coloring normal

2.3.4 Graph Coloring: GATE2008-IT-3

https://gateoverflow.in/3263

What is the chromatic number of the following graph?

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A. 2 B. 3 C. 4 D. 5

gate2008-it graph-theory graph-coloring normal

2.3.5 Graph Coloring: GATE2009-2

https://gateoverflow.in/796

What is the chromatic number of an n vertex simple connected graph which does not contain any odd length cycle? Assume $n > 2$.

A. 2 B. 3 C. $n-1$ D. n

gate2009 graph-theory graph-coloring normal

2.3.6 Graph Coloring: GATE2016-2-03

https://gateoverflow.in/39553

The minimum number of colours that is sufficient to vertex-colour any planar graph is _____.

gate2016-2 graph-theory graph-coloring normal numerical-answers

2.3.7 Graph Coloring: GATE2018-18

https://gateoverflow.in/204092

The chromatic number of the following graph is _____

graph-theory graph-coloring numerical-answers gate2018

2.3.8 Graph Coloring: TIFR2013-B-1

https://gateoverflow.in/25508

Let $G = (V, E)$ be a simple undirected graph on n vertices. A colouring of G is an assignment of colours to each vertex such that endpoints of every edge are given different colours. Let $\chi(G)$ denote the chromatic number of G, i.e. the minimum numbers of colours needed for a valid colouring of G. A set $B \subseteq V$ is an independent set if no pair of vertices in B is connected by an edge. Let $a(G)$ be the number of vertices in a largest possible independent set in G. In the absence of any further information about G we can conclude.

A. $\chi(G) \geq a(G)$
B. $\chi(G) \leq a(G)$
C. $a(G) \geq \frac{n}{\chi(G)}$
D. $a(G) \leq \frac{n}{\chi(G)}$
E. None of the above.

tifr2013 graph-theory graph-coloring

2.3.9 Graph Coloring: TIFR2017-B-1

https://gateoverflow.in/95669

A vertex colouring with three colours of a graph $G = (V, E)$ is a mapping $c : V \to \{R, G, B\}$ so that adjacent vertices receive distinct colours. Consider the following undirected graph.

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How many vertex colouring with three colours does this graph have?

A. 3^9 B. 6^3 C. 3×2^8 D. 27 E. 24

tifr2017 graph-theory graph-coloring

2.3.10 Graph Coloring: TIFR2017-B-10

https://gateoverflow.in/95817

A vertex colouring of a graph $G = (V, E)$ with k coulours is a mapping $c : V \to \{1, \ldots, k\}$ such that $c(u) \neq c(v)$ for every $(u, v) \in E$. Consider the following statements:

i. If every vertex in G has degree at most d then G admits a vertex coulouring using $d + 1$ colours.
ii. Every cycle admits a vertex colouring using 2 colours
iii. Every tree admits a vertex colouring using 2 colours

Which of the above statements is/are TRUE? Choose from the following options:

A. only i B. only i and ii C. only i and iii D. only ii and iii E. i, ii, and iii

tifr2017 graph-theory graph-coloring

2.3.11 Graph Coloring: TIFR2018-A-9

https://gateoverflow.in/179388

How many ways are there to assign colours from range $\{1, 2, \ldots, r\}$ to vertices of the following graph so that adjacent vertices receive distinct colours?

A. r^4
B. $r^4 - 4r^3$
C. $r^4 - 5r^3 + 8r^2 - 4r$
D. $r^4 - 4r^3 + 9r^2 - 3r$
E. $r^4 - 5r^3 + 10r^2 - 15r$

tifr2018 graph-theory graph-coloring

2.4 Graph Connectivity (29)

2.4.1 Graph Connectivity: GATE1987-9d

https://gateoverflow.in/82442

Specify an adjacency-lists representation of the undirected graph given above.

gate1987 graph-theory easy graph-connectivity descriptive

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2.4.2 Graph Connectivity: GATE1988-2xvi

https://gateoverflow.in/94340

Write the adjacency matrix representation of the graph given in below figure.

gate1988 descriptive graph-theory graph-connectivity

2.4.3 Graph Connectivity: GATE1990-1-viii

https://gateoverflow.in/83854

Fill in the blanks:

A graph which has the same number of edges as its complement must have number of vertices congruent to _____ or _____ modulo 4.

gate1990 graph-theory graph-connectivity

2.4.4 Graph Connectivity: GATE1991-01,xv

https://gateoverflow.in/510

The maximum number of possible edges in an undirected graph with n vertices and k components is _____.

gate1991 graph-theory graph-connectivity normal

2.4.5 Graph Connectivity: GATE1993-8.1

https://gateoverflow.in/2299

Consider a simple connected graph G with n vertices and n edges $(n > 2)$. Then, which of the following statements are true?

A. G has no cycles
B. The graph obtained by removing any edge from G is not connected
C. G has at least one cycle
D. The graph obtained by removing any two edges from G is not connected
E. None of the above

gate1993 graph-theory graph-connectivity easy

2.4.6 Graph Connectivity: GATE1994-2.5

https://gateoverflow.in/2472

The number of edges in a regular graph of degree d and n vertices is _____

gate1994 graph-theory easy graph-connectivity descriptive

2.4.7 Graph Connectivity: GATE1995-1.25

https://gateoverflow.in/2612

The minimum number of edges in a connected cyclic graph on n vertices is:

A. $n-1$ B. n C. $n+1$ D. None of the above

gate1995 graph-theory graph-connectivity easy

2.4.8 Graph Connectivity: GATE1999-1.15

https://gateoverflow.in/1468

The number of articulation points of the following graph is

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A. 0 B. 1 C. 2 D. 3

gate1999 graph-theory graph-connectivity normal

2.4.9 Graph Connectivity: GATE1999-5

https://gateoverflow.in/1504

Let G be a connected, undirected graph. A cut in G is a set of edges whose removal results in G being broken into two or more components, which are not connected with each other. The size of a cut is called its cardinality. A min-cut of G is a cut in G of minimum cardinality. Consider the following graph:

a. Which of the following sets of edges is a cut?
   i. $\{(A,B),(E,F),(B,D),(A,E),(A,D)\}$
   ii. $\{(B,D),(C,F),(A,B)\}$
b. What is cardinality of min-cut in this graph?
c. Prove that if a connected undirected graph G with n vertices has a min-cut of cardinality k, then G has at least $\left(\frac{n\times k}{2}\right)$ edges.

gate1999 graph-theory graph-connectivity normal

2.4.10 Graph Connectivity: GATE2002-1.25, ISRO2008-30, ISRO2016-6

https://gateoverflow.in/830

The maximum number of edges in a n-node undirected graph without self loops is

A. n^2 B. $\frac{n(n-1)}{2}$ C. $n-1$ D. $\frac{(n+1)(n)}{2}$

gate2002 graph-theory easy isro2008 isro2016 graph-connectivity

2.4.11 Graph Connectivity: GATE2003-8, ISRO2009-53

https://gateoverflow.in/899

Let G be an arbitrary graph with n nodes and k components. If a vertex is removed from G, the number of components in the resultant graph must necessarily lie down between

A. k and n B. $k-1$ and $k+1$ C. $k-1$ and $n-1$ D. $k+1$ and $n-k$

gate2003 graph-theory graph-connectivity normal isro2009

2.4.12 Graph Connectivity: GATE2004-IT-37

https://gateoverflow.in/3680

What is the number of vertices in an undirected connected graph with 27 edges, 6 vertices of degree $2, 3$ vertices of degree 4 and remaining of degree 3?

A. 10 B. 11 C. 18 D. 19

gate2004-it graph-theory graph-connectivity normal

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2.4.13 Graph Connectivity: GATE2004-IT-5

https://gateoverflow.in/3646

What is the maximum number of edges in an acyclic undirected graph with n vertices?

A. $n-1$ B. n C. $n+1$ D. $2n-1$

gate2004-it graph-theory graph-connectivity normal

2.4.14 Graph Connectivity: GATE2005-11

https://gateoverflow.in/1161

Let G be a simple graph with 20 vertices and 100 edges. The size of the minimum vertex cover of G is 8. Then, the size of the maximum independent set of G is:

A. 12 B. 8 C. less than 8 D. more than 12

gate2005 graph-theory normal graph-connectivity

2.4.15 Graph Connectivity: GATE2005-IT-56

https://gateoverflow.in/3817

Let G be a directed graph whose vertex set is the set of numbers from 1 to 100. There is an edge from a vertex i to a vertex j iff either $j = i + 1$ or $j = 3i$. The minimum number of edges in a path in G from vertex 1 to vertex 100 is

A. 4 B. 7 C. 23 D. 99

gate2005-it graph-theory graph-connectivity normal

2.4.16 Graph Connectivity: GATE2006-73

https://gateoverflow.in/43567

The 2^n vertices of a graph G corresponds to all subsets of a set of size n, for $n \geq 6$. Two vertices of G are adjacent if and only if the corresponding sets intersect in exactly two elements.

The number of connected components in G is:

A. n B. $n+2$ C. $2^{\frac{n}{2}}$ D. $\frac{2^n}{n}$

gate2006 graph-theory normal graph-connectivity

2.4.17 Graph Connectivity: GATE2006-IT-11

https://gateoverflow.in/3550

If all the edge weights of an undirected graph are positive, then any subset of edges that connects all the vertices and has minimum total weight is a

A. Hamiltonian cycle B. grid C. hypercube D. tree

gate2006-it graph-theory graph-connectivity normal

2.4.18 Graph Connectivity: GATE2007-23

https://gateoverflow.in/1221

Which of the following graphs has an Eulerian circuit?

A. Any k-regular graph where k is an even number.
B. A complete graph on 90 vertices.
C. The complement of a cycle on 25 vertices.
D. None of the above

gate2007 graph-theory normal graph-connectivity

2.4.19 Graph Connectivity: GATE2008-IT-27

https://gateoverflow.in/3317

G is a simple undirected graph. Some vertices of G are of odd degree. Add a node v to G and make it adjacent to each odd degree vertex of G. The resultant graph is sure to be

A. regular B. complete C. Hamiltonian D. Euler

gate2008-it graph-theory graph-connectivity normal

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2.4.20 Graph Connectivity: GATE2014-1-51

https://gateoverflow.in/1931

Consider an undirected graph G where self-loops are not allowed. The vertex set of G is $\{(i,j) \mid 1 \leq i \leq 12, 1 \leq j \leq 12\}$. There is an edge between (a,b) and (c,d) if $|a-c| \leq 1$ and $|b-d| \leq 1$. The number of edges in this graph is_____.

gate2014-1 graph-theory numerical-answers normal graph-connectivity

2.4.21 Graph Connectivity: GATE2014-2-3

https://gateoverflow.in/1955

The maximum number of edges in a bipartite graph on 12 vertices is____

gate2014-2 graph-theory graph-connectivity numerical-answers normal

2.4.22 Graph Connectivity: GATE2014-3-51

https://gateoverflow.in/2085

If G is the forest with n vertices and k connected components, how many edges does G have?

A. $\left\lfloor \frac{n}{k} \right\rfloor$
B. $\left\lceil \frac{n}{k} \right\rceil$
C. $n-k$
D. $n-k+1$

gate2014-3 graph-theory graph-connectivity normal

2.4.23 Graph Connectivity: GATE2015-2-50

https://gateoverflow.in/8252

In a connected graph, a bridge is an edge whose removal disconnects the graph. Which one of the following statements is true?

A. A tree has no bridges
B. A bridge cannot be part of a simple cycle
C. Every edge of a clique with size ≥ 3 is a bridge (A clique is any complete subgraph of a graph)
D. A graph with bridges cannot have cycle

gate2015-2 graph-theory graph-connectivity easy

2.4.24 Graph Connectivity: GATE2019-12

https://gateoverflow.in/302836

Let G be an undirected complete graph on n vertices, where $n > 2$. Then, the number of different Hamiltonian cycles in G is equal to

A. $n!$
B. $(n-1)!$
C. 1
D. $\frac{(n-1)!}{2}$

gate2019 engineering-mathematics discrete-mathematics graph-theory graph-connectivity

2.4.25 Graph Connectivity: GATE2019-38

https://gateoverflow.in/302810

Let G be any connected, weighted, undirected graph.

I. G has a unique minimum spanning tree, if no two edges of G have the same weight.
II. G has a unique minimum spanning tree, if, for every cut of G, there is a unique minimum-weight edge crossing the cut.

Which of the following statements is/are TRUE?

A. I only
B. II only
C. Both I and II
D. Neither I nor II

gate2019 engineering-mathematics discrete-mathematics graph-theory graph-connectivity

2.4.26 Graph Connectivity: TIFR2015-B-5

https://gateoverflow.in/29858

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Suppose $\begin{pmatrix} 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 \end{pmatrix}$

is the adjacency matrix of an undirected graph with six vertices: that is, the rows and columns are indexed by vertices of the graph, and an entry is 1 if the corresponding vertices are connected by an edge and is 0 otherwise; the same order of vertices is used for the rows and columns. Which of the graphs below has the above adjacency matrix?

i.

ii.

iii.

iv.

A. Only (i)
B. Only (ii)
C. Only (iii)
D. Only (iv)
E. (i) and (ii)

tifr2015 graph-connectivity graph-theory

2.4.27 Graph Connectivity: TIFR2019-B-12

https://gateoverflow.in/280483

Let $G = (V, E)$ be a directed graph with $n(\geq 2)$ vertices, including a special vertex r. Each edge $e \in E$ has a strictly positive edge weight $w(e)$. An arborescence in G rooted at r is a subgraph H of G in which every vertex $u \in V \backslash \{r\}$ has a directed path to the special vertex r. The weight of an arborescence H is the sum of the weights of the edges in H.

Let H^* be a minimum arborescence rooted at r, and w^* the weight of H^*. Which of the following is NOT always true?

A. $w^* \geq \sum_{u \in V \backslash \{r\}} \min_{(u,v) \in E} w((u,v))$
B. $w^* \geq \sum_{u \in V \backslash \{r\}} \min_{(v,u) \in E} w((v,u))$
C. H^* has exactly $n-1$ edges
D. H^* is acyclic
E. w^* is less than the weight of the minimum weight directed Hamiltonian cycle in G, when G has a directed Hamiltonian cycle

tifr2019 graph-connectivity graph-theory difficult

2.4.28 Graph Connectivity: TIFR2019-B-15

https://gateoverflow.in/280480

Consider directed graphs on n labelled vertices $\{1, 2, \ldots, n\}$, where each vertex has exactly one edge coming in and exactly coming in and exactly one edge going out. We allow self-loops. How many graphs have exactly two cycles ?

A. $\sum_{k=1}^{n-1} k!(n-k)!$
B. $\frac{n!}{2}\left[\sum_{k=1}^{n-1} \frac{1}{k(n-k)}\right]$
C. $n!\left[\sum_{k=1}^{n-1} \frac{1}{k}\right]$
D. $\frac{n!(n-1)}{2}$
E. None of the above

tifr2019 graph-connectivity graph-theory

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2.4.29 Graph Connectivity: TIFR2019-B-3

https://gateoverflow.in/280492

A graph is d – regular if every vertex has degree d. For a d – regular graph on n vertices, which of the following must be TRUE?

A. d divides n
B. Both d and n are even
C. Both d and n are odd
D. At least one of d and n is odd
E. At least one of d and n is even

tifr2019 graph-connectivity graph-theory

2.5 Graph Matching (1)

2.5.1 Graph Matching: GATE2003-36

https://gateoverflow.in/926

How many perfect matching are there in a complete graph of 6 vertices?

A. 15 B. 24 C. 30 D. 60

gate2003 graph-theory graph-matching normal

2.6 Graph Planarity (4)

2.6.1 Graph Planarity: GATE1990-3-vi

https://gateoverflow.in/87129

Which of the following graphs is/are planner?

gate1989 normal graph-theory graph-planarity descriptive

2.6.2 Graph Planarity: GATE1990-3-xi

https://gateoverflow.in/85384

Choose the correct alternatives (More than one may be correct).

A graph is planar if and only if,

A. It does not contain subgraphs homeomorphic to k_5 and $k_{3,3}$.
B. It does not contain subgraphs isomorphic to k_5 or $k_{3,3}$.
C. It does not contain a subgraph isomorphic to k_5 or $k_{3,3}$
D. It does not contain a subgraph homeomorphic to k_5 or $k_{3,3}$.

gate1990 normal graph-theory graph-planarity

2.6.3 Graph Planarity: GATE2005-10

https://gateoverflow.in/1159

Let G be a simple connected planar graph with 13 vertices and 19 edges. Then, the number of faces in the planar embedding of the graph is:

A. 6 B. 8 C. 9 D. 13

gate2005 graph-theory graph-planarity

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2.6.4 Graph Planarity: GATE2008-23

https://gateoverflow.in/421

Which of the following statements is true for every planar graph on n vertices?

A. The graph is connected
B. The graph is Eulerian
C. The graph has a vertex-cover of size at most $\frac{3n}{4}$
D. The graph has an independent set of size at least $\frac{n}{3}$

gate2008 graph-theory normal graph-planarity

2.7 Graph Search (1)

2.7.1 Graph Search: GATE2018-30

https://gateoverflow.in/204104

Let G be a simple undirected graph. Let T_D be a depth first search tree of G. Let T_B be a breadth first search tree of G. Consider the following statements.

I. No edge of G is a cross edge with respect to T_D. (A cross edge in G is between two nodes neither of which is an ancestor of the other in T_D).
II. For every edge (u, v) of G, if u is at depth i and v is at depth j in T_B, then $|i - j| = 1$.

Which of the statements above must necessarily be true?

A. I only
B. II only
C. Both I and II
D. Neither I nor II

gate2018 graph-theory graph-search normal

2.8 Line Graph (2)

2.8.1 Line Graph: GATE2013-26

https://gateoverflow.in/1537

The line graph $L(G)$ of a simple graph G is defined as follows:

There is exactly one vertex $v(e)$ in $L(G)$ for each edge e in G.

For any two edges e and e' in G, $L(G)$ has an edge between $v(e)$ and $v(e')$, if and only if e and e' are incident with the same vertex in G.

Which of the following statements is/are TRUE?

- (P) The line graph of a cycle is a cycle.
- (Q) The line graph of a clique is a clique.
- (R) The line graph of a planar graph is planar.
- (S) The line graph of a tree is a tree.

A. P only
B. P and R only
C. R only
D. P, Q and S only

gate2013 graph-theory normal line-graph

2.8.2 Line Graph: TIFR2017-B-13

https://gateoverflow.in/95821

For an undirected graph $G = (V, E)$, the line graph $G' = (V', E')$ is obtained by replacing each edge in E by a vertex, and adding an edge between two vertices in V' if the corresponding edges in G are incident on the same vertex. Which of the following is TRUE of line graphs?

A. the line graph for a complete graph is complete
B. the line graph for a connected graph is connected
C. the line graph for a bipartite graph is bipartite
D. the maximum degree of any vertex in the line graph is at most the maximum degree in the original graph
E. each vertex in the line graph has degree one or two

tifr2017 graph-theory line-graph

2.9 Minimum Spanning Trees (1)

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2.9.1 Minimum Spanning Trees: TIFR2018-B-3

https://gateoverflow.in/179287

How many distinct minimum weight spanning trees does the following undirected, weighted graph have ?

A. 1 B. 2 C. 4 D. 6 E. 8

tifr2018 graph-theory minimum-spanning-trees

2.10 Spanning Tree (3)

2.10.1 Spanning Tree: GATE1989-4-vii

https://gateoverflow.in/88152

Provide short answers to the following questions:

In the graph shown above, the depth-first spanning tree edges are marked with a 'T'. Identify the forward, backward and cross edges.

gate1989 descriptive graph-theory spanning-tree dfs

2.10.2 Spanning Tree: GATE2007-IT-25

https://gateoverflow.in/3458

What is the largest integer m such that every simple connected graph with n vertices and n edges contains at least m different spanning trees ?

A. 1 B. 2 C. 3 D. n

gate2007-it graph-theory spanning-tree normal

2.10.3 Spanning Tree: TIFR2015-B-11

https://gateoverflow.in/30043

Let K_n be the complete graph on n vertices labeled $\{1, 2, \ldots, n\}$ with $m = \frac{n(n-1)}{2}$ edges. What is the number of spanning trees of K_n ?

A. $\frac{m}{n-1}$ B. m^{n-1} C. n^{n-2} D. n^{n-1} E. None of the above.

tifr2015 graph-theory spanning-tree

2.11 Trees (2)

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2.11.1 Trees: GATE2010-1

https://gateoverflow.in/1147

Let $G = (V, E)$ be a graph. Define $\xi(G) = \sum_d i_d * d$, where i_d is the number of vertices of degree d in G. If S and T are two different trees with $\xi(S) = \xi(T)$, then

A. $|S| = 2|T|$
B. $|S| = |T| - 1$
C. $|S| = |T|$
D. $|S| = |T| + 1$

gate2010 graph-theory normal trees

2.11.2 Trees: TIFR2011-B-33

https://gateoverflow.in/20624

Which of the following is NOT a sufficient and necessary condition for an undirected graph G to be a tree?

A. G is connected and has $n - 1$ edges.
B. G is acyclic and connected.
C. G is acyclic and has $n - 1$ edges.
D. G is acyclic, connected and has $n - 1$ edges.
E. G has $n - 1$ edges.

tifr2011 graph-theory trees

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3 Discrete Mathematics: Mathematical Logic (84)

Syllabus: Propositional and first order logic.

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	0	0	2	1	1	1	0	0.8	2
2 Marks Count	1	1	1	0	0	1	0	0.7	1
Total Marks	2	2	4	1	1	3	**1**	**2.2**	**4**

3.1 First Order Logic (37)

3.1.1 First Order Logic: GATE1989-14a

https://gateoverflow.in/93179

Symbolize the expression "Every mother loves her children" in predicate logic.

gate1989 descriptive first-order-logic mathematical-logic

3.1.2 First Order Logic: GATE1991-15,b

https://gateoverflow.in/26748

Consider the following first order formula:

$$\left(\begin{array}{c} \forall x \exists y : R(x,y) \\ \wedge \\ \forall x \forall y : (R(x,y) \implies \neg R(y,x)) \\ \wedge \\ \forall x \forall y \forall z : (R(x,y) \wedge R(y,z) \implies R(x,z)) \\ \wedge \\ \forall x : \neg R(x,x) \end{array}\right)$$

Does it have finite models?

Is it satisfiable? If so, give a countable model for it.

gate1991 first-order-logic descriptive

3.1.3 First Order Logic: GATE1992-92,xv

https://gateoverflow.in/256

Which of the following predicate calculus statements is/are valid?

A. $(\forall(x))P(x) \vee (\forall(x))Q(x) \implies (\forall(x))(P(x) \vee Q(x))$
B. $(\exists(x))P(x) \wedge (\exists(x))Q(x) \implies (\exists(x))(P(x) \wedge Q(x))$
C. $(\forall(x))(P(x) \vee Q(x)) \implies (\forall(x))P(x) \vee (\forall(x))Q(x)$
D. $(\exists(x))(P(x) \vee Q(x)) \implies \sim (\forall(x))P(x) \vee (\exists(x))Q(x)$

gate1992 mathematical-logic normal first-order-logic

3.1.4 First Order Logic: GATE2003-32

https://gateoverflow.in/922

Which of the following is a valid first order formula? (Here α and β are first order formulae with x as their only free variable)

A. $((\forall x)[\alpha] \Rightarrow (\forall x)[\beta]) \Rightarrow (\forall x)[\alpha \Rightarrow \beta]$

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B. $(\forall x)[\alpha] \Rightarrow (\exists x)[\alpha \wedge \beta]$
C. $((\forall x)[\alpha \vee \beta] \Rightarrow (\exists x)[\alpha]) \Rightarrow (\forall x)[\alpha]$
D. $(\forall x)[\alpha \Rightarrow \beta] \Rightarrow (((\forall x)[\alpha]) \Rightarrow (\forall x)[\beta])$

gate2003 mathematical-logic first-order-logic normal

3.1.5 First Order Logic: GATE2003-33

https://gateoverflow.in/923

Consider the following formula and its two interpretations I_1 and I_2.

$\alpha : (\forall x)\,[P_x \Leftrightarrow (\forall y)\,[Q_{xy} \Leftrightarrow \neg Q_{yy}]] \Rightarrow (\forall x)\,[\neg P_x]$

I_1 : Domain: the set of natural numbers

$P_x =$ 'x is a prime number'

$Q_{xy} =$ 'y divides x'

I_2 : same as I_1 except that $P_x =$ 'x is a composite number'.

Which of the following statements is true?

A. I_1 satisfies α, I_2 does not
B. I_2 satisfies α, I_1 does not
C. Neither I_1 nor I_2 satisfies α
D. Both I_1 and I_2 satisfies α

gate2003 mathematical-logic difficult first-order-logic

3.1.6 First Order Logic: GATE2004-23, ISRO2007-32

https://gateoverflow.in/1020

Identify the correct translation into logical notation of the following assertion.

Some boys in the class are taller than all the girls

Note: $\text{taller}(x, y)$ is true if x is taller than y.

A. $(\exists x)(\text{boy}(x) \rightarrow (\forall y)(\text{girl}(y) \wedge \text{taller}(x, y)))$
B. $(\exists x)(\text{boy}(x) \wedge (\forall y)(\text{girl}(y) \wedge \text{taller}(x, y)))$
C. $(\exists x)(\text{boy}(x) \rightarrow (\forall y)(\text{girl}(y) \rightarrow \text{taller}(x, y)))$
D. $(\exists x)(\text{boy}(x) \wedge (\forall y)(\text{girl}(y) \rightarrow \text{taller}(x, y)))$

gate2004 mathematical-logic easy isro2007 first-order-logic

3.1.7 First Order Logic: GATE2004-IT-3

https://gateoverflow.in/3644

Let $a(x, y), b(x, y,)$ and $c(x, y)$ be three statements with variables x and y chosen from some universe. Consider the following statement:

$$(\exists x)(\forall y)[(a(x, y) \wedge b(x, y)) \wedge \neg c(x, y)]$$

Which one of the following is its equivalent?

A. $(\forall x)(\exists y)[(a(x, y) \vee b(x, y)) \rightarrow c(x, y)]$
B. $(\exists x)(\forall y)[(a(x, y) \vee b(x, y)) \wedge \neg c(x, y)]$
C. $\neg(\forall x)(\exists y)[(a(x, y) \wedge b(x, y)) \rightarrow c(x, y)]$
D. $\neg(\forall x)(\exists y)[(a(x, y) \vee b(x, y)) \rightarrow c(x, y)]$

gate2004-it mathematical-logic normal discrete-mathematics first-order-logic

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3.1.8 First Order Logic: GATE2005-41

https://gateoverflow.in/1166

What is the first order predicate calculus statement equivalent to the following?

"Every teacher is liked by some student"

A. $\forall(x)\,[\text{teacher}\,(x) \rightarrow \exists(y)\,[\text{student}\,(y) \rightarrow \text{likes}\,(y,x)]]$
B. $\forall(x)\,[\text{teacher}\,(x) \rightarrow \exists(y)\,[\text{student}\,(y) \wedge \text{likes}\,(y,x)]]$
C. $\exists(y)\forall(x)\,[\text{teacher}\,(x) \rightarrow [\text{student}\,(y) \wedge \text{likes}\,(y,x)]]$
D. $\forall(x)\,[\text{teacher}\,(x) \wedge \exists(y)\,[\text{student}\,(y) \rightarrow \text{likes}\,(y,x)]]$

gate2005 mathematical-logic easy first-order-logic

3.1.9 First Order Logic: GATE2005-IT-36

https://gateoverflow.in/3783

Let $P(x)$ and $Q(x)$ be arbitrary predicates. Which of the following statements is always **TRUE**?

A. $((\forall x\,(P\,(x) \vee Q\,(x)))) \implies ((\forall x P\,(x)) \vee (\forall x Q\,(x)))$
B. $(\forall x\,(P\,(x) \implies Q\,(x))) \implies ((\forall x P\,(x)) \implies (\forall x Q\,(x)))$
C. $(\forall x\,(P\,(x)) \implies \forall x\,(Q\,(x))) \implies (\forall x\,(P\,(x) \implies Q\,(x)))$
D. $(\forall x\,(P\,(x)) \Leftrightarrow (\forall x\,(Q\,(x)))) \implies (\forall x\,(P\,(x) \Leftrightarrow Q\,(x)))$

gate2005-it mathematical-logic first-order-logic normal

3.1.10 First Order Logic: GATE2006-26

https://gateoverflow.in/989

Which one of the first order predicate calculus statements given below correctly expresses the following English statement?

Tigers and lions attack if they are hungry or threatened.

A. $\forall x[(\text{tiger}(x) \wedge \text{lion}(x)) \rightarrow (\text{hungry}(x) \vee \text{threatened}(x)) \rightarrow \text{attacks}(x)\ ]$
B. $\forall x[(\text{tiger}(x) \vee \text{lion}(x)) \rightarrow (\text{hungry}(x) \vee \text{threatened}(x)) \wedge \text{attacks}(x)\ ]$
C. $\forall x[(\text{tiger}(x) \vee \text{lion}(x)) \rightarrow \text{attacks}(x) \rightarrow (\text{hungry}(x) \vee \text{threatened}(x))\ ]$
D. $\forall x[(\text{tiger}(x) \vee \text{lion}(x)) \rightarrow (\text{hungry}(x) \vee \text{threatened}(x)) \rightarrow \text{attacks}(x)\ ]$

gate2006 mathematical-logic normal first-order-logic

3.1.11 First Order Logic: GATE2006-IT-21

https://gateoverflow.in/3560

Consider the following first order logic formula in which R is a binary relation symbol.

$$\forall x \forall y(R(x,y) \implies R(y,x))$$

The formula is

A. satisfiable and valid
B. satisfiable and so is its negation
C. unsatisfiable but its negation is valid
D. satisfiable but its negation is unsatisfiable

gate2006-it mathematical-logic normal first-order-logic

3.1.12 First Order Logic: GATE2007-22

https://gateoverflow.in/1220

Let $\text{Graph}(x)$ be a predicate which denotes that x is a graph. Let $\text{Connected}(x)$ be a predicate which denotes that x is connected. Which of the following first order logic sentences **DOES NOT** represent the statement:

"Not every graph is connected"

A. $\neg\forall x\left(\text{Graph}(x) \implies \text{Connected}(x)\right)$
B. $\exists x\left(\text{Graph}(x) \wedge \neg\,\text{Connected}(x)\right)$

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C. $\neg \forall x \left(\neg \text{ Graph}(x) \vee \text{ Connected}(x) \right)$
D. $\forall x \left(\text{ Graph}(x) \implies \neg \text{ Connected}(x) \right)$

gate2007 mathematical-logic easy first-order-logic

3.1.13 First Order Logic: GATE2007-IT-21

https://gateoverflow.in/3454

Which one of these first-order logic formulae is valid?

A. $\forall x \left(P(x) \implies Q(x) \right) \implies \left(\forall x P(x) \implies \forall x Q(x) \right)$
B. $\exists x \left(P(x) \vee Q(x) \right) \implies \left(\exists x P(x) \implies \exists x Q(x) \right)$
C. $\exists x \left(P(x) \wedge Q(x) \right) \iff \left(\exists x P(x) \wedge \exists x Q(x) \right)$
D. $\forall x \exists y P(x, y) \implies \exists y \forall x P(x, y)$

gate2007-it mathematical-logic normal first-order-logic

3.1.14 First Order Logic: GATE2008-30

https://gateoverflow.in/441

Let fsa and pda be two predicates such that $\text{fsa}(x)$ means x is a finite state automaton and $\text{pda}(y)$ means that y is a pushdown automaton. Let equivalent be another predicate such that $\text{equivalent}(a, b)$ means a and b are equivalent. Which of the following first order logic statements represent the following?

Each finite state automaton has an equivalent pushdown automaton

A. $(\forall x \text{ fsa}(x)) \implies (\exists y \text{ pda}(y) \wedge \text{equivalent}(x, y))$
B. $\neg \forall y (\exists x \text{ fsa}(x) \implies \text{pda}(y) \wedge \text{equivalent}(x, y))$
C. $\forall x \exists y (\text{fsa}(x) \wedge \text{pda}(y) \wedge \text{equivalent}(x, y))$
D. $\forall x \exists y (\text{fsa}(y) \wedge \text{pda}(x) \wedge \text{equivalent}(x, y))$

gate2008 easy mathematical-logic first-order-logic

3.1.15 First Order Logic: GATE2008-IT-21

https://gateoverflow.in/3282

Which of the following first order formulae is logically valid? Here $\alpha(x)$ is a first order formula with x as a free variable, and β is a first order formula with no free variable.

A. $[\beta \rightarrow (\exists x, \alpha(x))] \rightarrow [\forall x, \beta \rightarrow \alpha(x)]$
B. $[\exists x, \beta \rightarrow \alpha(x)] \rightarrow [\beta \rightarrow (\forall x, \alpha(x))]$
C. $[(\exists x, \alpha(x)) \rightarrow \beta] \rightarrow [\forall x, \alpha(x) \rightarrow \beta]$
D. $[(\forall x, \alpha(x)) \rightarrow \beta] \rightarrow [\forall x, \alpha(x) \rightarrow \beta]$

gate2008-it first-order-logic normal

3.1.16 First Order Logic: GATE2008-IT-22

https://gateoverflow.in/3283

Which of the following is the negation of $[\forall x, \alpha \rightarrow (\exists y, \beta \rightarrow (\forall u, \exists v, y))]$

A. $[\exists x, \alpha \rightarrow (\forall y, \beta \rightarrow (\exists u, \forall v, y))]$
B. $[\exists x, \alpha \rightarrow (\forall y, \beta \rightarrow (\exists u, \forall v, \neg y))]$
C. $[\forall x, \neg \alpha \rightarrow (\exists y, \neg \beta \rightarrow (\forall u, \exists v, \neg y))]$
D. $[\exists x, \alpha \wedge (\forall y, \beta \wedge (\exists u, \forall v, \neg y))]$

gate2008-it mathematical-logic normal first-order-logic

3.1.17 First Order Logic: GATE2009-23

https://gateoverflow.in/800

Which one of the following is the most appropriate logical formula to represent the statement?

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"Gold and silver ornaments are precious".
The following notations are used:

- $G(x)$: x is a gold ornament
- $S(x)$: x is a silver ornament
- $P(x)$: x is precious

A. $\forall x(P(x) \implies (G(x) \land S(x)))$
B. $\forall x((G(x) \land S(x)) \implies P(x))$
C. $\exists x((G(x) \land S(x)) \implies P(x))$
D. $\forall x((G(x) \lor S(x)) \implies P(x))$

gate2009 mathematical-logic easy first-order-logic

3.1.18 First Order Logic: GATE2009-26

https://gateoverflow.in/803

Consider the following well-formed formulae:

I. $\neg\forall x(P(x))$
II. $\neg\exists x(P(x))$
III. $\neg\exists x(\neg P(x))$
IV. $\exists x(\neg P(x))$

Which of the above are equivalent?

A. I and III B. I and IV C. II and III D. II and IV

gate2009 mathematical-logic normal first-order-logic

3.1.19 First Order Logic: GATE2010-30

https://gateoverflow.in/1156

Suppose the predicate $F(x, y, t)$ is used to represent the statement that person x can fool person y at time t.
Which one of the statements below expresses best the meaning of the formula,

$$\forall x \exists y \exists t(\neg F(x, y, t))$$

A. Everyone can fool some person at some time
B. No one can fool everyone all the time
C. Everyone cannot fool some person all the time
D. No one can fool some person at some time

gate2010 mathematical-logic easy first-order-logic

3.1.20 First Order Logic: GATE2011-30

https://gateoverflow.in/2132

Which one of the following options is CORRECT given three positive integers x, y and z, and a predicate

$$P(x) = \neg(x = 1) \land \forall y(\exists z(x = y * z) \Rightarrow (y = x) \lor (y = 1))$$

A. $P(x)$ being true means that x is a prime number
B. $P(x)$ being true means that x is a number other than 1
C. $P(x)$ is always true irrespective of the value of x
D. $P(x)$ being true means that x has exactly two factors other than 1 and x

gate2011 mathematical-logic normal first-order-logic

3.1.21 First Order Logic: GATE2012-13

https://gateoverflow.in/45

What is the correct translation of the following statement into mathematical logic?

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"Some real numbers are rational"

A. $\exists x(real(x) \vee rational(x))$
B. $\forall x(real(x) \rightarrow rational(x))$
C. $\exists x(real(x) \wedge rational(x))$
D. $\exists x(rational(x) \rightarrow real(x))$

gate2012 mathematical-logic easy first-order-logic

3.1.22 First Order Logic: GATE2013-27

https://gateoverflow.in/1538

What is the logical translation of the following statement?

"None of my friends are perfect."

A. $\exists x(F(x) \wedge \neg P(x))$
B. $\exists x(\neg F(x) \wedge P(x))$
C. $\exists x(\neg F(x) \wedge \neg P(x))$
D. $\neg \exists x(F(x) \wedge P(x))$

gate2013 mathematical-logic easy first-order-logic

3.1.23 First Order Logic: GATE2013-47

https://gateoverflow.in/80

Which one of the following is **NOT** logically equivalent to $\neg \exists x(\forall y(\alpha) \wedge \forall z(\beta))$?

A. $\forall x(\exists z(\neg \beta) \rightarrow \forall y(\alpha))$
B. $\forall x(\forall z(\beta) \rightarrow \exists y(\neg \alpha))$
C. $\forall x(\forall y(\alpha) \rightarrow \exists z(\neg \beta))$
D. $\forall x(\exists y(\neg \alpha) \rightarrow \exists z(\neg \beta))$

mathematical-logic normal marks-to-all gate2013 first-order-logic

3.1.24 First Order Logic: GATE2014-1-1

https://gateoverflow.in/769

Consider the statement

"Not all that glitters is gold"

Predicate glitters(x) is true if x glitters and predicate gold(x) is true if x is gold. Which one of the following logical formulae represents the above statement?

A. $\forall x : glitters(x) \Rightarrow \neg gold(x)$
B. $\forall x : gold(x) \Rightarrow glitters(x)$
C. $\exists x : gold(x) \wedge \neg glitters(x)$
D. $\exists x : glitters(x) \wedge \neg gold(x)$

gate2014-1 mathematical-logic first-order-logic

3.1.25 First Order Logic: GATE2014-3-53

https://gateoverflow.in/2087

The CORRECT formula for the sentence, "not all Rainy days are Cold" is

A. $\forall d(\text{Rainy}(d) \wedge \text{~Cold}(d))$
B. $\forall d(\text{~Rainy}(d) \rightarrow \text{Cold}(d))$
C. $\exists d(\text{~Rainy}(d) \rightarrow \text{Cold}(d))$
D. $\exists d(\text{Rainy}(d) \wedge \text{~Cold}(d))$

gate2014-3 mathematical-logic easy first-order-logic

3.1.26 First Order Logic: GATE2015-2-55

https://gateoverflow.in/8259

Which one of the following well-formed formulae is a tautology?

A. $\forall x\, \exists y\, R(x,y) \leftrightarrow \exists y\, \forall x\, R(x,y)$
B. $(\forall x\, [\exists y\, R(x,y) \rightarrow S(x,y)]) \rightarrow \forall x\, \exists y\, S(x,y)$
C. $[\forall x\, \exists y\, (P(x,y) \rightarrow R(x,y))] \leftrightarrow [\forall x\, \exists y\, (\neg P(x,y) \vee R(x,y))]$
D. $\forall x\, \forall y\, P(x,y) \rightarrow \forall x\, \forall y\, P(y,x)$

gate2015-2 mathematical-logic normal first-order-logic

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3.1.27 First Order Logic: GATE2016-2-27

https://gateoverflow.in/39618

Which one of the following well-formed formulae in predicate calculus is **NOT** valid ?

A. $(\forall_x p(x) \implies \forall_x q(x)) \implies (\exists_x \neg p(x) \vee \forall_x q(x))$
B. $(\exists x p(x) \vee \exists x q(x)) \implies \exists x(p(x) \vee q(x))$
C. $\exists x(p(x) \wedge q(x)) \implies (\exists x p(x) \wedge \exists x q(x))$
D. $\forall x(p(x) \vee q(x)) \implies (\forall x p(x) \vee \forall x q(x))$

gate2016-2 mathematical-logic first-order-logic normal

3.1.28 First Order Logic: GATE2017-1-02

https://gateoverflow.in/118701

Consider the first-order logic sentence $F : \forall x(\exists y R(x, y))$. Assuming non-empty logical domains, which of the sentences below are *implied* by F?

I. $\exists y(\exists x R(x, y))$
II. $\exists y(\forall x R(x, y))$
III. $\forall y(\exists x R(x, y))$
IV. $\neg \exists x(\forall y \neg R(x, y))$

A. IV only
B. I and IV only
C. II only
D. II and III only

gate2017-1 mathematical-logic first-order-logic

3.1.29 First Order Logic: GATE2018-28

https://gateoverflow.in/204102

Consider the first-order logic sentence

$$\varphi \equiv \exists\, s\, \exists\, t\, \exists\, u\, \forall\, v\, \forall\, w \forall\, x\, \forall\, y\, \psi(s, t, u, v, w, x, y)$$

where $\psi(s, t, u, v, w, x, y,)$ is a quantifier-free first-order logic formula using only predicate symbols, and possibly equality, but no function symbols. Suppose φ has a model with a universe containing 7 elements.

Which one of the following statements is necessarily true?

A. There exists at least one model of φ with universe of size less than or equal to 3
B. There exists no model of φ with universe of size less than or equal to 3
C. There exists no model of φ with universe size of greater than 7
D. Every model of φ has a universe of size equal to 7

gate2018 mathematical-logic normal first-order-logic

3.1.30 First Order Logic: GATE2019-35

https://gateoverflow.in/302813

Consider the first order predicate formula φ:

$\forall x[(\forall z\, z \mid x \Rightarrow ((z = x) \vee (z = 1))) \rightarrow \exists w(w > x) \wedge (\forall z\, z \mid w \Rightarrow ((w = z) \vee (z = 1)))]$

Here $a \mid b$ denotes that $'a$ divides b' , where a and b are integers. Consider the following sets:

$S1 : \{1, 2, 3, \ldots, 100\}$

$S2 :$ Set of all positive integers

$S3 :$ Set of all integers

Which of the above sets satisfy φ?

A. S1 and S2
B. S1 and S3
C. S2 and S3
D. S1, S2 and S3

gate2019 engineering-mathematics discrete-mathematics mathematical-logic first-order-logic

3.1.31 First Order Logic: TIFR2010-A-8

https://gateoverflow.in/18239

Which of the following is NOT necessarily true? { Notation: The symbol " $\neg$"notes negation; $P(x, y)$ means

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that for given x and y, the property $P(x, y)$ is true }.

a. $(\forall x \forall y P(x, y)) \Rightarrow (\forall y \forall x P(x, y))$
b. $(\forall x \exists y \neg P(x, y)) \Rightarrow \neg(\exists x \forall y P(x, y))$
c. $(\exists x \exists y P(x, y)) \Rightarrow (\exists y \exists x P(x, y))$
d. $(\exists x \forall y P(x, y)) \Rightarrow (\forall y \exists x P(x, y))$
e. $(\forall x \exists y P(x, y)) \Rightarrow (\exists y \forall x P(x, y))$

tifr2010 mathematical-logic first-order-logic

3.1.32 First Order Logic: TIFR2012-A-2

https://gateoverflow.in/20939

If $Mr. M$ is guilty, then no witness is lying unless he is afraid. There is a witness who is afraid. Which of the following statements is true?

(Hint: Formulate the problem using the following predicates
$G - Mr. M$ is guilty
$W(x) - x$ is a witness
$L(x) - x$ is lying
$A(x) - x$ is afraid)

A. $Mr. M$ is guilty.
B. $Mr. M$ is not guilty.
C. From these facts one cannot conclude that $Mr. M$ is guilty.
D. There is a witness who is lying.
E. No witness is lying.

tifr2012 mathematical-logic first-order-logic

3.1.33 First Order Logic: TIFR2012-B-3

https://gateoverflow.in/25048

For a person p, let $w(p)$, $A(p, y)$, $L(p)$ and $J(p)$ denote that p is a woman, p admires y, p is a lawyer and p is a judge respectively. Which of the following is the correct translation in first order logic of the sentence: "All woman who are lawyers admire some judge"?

a. $\forall x : [(w(x) \Lambda L(x)) \Rightarrow (\exists y : (J(y) \Lambda w(y) \Lambda A(x, y)))]$
b. $\forall x : [(w(x) \Rightarrow L(x)) \Rightarrow (\exists y : (J(y) \Lambda A(x, y)))]$
c. $\forall x \forall y : [(w(x) \Lambda L(x)) \Rightarrow (J(y) \Lambda A(x, y))]$
d. $\exists y \forall x : [(w(x) \Lambda L(x)) \Rightarrow (J(y) \Lambda A(x, y))]$
e. $\forall x : [(w(x) \Lambda L(x)) \Rightarrow (\exists y : (J(y) \Lambda A(x, y)))]$

tifr2012 mathematical-logic first-order-logic

3.1.34 First Order Logic: TIFR2016-B-4

https://gateoverflow.in/97634

In the following, A stands for a set of apples, and $S(x, y)$ stands for "x is sweeter than y. Let

$$\Psi \equiv \exists x : x \in A$$

$$\Phi \equiv \forall x \in A : \exists y \in A : S(x, y).$$

Which of the following statements implies that there are infinitely many apples (i.e.,, A is an inifinite set)?

A. $\Psi \wedge \Phi \wedge [\forall x \in A : \neg S(x, x)]$
B. $\Psi \wedge \Phi \wedge [\forall x \in A : S(x, x)]$
C. $\Psi \wedge \Phi \wedge [\forall x, y \in A : S(x, x) \wedge S(x, y) \rightarrow S(y, y)]$
D. $\Psi \wedge \Phi \wedge [\forall x \in A : \neg S(x, x)] \wedge [\forall x, y, z \in A : S(x, y) \wedge S(y, z) \rightarrow s(y, x)]$
E. $\Psi \wedge \Phi \wedge [\forall x \in A : \neg S(x, x)] \wedge [\forall x, y, z \in A : S(x, y) \wedge S(y, z) \rightarrow s(x, z)]$

tifr2016 mathematical-logic first-order-logic

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3.1.35 First Order Logic: TIFR2017-B-11

https://gateoverflow.in/95818

Given that

- $B(x)$ means "x is a bat",
- $F(x)$ means "x is a fly", and
- $E(x, y)$ means "x eats y",

what is the best English translation of

$$\forall x(F(x) \rightarrow \forall y(E(y, x) \rightarrow B(y)))?$$

A. all flies eat bats
B. every fly is eaten by some bat
C. bats eat only flies
D. every bat eats flies
E. only bats eat flies

tifr2017 first-order-logic

3.1.36 First Order Logic: TIFR2017-B-6

https://gateoverflow.in/95689

Consider the First Order Logic (FOL) with equality and suitable function and relation symbols. Which of the following is FALSE?

A. Partial orders cannot be axiomatized in FOL
B. FOL has a complete proof system
C. Natural numbers cannot be axiomatized in FOL
D. Real numbers cannot be axiomatized in FOL
E. Relational numbers cannot be axiomatized in FOL

tifr2017 first-order-logic normal

3.1.37 First Order Logic: TIFR2019-B-4

https://gateoverflow.in/280491

Let φ be a propositional formula on a set of variables A and φ be a propositional formula on a set of variables B, such that $\varphi \Rightarrow \psi$. A $Craig\ interpolant$ of φ and ψ is a propositional formula μ on variables $A \cap B$ such that $\varphi \Rightarrow \mu$ and $\mu \Rightarrow \psi$. Given propositional formula $\varphi = q \vee (r \wedge s)$ on the set of variables $A = \{q, r, s\}$ and propositional formula $\psi = \neg q \rightarrow (s \vee t)$ on the set of variables $B = \{q, s, t\}$, which of the following is a Craig interpolant for φ and ψ?

A. q
B. φ itself
C. $q \vee s$
D. $q \vee r$
E. $\neg q \wedge s$

tifr2019 engineering-mathematics discrete-mathematics mathematical-logic first-order-logic

3.2 Logical Reasoning (9)

3.2.1 Logical Reasoning: GATE2012-1

https://gateoverflow.in/33

Consider the following logical inferences.

I_1: If it rains then the cricket match will not be played.
The cricket match was played.
Inference: There was no rain.

I_2: If it rains then the cricket match will not be played.
It did not rain.
Inference: The cricket match was played.

Which of the following is **TRUE**?

A. Both I_1 and I_2 are correct inferences
B. I_1 is correct but I_2 is not a correct inference
C. I_1 is not correct but I_2 is a correct inference
D. Both I_1 and I_2 are not correct inferences

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gate2012 mathematical-logic easy logical-reasoning

3.2.2 Logical Reasoning: GATE2015-2-3

https://gateoverflow.in/8049

Consider the following two statements.

- S_1: If a candidate is known to be corrupt, then he will not be elected
- S_2: If a candidate is kind, he will be elected

Which one of the following statements follows from S_1 and S_2 as per sound inference rules of logic?

A. If a person is known to be corrupt, he is kind
B. If a person is not known to be corrupt, he is not kind
C. If a person is kind, he is not known to be corrupt
D. If a person is not kind, he is not known to be corrupt

gate2015-2 mathematical-logic normal logical-reasoning

3.2.3 Logical Reasoning: GATE2015-3-24

https://gateoverflow.in/8427

In a room there are only two types of people, namely Type 1 and Type 2. Type 1 people always tell the truth and Type 2 people always lie. You give a fair coin to a person in that room, without knowing which type he is from and tell him to toss it and hide the result from you till you ask for it. Upon asking the person replies the following

"The result of the toss is head if and only if I am telling the truth"

Which of the following options is correct?

A. The result is head
B. The result is tail
C. If the person is of Type 2, then the result is tail
D. If the person is of Type 1, then the result is tail

gate2015-3 mathematical-logic difficult logical-reasoning

3.2.4 Logical Reasoning: TIFR2010-A-4

https://gateoverflow.in/18212

- If the bank receipt is forged, then Mr. M is liable.
- If Mr. M is liable, he will go bankrupt.
- If the bank will loan him money, he will not go bankrupt.
- The bank will loan him money.

Which of the following can be concluded from the above statements?

a. Mr. M is liable
b. The receipt is not forged
c. Mr. M will go bankrupt
d. The bank will go bankrupt
e. None of the above

tifr2010 logical-reasoning mathematical-logic

3.2.5 Logical Reasoning: TIFR2011-A-1

https://gateoverflow.in/237

- If either wages or prices are raised, there will be inflation.
- If there is inflation, then either the government must regulate it or the people will suffer.
- If the people suffer, the government will be unpopular.
- Government will not be unpopular.

Which of the following can be validly concluded from the above statements.

A. People will not suffer
B. If the inflation is not regulated, then wages are not raised

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C. Prices are not raised
D. If the inflation is not regulated, then the prices are not raised
E. Wages are not raised

tifr2011 mathematical-logic normal logical-reasoning

3.2.6 Logical Reasoning: TIFR2011-A-12

https://gateoverflow.in/20221

The action for this problem takes place in an island of Knights and Knaves, where Knights always make true statements and Knaves always make false statements and everybody is either a Knight or a Knave. Two friends A and B lives in a house. The census taker (an outsider) knocks on the door and it is opened by A. The census taker says "I need information about you and your friend. Which if either is a Knight and which if either is a Knave?". "We are both Knaves" says A angrily and slams the door. What, if any thing can the census taker conclude?

A. A is a Knight and B is a Knave.
B. A is a Knave and B is a Knight.
C. Both are Knaves.
D. Both are Knights.
E. No conclusion can be drawn.

tifr2011 mathematical-logic logical-reasoning

3.2.7 Logical Reasoning: TIFR2012-A-3

https://gateoverflow.in/20981

Long ago,in a planet far far away, there lived three races of intelligent inhabitants: the blues (who always tell the truth), the whites (who always lie), and the pinks (who, when asked a series of questions, start with a lie and then tell the truth and lie alternately). To three creatures, chosen from the planet and seated facing each other at A, B, and C (see figure), the following three questions are put:

i. What race is your left-hand neighbour?
ii. What race is your right-hand neighbour?
iii. What race are you?

Here are their answers:

A. (i) White (ii) Pink (iii) Blue
B. (i) Pink (ii) Pink (iii) Blue
C. (i) White (ii) Blue (iii) Blue

What is the actual race of each of the three creatures?

A. A is Pink, B is White, C is Blue.
B. A is Blue, B is Pink, C is White.
C. A is Pink, B is Blue, C is Pink.
D. A is White, B is Pink, C is Blue.
E. Cannot be determined from the above data.

tifr2012 mathematical-logic logical-reasoning

3.2.8 Logical Reasoning: TIFR2013-A-3

https://gateoverflow.in/25384

Three candidates, Amar, Birendra and Chanchal stand for the local election. Opinion polls are conducted and show that fraction a of the voters prefer Amar to Birendra, fraction b prefer Birendra to Chanchal and fraction c prefer Chanchal to Amar. Which of the following is impossible?

a. $(a, b, c) = (0.51, 0.51, 0.51)$;
b. $(a, b, c) = (0.61, 0.71, 0.67)$;
c. $(a, b, c) = (0.68, 0.68, 0.68)$;
d. $(a, b, c) = (0.49, 0.49, 0.49)$;
e. None of the above.

tifr2013 set-theory&algebra logical-reasoning

3.2.9 Logical Reasoning: TIFR2014-A-8

https://gateoverflow.in/25994

All that glitters is gold. No gold is silver.

Claims:

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1. No silver glitters.
2. Some gold glitters.

Then, which of the following is TRUE?

a. Only claim 1 follows.
b. Only claim 2 follows.
c. Either claim 1 or claim 2 follows but not both.
d. Neither claim 1 nor claim 2 follows.
e. Both claim 1 and claim 2 follow.

tifr2014 mathematical-logic logical-reasoning

3.3 Propositional Logic (38)

3.3.1 Propositional Logic: GATE1987-10e

https://gateoverflow.in/82457

Show that the conclusion $(r \to q)$ follows from the premises:

$p, (p \to q) \vee (p \wedge (r \to q))$

gate1987 mathematical-logic propositional-logic proof descriptive

3.3.2 Propositional Logic: GATE1988-2vii

https://gateoverflow.in/93947

Define the validity of a well-formed formula(wff)

gate1988 descriptive mathematical-logic propositional-logic

3.3.3 Propositional Logic: GATE1989-3-v

https://gateoverflow.in/87126

Answer the following:

Which of the following well-formed formulas are equivalent?

A. $P \to Q$
B. $\neg Q \to \neg P$
C. $\neg P \vee Q$
D. $\neg Q \to P$

gate1989 normal mathematical-logic propositional-logic

3.3.4 Propositional Logic: GATE1990-3-x

https://gateoverflow.in/84861

Choose the correct alternatives (More than one may be correct).

Indicate which of the following well-formed formulae are valid:

A. $(P \Rightarrow Q) \wedge (Q \Rightarrow R) \Rightarrow (P \Rightarrow R)$
B. $(P \Rightarrow Q) \Rightarrow (\neg P \Rightarrow \neg Q)$
C. $(P \wedge (\neg P \vee \neg Q)) \Rightarrow Q$
D. $(P \Rightarrow R) \vee (Q \Rightarrow R) \Rightarrow ((P \vee Q) \Rightarrow R)$

gate1990 normal mathematical-logic propositional-logic

3.3.5 Propositional Logic: GATE1991-03,xii

https://gateoverflow.in/526

Choose the correct alternatives (more than one may be correct) and write the corresponding letters only:

If F_1, F_2 and F_3 are propositional formulae such that $F_1 \wedge F_2 \to F_3$ and $F_1 \wedge F_2 \to \sim F_3$ are both tautologies, then which of the following is true:

A. Both F_1 and F_2 are tautologies
B. The conjunction $F_1 \wedge F_2$ is not satisfiable
C. Neither is tautologous
D. Neither is satisfiable
E. None of the above.

gate1991 mathematical-logic normal propositional-logic

3.3.6 Propositional Logic: GATE1992-02,xvi

https://gateoverflow.in/574

Choose the correct alternatives (more than one may be correct) and write the corresponding letters only:

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Which of the following is/are a tautology?

A. $a \vee b \rightarrow b \wedge c$
B. $a \wedge b \rightarrow b \vee c$
C. $a \vee b \rightarrow (b \rightarrow c)$
D. $a \rightarrow b \rightarrow (b \rightarrow c)$

gate1992 mathematical-logic easy propositional-logic

3.3.7 Propositional Logic: GATE1992-15.a

https://gateoverflow.in/594

Use Modus ponens $(A, A \rightarrow B| = B)$ or resolution to show that the following set is inconsistent:

1. $Q(x) \rightarrow P(x) \vee \sim R(a)$
2. $R(a) \wedge \sim Q(a)$
3. $Q(a)$
4. $\sim P(y)$

where x and y are universally quantified variables, a is a constant and P, Q, R are monadic predicates.

gate1992 normal mathematical-logic propositional-logic

3.3.8 Propositional Logic: GATE1993-18

https://gateoverflow.in/2315

Show that proposition C is a logical consequence of the formula

$$A \wedge (A \rightarrow (B \vee C)) \wedge (B \rightarrow \neg A)$$

using truth tables.

gate1993 mathematical-logic normal propositional-logic proof descriptive

3.3.9 Propositional Logic: GATE1993-8.2

https://gateoverflow.in/2300

The proposition $p \wedge (\sim p \vee q)$ is:

A. a tautology
B. logically equivalent to $p \wedge q$
C. logically equivalent to $p \vee q$
D. a contradiction
E. none of the above

gate1993 mathematical-logic easy propositional-logic

3.3.10 Propositional Logic: GATE1994-3.13

https://gateoverflow.in/2499

Let p and q be propositions. Using only the Truth Table, decide whether

- $p \Longleftrightarrow q$ does not imply $p \rightarrow \neg q$

is **True** or **False**.

gate1994 mathematical-logic normal propositional-logic descriptive

3.3.11 Propositional Logic: GATE1995-13

https://gateoverflow.in/2649

Obtain the principal (canonical) conjunctive normal form of the propositional formula

$$(p \wedge q) \vee (\neg q \wedge r)$$

where $\wedge$ is logical and, $\vee$ is inclusive or and $\neg$ is negation.

gate1995 mathematical-logic propositional-logic normal descriptive

3.3.12 Propositional Logic: GATE1995-2.19

https://gateoverflow.in/2631

If the proposition $\neg p \rightarrow q$ is true, then the truth value of the proposition $\neg p \vee (p \rightarrow q)$, where $\neg$ is negation,

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$\vee$ is inclusive OR and $\rightarrow$ is implication, is

A. True B. Multiple Values C. False D. Cannot be determined

gate1995 mathematical-logic normal propositional-logic

3.3.13 Propositional Logic: GATE1996-2.3

https://gateoverflow.in/2732

Which of the following is false? Read $\wedge$ as AND, $\vee$ as OR, $\neg$ as NOT, $\rightarrow$ as one way implication and $\leftrightarrow$ as two way implication

A. $((x \rightarrow y) \wedge x) \rightarrow y$
B. $((\neg x \rightarrow y) \wedge (\neg x \rightarrow \neg y)) \rightarrow x$
C. $(x \rightarrow (x \vee y))$
D. $((x \vee y) \leftrightarrow (\neg x \rightarrow \neg y))$

gate1996 mathematical-logic normal propositional-logic

3.3.14 Propositional Logic: GATE1997-3.2

https://gateoverflow.in/2233

Which of the following propositions is a tautology?

A. $(p \vee q) \rightarrow p$
B. $p \vee (q \rightarrow p)$
C. $p \vee (p \rightarrow q)$
D. $p \rightarrow (p \rightarrow q)$

gate1997 mathematical-logic easy propositional-logic

3.3.15 Propositional Logic: GATE1998-1.5

https://gateoverflow.in/1642

What is the converse of the following assertion?

- I stay only if you go

A. I stay if you go
B. If I stay then you go
C. If you do not go then I do not stay
D. If I do not stay then you go

gate1998 mathematical-logic easy propositional-logic

3.3.16 Propositional Logic: GATE1999-14

https://gateoverflow.in/1513

Show that the formula $[(\sim p \vee q) \Rightarrow (q \Rightarrow p)]$ is not a tautology.

Let A be a tautology and B any other formula. Prove that $(A \vee B)$ is a tautology.

gate1999 mathematical-logic normal propositional-logic proof descriptive

3.3.17 Propositional Logic: GATE2000-2.7

https://gateoverflow.in/654

Let a, b, c, d be propositions. Assume that the equivalence $a \Leftrightarrow (b \vee \neg b)$ and $b \Leftrightarrow c$ hold. Then the truth-value of the formula $(a \wedge b) \rightarrow (a \wedge c) \vee d$ is always

A. True
B. False
C. Same as the truth-value of b
D. Same as the truth-value of d

gate2000 mathematical-logic normal propositional-logic

3.3.18 Propositional Logic: GATE2001-1.3

https://gateoverflow.in/696

Consider two well-formed formulas in propositional logic

$F_1 : P \Rightarrow \neg P \qquad F_2 : (P \Rightarrow \neg P) \vee (\neg P \Rightarrow P)$

Which one of the following statements is correct?

A. F_1 is satisfiable, F_2 is valid
B. F_1 unsatisfiable, F_2 is satisfiable

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C. F_1 is unsatisfiable, F_2 is valid
D. F_1 and F_2 are both satisfiable

gate2001 mathematical-logic easy propositional-logic

3.3.19 Propositional Logic: GATE2002-1.8

https://gateoverflow.in/812

"If X then Y unless Z" is represented by which of the following formulas in prepositional logic? (" $\neg$" is negation, "$\wedge$" is conjunction, and "$\rightarrow$" is implication)

A. $(X \wedge \neg Z) \rightarrow Y$
B. $(X \wedge Y) \rightarrow \neg Z$
C. $X \rightarrow (Y \wedge \neg Z)$
D. $(X \rightarrow Y) \wedge \neg Z$

gate2002 mathematical-logic normal propositional-logic

3.3.20 Propositional Logic: GATE2002-5b

https://gateoverflow.in/3915

Determine whether each of the following is a tautology, a contradiction, or neither (" $\vee$" is disjunction, "$\wedge$" is conjunction, "$\rightarrow$" is implication, "$\neg$" is negation, and "$\leftrightarrow$" is biconditional (if and only if).

1. $A \leftrightarrow (A \vee A)$
2. $(A \vee B) \rightarrow B$
3. $A \wedge (\neg(A \vee B))$

gate2002 mathematical-logic easy descriptive propositional-logic

3.3.21 Propositional Logic: GATE2003-72

https://gateoverflow.in/959

The following resolution rule is used in logic programming.
Derive clause $(P \vee Q)$ from clauses $(P \vee R), (Q \vee \neg R)$
Which of the following statements related to this rule is FALSE?

A. $((P \vee R) \wedge (Q \vee \neg R)) \Rightarrow (P \vee Q)$ is logically valid
B. $(P \vee Q) \Rightarrow ((P \vee R)) \wedge (Q \vee \neg R))$ is logically valid
C. $(P \vee Q)$ is satisfiable if and only if $(P \vee R) \wedge (Q \vee \neg R)$ is satisfiable
D. $(P \vee Q) \Rightarrow \text{FALSE}$ if and only if both P and Q are unsatisfiable

gate2003 mathematical-logic normal propositional-logic

3.3.22 Propositional Logic: GATE2004-70

https://gateoverflow.in/1064

The following propositional statement is $(P \implies (Q \vee R)) \implies ((P \wedge Q) \implies R)$

A. satisfiable but not valid
B. valid
C. a contradiction
D. None of the above

gate2004 mathematical-logic normal propositional-logic

3.3.23 Propositional Logic: GATE2004-IT-31

https://gateoverflow.in/3674

Let p, q, r and s be four primitive statements. Consider the following arguments:

$P: [(\neg p \vee q) \wedge (r \rightarrow s) \wedge (p \vee r)] \rightarrow (\neg s \rightarrow q)$
$Q: [(\neg p \wedge q) \wedge [q \rightarrow (p \rightarrow r)]] \rightarrow \neg r$
$R: [[(q \wedge r) \rightarrow p] \wedge (\neg q \vee p)] \rightarrow r$
$S: [p \wedge (p \rightarrow r) \wedge (q \vee \neg r)] \rightarrow q$

Which of the above arguments are valid?

A. P and Q only
B. P and R only
C. P and S only
D. P, Q, R and S

gate2004-it mathematical-logic normal propositional-logic

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3.3.24 Propositional Logic: GATE2005-40

https://gateoverflow.in/1165

Let P, Q and R be three atomic propositional assertions. Let X denote $(P \vee Q) \rightarrow R$ and Y denote $(P \rightarrow R) \vee (Q \rightarrow R)$. Which one of the following is a tautology?

A. $X \equiv Y$ B. $X \rightarrow Y$ C. $Y \rightarrow X$ D. $\neg Y \rightarrow X$

gate2005 mathematical-logic propositional-logic normal

3.3.25 Propositional Logic: GATE2006-27

https://gateoverflow.in/990

Consider the following propositional statements:

- $P_1 : ((A \wedge B) \rightarrow C)) \equiv ((A \rightarrow C) \wedge (B \rightarrow C))$
- $P_2 : ((A \vee B) \rightarrow C)) \equiv ((A \rightarrow C) \vee (B \rightarrow C))$

Which one of the following is true?

A. P_1 is a tautology, but not P_2
B. P_2 is a tautology, but not P_1
C. P_1 and P_2 are both tautologies
D. Both P_1 and P_2 are not tautologies

gate2006 mathematical-logic normal propositional-logic

3.3.26 Propositional Logic: GATE2008-31

https://gateoverflow.in/442

P and Q are two propositions. Which of the following logical expressions are equivalent?

I. $P \vee \neg Q$
II. $\neg(\neg P \wedge Q)$
III. $(P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$
IV. $(P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge Q)$

A. Only I and II
B. Only I, II and III
C. Only I, II and IV
D. All of I, II, III and IV

gate2008 normal mathematical-logic propositional-logic

3.3.27 Propositional Logic: GATE2009-24

https://gateoverflow.in/801

The binary operation $\square$ is defined as follows

P	Q	P$\square$Q
T	T	T
T	F	T
F	T	F
F	F	T

Which one of the following is equivalent to $P \vee Q$?

A. $\neg Q \square \neg P$
B. $P \square \neg Q$
C. $\neg P \square Q$
D. $\neg P \square \neg Q$

gate2009 mathematical-logic easy propositional-logic

3.3.28 Propositional Logic: GATE2014-1-53

https://gateoverflow.in/1933

Which one of the following propositional logic formulas is TRUE when exactly two of p, q and r are TRUE?

A. $((p \leftrightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$
B. $(\sim (p \leftrightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$
C. $((p \rightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$
D. $(\sim (p \leftrightarrow q) \wedge r) \wedge (p \wedge q \wedge \sim r)$

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gate2014-1 mathematical-logic normal propositional-logic

3.3.29 Propositional Logic: GATE2014-2-53

https://gateoverflow.in/2020

Which one of the following Boolean expressions is NOT a tautology?

A. $((a \rightarrow b) \wedge (b \rightarrow c)) \rightarrow (a \rightarrow c)$
B. $(a \rightarrow c) \rightarrow (\sim b \rightarrow (a \wedge c))$
C. $(a \wedge b \wedge c) \rightarrow (c \vee a)$
D. $a \rightarrow (b \rightarrow a)$

gate2014-2 mathematical-logic propositional-logic normal

3.3.30 Propositional Logic: GATE2014-3-1

https://gateoverflow.in/2035

Consider the following statements:

- P: Good mobile phones are not cheap
- Q: Cheap mobile phones are not good

L: P implies Q
M: Q implies P
N: P is equivalent to Q

Which one of the following about L, M, and N is CORRECT?

A. Only L is TRUE.
B. Only M is TRUE.
C. Only N is TRUE.
D. L, M and N are TRUE.

gate2014-3 mathematical-logic easy propositional-logic

3.3.31 Propositional Logic: GATE2015-1-14

https://gateoverflow.in/8209

Which one of the following is NOT equivalent to $p \leftrightarrow q$?

A. $(\neg p \vee q) \wedge (p \vee \neg q)$
B. $(\neg p \vee q) \wedge (q \rightarrow p)$
C. $(\neg p \wedge q) \vee (p \wedge \neg q)$
D. $(\neg p \wedge \neg q) \vee (p \wedge q)$

gate2015-1 mathematical-logic easy propositional-logic

3.3.32 Propositional Logic: GATE2016-1-1

https://gateoverflow.in/39663

Let p, q, r, s represents the following propositions.

- $p : x \in \{8, 9, 10, 11, 12\}$
- $q : x$ is a composite number.
- $r : x$ is a perfect square.
- $s : x$ is a prime number.

The integer $x \geq 2$ which satisfies $\neg((p \Rightarrow q) \wedge (\neg r \vee \neg s))$ is _____.

gate2016-1 mathematical-logic normal numerical-answers propositional-logic

3.3.33 Propositional Logic: GATE2016-2-01

https://gateoverflow.in/39568

Consider the following expressions:

i. $false$

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ii. Q
iii. $true$
iv. $P \vee Q$
v. $\neg Q \vee P$

The number of expressions given above that are logically implied by $P \wedge (P \Rightarrow Q)$ is _____.

gate2016-2 mathematical-logic normal numerical-answers propositional-logic

3.3.34 Propositional Logic: GATE2017-1-01

https://gateoverflow.in/118698

The statement $(\neg p) \Rightarrow (\neg q)$ is logically equivalent to which of the statements below?

I. $p \Rightarrow q$
II. $q \Rightarrow p$
III. $(\neg q) \vee p$
IV. $(\neg p) \vee q$

A. I only
B. I and IV only
C. II only
D. II and III only

gate2017-1 mathematical-logic propositional-logic easy

3.3.35 Propositional Logic: GATE2017-1-29

https://gateoverflow.in/118310

Let p, q and r be propositions and the expression $(p \rightarrow q) \rightarrow r$ be a contradiction. Then, the expression $(r \rightarrow p) \rightarrow q$ is

A. a tautology
B. a contradiction
C. always TRUE when p is FALSE
D. always TRUE when q is TRUE

gate2017-1 mathematical-logic propositional-logic

3.3.36 Propositional Logic: GATE2017-2-11

https://gateoverflow.in/118151

Let p, q, r denote the statements "*It is raining*", "*It is cold*", and "*It is pleasant*", respectively. Then the statement "*It is not raining and it is pleasant, and it is not pleasant only if it is raining and it is cold* " is represented by

A. $(\neg p \wedge r) \wedge (\neg r \rightarrow (p \wedge q))$
B. $(\neg p \wedge r) \wedge ((p \wedge q) \rightarrow \neg r)$
C. $(\neg p \wedge r) \vee ((p \wedge q) \rightarrow \neg r)$
D. $(\neg p \wedge r) \vee (r \rightarrow (p \wedge q))$

gate2017-2 mathematical-logic propositional-logic

3.3.37 Propositional Logic: TIFR2015-A-5

https://gateoverflow.in/29454

What is logically equivalent to "If Kareena and Parineeti go to the shopping mall then it is raining":

a. If Kareena and Parineeti do not go to the shopping mall then it is not raining.
b. If Kareena and Parineeti do not go to the shopping mall then it is raining.
c. If it is raining then Kareena and Parineeti go to the shopping mall.
d. If it is not raining then Kareena and Parineeti do not go to the shopping mall.
e. None of the above.

tifr2015 mathematical-logic propositional-logic

3.3.38 Propositional Logic: TIFR2018-B-4

https://gateoverflow.in/179288

The notation "$\Rightarrow$" denotes "implies" and "$\wedge$" denotes "and" in the following formulae.

Let X denote the formula: $(b \Rightarrow a) \Rightarrow (a \Rightarrow b)$

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Let Y denote the formula: $(a \Rightarrow b) \wedge b$

Which of the following is TRUE ?

A. X is satisfiable and Y is not satisfiable.
B. X is satisfiable and Y is tautology.
C. X is not tautology and Y is not satisfiable.
D. X is not tautology and Y is satisfiable.
E. X is a tautology and Y is satisfiable,

tifr2018 mathematical-logic propositional-logic

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4 Discrete Mathematics: Set Theory & Algebra (182)

Syllabus: Sets, Relations, Functions, Partial orders, Lattices, Groups.

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	1	1	0	2	0	0	0	0.7	2
2 Marks Count	0	1	1	0	1	2	0	0.8	2
Total Marks	1	3	2	2	2	4	**1**	**2.3**	**4**

4.1 Binary Operation (8)

4.1.1 Binary Operation: GATE1989-1-v

https://gateoverflow.in/87051

The number of possible commutative binary operations that can be defined on a set of n elements (for a given n) is _____.

gate1989 descriptive set-theory&algebra binary-operation

4.1.2 Binary Operation: GATE1994-2.2

https://gateoverflow.in/2469

On the set N of non-negative integers, the binary operation _____ is associative and non-commutative.

gate1994 set-theory&algebra normal binary-operation descriptive

4.1.3 Binary Operation: GATE2003-38

https://gateoverflow.in/929

Consider the set $\{a, b, c\}$ with binary operators $+$ and $*$ defined as follows:

$+$	**a**	**b**	**c**
a	b	a	c
b	a	b	c
c	a	c	b

*	**a**	**b**	**c**
a	a	b	c
b	b	c	a
c	c	c	b

For example, $a + c = c, c + a = a, c * b = c$ and $b * c = a$.
Given the following set of equations:

- $(a * x) + (a * y) = c$
- $(b * x) + (c * y) = c$

The number of solution(s) (i.e., pair(s) (x, y) that satisfy the equations) is

A. 0 B. 1 C. 2 D. 3

gate2003 set-theory&algebra normal binary-operation

4.1.4 Binary Operation: GATE2006-28

https://gateoverflow.in/991

A logical binary relation $\odot$, is defined as follows:

A	**B**	**A $\odot$ B**
True	True	True
True	False	True
False	True	False
False	False	True

Let $\sim$ be the unary negation (NOT) operator, with higher precedence then $\odot$.
Which one of the following is equivalent to $A \wedge B$?

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A. $(\sim A \odot B)$
B. $\sim (A \odot \sim B)$
C. $\sim (\sim A \odot \sim B)$
D. $\sim (\sim A \odot B)$

gate2006 set-theory&algebra binary-operation

4.1.5 Binary Operation: GATE2006-IT-2

https://gateoverflow.in/3539

For the set N of natural numbers and a binary operation $f : N \times N \rightarrow N,$ an element $z \in N$ is called an identity for $f,$ if $f(a, z) = a = f(z, a),$ for all $a \in N.$ Which of the following binary operations have an identity?

I. $f(x, y) = x + y - 3$
II. $f(x, y) = \max(x, y)$
III. $f(x, y) = x^y$

A. I and II only
B. II and III only
C. I and III only
D. None of these

gate2006-it set-theory&algebra easy binary-operation

4.1.6 Binary Operation: GATE2013-1

https://gateoverflow.in/59

A binary operation $\oplus$ on a set of integers is defined as $x \oplus y = x^2 + y^2$. Which one of the following statements is **TRUE** about $\oplus$?

A. Commutative but not associative
B. Both commutative and associative
C. Associative but not commutative
D. Neither commutative nor associative

gate2013 set-theory&algebra easy binary-operation

4.1.7 Binary Operation: GATE2015-1-28

https://gateoverflow.in/8226

The binary operator $\neq$ is defined by the following truth table.

p	**q**	**p $\neq$ q**
0	0	0
0	1	1
1	0	1
1	1	0

Which one of the following is true about the binary operator $\neq$?

A. Both commutative and associative
B. Commutative but not associative
C. Not commutative but associative
D. Neither commutative nor associative

gate2015-1 set-theory&algebra easy binary-operation

4.1.8 Binary Operation: GATE2015-3-2

https://gateoverflow.in/8393

Let $\#$ be the binary operator defined as

$X \# Y = X' + Y'$ where X and Y are Boolean variables.

Consider the following two statements.

- (S_1) $(P \# Q) \# R = P \# (Q \# R)$
- (S_2) $Q \# R = (R \# Q)$

Which are the following is/are true for the Boolean variables P, Q and R?

A. Only S_1 is true
B. Only S_2 is true
C. Both S_1 and S_2 are true
D. Neither S_1 nor S_2 are true

gate2015-3 set-theory&algebra binary-operation normal

4.2 Cosets (1)

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4.2.1 Cosets: GATE1999-4

https://gateoverflow.in/1503

Let G be a finite group and H be a subgroup of G. For $a \in G$, define $aH = \{ah \mid h \in H\}$.

a. Show that $|aH| = |bH|$.
b. Show that for every pair of elements $a, b \in G$, either $aH = bH$ or aH and bH are disjoint.
c. Use the above to argue that the order of H must divide the order of G.

gate1999 set-theory&algebra groups normal cosets

4.3 Countable Uncountable Set (3)

4.3.1 Countable Uncountable Set: GATE1994-3.9

https://gateoverflow.in/2495

Every subset of a countable set is countable.

State whether the above statement is true or false with reason.

gate1994 set-theory&algebra normal sets descriptive countable-uncountable-set

4.3.2 Countable Uncountable Set: GATE2014-3-16

https://gateoverflow.in/2050

Let Σ be a finite non-empty alphabet and let 2^{Σ^*} be the power set of Σ^*. Which one of the following is **TRUE**?

A. Both 2^{Σ^*} and Σ^* are countable
B. 2^{Σ^*} is countable and Σ^* is uncountable
C. 2^{Σ^*} is uncountable and Σ^* is countable
D. Both 2^{Σ^*} and Σ^* are uncountable

gate2014-3 set-theory&algebra sets normal countable-uncountable-set

4.3.3 Countable Uncountable Set: GATE2018-27

https://gateoverflow.in/204101

Let N be the set of natural numbers. Consider the following sets,

- P : Set of Rational numbers (positive and negative)
- Q : Set of functions from $\{0, 1\}$ to N
- R : Set of functions from N to $\{0, 1\}$
- S : Set of finite subsets of N

Which of the above sets are countable?

A. Q and S only B. P and S only C. P and R only D. P, Q and S only

gate2018 set-theory&algebra countable-uncountable-set normal

4.4 Functions (34)

4.4.1 Functions: GATE1987-9b

https://gateoverflow.in/82437

How many one-to-one functions are there from a set A with n elements onto itself?

gate1987 set-theory&algebra functions descriptive

4.4.2 Functions: GATE1988-13ii

https://gateoverflow.in/94634

If the set S has a finite number of elements, prove that if f maps S onto S, then f is one-to-one.

gate1988 descriptive set-theory&algebra functions

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4.4.3 Functions: GATE1989-13c

https://gateoverflow.in/93178

Find the number of single valued functions from set A to another set B, given that the cardinalities of the sets A and B are m and n respectively.

gate1989 descriptive functions

4.4.4 Functions: GATE1993-8.6

https://gateoverflow.in/2304

Let A and B be sets with cardinalities m and n respectively. The number of one-one mappings from A to B, when $m < n$, is

A. m^n B. ${}^nP_m$ C. ${}^mC_n$ D. ${}^nC_m$ E. ${}^mP_n$

gate1993 set-theory&algebra functions easy

4.4.5 Functions: GATE1996-1.3

https://gateoverflow.in/2707

Suppose X and Y are sets and $|X|$ and $|Y|$ are their respective cardinality. It is given that there are exactly 97 functions from X to Y. From this one can conclude that

A. $|X| = 1, |Y| = 97$
B. $|X| = 97, |Y| = 1$
C. $|X| = 97, |Y| = 97$
D. None of the above

gate1996 set-theory&algebra functions normal

4.4.6 Functions: GATE1996-2.1

https://gateoverflow.in/2730

Let R denote the set of real numbers. Let $f : R \times R \rightarrow R \times R$ be a bijective function defined by $f(x, y) = (x + y, x - y)$. The inverse function of f is given by

A. $f^{-1}(x, y) = \left(\frac{1}{x+y}, \frac{1}{x-y}\right)$
B. $f^{-1}(x, y) = (x - y, x + y)$
C. $f^{-1}(x, y) = \left(\frac{x+y}{2}, \frac{x-y}{2}\right)$
D. $f^{-1}(x, y) = [2(x - y), 2(x + y)]$

gate1996 set-theory&algebra functions normal

4.4.7 Functions: GATE1997-13

https://gateoverflow.in/2273

Let F be the set of one-to-one functions from the set $\{1, 2, \ldots, n\}$ to the set $\{1, 2, \ldots, m\}$ where $m \geq n \geq 1$.

a. How many functions are members of F?
b. How many functions f in F satisfy the property $f(i) = 1$ for some $i, 1 \leq i \leq n$?
c. How many functions f in F satisfy the property $f(i) < f(j)$ for all $i, j \;\; 1 \leq i \leq j \leq n$?

gate1997 set-theory&algebra functions normal descriptive

4.4.8 Functions: GATE1998-1.8

https://gateoverflow.in/1645

The number of functions from an m element set to an n element set is

A. $m + n$ B. m^n C. n^m D. $m * n$

gate1998 set-theory&algebra permutation-and-combination functions easy

4.4.9 Functions: GATE2001-2.3

https://gateoverflow.in/721

Let $f : A \rightarrow B$ a function, and let E and F be subsets of A. Consider the following statements about images.

- $S1 : f(E \cup F) = f(E) \cup f(F)$

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- $S2 : f(E \cap F) = f(E) \cap f(F)$

Which of the following is true about S1 and S2?

A. Only S1 is correct
B. Only S2 is correct
C. Both S1 and S2 are correct
D. None of S1 and S2 is correct

gate2001 set-theory&algebra functions normal

4.4.10 Functions: GATE2001-4

https://gateoverflow.in/745

Consider the function $h : N \times N \rightarrow N$ so that $h(a, b) = (2a + 1)2^b - 1$, where $N = \{0, 1, 2, 3, \ldots\}$ is the set of natural numbers.

a. Prove that the function h is an injection (one-one).
b. Prove that it is also a Surjection (onto)

gate2001 functions set-theory&algebra normal descriptive

4.4.11 Functions: GATE2003-37

https://gateoverflow.in/927

Let $f : A \rightarrow B$ be an injective (one-to-one) function. Define $g : 2^A \rightarrow 2^B$ as:
$g(C) = \{f(x) \mid x \in C\}$, for all subsets C of A.
Define $h : 2^B \rightarrow 2^A$ as: $h(D) = \{x \mid x \in A, f(x) \in D\}$, for all subsets D of B. Which of the following statements is always true?

A. $g(h(D)) \subseteq D$
B. $g(h(D)) \supseteq D$
C. $g(h(D)) \cap D = \phi$
D. $g(h(D)) \cap (B - D) \neq \phi$

gate2003 set-theory&algebra functions normal

4.4.12 Functions: GATE2003-39

https://gateoverflow.in/930

Let $\Sigma = \{a, b, c, d, e\}$ be an alphabet. We define an encoding scheme as follows:
$g(a) = 3, g(b) = 5, g(c) = 7, g(d) = 9, g(e) = 11$.
Let p_i denote the i-th prime number $(p_1 = 2)$.
For a non-empty string $s = a_1 \ldots a_n$, where each $a_i \in \Sigma$, define $f(s) = \Pi_{i=1}^{n} P_i^{g(a_i)}$.
For a non-empty sequence $\langle s_j, \ldots, s_n \rangle$ of stings from Σ^+, define $h(\langle s_i \ldots s_n \rangle) = \Pi_{i=1}^{n} P_i^{f(s_i)}$
Which of the following numbers is the encoding, h, of a non-empty sequence of strings?

A. $2^7 3^7 5^7$
B. $2^8 3^8 5^8$
C. $2^9 3^9 5^9$
D. $2^{10} 3^{10} 5^{10}$

gate2003 set-theory&algebra functions normal

4.4.13 Functions: GATE2005-43

https://gateoverflow.in/1168

Let $f : B \rightarrow C$ and $g : A \rightarrow B$ be two functions and let $h = fog$. Given that h is an onto function which one of the following is TRUE?

A. f and g should both be onto functions
B. f should be onto but g need not to be onto
C. g should be onto but f need not be onto
D. both f and g need not be onto

gate2005 set-theory&algebra functions normal

4.4.14 Functions: GATE2005-IT-31

https://gateoverflow.in/3777

Let f be a function from a set A to a set B, g a function from B to C, and h a function from A to C, such that $h(a) = g(f(a))$ for all $a \in A$. Which of the following statements is always true for all such functions f and g?

A. g is onto $\implies$ h is onto
B. h is onto $\implies$ f is onto
C. h is onto $\implies$ g is onto
D. h is onto $\implies$ f and g are onto

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gate2005-it set-theory&algebra functions normal

4.4.15 Functions: GATE2006-2

https://gateoverflow.in/881

Let X, Y, Z be sets of sizes x, y and z respectively. Let $W = X \times Y$ and E be the set of all subsets of W. The number of functions from Z to E is

A. $z^{2^{xy}}$ B. $z \times 2^{xy}$ C. $z^{2^{x+y}}$ D. 2^{xyz}

gate2006 set-theory&algebra normal functions

4.4.16 Functions: GATE2006-25

https://gateoverflow.in/988

Let $S = \{1, 2, 3, \ldots, m\}, m > 3$. Let $X_1, \ldots, X_n$ be subsets of S each of size 3. Define a function f from S to the set of natural numbers as, $f(i)$ is the number of sets X_j that contain the element i. That is $f(i) = |\{j \mid i \in X_j\}|$ then $\sum_{i=1}^{m} f(i)$ is:

A. $3m$ B. $3n$ C. $2m+1$ D. $2n+1$

gate2006 set-theory&algebra normal functions

4.4.17 Functions: GATE2006-IT-6

https://gateoverflow.in/3545

Given a boolean function $f(x_1, x_2, \ldots, x_n)$, which of the following equations is NOT true?

A. $f(x_1, x_2, \ldots, x_n) = x_1' f(x_1, x_2, \ldots, x_n) + x_1 f(x_1, x_2, \ldots, x_n)$
B. $f(x_1, x_2, \ldots, x_n) = x_2 f(x_1, x_2, \ldots, x_n) + x_2' f(x_1, x_2, \ldots, x_n)$
C. $f(x_1, x_2, \ldots, x_n) = x_n' f(x_1, x_2, \ldots, 0) + x_n f(x_1, x_2, \ldots, 1)$
D. $f(x_1, x_2, \ldots, x_n) = f(0, x_2, \ldots, x_n) + f(1, x_2, \ldots, x_n)$

gate2006-it set-theory&algebra functions normal

4.4.18 Functions: GATE2007-3

https://gateoverflow.in/1202

What is the maximum number of different Boolean functions involving n Boolean variables?

A. n^2 B. 2^n C. 2^{2^n} D. 2^{n^2}

gate2007 permutation-and-combination functions normal

4.4.19 Functions: GATE2012-37

https://gateoverflow.in/1759

How many onto (or surjective) functions are there from an n-element $(n \geq 2)$ set to a 2-element set?

A. 2^n B. $2^n - 1$ C. $2^n - 2$ D. $2(2^n - 2)$

gate2012 set-theory&algebra functions normal

4.4.20 Functions: GATE2014-1-50

https://gateoverflow.in/1930

Let S denote the set of all functions $f : \{0,1\}^4 \rightarrow \{0,1\}$. Denote by N the number of functions from S to the set $\{0,1\}$. The value of $\log_2 \log_2 N$ is _____.

gate2014-1 set-theory&algebra functions permutation-and-combination numerical-answers

4.4.21 Functions: GATE2014-3-2

https://gateoverflow.in/2036

Let X and Y be finite sets and $f : X \rightarrow Y$ be a function. Which one of the following statements is TRUE?

A. For any subsets A and B of X, $|fA \cup B| = |f(A)| + |f(B)|$
B. For any subsets A and B of X, $f(A \cap B) = f(A) \cap f(B)$
C. For any subsets A and B of X, $|f(A \cap B)| = \min\{|f(A)|, |f(B)|\}$

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D. For any subsets S and T of Y, $f^{-1}(S \cap T) = f^{-1}(S) \cap f^{-1}(T)$

gate2014-3 set-theory&algebra functions normal

4.4.22 Functions: GATE2014-3-49

https://gateoverflow.in/2083

Consider the set of all functions $f : \{0, 1, \ldots, 2014\} \to \{0, 1, \ldots, 2014\}$ such that $f(f(i)) = i$, for all $0 \leq i \leq 2014$. Consider the following statements:

P. For each such function it must be the case that for every $i, f(i) = i$.

Q. For each such function it must be the case that for some $i, f(i) = i$.

R. Each function must be onto.

Which one of the following is CORRECT?

A. P, Q and R are true
B. Only Q and R are true
C. Only P and Q are true
D. Only R is true

gate2014-3 set-theory&algebra functions normal

4.4.23 Functions: GATE2015-1-39

https://gateoverflow.in/8294

Consider the operations

$f\ (X,\ Y,\ Z) = X'YZ + XY' + Y'Z'$ and $g\ (X,\ Y,\ Z) = X'YZ + X'YZ' + XY$

Which one of the following is correct?

A. Both $\{f\}$ and $\{g\}$ are functionally complete
B. Only $\{f\}$ is functionally complete
C. Only $\{g\}$ is functionally complete
D. Neither $\{f\}$ nor $\{g\}$ is functionally complete

gate2015-1 set-theory&algebra functions difficult

4.4.24 Functions: GATE2015-1-5

https://gateoverflow.in/8025

If $g(x) = 1 - x$ and $h(x) = \frac{x}{x-1}$, then $\frac{g(h(x))}{h(g(x))}$ is:

A. $\frac{h(x)}{g(x)}$
B. $\frac{-1}{x}$
C. $\frac{g(x)}{h(x)}$
D. $\frac{x}{(1-x)^2}$

gate2015-1 set-theory&algebra functions normal

4.4.25 Functions: GATE2015-2-40

https://gateoverflow.in/8212

The number of onto functions (surjective functions) from set $X = \{1, 2, 3, 4\}$ to set $Y = \{a, b, c\}$ is _____.

gate2015-2 set-theory&algebra functions normal numerical-answers

4.4.26 Functions: GATE2015-2-54

https://gateoverflow.in/8257

Let X and Y denote the sets containing 2 and 20 distinct objects respectively and F denote the set of all possible functions defined from X to Y. Let f be randomly chosen from F. The probability of f being one-to-one is _____.

gate2015-2 set-theory&algebra functions normal numerical-answers

4.4.27 Functions: GATE2015-2-GA-9

https://gateoverflow.in/8040

If p, q, r, s are distinct integers such that:

$f(p, q, r, s) = \max(p, q, r, s)$

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$g(p,q,r,s) = \min(p,q,r,s)$

$h(p,q,r,s) = \text{remainder of } \frac{(p\times q)}{(r\times s)} \text{ if } (p\times q) > (r\times s)$
$\text{or remainder of } \frac{(r\times s)}{(p\times q)} \text{ if } (r\times s) > (p\times q)$

Also a function $fgh(p,q,r,s) = f(p,q,r,s) \times g(p,q,r,s) \times h(p,q,r,s)$
Also the same operations are valid with two variable functions of the form $f(p,q)$
What is the value of $fg(h(2,5,7,3),4,6,8)$?

gate2015-2 set-theory&algebra functions normal numerical-answers

4.4.28 Functions: GATE2016-1-28

https://gateoverflow.in/39717

A function $f:\mathbb{N}^+ \to \mathbb{N}^+$, defined on the set of positive integers $\mathbb{N}^+$,satisfies the following properties:

$$f(n) = f(n/2) \quad \text{if } n \text{ is even}$$

$$f(n) = f(n+5) \quad \text{if } n \text{ is odd}$$

Let $R = \{i \mid \exists j : f(j) = i\}$ be the set of distinct values that f takes. The maximum possible size of R is _____.

gate2016-1 set-theory&algebra functions normal numerical-answers

4.4.29 Functions: TIFR2012-B-1

https://gateoverflow.in/25046

For $x, y \in \{0,1\}^n$, let $x \oplus y$ be the element of $\{0,1\}^n$ obtained by the component-wise exclusive-or of x and y. A Boolean function $F:\{0,1\}^n \to \{0,1\}$ is said to be linear if $F(x \oplus y) = F(x) \oplus F(y)$, for all x and y. The number of linear functions from $\{0,1\}^n$ to $\{0,1\}$ is.

a. 2^{2n} b. 2^{n+1} c. $2^{n-1}+1$ d. $n!$ e. 2^n

tifr2012 set-theory&algebra functions

4.4.30 Functions: TIFR2013-B-16

https://gateoverflow.in/25859

Consider a function $T_{k,n}:\{0,1\}^n \to \{0,1\}$ which returns 1 if at least k of its n inputs are 1. Formally, $T_{k,n}(x) = 1$ if $\sum_1^n x_i \geq k$. Let $y \in \{0,1\}^n$ be such that y has exactly k ones. Then, the function $T_{k,n-1}(y_1, y_2, \ldots . y_{i-1}, y_{i+1}, \ldots, y_n)$ (where y_i is omitted) is equivalent to

a. $T_{k-1}, n(y)$ b. $T_{k,n}(y)$ c. y_i d. $\neg y_i$ e. None of the above.

tifr2013 set-theory&algebra functions

4.4.31 Functions: TIFR2014-B-18

https://gateoverflow.in/27351

Let k be an integer at least 4 and let $[k] = \{1,2,\ldots,k\}$. Let $f:[k]^4 \to \{0,1\}$ be defined as follows: $f(y_1,y_2,y_3,y_4) = 1$ if an only if the $y_i's$ are all distinct. For each choice $z = (z_1,z_2,z_3) \in [k]^3$, let $g_z:[k] \to \{0,1\}$ be defined by $g_z(Y) = f(Y,z_1,z_2,z_3)$. Let N be the number of distinct functions g_z that are obtained as z varies in $\{1,2,\ldots,k\}^3$, that is, $N = \left|\left\{g_z : z \in \{1,2,\ldots,k\}^3\right\}\right|$. What is N?

a. k^3+1 b. $2^{\binom{k}{3}}$ c. $\binom{k}{3}$ d. $\binom{k}{3}+1$ e. $4\binom{k}{3}$

tifr2014 set-theory&algebra functions

4.4.32 Functions: TIFR2017-A-11

https://gateoverflow.in/95289

Let $f \circ g$ denote function composition such that $(f \circ g)(x) = f(g(x))$. Let $f: A \to B$ such that for all $g : B \to A$ and $h : B \to A$ we have $f \circ g = f \circ h \Rightarrow g = h$. Which of the following must be true?

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A. f is onto (surjective)
B. f is one-to-one (injective)
C. f is both one-to-one and onto (bijective)
D. the range of f is finite
E. the domain of f is finite

tifr2017 set-theory&algebra functions

4.4.33 Functions: TIFR2018-B-10

https://gateoverflow.in/179294

For two n bit strings $x, y \in \{0,1\}^n$, define $z = x \oplus y$ to be the bitwise XOR of the two strings (that is, if x_i, y_i, z_i denote the ith bits of x, y, z respectively, then $z_i = x_i + y_i \bmod 2$). A function $h : \{0,1\}^n \to \{0,1\}^n$ is called linear if $h(x \oplus y) = h(x) \oplus h(y)$, for every $x, y \in \{0,1\}^n$. The number of such linear functions for $n \geq 2$ is:

A. 2^n
B. 2^{n^2}
C. $2^{\frac{n}{2}}$
D. 2^{4n}
E. 2^{n^2+n}

tifr2018 functions

4.4.34 Functions: TIFR2019-A-12

https://gateoverflow.in/280498

Let f be a function with both input and output in the set $\{0,1,2,\ldots,9\}$, and let the function g be defined as $g(x) = f(9-x)$. The function f is non-decreasing, so that $f(x) \geq f(y)$ for $x \geq y$. Consider the following statements:

i. There exists $x \in \{0,\ldots,9\}$ so that $x = f(x)$
ii. There exists $x \in \{0,\ldots,9\}$ so that $x = g(x)$
iii. There exists $x \in \{0,\ldots,9\}$ so that $x = (f(x) + g(x)) \bmod 10$

Which of the above statements must be TRUE for ALL such functions f and g?

A. Only (i)
B. Only (i) and (ii)
C. Only (iii)
D. None of them
E. All of them

tifr2019 engineering-mathematics discrete-mathematics set-theory&algebra functions

4.5 Groups (27)

4.5.1 Groups: GATE1988-2xviii

https://gateoverflow.in/94353

Show that if G is a group such that $(a,b)^2 = a^2.b^2$ for all a, b belonging to G, then G is an abelian.

gate1988 descriptive groups

4.5.2 Groups: GATE1990-2-x

https://gateoverflow.in/84039

Match the pairs in the following questions:

(a)	Groups	(p)	Associativity
(b)	Semigroups	(q)	Identity
(c)	Monoids	(r)	Commutativity
(d)	Abelian groups	(s)	Left inverse

gate1990 match-the-following set-theory&algebra groups

4.5.3 Groups: GATE1992-14a

https://gateoverflow.in/593

If G is a group of even order, then show that there exists an element $a \neq e$, e, the identity in G, such that $a^2 = e$.

gate1992 set-theory&algebra groups normal descriptive proof

4.5.4 Groups: GATE1992-14b

https://gateoverflow.in/43580

Consider the set of integers $\{1,2,3,4,6,8,12,24\}$ together with the two binary operations LCM (lowest

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common multiple) and GCD (greatest common divisor). Which of the following algebraic structures does this represent?

A. group B. ring C. field D. lattice

gate1992 set-theory&algebra groups normal

4.5.5 Groups: GATE1993-28

https://gateoverflow.in/2324

Let $(\{p, q\}, *)$ be a semigroup where $p * p = q$. Show that:

a. $p * q = q * p$ and
b. $q * q = q$

gate1993 set-theory&algebra groups normal descriptive

4.5.6 Groups: GATE1994-1.10

https://gateoverflow.in/2451

Some group (G, o) is known to be abelian. Then, which one of the following is true for G?

A. $g = g^{-1}$ for every $g \in G$
B. $g = g^2$ for every $g \in G$
C. $(goh)^2 = g^2 oh^2$ for every $g, h \in G$
D. G is of finite order

gate1994 set-theory&algebra groups normal

4.5.7 Groups: GATE1995-2.17

https://gateoverflow.in/2629

Let A be the set of all non-singular matrices over real number and let $*$ be the matrix multiplication operation. Then

A. A is closed under $*$ but $\langle A, * \rangle$ is not a semigroup.
B. $\langle A, * \rangle$ is a semigroup but not a monoid.
C. $\langle A, * \rangle$ is a monoid but not a group.
D. $\langle A, * \rangle$ is a a group but not an abelian group.

gate1995 set-theory&algebra groups

4.5.8 Groups: GATE1995-21

https://gateoverflow.in/2659

Let G_1 and G_2 be subgroups of a group G.

a. Show that $G_1 \cap G_2$ is also a subgroup of G.
b. Is $G_1 \cup G_2$ always a subgroup of G?.

gate1995 set-theory&algebra groups normal descriptive proof

4.5.9 Groups: GATE1996-1.4

https://gateoverflow.in/2708

Which of the following statements is FALSE?

A. The set of rational numbers is an abelian group under addition
B. The set of integers in an abelian group under addition
C. The set of rational numbers form an abelian group under multiplication
D. The set of real numbers excluding zero is an abelian group under multiplication

gate1996 set-theory&algebra groups normal

4.5.10 Groups: GATE1996-2.4

https://gateoverflow.in/2733

Which one of the following is false?

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A. The set of all bijective functions on a finite set forms a group under function composition.
B. The set $\{1, 2, \ldots p-1\}$ forms a group under multiplication mod p, where p is a prime number.
C. The set of all strings over a finite alphabet forms a group under concatenation.
D. A subset $S \neq \emptyset$ of G is a subgroup of the group $\langle G, * \rangle$ if and only if for any pair of elements $a, b \in S, a * b^{-1} \in S$.

gate1996 set-theory&algebra normal sets groups

4.5.11 Groups: GATE1997-3.1

https://gateoverflow.in/2232

Let $(Z, *)$ be an algebraic structure where Z is the set of integers and the operation $*$ is defined by $n * m = \max(n, m)$. Which of the following statements is true for $(Z, *)$?

A. $(Z, *)$ is a monoid
B. $(Z, *)$ is an Abelian group
C. $(Z, *)$ is a group
D. None of the above

gate1997 set-theory&algebra groups normal

4.5.12 Groups: GATE1998-12

https://gateoverflow.in/1726

Let $(A, *)$ be a semigroup, Furthermore, for every a and b in A, if $a \neq b$, then $a * b \neq b * a$.

a. Show that for every a in A, $a * a = a$
b. Show that for every a, b in A, $a * b * a = a$
c. Show that for every a, b, c in A, $a * b * c = a * c$

gate1998 set-theory&algebra groups descriptive

4.5.13 Groups: GATE2000-4

https://gateoverflow.in/675

Let $S = \{0, 1, 2, 3, 4, 5, 6, 7\}$ and $\otimes$ denote multiplication modulo 8, that is, $x \otimes y = (xy) \mod 8$

a. Prove that $(\{0, 1\}, \otimes)$ is not a group.
b. Write three distinct groups $(G, \otimes)$ where $G \subset S$ and G has 2 elements.

gate2000 set-theory&algebra descriptive groups

4.5.14 Groups: GATE2002-1.6

https://gateoverflow.in/810

Which of the following is true?

A. The set of all rational negative numbers forms a group under multiplication.
B. The set of all non-singular matrices forms a group under multiplication.
C. The set of all matrices forms a group under multiplication.
D. Both B and C are true.

gate2002 set-theory&algebra groups normal

4.5.15 Groups: GATE2003-7

https://gateoverflow.in/898

Consider the set Σ^* of all strings over the alphabet $\Sigma = \{0, 1\}$. Σ^* with the concatenation operator for strings

A. does not form a group
B. forms a non-commutative group
C. does not have a right identity element
D. forms a group if the empty string is removed from Σ^*

gate2003 set-theory&algebra groups normal

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4.5.16 Groups: GATE2004-72

https://gateoverflow.in/1066

The following is the incomplete operation table of a $4-$element group.

*	e	a	b	c
e	e	a	b	c
a	a	b	c	e
b				
c				

The last row of the table is

A. $c\ a\ e\ b$
B. $c\ b\ a\ e$
C. $c\ b\ e\ a$
D. $c\ e\ a\ b$

gate2004 set-theory&algebra groups normal

4.5.17 Groups: GATE2005-13

https://gateoverflow.in/1163

The set $\{1, 2, 4, 7, 8, 11, 13, 14\}$ is a group under multiplication modulo 15. The inverses of 4 and 7 are respectively:

A. 3 and 13
B. 2 and 11
C. 4 and 13
D. 8 and 14

gate2005 set-theory&algebra normal groups

4.5.18 Groups: GATE2005-46

https://gateoverflow.in/1171

Consider the set H of all $3 * 3$ matrices of the type

$$\begin{pmatrix} a & f & e \\ 0 & b & d \\ 0 & 0 & c \end{pmatrix}$$

where a, b, c, d, e and f are real numbers and $abc \neq 0$. Under the matrix multiplication operation, the set H is:

A. a group
B. a monoid but not a group
C. a semi group but not a monoid
D. neither a group nor a semi group

gate2005 set-theory&algebra groups normal

4.5.19 Groups: GATE2006-3

https://gateoverflow.in/882

The set $\{1, 2, 3, 5, 7, 8, 9\}$ under multiplication modulo 10 is not a group. Given below are four possible reasons. Which one of them is false?

A. It is not closed
B. 2 does not have an inverse
C. 3 does not have an inverse
D. 8 does not have an inverse

gate2006 set-theory&algebra groups normal

4.5.20 Groups: GATE2007-21

https://gateoverflow.in/1219

How many different non-isomorphic Abelian groups of order 4 are there?

A. 2
B. 3
C. 4
D. 5

gate2007 groups normal

4.5.21 Groups: GATE2009-1

https://gateoverflow.in/795

Which one of the following is **NOT** necessarily a property of a Group?

A. Commutativity
B. Associativity
C. Existence of inverse for every element
D. Existence of identity

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gate2009 set-theory&algebra easy groups

4.5.22 Groups: GATE2009-22

https://gateoverflow.in/799

For the composition table of a cyclic group shown below:

*	a	b	c	d
a	a	b	c	d
b	b	a	d	c
c	c	d	b	a
d	d	c	a	b

Which one of the following choices is correct?

A. a, b are generators
B. b, c are generators
C. c, d are generators
D. d, a are generators

gate2009 set-theory&algebra normal groups

4.5.23 Groups: GATE2010-4

https://gateoverflow.in/1150

Consider the set $S = \{1, \omega, \omega^2\}$, where ω and ω^2 are cube roots of unity. If $*$ denotes the multiplication operation, the structure $(S, *)$ forms

A. A Group
B. A Ring
C. An integral domain
D. A field

gate2010 set-theory&algebra normal groups

4.5.24 Groups: GATE2014-3-3

https://gateoverflow.in/2037

Let G be a group with 15 elements. Let L be a subgroup of G. It is known that $L \neq G$ and that the size of L is at least 4. The size of L is _____.

gate2014-3 set-theory&algebra groups numerical-answers normal

4.5.25 Groups: GATE2014-3-50

https://gateoverflow.in/2084

There are two elements x, y in a group $(G, *)$ such that every element in the group can be written as a product of some number of x's and y's in some order. It is known that

$$x * x = y * y = x * y * x * y = y * x * y * x = e$$

where e is the identity element. The maximum number of elements in such a group is ____.

gate2014-3 set-theory&algebra groups numerical-answers normal

4.5.26 Groups: GATE2018-19

https://gateoverflow.in/204093

Let G be a finite group on 84 elements. The size of a largest possible proper subgroup of G is _____

gate2018 groups numerical-answers set-theory&algebra

4.5.27 Groups: GATE2019-10

https://gateoverflow.in/302838

Let G be an arbitrary group. Consider the following relations on G:

$R_1 : \forall a, b \in G,\ aR_1b$ if and only if $\exists g \in G$ such that $a = g^{-1}bg$

$R_2 : \forall a, b \in G,\ aR_2b$ if and only if $a = b^{-1}$

Which of the above is/are equivalence relation/relations?

A. R_1 and R_2
B. R_1 only
C. R_2 only
D. Neither R_1 nor R_2

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4.6 Lattice (10)

4.6.1 Lattice: GATE1988-1vii

https://gateoverflow.in/91351

The complement(s) of the element 'a' in the lattice shown in below figure is (are) ____

gate1988 descriptive lattice set-theory&algebra

4.6.2 Lattice: GATE1990-17c

https://gateoverflow.in/86884

Show that the elements of the lattice $(N, \leq)$, where N is the set of positive intergers and $a \leq b$ if and only if a divides b, satisfy the distributive property.

gate1990 descriptive set-theory&algebra lattice

4.6.3 Lattice: GATE1994-2.9

https://gateoverflow.in/2476

The Hasse diagrams of all the lattices with up to four elements are _____ (write all the relevant Hasse diagrams)

gate1994 set-theory&algebra lattice normal descriptive

4.6.4 Lattice: GATE1997-3.3

https://gateoverflow.in/2234

In the lattice defined by the Hasse diagram given in following figure, how many complements does the element 'e' have?

A. 2 B. 3 C. 0 D. 1

gate1997 set-theory&algebra lattice normal

4.6.5 Lattice: GATE2002-4

https://gateoverflow.in/857

$S = \{(1,2),(2,1)\}$ is binary relation on set $A = \{1,2,3\}$. Is it irreflexive? Add the minimum number of ordered pairs to S to make it an equivalence relation. Give the modified S.

Let $S = \{a, b\}$ and let $\square(S)$ be the powerset of S. Consider the binary relation '$\subseteq$ (set inclusion)' on $\square(S)$. Draw the Hasse diagram corresponding to the lattice $(\square(S), \subseteq)$

gate2002 set-theory&algebra normal lattice descriptive

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4.6.6 Lattice: GATE2005-9

https://gateoverflow.in/1158

The following is the Hasse diagram of the poset $[\{a,b,c,d,e\},\prec]$

The poset is :

A. not a lattice
B. a lattice but not a distributive lattice
C. a distributive lattice but not a Boolean algebra
D. a Boolean algebra

gate2005 set-theory&algebra lattice normal

4.6.7 Lattice: GATE2008-IT-28

https://gateoverflow.in/3318

Consider the following Hasse diagrams.

Which all of the above represent a lattice?

A. (i) and (iv) only
B. (ii) and (iii) only
C. (iii) only
D. (i), (ii) and (iv) only

gate2008-it set-theory&algebra lattice normal

4.6.8 Lattice: GATE2015-1-34

https://gateoverflow.in/8281

Suppose $L=\{p,q,r,s,t\}$ is a lattice represented by the following Hasse diagram:

For any $x,y\in L$, not necessarily distinct , $x\vee y$ and $x\wedge y$ are join and meet of x,y, respectively. Let $L^3=\{(x,y,z):x,y,z\in L\}$ be the set of all ordered triplets of the elements of L. Let p_r be the probability that an element $(x,y,z)\in L^3$ chosen equiprobably satisfies $x\vee(y\wedge z)=(x\vee y)\wedge(x\vee z)$. Then

A. $p_r=0$
B. $p_r=1$
C. $0<p_r\leq\frac{1}{5}$
D. $\frac{1}{5}<p_r<1$

gate2015-1 set-theory&algebra normal lattice

4.6.9 Lattice: GATE2017-2-21

https://gateoverflow.in/118278

Consider the set $X=\{a,b,c,d,e\}$ under partial ordering $R=\{(a,a),(a,b),(a,c),(a,d),(a,e),(b,b),(b,c),(b,e),(c,c),(c,e),(d,d),(d,e),(e,e)\}$

The Hasse diagram of the partial order (X,R) is shown below.

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The minimum number of ordered pairs that need to be added to R to make (X, R) a lattice is _____

gate2017-2 set-theory&algebra lattice numerical-answers normal

4.6.10 Lattice: TIFR2012-B-4

https://gateoverflow.in/25090

Let $\wedge$, $\vee$ denote the meet and join operations of lattice. A lattice is called distributive if for all x, y, z,
$x \wedge (y \vee z) = (x \wedge y) \vee (x \wedge z)$
It is called complete if meet and join exist for every subset. It is called modular if for all x, y, z
$z \leq x \Rightarrow x \wedge (y \vee z) = (x \wedge y) \vee z$
The positive integers under divisibility ordering i.e. $p \leq q$ if p divides q forms a.

a. Complete lattice.
b. Modular, but not distributive lattice.
c. Distributive lattice.
d. Lattice but not a complete lattice.
e. Under the give ordering positive integers do not form a lattice.

tifr2012 set-theory&algebra lattice

4.7 Mathematical Induction (2)

4.7.1 Mathematical Induction: GATE1995-23

https://gateoverflow.in/2661

Prove using mathematical induction for $n \geq 5, 2^n > n^2$

gate1995 set-theory&algebra proof mathematical-induction descriptive

4.7.2 Mathematical Induction: GATE2000-3

https://gateoverflow.in/674

Consider the following sequence:

$s_1 = s_2 = 1$ and $s_i = 1 + \min(s_{i-1}, s_{i-2})$ for $i > 2$.

Prove by induction on n that $s_n = \lceil \frac{n}{2} \rceil$.

gate2000 set-theory&algebra mathematical-induction descriptive

4.8 Number Theory (8)

4.8.1 Number Theory: GATE1991-15,a

https://gateoverflow.in/542

Show that the product of the least common multiple and the greatest common divisor of two positive integers a and b is $a \times b$.

gate1991 set-theory&algebra normal number-theory proof descriptive

4.8.2 Number Theory: GATE1995-7

https://gateoverflow.in/2642

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a. Determine the number of divisors of 600.
b. Compute without using power series expansion $\lim_{x \to 0} \frac{\sin x}{x}$

gate1995 normal number-theory combined-question

4.8.3 Number Theory: GATE2005-IT-34

https://gateoverflow.in/3780

Let $n = p^2 q$, where p and q are distinct prime numbers. How many numbers m satisfy $1 \leq m \leq n$ and $gcd\ (m, n) = 1$? Note that $gcd\ (m, n)$ is the greatest common divisor of m and n.

A. $p(q-1)$ B. pq C. $\left(p^2-1\right)(q-1)$ D. $p(p-1)(q-1)$

gate2005-it set-theory&algebra normal number-theory

4.8.4 Number Theory: GATE2007-IT-16

https://gateoverflow.in/3449

The minimum positive integer p such that $3^p \pmod{17} = 1$ is

A. 5 B. 8 C. 12 D. 16

gate2007-it set-theory&algebra normal number-theory

4.8.5 Number Theory: GATE2008-IT-24

https://gateoverflow.in/3285

The exponent of 11 in the prime factorization of 300! is

A. 27 B. 28 C. 29 D. 30

gate2008-it set-theory&algebra normal number-theory

4.8.6 Number Theory: GATE2014-2-49

https://gateoverflow.in/2015

The number of distinct positive integral factors of 2014 is _____

gate2014-2 set-theory&algebra easy numerical-answers number-theory

4.8.7 Number Theory: GATE2015-2-9

https://gateoverflow.in/8058

The number of divisors of 2100 is ____.

gate2015-2 set-theory&algebra number-theory easy numerical-answers

4.8.8 Number Theory: TIFR2014-A-14

https://gateoverflow.in/26392

Let m and n be any two positive integers. Then, which of the following is FALSE?

a. $m+1$ divides $m^{2n}-1$.
b. For any prime p, $m^p \equiv m(\mod p)$.
c. If one of m, n is prime, then there are integers x, y such that $mx + ny = 1$.
d. If $m < n$, then $m!$ divides $n(n-1)(n-2)\ldots(n-m+1)$.
e. If $2^n - 1$ is prime, then n is prime.

tifr2014 number-theory set-theory&algebra

4.9 Partial Order (13)

4.9.1 Partial Order: GATE1991-01,xiv

https://gateoverflow.in/509

If the longest chain in a partial order is of length n, then the partial order can be written as a _____ of n antichains.

gate1991 set-theory&algebra partial-order normal descriptive

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4.9.2 Partial Order: GATE1993-8.5

https://gateoverflow.in/2303

The less-than relation, $<$, on reals is

A. a partial ordering since it is asymmetric and reflexive
B. a partial ordering since it is antisymmetric and reflexive
C. not a partial ordering because it is not asymmetric and not reflexive
D. not a partial ordering because it is not antisymmetric and reflexive
E. none of the above

gate1993 set-theory&algebra partial-order easy

4.9.3 Partial Order: GATE1996-1.2

https://gateoverflow.in/2706

Let $X = \{2, 3, 6, 12, 24\}$, Let $\leq$ be the partial order defined by $X \leq Y$ if x divides y. Number of edges in the Hasse diagram of $(X, \leq)$ is

A. 3 B. 4 C. 9 D. None of the above

gate1996 set-theory&algebra partial-order normal

4.9.4 Partial Order: GATE1997-6.1

https://gateoverflow.in/2257

A partial order $\leq$ is defined on the set $S = \{x, a_1, a_2, \ldots, a_n, y\}$ as $x \leq_i a_i$ for all i and $a_i \leq y$ for all i, where $n \geq 1$. The number of total orders on the set S which contain the partial order $\leq$ is

A. $n!$ B. $n+2$ C. n D. 1

gate1997 set-theory&algebra partial-order normal

4.9.5 Partial Order: GATE1998-11

https://gateoverflow.in/1725

Suppose $A = \{a, b, c, d\}$ and Π_1 is the following partition of A
$\Pi_1 = \{\{a, b, c\}\{d\}\}$

a. List the ordered pairs of the equivalence relations induced by Π_1.
b. Draw the graph of the above equivalence relation.
c. Let $\Pi_2 = \{\{a\}, \{b\}, \{c\}, \{d\}\}$
$\Pi_3 = \{\{a, b, c, d\}\}$
and $\Pi_4 = \{\{a, b\}, \{c, d\}\}$
Draw a Poset diagram of the poset, $\langle \{\Pi_1, \Pi_2, \Pi_3, \Pi_4\}, \text{ refines } \rangle$.

gate1998 set-theory&algebra normal partial-order descriptive

4.9.6 Partial Order: GATE2003-31

https://gateoverflow.in/921

Let $(S, \leq)$ be a partial order with two minimal elements a and b, and a maximum element c. Let P: S $\rightarrow$ {**True, False**} be a predicate defined on S. Suppose that P(a) = **True**, P(b) = **False** and P(x) $\implies$ P(y) for all $x, y \in S$ satisfying $x \leq y$, where $\implies$ stands for logical implication. Which of the following statements CANNOT be true?

A. P(x) = **True** for all x $\in$ S such that x $\neq$ b
B. P(x) = **False** for all x $\in$ S such that x $\neq$ a and x $\neq$ c
C. P(x) = **False** for all x $\in$ S such that b $\leq$ x and x $\neq$ c
D. P(x) = **False** for all x $\in$ S such that a $\leq$ x and b $\leq$ x

gate2003 set-theory&algebra partial-order normal propositional-logic

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4.9.7 Partial Order: GATE2004-73

https://gateoverflow.in/1067

The inclusion of which of the following sets into

$S = \{\{1,2\},\{1,2,3\},\{1,3,5\},\{1,2,4\},\{1,2,3,4,5\}\}$

is necessary and sufficient to make S a complete lattice under the partial order defined by set containment?

A. $\{1\}$
B. $\{1\},\{2,3\}$
C. $\{1\},\{1,3\}$
D. $\{1\},\{1,3\},\{1,2,3,4\},\{1,2,3,5\}$

gate2004 set-theory&algebra partial-order normal

4.9.8 Partial Order: GATE2007-26

https://gateoverflow.in/1224

Consider the set $S = \{a,b,c,d\}$. Consider the following 4 partitions $\pi_1, \pi_2, \pi_3, \pi_4$ on S : $\pi_1 = \{\overline{abcd}\}, \quad \pi_2 = \{\overline{ab}, \overline{cd}\}, \quad \pi_3 = \{\overline{abc}, \bar{d}\}, \quad \pi_4 = \{\bar{a}, \bar{b}, \bar{c}, \bar{d}\}$.
Let $\prec$ be the partial order on the set of partitions $S' = \{\pi_1, \pi_2, \pi_3, \pi_4\}$ defined as follows: $\pi_i \prec \pi_j$ if and only if π_i refines π_j. The poset diagram for $(S', \prec)$ is:

A.

B.

C.

D.

gate2007 set-theory&algebra normal partial-order descriptive

4.9.9 Partial Order: GATE2007-IT-23

https://gateoverflow.in/3456

A partial order P is defined on the set of natural numbers as follows. Here $\frac{x}{y}$ denotes integer division.

i. $(0,0) \in P$.
ii. $(a,b) \in P$ if and only if $(a\%10) \leq (b\%10)$ and $(\frac{a}{10}, \frac{b}{10}) \in P$.

Consider the following ordered pairs:

i. $(101, 22)$
ii. $(22, 101)$
iii. $(145, 265)$
iv. $(0, 153)$

Which of these ordered pairs of natural numbers are contained in P?

A. (i) and (iii)
B. (ii) and (iv)
C. (i) and (iv)
D. (iii) and (iv)

gate2007-it set-theory&algebra partial-order normal

4.9.10 Partial Order: TIFR2012-B-5

https://gateoverflow.in/25092

Let R be a binary relation over a set S. The binary relation R is called an equivalence relation if it is reflexive transitive and symmetric. The relation is called partial order if it is reflexive, transitive and anti symmetric. (Notation: Let aRb denote that order pair $(a,b) \in R$.) The relation R is called a well-order if R is a partial order and there does not exist an infinite descending chain (with respect to R) within S. An infinite sequence

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$x_1, x_2 \ldots$ of elements of S is called an infinite descending chain if for all i we have $x_{i+1} R x_i$ and $x_i \neq x_{i+1}$.

Take $S = \aleph \times \aleph$ and let the binary relation $\sqsubseteq$ over S be such that $(i_1, j_1) \sqsubseteq (i_2, j_2)$ if and only if either $(i_1 < i_2)$ or $((i_1 = i_2) \wedge (j_1 \leq j_2))$. Which statement is true of $\sqsubseteq$?

a. $\sqsubseteq$ is an equivalence relation but not a well order.
b. $\sqsubseteq$ is a partial order but not a well order.
c. $\sqsubseteq$ is a partial order and a well order.
d. $\sqsubseteq$ is an equivalence relation and a well order.
e. $\sqsubseteq$ is neither a partial order nor an equivalence relation.

tifr2012 set-theory&algebra partial-order

4.9.11 Partial Order: TIFR2013-B-4

https://gateoverflow.in/25664

A set S together with partial order $\ll$ is called a well order if it has no infinite descending chains, i.e. there is no infinite sequence $x_1, x_2, \ldots$ of elements from S such that $x_{i+1} \ll x_i$ and $x_{i+1} \neq x_i$ for all i.

Consider the set of all words (finite sequence of letters $a - z$), denoted by W, in dictionary order.

a. Between "aa" and "az" there are only 24 words.
b. Between "aa" and "az" there are only 2^{24} words.
c. W is not a partial order.
d. W is a partial order but not a well order.
e. W is a well order.

tifr2013 set-theory&algebra partial-order

4.9.12 Partial Order: TIFR2014-B-15

https://gateoverflow.in/27322

Consider the set N^* of finite sequences of natural numbers with $x \leq_p y$ denoting that sequence x is a prefix of sequence y. Then, which of the following is true?

a. N^* is uncountable.
b. $\leq_p$ is a total order.
c. Every non-empty subset of N^* has a least upper bound.
d. Every non-empty subset of N^* has a greatest lower bound.
e. Every non-empty finite subset of N^* has a least upper bound.

tifr2014 set-theory&algebra partial-order

4.9.13 Partial Order: TIFR2014-B-16

https://gateoverflow.in/27341

Consider the ordering relation $x \mid y \subseteq N \times N$ over natural numbers N such that $x \mid y$ if there exists $z \in N$ such that $x \bullet z = y$. A set is called lattice if every finite subset has a least upper bound and greatest lower bound. It is called a complete lattice if every subset has a least upper bound and greatest lower bound. Then,

a. $|$ is an equivalence relation.
b. Every subset of N has an upper bound under $|$.
c. $|$ is a total order.
d. $(N, |)$ is a complete lattice.
e. $(N, |)$ is a lattice but not a complete lattice.

tifr2014 set-theory&algebra partial-order

4.10 Polynomials (7)

4.10.1 Polynomials: GATE1987-1-xxii

https://gateoverflow.in/80379

The equation

$7x^7 + 14x^6 + 12x^5 + 3x^4 + 12x^3 + 10x^2 + 5x + 7 = 0$ has

A. All complex roots
B. At least one real root
C. Four pairs of imaginary roots
D. None of the above

gate1987 polynomials

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4.10.2 Polynomials: GATE1995-2.8

https://gateoverflow.in/2620

If the cube roots of unity are $1, \omega$ and ω^2, then the roots of the following equation are

$$(x-1)^3 + 8 = 0$$

A. $-1, 1+2\omega, 1+2\omega^2$
B. $1, 1-2\omega, 1-2\omega^2$
C. $-1, 1-2\omega, 1-2\omega^2$
D. $-1, 1+2\omega, -1+2\omega^2$

gate1995 set-theory&algebra normal polynomials

4.10.3 Polynomials: GATE1997-4.4

https://gateoverflow.in/2245

A polynomial $p(x)$ is such that $p(0) = 5, p(1) = 4, p(2) = 9$ and $p(3) = 20$. The minimum degree it should have is

A. 1
B. 2
C. 3
D. 4

gate1997 set-theory&algebra normal polynomials

4.10.4 Polynomials: GATE2000-2.4

https://gateoverflow.in/651

A polynomial $p(x)$ satisfies the following:

- $p(1) = p(3) = p(5) = 1$
- $p(2) = p(4) = -1$

The minimum degree of such a polynomial is

A. 1
B. 2
C. 3
D. 4

gate2000 set-theory&algebra normal polynomials

4.10.5 Polynomials: GATE2014-2-5

https://gateoverflow.in/1957

A non-zero polynomial $f(x)$ of degree 3 has roots at $x = 1$, $x = 2$ and $x = 3$. Which one of the following must be TRUE?

A. $f(0)f(4) < 0$
B. $f(0)f(4) > 0$
C. $f(0) + f(4) > 0$
D. $f(0) + f(4) < 0$

gate2014-2 set-theory&algebra polynomials normal

4.10.6 Polynomials: GATE2017-2-24

https://gateoverflow.in/118185

Consider the quadratic equation $x^2 - 13x + 36 = 0$ with coefficients in a base b. The solutions of this equation in the same base b are $x = 5$ and $x = 6$. Then $b =$ _____

gate2017-2 polynomials numerical-answers set-theory&algebra

4.10.7 Polynomials: TIFR2012-A-12

https://gateoverflow.in/25035

For the polynomial $p(x) = 8x^{10} - 7x^3 + x - 1$ consider the following statements (which may be true or false)

i. It has a root between $[0, 1]$.
ii. It has a root between $[0, -1]$.
iii. It has no roots outside $(-1, 1)$.

Which of the above statements are true?

A. Only (i).
B. Only (i) and (ii).
C. Only (i) and (iii).
D. Only (ii) and (iii).
E. All of (i), (ii) and (iii).

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tifr2012 set-theory&algebra polynomials

4.11 Relations (34)

4.11.1 Relations: GATE1987-2d

https://gateoverflow.in/80583

State whether the following statements are TRUE or FALSE:

The union of two equivalence relations is also an equivalence relation.

gate1987 discrete-mathematics relations descriptive

4.11.2 Relations: GATE1987-9a

https://gateoverflow.in/82436

How many binary relations are there on a set A with n elements?

gate1987 set-theory&algebra relations descriptive

4.11.3 Relations: GATE1987-9e

https://gateoverflow.in/82446

How many true inclusion relations are there of the from $A \subseteq B$, where A and B are subsets of a set S with n elements?

gate1987 set-theory&algebra relations

4.11.4 Relations: GATE1989-1-iv

https://gateoverflow.in/87048

The transitive closure of the relation $\{(1,2),(2,3),(3,4),(5,4)\}$ on the set $\{1,2,3,4,5\}$ is _____.

gate1989 set-theory&algebra relations descriptive

4.11.5 Relations: GATE1992-15.b

https://gateoverflow.in/43579

Let S be the set of all integers and let $n > 1$ be a fixed integer. Define for $a, b \in S, aRb$ iff $a - b$ is a multiple of n. Show that R is an equivalence relation and find its equivalence classes for $n = 5$.

gate1992 set-theory&algebra normal relations

4.11.6 Relations: GATE1994-2.3

https://gateoverflow.in/2470

Amongst the properties $\{\text{reflexivity, symmetry, anti-symmetry, transitivity}\}$ the relation $R = \{(x,y) \in N^2 | x \neq y\}$ satisfies _____

gate1994 set-theory&algebra normal relations descriptive

4.11.7 Relations: GATE1995-1.19

https://gateoverflow.in/2606

Let R be a symmetric and transitive relation on a set A. Then

A. R is reflexive and hence an equivalence relation
B. R is reflexive and hence a partial order
C. R is reflexive and hence not an equivalence relation
D. None of the above

gate1995 set-theory&algebra relations normal

4.11.8 Relations: GATE1996-2.2

https://gateoverflow.in/2731

Let R be a non-empty relation on a collection of sets defined by ${}_AR_B$ if and only if $A \cap B = \phi$. Then, (pick the true statement)

A. A is reflexive and transitive
B. R is symmetric and not transitive
C. R is an equivalence relation
D. R is not reflexive and not symmetric

gate1996 set-theory&algebra relations normal

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4.11.9 Relations: GATE1996-8

https://gateoverflow.in/2760

Let F be the collection of all functions $f : \{1, 2, 3\} \to \{1, 2, 3\}$. If f and $g \in F$, define an equivalence relation $\sim$ by $f \sim g$ if and only if $f(3) = g(3)$.

a. Find the number of equivalence classes defined by $\sim$.
b. Find the number of elements in each equivalence class.

gate1996 set-theory&algebra relations functions normal descriptive

4.11.10 Relations: GATE1997-14

https://gateoverflow.in/2274

Let R be a reflexive and transitive relation on a set A. Define a new relation E on A as

$E = \{(a, b) \mid (a, b) \in R \text{ and } (b, a) \in R\}$

Prove that E is an equivalence relation on A.

Define a relation $\leq$ on the equivalence classes of E as $E_1 \leq E_2$ if $\exists a, b$ such that $a \in E_1, b \in E_2$ and $(a, b) \in R$. Prove that $\leq$ is a partial order.

gate1997 set-theory&algebra relations normal proof descriptive

4.11.11 Relations: GATE1997-6.3

https://gateoverflow.in/2259

The number of equivalence relations of the set $\{1, 2, 3, 4\}$ is

A. 15 B. 16 C. 24 D. 4

gate1997 set-theory&algebra relations normal

4.11.12 Relations: GATE1998-1.6

https://gateoverflow.in/1643

Suppose A is a finite set with n elements. The number of elements in the largest equivalence relation of A is

A. n B. n^2 C. 1 D. $n + 1$

gate1998 set-theory&algebra relations easy

4.11.13 Relations: GATE1998-1.7

https://gateoverflow.in/1644

Let R_1 and R_2 be two equivalence relations on a set. Consider the following assertions:

i. $R_1 \cup R_2$ is an equivalence relation
ii. $R_1 \cap R_2$ is an equivalence relation

Which of the following is correct?

A. Both assertions are true
B. Assertions (i) is true but assertions (ii) is not true
C. Assertions (ii) is true but assertions (i) is not true
D. Neither (i) nor (ii) is true

gate1998 set-theory&algebra relations normal

4.11.14 Relations: GATE1998-10a

https://gateoverflow.in/1724

Prove by induction that the expression for the number of diagonals in a polygon of n sides is $\frac{n(n-3)}{2}$

gate1998 set-theory&algebra descriptive relations

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4.11.15 Relations: GATE1998-10b

https://gateoverflow.in/232729

Let R be a binary relation on $A = \{a, b, c, d, e, f, g, h\}$ represented by the following two component digraph. Find the smallest integers m and n such that $m < n$ and $R^m = R^n$.

gate1998 descriptive set-theory&algebra relations

4.11.16 Relations: GATE1998-2.3

https://gateoverflow.in/1675

The binary relation $R = \{(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2), (3,3), (3,4)\}$ on the set $A = \{1, 2, 3, 4\}$ is

A. reflexive, symmetric and transitive
B. neither reflexive, nor irreflexive but transitive
C. irreflexive, symmetric and transitive
D. irreflexive and antisymmetric

gate1998 set-theory&algebra easy relations

4.11.17 Relations: GATE1999-1.2

https://gateoverflow.in/1456

The number of binary relations on a set with n elements is:

A. n^2
B. 2^n
C. 2^{n^2}
D. None of the above

gate1999 set-theory&algebra relations permutation-and-combination easy

4.11.18 Relations: GATE1999-2.3

https://gateoverflow.in/1481

Let L be a set with a relation R which is transitive, anti-symmetric and reflexive and for any two elements $a, b \in L$, let the least upper bound $lub(a, b)$ and the greatest lower bound $glb(a, b)$ exist. Which of the following is/are true?

A. L is a poset
B. L is a Boolean algebra
C. L is a lattice
D. None of the above

gate1999 set-theory&algebra normal relations

4.11.19 Relations: GATE1999-3

https://gateoverflow.in/1522

a. Mr. X claims the following:
If a relation R is both symmetric and transitive, then R is reflexive. For this, Mr. X offers the following proof:

"From xRy, using symmetry we get yRx. Now because R is transitive xRy and yRx together imply xRx. Therefore, R is reflexive".

b. Give an example of a relation R which is symmetric and transitive but not reflexive.

gate1999 set-theory&algebra relations normal descriptive

4.11.20 Relations: GATE2000-2.5

https://gateoverflow.in/652

A relation R is defined on the set of integers as xRy iff $(x + y)$ is even. Which of the following statements is true?

A. R is not an equivalence relation
B. R is an equivalence relation having 1 equivalence class
C. R is an equivalence relation having 2 equivalence classes

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D. R is an equivalence relation having 3 equivalence classes

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4.11.21 Relations: GATE2001-1.2

https://gateoverflow.in/695

Consider the following relations:

- R1 (a, b) iff $(a + b)$ is even over the set of integers
- R2 (a, b) iff $(a + b)$ is odd over the set of integers
- R3 (a, b) iff $a.b > 0$ over the set of non-zero rational numbers
- R4 (a, b) iff $|a - b| \leq 2$ over the set of natural numbers

Which of the following statements is correct?

A. R1 and R2 are equivalence relations, R3 and R4 are not
B. R1 and R3 are equivalence relations, R2 and R4 are not
C. R1 and R4 are equivalence relations, R2 and R3 are not
D. R1, R2, R3 and R4 all are equivalence relations

gate2001 set-theory&algebra normal relations

4.11.22 Relations: GATE2002-2.17

https://gateoverflow.in/847

The binary relation $S = \phi(\text{empty set})$ on a set $A = \{1, 2, 3\}$ is

A. Neither reflexive nor symmetric
B. Symmetric and reflexive
C. Transitive and reflexive
D. Transitive and symmetric

gate2002 set-theory&algebra normal relations

4.11.23 Relations: GATE2002-3

https://gateoverflow.in/856

Let A be a set of $n(> 0)$ elements. Let N_r be the number of binary relations on A and let N_f be the number of functions from A to A

A. Give the expression for N_r, in terms of n.
B. Give the expression for N_f, terms of n.
C. Which is larger for all possible n, N_r or N_f

gate2002 set-theory&algebra normal descriptive relations

4.11.24 Relations: GATE2004-24

https://gateoverflow.in/1021

Consider the binary relation:

$S = \{(x, y) \mid y = x + 1 \text{ and } x, y \in \{0, 1, 2\}\}$

The reflexive transitive closure is S is

A. $\{(x, y) \mid y > x \text{ and } x, y \in \{0, 1, 2\}\}$
B. $\{(x, y) \mid y \geq x \text{ and } x, y \in \{0, 1, 2\}\}$
C. $\{(x, y) \mid y < x \text{ and } x, y \in \{0, 1, 2\}\}$
D. $\{(x, y) \mid y \leq x \text{ and } x, y \in \{0, 1, 2\}\}$

gate2004 set-theory&algebra easy relations

4.11.25 Relations: GATE2004-IT-4

https://gateoverflow.in/3645

Let R_1 be a relation from $A = \{1, 3, 5, 7\}$ to $B = \{2, 4, 6, 8\}$ and R_2 be another relation from B to C = {1, 2, 3, 4} as defined below:

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i. An element x in A is related to an element y in B (under R_1) if $x+y$ is divisible by 3.
ii. An element x in B is related to an element y in C (under R_2) if $x+y$ is even but not divisible by 3.

Which is the composite relation R_1R_2 from A to C?

A. $R_1R_2 = (1,2),(1,4),(3,3),(5,4),(7,3)$
B. $R_1R_2 = (1,2),(1,3),(3,2),(5,2),(7,3)$
C. $R_1R_2 = (1,2),(3,2),(3,4),(5,4),(7,2)$
D. $R_1R_2 = (3,2),(3,4),(5,1),(5,3),(7,1)$

gate2004-it set-theory&algebra relations normal

4.11.26 Relations: GATE2005-42

https://gateoverflow.in/1167

Let R and S be any two equivalence relations on a non-empty set A. Which one of the following statements is TRUE?

A. $R \cup S, R \cap S$ are both equivalence relations
B. $R \cup S$ is an equivalence relation
C. $R \cap S$ is an equivalence relation
D. Neither $R \cup S$ nor $R \cap S$ are equivalence relations

gate2005 set-theory&algebra normal relations

4.11.27 Relations: GATE2005-7

https://gateoverflow.in/1349

The time complexity of computing the transitive closure of a binary relation on a set of n elements is known to be:

A. $O(n)$ B. $O(n \log n)$ C. $O\left(n^{\frac{3}{2}}\right)$ D. $O\left(n^3\right)$

gate2005 set-theory&algebra normal relations

4.11.28 Relations: GATE2006-4

https://gateoverflow.in/883

A relation R is defined on ordered pairs of integers as follows:

$$(x,y)R(u,v) \text{ if } x<u \text{ and } y>v$$

Then R is:

A. Neither a Partial Order nor an Equivalence Relation
B. A Partial Order but not a Total Order
C. A total Order
D. An Equivalence Relation

gate2006 set-theory&algebra normal relations

4.11.29 Relations: GATE2007-2

https://gateoverflow.in/1201

Let S be a set of n elements. The number of ordered pairs in the largest and the smallest equivalence relations on S are:

A. n and n B. n^2 and n C. n^2 and 0 D. n and 1

gate2007 set-theory&algebra normal relations

4.11.30 Relations: GATE2009-4

https://gateoverflow.in/797

Consider the binary relation $R = \{(x,y),(x,z),(z,x),(z,y)\}$ on the set $\{x,y,z\}$. Which one of the following is **TRUE**?

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A. R is symmetric but NOT antisymmetric
B. R is NOT symmetric but antisymmetric
C. R is both symmetric and antisymmetric
D. R is neither symmetric nor antisymmetric

gate2009 set-theory&algebra easy relations

4.11.31 Relations: GATE2010-3

https://gateoverflow.in/1149

What is the possible number of reflexive relations on a set of 5 elements?

A. 2^{10}
B. 2^{15}
C. 2^{20}
D. 2^{25}

gate2010 set-theory&algebra easy relations

4.11.32 Relations: GATE2015-2-16

https://gateoverflow.in/8089

Let R be the relation on the set of positive integers such that aRb and only if a and b are distinct and let have a common divisor other than 1. Which one of the following statements about R is true?

R is symmetric and reflexive but not transitive

R is reflexive but not symmetric not transitive

R is transitive but not reflexive and not symmetric

R is symmetric but not reflexive and not transitive

gate2015-2 set-theory&algebra relations normal

4.11.33 Relations: GATE2015-3-41

https://gateoverflow.in/8500

Let R be a relation on the set of ordered pairs of positive integers such that $((p,q),(r,s)) \in R$ if and only if $p-s=q-r$. Which one of the following is true about R?

A. Both reflexive and symmetric
B. Reflexive but not symmetric
C. Not reflexive but symmetric
D. Neither reflexive nor symmetric

gate2015-3 set-theory&algebra relations normal

4.11.34 Relations: GATE2016-2-26

https://gateoverflow.in/39603

A binary relation R on $\mathbb{N} \times \mathbb{N}$ is defined as follows: $(a,b)R(c,d)$ if $a \leq c$ or $b \leq d$. Consider the following propositions:

P : R is reflexive.

Q : R is transitive.

Which one of the following statements is **TRUE**?

A. Both P and Q are true.
B. P is true and Q is false.
C. P is false and Q is true.
D. Both P and Q are false.

gate2016-2 set-theory&algebra relations normal

4.12 Sets (35)

4.12.1 Sets: GATE1993-17

https://gateoverflow.in/2314

Out of a group of 21 persons, 9 eat vegetables, 10 eat fish and 7 eat eggs. 5 persons eat all three. How many persons eat at least two out of the three dishes?

gate1993 set-theory&algebra easy sets descriptive

4.12.2 Sets: GATE1993-8.3

https://gateoverflow.in/2301

Let S be an infinite set and $S_1 \ldots, S_n$ be sets such that $S_1 \cup S_2 \cup \cdots \cup S_n = S$. Then

A. at least one of the set S_i is a finite set
B. not more than one of the set S_i can be finite

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C. at least one of the sets S_i is an infinite
D. not more than one of the sets S_i can be infinite
E. None of the above

gate1993 set-theory&algebra normal sets

4.12.3 Sets: GATE1993-8.4

https://gateoverflow.in/2302

Let A be a finite set of size n. The number of elements in the power set of $A \times A$ is:

A. 2^{2^n} B. 2^{n^2} C. $(2^n)^2$ D. $(2^2)^n$ E. None of the above

gate1993 set-theory&algebra easy sets

4.12.4 Sets: GATE1994-2.4

https://gateoverflow.in/2471

The number of subsets $\{1, 2, \ldots, n\}$ with odd cardinality is _____

gate1994 set-theory&algebra easy sets descriptive

4.12.5 Sets: GATE1994-3.8

https://gateoverflow.in/2494

Give a relational algebra expression using only the minimum number of operators from $(\cup, -)$ which is equivalent to $R \cap S$.

gate1994 set-theory&algebra normal sets descriptive

4.12.6 Sets: GATE1995-1.20

https://gateoverflow.in/2607

The number of elements in the power set $P(S)$ of the set $S = \{\{\emptyset\}, 1, \{2, 3\}\}$ is:

A. 2 B. 4 C. 8 D. None of the above

gate1995 set-theory&algebra normal sets

4.12.7 Sets: GATE1995-25b

https://gateoverflow.in/314348

Determine the number of positive integers (≤ 720) which are not divisible by any of $2, 3$ or 5.

gate1995 set-theory&algebra numerical-answers sets

4.12.8 Sets: GATE1996-1.1

https://gateoverflow.in/2705

Let A and B be sets and let A^c and B^c denote the complements of the sets A and B. The set $(A - B) \cup (B - A) \cup (A \cap B)$ is equal to

A. $A \cup B$ B. $A^c \cup B^c$ C. $A \cap B$ D. $A^c \cap B^c$

gate1996 set-theory&algebra easy sets

4.12.9 Sets: GATE1998-2.4

https://gateoverflow.in/1676

In a room containing 28 people, there are 18 people who speak English, 15, people who speak Hindi and 22 people who speak Kannada. 9 persons speak both English and Hindi, 11 persons speak both Hindi and Kannada whereas 13 persons speak both Kannada and English. How many speak all three languages?

A. 9 B. 8 C. 7 D. 6

gate1998 set-theory&algebra easy sets

4.12.10 Sets: GATE2000-2.6

https://gateoverflow.in/653

Let $P(S)$ denotes the power set of set S. Which of the following is always true?

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A. $P(P(S)) = P(S)$
B. $P(S) \cap P(P(S)) = \{\emptyset\}$
C. $P(S) \cap S = P(S)$
D. $S \notin P(S)$

gate2000 set-theory&algebra easy sets

4.12.11 Sets: GATE2000-6

https://gateoverflow.in/677

Let S be a set of n elements $\{1, 2, \ldots\ldots, n\}$ and G a graph with 2^n vertices, each vertex corresponding to a distinct subset of S. Two vertices are adjacent iff the symmetric difference of the corresponding sets has exactly 2 elements. Note: The symmetric difference of two sets R_1 and R_2 is defined as $(R_1 \setminus R_2) \cup (R_2 \setminus R_1)$

Every vertex in G has the same degree. What is the degree of a vertex in G?

How many connected components does G have?

gate2000 set-theory&algebra normal descriptive sets

4.12.12 Sets: GATE2001-2.2

https://gateoverflow.in/720

Consider the following statements:

- $S1$: There exists infinite sets A, B, C such that $A \cap (B \cup C)$ is finite.
- $S2$: There exists two irrational numbers x and y such that $(x + y)$ is rational.

Which of the following is true about $S1$ and $S2$?

A. Only $S1$ is correct
B. Only $S2$ is correct
C. Both $S1$ and $S2$ are correct
D. None of $S1$ and $S2$ is correct

gate2001 set-theory&algebra normal sets

4.12.13 Sets: GATE2001-3

https://gateoverflow.in/744

a. Prove that powerset $(A \cap B) = \text{powerset}(A) \cap \text{powerset}(B)$
b. Let $sum(n) = 0 + 1 + 2 + \ldots\ldots + n$ for all natural numbers n. Give an induction proof to show that the following equation is true for all natural numbers m and n:

$$sum(m + n) = sum(m) + sum(n) + mn$$

gate2001 set-theory&algebra normal sets descriptive

4.12.14 Sets: GATE2004-IT-2

https://gateoverflow.in/3643

In a class of 200 students, 125 students have taken Programming Language course, 85 students have taken Data Structures course, 65 students have taken Computer Organization course; 50 students have taken both Programming Language and Data Structures, 35 students have taken both Programming Language and Computer Organization; 30 students have taken both Data Structures and Computer Organization, 15 students have taken all the three courses.

How many students have not taken any of the three courses?

A. 15
B. 20
C. 25
D. 30

gate2004-it set-theory&algebra easy sets

4.12.15 Sets: GATE2005-8

https://gateoverflow.in/1157

Let A, B and C be non-empty sets and let $X = (A - B) - C$ and $Y = (A - C) - (B - C)$. Which one of the following is TRUE?

A. $X = Y$
B. $X \subset Y$
C. $Y \subset X$
D. None of these

gate2005 set-theory&algebra easy sets

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4.12.16 Sets: GATE2005-IT-33

https://gateoverflow.in/3779

Let A be a set with n elements. Let C be a collection of distinct subsets of A such that for any two subsets S_1 and S_2 in C, either $S_1 \subset S_2$ or $S_2 \subset S_1$. What is the maximum cardinality of C?

A. n B. $n+1$ C. $2^{n-1}+1$ D. $n!$

gate2005-it set-theory&algebra normal sets

4.12.17 Sets: GATE2006-22

https://gateoverflow.in/983

Let E, F and G be finite sets. Let

$X = (E \cap F) - (F \cap G)$ and
$Y = (E - (E \cap G)) - (E - F)$.

Which one of the following is true?

A. $X \subset Y$
B. $X \supset Y$
C. $X = Y$
D. $X - Y \neq \phi$ and $Y - X \neq \phi$

gate2006 set-theory&algebra normal sets

4.12.18 Sets: GATE2006-24

https://gateoverflow.in/987

Given a set of elements N = {1, 2, ..., n} and two arbitrary subsets A⊆N and B⊆N, how many of the n! permutations π from N to N satisfy min(π(A)) = min(π(B)), where min(S) is the smallest integer in the set of integers S, and π(S) is the set of integers obtained by applying permutation π to each element of S?

A. $(n - |A \cup B|)|A||B|$
B. $(|A|^2 + |B|^2)n^2$
C. $n!\frac{|A \cap B|}{|A \cup B|}$
D. $\frac{|A \cap B|^2}{{}^n\mathrm{C}_{|A \cup B|}}$

gate2006 set-theory&algebra normal sets

4.12.19 Sets: GATE2006-IT-23

https://gateoverflow.in/3562

Let P, Q and R be sets let Δ denote the symmetric difference operator defined as $P \Delta Q = (P \cup Q) - (P \cap Q)$. Using Venn diagrams, determine which of the following is/are TRUE?

I. $P \Delta (Q \cap R) = (P \Delta Q) \cap (P \Delta R)$
II. $P \cap (Q \cap R) = (P \cap Q) \Delta (P \Delta R)$

A. I only B. II only C. Neither I nor II D. Both I and II

gate2006-it set-theory&algebra normal sets

4.12.20 Sets: GATE2006-IT-24

https://gateoverflow.in/3563

What is the cardinality of the set of integers X defined below?
$X = \{n \mid 1 \leq n \leq 123, n$ is not divisible by either 2, 3 or $5\}$

A. 28 B. 33 C. 37 D. 44

gate2006-it set-theory&algebra normal sets

4.12.21 Sets: GATE2008-2

https://gateoverflow.in/400

If P, Q, R are subsets of the universal set U, then

$$(P \cap Q \cap R) \cup (P^c \cap Q \cap R) \cup Q^c \cup R^c$$

is

A. $Q^c \cup R^c$
B. $P \cup Q^c \cup R^c$

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C. $P^c \cup Q^c \cup R^c$
D. U

gate2008 normal set-theory&algebra sets

4.12.22 Sets: GATE2014-2-50

https://gateoverflow.in/2016

Consider the following relation on subsets of the set S of integers between 1 and 2014. For two distinct subsets U and V of S we say $U < V$ if the minimum element in the symmetric difference of the two sets is in U.

Consider the following two statements:

- $S1$: There is a subset of S that is larger than every other subset.
- $S2$: There is a subset of S that is smaller than every other subset.

Which one of the following is CORRECT?

A. Both $S1$ and $S2$ are true
B. $S1$ is true and $S2$ is false
C. $S2$ is true and $S1$ is false
D. Neither $S1$ nor $S2$ is true

gate2014-2 set-theory&algebra normal sets

4.12.23 Sets: GATE2015-1-16

https://gateoverflow.in/8238

For a set A, the power set of A is denoted by 2^A. If $A = \{5, \{6\}, \{7\}\}$, which of the following options are TRUE?

I. $\phi \in 2^A$
II. $\phi \subseteq 2^A$
III. $\{5, \{6\}\} \in 2^A$
IV. $\{5, \{6\}\} \subseteq 2^A$

A. I and III only
B. II and III only
C. I, II and III only
D. I, II and IV only

gate2015-1 set-theory&algebra sets normal

4.12.24 Sets: GATE2015-2-18

https://gateoverflow.in/8092

The cardinality of the power set of $\{0, 1, 2, \ldots, 10\}$ is _____

gate2015-2 set-theory&algebra sets easy numerical-answers

4.12.25 Sets: GATE2015-3-23

https://gateoverflow.in/8426

Suppose U is the power set of the set $S = \{1, 2, 3, 4, 5, 6\}$. For any $T \in U$, let $|T|$ denote the number of elements in T and T' denote the complement of T. For any $T, R \in U$ let $T \backslash R$ be the set of all elements in T which are not in R. Which one of the following is true?

A. $\forall X \in U, (|X| = |X'|)$
B. $\exists X \in U, \exists Y \in U, (|X| = 5, |Y| = 5 \text{ and } X \cap Y = \phi)$
C. $\forall X \in U, \forall Y \in U, (|X| = 2, |Y| = 3 \text{ and } X \backslash Y = \phi)$
D. $\forall X \in U, \forall Y \in U, (X \backslash Y = Y' \backslash X')$

gate2015-3 set-theory&algebra sets normal

4.12.26 Sets: GATE2016-2-28

https://gateoverflow.in/39595

Consider a set U of 23 different compounds in a chemistry lab. There is a subset S of U of 9 compounds, each of which reacts with exactly 3 compounds of U. Consider the following statements:

I. Each compound in U \ S reacts with an odd number of compounds.
II. At least one compound in U \ S reacts with an odd number of compounds.
III. Each compound in U \ S reacts with an even number of compounds.

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Which one of the above statements is **ALWAYS TRUE**?

A. Only I B. Only II C. Only III D. None.

gate2016-2 set-theory&algebra difficult sets

4.12.27 Sets: GATE2017-1-47

https://gateoverflow.in/118330

The number of integers between 1 and 500 (both inclusive) that are divisible by 3 or 5 or 7 is _____ .

gate2017-1 set-theory&algebra normal numerical-answers sets

4.12.28 Sets: TIFR2010-A-15

https://gateoverflow.in/18394

Let A, B be sets. Let $\bar{A}$ denote the compliment of set A (with respect to some fixed universe), and $(A-B)$ denote the set of elements in A which are not in B. Set $(A-(A-B))$ is equal to:

a. B b. $A \cap \bar{B}$ c. $A-B$ d. $A \cap B$ e. $\bar{B}$

tifr2010 set-theory&algebra sets

4.12.29 Sets: TIFR2010-A-18

https://gateoverflow.in/18496

Let X be a set of size n. How many pairs of sets (A, B) are there that satisfy the condition $A \subseteq B \subseteq X$?

a. 2^{n+1} b. 2^{2n} c. 3^n d. 2^n+1 e. 3^{n+1}

tifr2010 sets

4.12.30 Sets: TIFR2011-A-10

https://gateoverflow.in/20039

Let m, n denote two integers from the set $\{1, 2, \ldots, 10\}$. The number of ordered pairs (m, n) such that $2^m + 2^n$ is divisible by 5 is.

a. 10 b. 14 c. 24 d. 8 e. None of the above.

tifr2011 set-theory&algebra sets

4.12.31 Sets: TIFR2011-B-23

https://gateoverflow.in/20400

Suppose $(S_1, S_2, \ldots, S_m)$ is a finite collection of non-empty subsets of a universe U. Note that the sets in this collection need not be distinct. Consider the following basic step to be performed on this sequence. While there exist sets S_i and S_j in the sequence, neither of which is a subset of the other, delete them from the sequence, and

i. If $S_i \cap S_j \neq \emptyset$, then add the sets $S_i \cup S_j$ and $S_i \cap S_j$ to the sequence;
ii. If $S_i \cap S_j = \emptyset$, then add only the set $S_i \cup S_j$ to the sequence.

In each step we delete two sets from the sequence and add at most two sets to the sequence. Also, note that empty sets are never added to the sequence. Which of the following statements is TRUE?

a. The size of the smallest set in the sequence decreases in every step.
b. The size of the largest set in the sequence increases in every step.
c. The process always terminates.
d. The process terminates if U is finite but might not if U is infinite.
e. There is a finite collection of subsets of a finite universe U and a choice of S_i and S_j in each step such that the process does not terminate.

tifr2011 set-theory&algebra sets

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4.12.32 Sets: TIFR2012-A-8

https://gateoverflow.in/21007

How many pairs of sets (A, B) are there that satisfy the condition $A, B \subseteq \{1, 2, \ldots, 5\}, A \cap B = \{\}$?

a. 125 b. 127 c. 243 d. 257

tifr2012 set-theory&algebra sets

4.12.33 Sets: TIFR2016-A-8

https://gateoverflow.in/97234

Let A and B be finite sets such that $A \subseteq B$. Then, what is the value of the expression:

$$\Sigma_{C:A \subseteq C \subseteq B}(-1)^{|C \setminus A|},$$

Where $C \setminus A = \{x \in C : x \notin A\}$?

A. Always 0
B. Always 1
C. 0 if $A = B$ and 1 otherwise
D. 1 if $A = B$ and 0 otherwise
E. Depends on the soze of the universe

tifr2016 set-theory&algebra sets

4.12.34 Sets: TIFR2017-A-10

https://gateoverflow.in/95272

For a set A define $P(A)$ to be the set of all subsets of A. For example, if $A = \{1, 2\}$ then $P(A) = \{\emptyset, \{1, 2\}, \{1\}, \{2\}\}$. Let $A \to P(A)$ be a function and A is not empty. Which of the following must be TRUE?

1. f cannot be one-to-one (injective)
2. f cannot be onto (surjective)
3. f is both one-to-one and onto (bijective)
4. there is no such f possible
5. if such a function f exists, then A is infinite

tifr2017 set-theory&algebra sets functions easy

4.12.35 Sets: TIFR2019-A-1

https://gateoverflow.in/280509

Let X be a set with n elements. How many subsets of X have odd cardinality?

A. n
B. 2^n
C. $2^{n/2}$
D. 2^{n-1}
E. Can not be determined without knowing whether n is odd or even

tifr2019 engineering-mathematics discrete-mathematics set-theory&algebra sets

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5 Engineering Mathematics: Calculus (56)

Syllabus: Limits, Continuity, and Differentiability, Maxima and minima, Mean value theorem, Integration.

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	1	1	0	1	1	1	0	0.8	1
2 Marks Count	0	0	1	0	0	0	0	0.2	1
Total Marks	1	1	2	1	1	1	**1**	**1.2**	**2**

5.1 Continuity (4)

5.1.1 Continuity: GATE2010-ME

https://gateoverflow.in/41570

The function $y = |2 - 3x|$

A. **is continuous** $\forall x \in R$ and differentiable $\forall x \in R$
B. **is continuous** $\forall x \in R$ and differentiable $\forall x \in R$ except at $x = \frac{3}{2}$
C. **is continuous** $\forall x \in R$ and differentiable $\forall x \in R$ except at $x = \frac{2}{3}$
D. **is continuous** $\forall x \in R$ except $x = 3$ and differentiable $\forall x \in R$

calculus gate2010me engineering-mathematics continuity

5.1.2 Continuity: GATE2013-22

https://gateoverflow.in/1533

Which one of the following functions is continuous at $x = 3$?

A. $f(x) = \begin{cases} 2, & \text{if } x = 3 \\ x - 1 & \text{if } x > 3 \\ \frac{x+3}{3} & \text{if } x < 3 \end{cases}$
B. $f(x) = \begin{cases} 4, & \text{if } x = 3 \\ 8 - x & \text{if } x \neq 3 \end{cases}$
C. $f(x) = \begin{cases} x + 3, & \text{if } x \leq 3 \\ x - 4 & \text{if } x > 3 \end{cases}$
D. $f(x) = \begin{cases} \frac{1}{x^3 - 27} & \text{if } x \neq 3 \end{cases}$

gate2013 calculus continuity normal

5.1.3 Continuity: GATE2014-1-47

https://gateoverflow.in/1925

A function $f(x)$ is continuous in the interval $[0, 2]$. It is known that $f(0) = f(2) = -1$ and $f(1) = 1$. Which one of the following statements must be true?

A. There exists a y in the interval $(0, 1)$ such that $f(y) = f(y + 1)$
B. For every y in the interval $(0, 1)$,$f(y) = f(2 - y)$
C. The maximum value of the function in the interval $(0, 2)$ is 1
D. There exists a y in the interval $(0, 1)$ such that $f(y) = -f(2 - y)$

gate2014-1 calculus continuity normal

5.1.4 Continuity: GATE2015-2-26

https://gateoverflow.in/8124

Let $f(x) = x^{-\left(\frac{1}{3}\right)}$ and A denote the area of region bounded by $f(x)$ and the X-axis, when x varies from -1 to 1. Which of the following statements is/are TRUE?

I. f is continuous in $[-1, 1]$
II. f is not bounded in $[-1, 1]$
III. A is nonzero and finite

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A. II only B. III only C. II and III only D. I, II and III

gate2015-2 continuity functions normal

5.2 Differentiability (9)

5.2.1 Differentiability: GATE1996-1.6

https://gateoverflow.in/2710

The formula used to compute an approximation for the second derivative of a function f at a point X_0 is

A. $\frac{f(x_0+h)+f(x_0-h)}{2}$

B. $\frac{f(x_0+h)-f(x_0-h)}{2h}$

C. $\frac{f(x_0+h)+2f(x_0)+f(x_0-h)}{h^2}$

D. $\frac{f(x_0+h)-2f(x_0)+f(x_0-h)}{h^2}$

gate1996 calculus differentiability normal

5.2.2 Differentiability: GATE1996-3

https://gateoverflow.in/2755

Let f be a function defined by

$$f(x) = \begin{cases} x^2 & \text{for } x \leq 1 \\ ax^2+bx+c & \text{for } 1 < x \leq 2 \\ x+d & \text{for } x > 2 \end{cases}$$

Find the values for the constants a, b, c and d so that f is continuous and differentiable everywhere on the real line.

gate1996 calculus continuity differentiability normal descriptive

5.2.3 Differentiability: GATE1998-1.4

https://gateoverflow.in/1641

Consider the function $y = |x|$ in the interval $[-1, 1]$. In this interval, the function is

A. continuous and differentiable

B. continuous but not differentiable

C. differentiable but not continuous

D. neither continuous nor differentiable

gate1998 calculus continuity differentiability easy

5.2.4 Differentiability: GATE2007-1

https://gateoverflow.in/1200

Consider the following two statements about the function $f(x) = |x|$:

- P. $f(x)$ is continuous for all real values of x.
- Q. $f(x)$ is differentiable for all real values of x .

Which of the following is **TRUE**?

A. P is true and Q is false.

B. P is false and Q is true.

C. Both P and Q are true.

D. Both P and Q are false.

gate2007 calculus continuity differentiability easy

5.2.5 Differentiability: GATE2014-1-46

https://gateoverflow.in/1924

The function $f(x) = x \sin x$ satisfies the following equation:

$$f''(x) + f(x) + t \cos x = 0$$

. The value of t is_____.

gate2014-1 calculus easy numerical-answers differentiability

5.2.6 Differentiability: GATE2014-1-6

https://gateoverflow.in/1763

Let the function

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$$f(\theta) = \begin{vmatrix} \sin\theta & \cos\theta & \tan\theta \\ \sin(\frac{\pi}{6}) & \cos(\frac{\pi}{6}) & \tan(\frac{\pi}{6}) \\ \sin(\frac{\pi}{3}) & \cos(\frac{\pi}{3}) & \tan(\frac{\pi}{3}) \end{vmatrix}$$

where
$\theta \in \left[\frac{\pi}{6}, \frac{\pi}{3}\right]$ and $f'(\theta)$ denote the derivative of f with respect to θ. Which of the following statements is/are **TRUE**?

I. There exists $\theta \in (\frac{\pi}{6}, \frac{\pi}{3})$ such that $f'(\theta) = 0$
II. There exists $\theta \in (\frac{\pi}{6}, \frac{\pi}{3})$ such that $f'(\theta) \neq 0$

A. I only B. II only C. Both I and II D. Neither I Nor II

gate2014-1 calculus differentiability normal

5.2.7 Differentiability: GATE2016-2-02

https://gateoverflow.in/39571

Let $f(x)$ be a polynomial and $g(x) = f'(x)$ be its derivative. If the degree of $(f(x) + f(-x))$ is 10, then the degree of $(g(x) - g(-x))$ is _____.

gate2016-2 calculus normal numerical-answers differentiability

5.2.8 Differentiability: GATE2017-2-10

https://gateoverflow.in/118262

If $f(x) = R\ \sin(\frac{\pi x}{2}) + S, f'\left(\frac{1}{2}\right) = \sqrt{2}$ and $\int_0^1 f(x)dx = \frac{2R}{\pi}$, then the constants R and S are

A. $\frac{2}{\pi}$ and $\frac{16}{\pi}$ B. $\frac{2}{\pi}$ and 0 C. $\frac{4}{\pi}$ and 0 D. $\frac{4}{\pi}$ and $\frac{16}{\pi}$

gate2017-2 engineering-mathematics calculus differentiability

5.2.9 Differentiability: TIFR2018-A-5

https://gateoverflow.in/179274

Which of the following id the derivative of $f(x) = x^x$ when $x > 0$?

A. x^x
B. $x^x \ln\ x$
C. $x^x + x^x \ln\ x$
D. $(x^x)(x^x \ln\ x)$
E. None of the above;function is not differentiable for $x > 0$

tifr2018 calculus differentiability

5.3 Integration (12)

5.3.1 Integration: GATE1993-02.6

https://gateoverflow.in/610

The value of the double integral $\int_0^1 \int_0^{\frac{1}{x}} \frac{x}{1+y^2} dxdy$ is_____.

gate1993 calculus integration normal

5.3.2 Integration: GATE2000-2.3

https://gateoverflow.in/650

Let $S = \sum_{i=3}^{100} i \log_2 i$, and $T = \int_2^{100} x \log_2 x dx$.
Which of the following statements is true?

A. $S > T$
B. $S = T$
C. $S < T$ and $2S > T$
D. $2S \leq T$

gate2000 calculus integration normal

5.3.3 Integration: GATE2005-IT-35

https://gateoverflow.in/3782

What is the value of $\int_0^{2\pi} (x - \pi)^2 (\sin x) dx$

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A. -1 B. 0 C. 1 D. π

gate2005-it calculus integration normal

5.3.4 Integration: GATE2009-25

https://gateoverflow.in/802

$\int_0^{\pi/4} (1-\tan x)/(1+\tan x)\, dx$

A. 0 B. 1 C. $ln2$ D. $1/2ln2$

gate2009 calculus integration normal

5.3.5 Integration: GATE2011-31

https://gateoverflow.in/2133

Given $i = \sqrt{-1}$, what will be the evaluation of the definite integral $\int\limits_0^{\pi/2} \frac{\cos x + i \sin x}{\cos x - i \sin x} dx$?

A. 0 B. 2 C. $-i$ D. i

gate2011 calculus integration normal

5.3.6 Integration: GATE2014-3-47

https://gateoverflow.in/2081

The value of the integral given below is

$$\int\limits_0^{\pi} x^2 \cos x \, dx$$

A. -2π B. π C. $-\pi$ D. 2π

gate2014-3 calculus limits integration normal

5.3.7 Integration: GATE2014-3-6

https://gateoverflow.in/2040

If $\int\limits_0^{2\pi} |x \sin x| dx = k\pi$, then the value of k is equal to _____.

gate2014-3 calculus integration limits numerical-answers easy

5.3.8 Integration: GATE2015-1-44

https://gateoverflow.in/8314

Compute the value of:

$$\int_{\frac{1}{\pi}}^{\frac{2}{\pi}} \frac{\cos(1/x)}{x^2} dx$$

gate2015-1 calculus integration normal numerical-answers

5.3.9 Integration: GATE2015-3-45

https://gateoverflow.in/8554

If for non-zero x, $af(x) + bf(\frac{1}{x}) = \frac{1}{x} - 25$ where a $a \neq b$ then $\int_1^2 f(x)dx$ is

A. $\frac{1}{a^2-b^2}\left[a(\ln 2 - 25) + \frac{47b}{2}\right]$
B. $\frac{1}{a^2-b^2}\left[a(2\ln 2 - 25) - \frac{47b}{2}\right]$
C. $\frac{1}{a^2-b^2}\left[a(2\ln 2 - 25) + \frac{47b}{2}\right]$
D. $\frac{1}{a^2-b^2}\left[a(\ln 2 - 25) - \frac{47b}{2}\right]$

gate2015-3 calculus integration normal

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5.3.10 Integration: GATE2018-16

https://gateoverflow.in/204090

The value of $\int_0^{\pi/4} x\cos(x^2)dx$ correct to three decimal places (assuming that $\pi = 3.14$) is ____

gate2018 calculus integration normal numerical-answers

5.3.11 Integration: TIFR2011-A-11

https://gateoverflow.in/20219

$$\int_0^1 \ln x \, \mathrm{d}x =$$

a. 1 b. -1 c. ∞ d. $-\infty$ e. None of the above.

tifr2011 calculus integration

5.3.12 Integration: TIFR2019-A-13

https://gateoverflow.in/280497

Consider the integral

$$\int_0^1 \frac{x^{300}}{1+x^2+x^3}dx$$

What is the value of this integral correct up to two decimal places?

A. 0.00 B. 0.02 C. 0.10 D. 0.33 E. 1.00

tifr2019 engineering-mathematics calculus integration

5.4 Limits (15)

5.4.1 Limits: GATE1993-02.1

https://gateoverflow.in/605

In questions 2.1 to 2.10 below, each blank (___) is to be suitably filled in. $\lim_{x\to 0} \frac{x(e^x-1)+2(\cos x-1)}{x(1-\cos x)}$ is_____

gate1993 limits calculus normal numerical-answers

5.4.2 Limits: GATE2008-1

https://gateoverflow.in/399

$\lim_{x\to\infty} \frac{x-\sin x}{x+\cos x}$ equals

A. 1 B. -1 C. ∞ D. $-\infty$

gate2008 calculus limits easy

5.4.3 Limits: GATE2010-5

https://gateoverflow.in/1151

What is the value of $\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^{2n}$?

A. 0 B. e^{-2} C. $e^{-1/2}$ D. 1

gate2010 calculus limits normal

5.4.4 Limits: GATE2015-1-4

https://gateoverflow.in/8021

$\lim_{x\to\infty} x^{\frac{1}{x}}$ is

A. ∞ B. 0 C. 1 D. Not defined

gate2015-1 calculus limits normal

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5.4.5 Limits: GATE2015-3-9

https://gateoverflow.in/8403

The value of $\lim_{x\to\infty}(1+x^2)^{e^{-x}}$ is

A. 0 B. $\frac{1}{2}$ C. 1 D. ∞

gate2015-3 calculus limits normal

5.4.6 Limits: GATE2016-1-3

https://gateoverflow.in/39630

$$\lim_{x\to 4}\frac{\sin(x-4)}{x-4}$$

=_____.

gate2016-1 calculus limits easy numerical-answers

5.4.7 Limits: GATE2017-1-28

https://gateoverflow.in/118309

The value of $\lim_{x\to 1}\frac{x^7-2x^5+1}{x^3-3x^2+2}$

A. is 0 B. is -1 C. is 1 D. does not exist

gate2017-1 calculus limits normal

5.4.8 Limits: GATE2019-13

https://gateoverflow.in/302835

Compute $\lim_{x\to 3}\frac{x^4-81}{2x^2-5x-3}$

A. 1 B. $53/12$ C. $108/7$ D. Limit does not exist

gate2019 engineering-mathematics calculus limits

5.4.9 Limits: TIFR2010-A-7

https://gateoverflow.in/18234

The limit of $\frac{10^n}{n!}$ as $n\to\infty$ is.

A. 0 B. 1 C. e D. 10 E. ∞

tifr2010 calculus limits

5.4.10 Limits: TIFR2011-A-14

https://gateoverflow.in/20224

What is the value of the following limit?

$$\lim_{x\to 0}\frac{d}{dx}\frac{\sin^2 x}{x}$$

a. 0 b. 2 c. 1 d. $\frac{1}{2}$ e. None of the above

tifr2011 calculus limits

5.4.11 Limits: TIFR2011-A-17

https://gateoverflow.in/20254

What is the value of the following limit?

$$\lim_{x\to 0}\frac{2^x-1}{x}$$

a. 0 b. $\log_2(e)$ c. $\log_e(2)$ d. 1 e. None of the above.

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tifr2011 limits

5.4.12 Limits: TIFR2012-A-14

https://gateoverflow.in/25037

The limit $\lim_{n\to\infty}\left(\sqrt{n^2+n}-n\right)$ equals.

A. ∞ B. 1 C. $1/2$ D. 0 E. None of the above.

tifr2012 calculus limits

5.4.13 Limits: TIFR2014-A-16

https://gateoverflow.in/27107

Let $x_0 = 1$ and

$x_{n+1} = \frac{3+2x_n}{3+x_n}, n \geq 0$.

$x_\infty = \lim_{n\to\infty} x_n$ is

A. $\left(\sqrt{5}-1\right)/2$
B. $\left(\sqrt{5}+1\right)/2$
C. $\left(\sqrt{13}-1\right)/2$
D. $\left(-\sqrt{13}-1\right)/2$
E. None of the above.

tifr2014 limits

5.4.14 Limits: TIFR2014-A-18

https://gateoverflow.in/27128

We are given a collection of real numbers where a real number $a_i \neq 0$ occurs n_i times. Let the collection be enumerated as $\{x_1, x_2, \ldots x_n\}$ so that $x_1 = x_2 = \ldots = x_{n_1} = a_1$ and so on, and $n = \sum_i n_i$ is finite. What is

$\lim_{k\to\infty}\left(\sum_{i=1}^{n}\frac{1}{|x_i|^k}\right)^{-1/k}$?

A. $\max_i\left(n_i|a_i|\right)$
B. $\min_i|a_i|$
C. $\min_i\left(n_i|a_i|\right)$
D. $\max_i|a_i|$
E. None of the above.

tifr2014 limits

5.4.15 Limits: TIFR2019-A-15

https://gateoverflow.in/280495

Consider the matrix

$$A = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & \frac{3}{4} & \frac{1}{4} \\ 0 & \frac{1}{4} & \frac{3}{4} \end{bmatrix}$$

What is $\lim_{n\to\infty} A^n$?

A. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} \frac{1}{4} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$

C. $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \end{bmatrix}$

D. $\begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ 0 & \frac{1}{2} & \frac{1}{2} \\ 0 & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$

E. The limit exists, but it is none of the above

tifr2019 engineering-mathematics calculus limits

5.5 Maxima Minima (16)

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5.5.1 Maxima Minima: GATE1987-1-xxvi

https://gateoverflow.in/80571

If $f(x_i).\, f(x_{i+1}) < 0$ then

A. There must be a root of $f(x)$ between x_i and x_{i+1}
B. There need not be a root of $f(x)$ between x_i and x_{i+1}.
C. There fourth derivative of $f(x)$ with respect to x vanishes at x_i.
D. The fourth derivative of $f(x)$ with respect to x vanishes at x_{i+1}.

gate1987 calculus maxima-minima

5.5.2 Maxima Minima: GATE1995-1.21

https://gateoverflow.in/2608

In the interval $[0, \pi]$ the equation $x = \cos x$ has

A. No solution
B. Exactly one solution
C. Exactly two solutions
D. An infinite number of solutions

gate1995 calculus normal maxima-minima

5.5.3 Maxima Minima: GATE1995-25a

https://gateoverflow.in/2664

Find the minimum value of $3 - 4x + 2x^2$.

gate1995 calculus maxima-minima easy

5.5.4 Maxima Minima: GATE1997-4.1

https://gateoverflow.in/2242

What is the maximum value of the function $f(x) = 2x^2 - 2x + 6$ in the interval $[0, 2]$?

A. 6
B. 10
C. 12
D. 5.5

gate1997 calculus maxima-minima normal

5.5.5 Maxima Minima: GATE1998-8

https://gateoverflow.in/1722

a. Find the points of local maxima and minima, if any, of the following function defined in $0 \leq x \leq 6$.

$$x^3 - 6x^2 + 9x + 15$$

b. Integrate

$$\int_{-\pi}^{\pi} x \cos x dx$$

gate1998 calculus maxima-minima integration normal descriptive

5.5.6 Maxima Minima: GATE2008-25

https://gateoverflow.in/423

A point on a curve is said to be an extremum if it is a local minimum or a local maximum. The number of distinct extrema for the curve $3x^4 - 16x^3 + 24x^2 + 37$ is

A. 0
B. 1
C. 2
D. 3

gate2008 calculus maxima-minima easy

5.5.7 Maxima Minima: GATE2008-IT-31

https://gateoverflow.in/3341

If $f(x)$ is defined as follows, what is the minimum value of $f(x)$ for $x \in (0, 2]$?

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$$f(x) = \begin{cases} \frac{25}{8x} \text{ when } x \leq \frac{3}{2} \\ x + \frac{1}{x} \text{ otherwise} \end{cases}$$

A. 2 B. $2\left(\frac{1}{12}\right)$ C. $2\left(\frac{1}{6}\right)$ D. $2\left(\frac{1}{2}\right)$

gate2008-it calculus maxima-minima normal

5.5.8 Maxima Minima: GATE2012-9

https://gateoverflow.in/41

Consider the function $f(x) = \sin(x)$ in the interval $x = \left[\frac{\pi}{4}, \frac{7\pi}{4}\right]$. The number and location(s) of the local minima of this function are

A. One, at $\frac{\pi}{2}$

B. One, at $\frac{3\pi}{2}$

C. Two, at $\frac{\pi}{2}$ and $\frac{3\pi}{2}$

D. Two, at $\frac{\pi}{4}$ and $\frac{3\pi}{2}$

gate2012 calculus maxima-minima normal nielit

5.5.9 Maxima Minima: GATE2015-2-GA-3

https://gateoverflow.in/8030

Consider a function $f(x) = 1 - |x|$ on $-1 \leq x \leq 1$. The value of x at which the function attains a maximum, and the maximum value of the function are:

A. $0, -1$ B. $-1, 0$ C. $0, 1$ D. $-1, 2$

gate2015-2 set-theory&algebra functions normal maxima-minima

5.5.10 Maxima Minima: TIFR2010-A-3

https://gateoverflow.in/18209

The function $f(x) = 2.5 \log_e\left(2 + \exp\left(x^2 - 4x + 5\right)\right)$ attains a minimum at $x =$?

a. 0 b. 1 c. 2 d. 3 e. 4

tifr2010 calculus maxima-minima

5.5.11 Maxima Minima: TIFR2011-A-4

https://gateoverflow.in/20002

Consider the problem of maximizing $x^2 - 2x + 5$ such that $0 < x < 2$. The value of x at which the maximum is achieved is:

a. 0.5 b. 1 c. 1.5 d. 1.75 e. None of the above.

tifr2011 calculus maxima-minima

5.5.12 Maxima Minima: TIFR2012-A-13

https://gateoverflow.in/25036

The maximum value of the function.

$f(x, y, z) = (x - 1/3)^2 + (y - 1/3)^2 + (z - 1/3)^2$

Subject to the constraints

$x + y + z = 1, x \geq 0, y \geq 0, z \geq 0$

is

a. $1/3$ b. $2/3$ c. 1 d. $4/3$ e. $4/9$

tifr2012 calculus maxima-minima

5.5.13 Maxima Minima: TIFR2012-A-15

https://gateoverflow.in/25040

Consider the differential equation $dx/dt = (1 - x)(2 - x)(3 - x)$. Which of its equilibria is unstable?

a. $x = 0$ b. $x = 1$ c. $x = 2$ d. $x = 3$ e. None of the above.

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tifr2012 calculus maxima-minima

5.5.14 Maxima Minima: TIFR2013-A-16

https://gateoverflow.in/25496

The minimum of the function $f(x) = x \log_e(x)$ over the interval $[\frac{1}{2}, \infty)$ is

a. 0 b. $-e$ c. $\frac{-\log_e(2)}{2}$ d. $\frac{-1}{e}$ e. None of the above

tifr2013 calculus maxima-minima

5.5.15 Maxima Minima: TIFR2014-A-9

https://gateoverflow.in/25996

Solve min $x^2 + y^2$ subject to

$$\begin{aligned} x + y &\geq 10, \\ 2x + 3y &\geq 20, \\ x &\geq 4, \\ y &\geq 4. \end{aligned}$$

a. 32 b. 50 c. 52 d. 100 e. None of the above

tifr2014 calculus maxima-minima

5.5.16 Maxima Minima: TIFR2015-A-11

https://gateoverflow.in/29581

Suppose that $f(x)$ is a continuous function such that $0.4 \leq f(x) \leq 0.6$ for $0 \leq x \leq 1$. Which of the following is always true?

A. $f(0.5) = 0.5$.
B. There exists x between 0 and 1 such that $f(x) = 0.8x$.
C. There exists x between 0 and 0.5 such that $f(x) = x$.
D. $f(0.5) > 0.5$.
E. None of the above statements are always true.

tifr2015 maxima-minima calculus

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6 Engineering Mathematics: Linear Algebra (80)

Syllabus: Matrices, determinants, System of linear equations, Eigenvalues and eigenvectors, LU decomposition.

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	1	1	1	1	1	2	1	1.2	2
2 Marks Count	1	1	2	1	0	0	0	0.8	2
Total Marks	3	3	5	3	1	2	**1**	**2.5**	**5**

6.1 Cartesian Coordinates (1)

6.1.1 Cartesian Coordinates: GATE2007-IT-80

https://gateoverflow.in/3532

Let $P_1, P_2, \ldots, P_n$ be n points in the $xy-$plane such that no three of them are collinear. For every pair of points P_i and P_j, let L_{ij} be the line passing through them. Let L_{ab} be the line with the steepest gradient amongst all $\frac{n(n-1)}{2}$ lines.

Which one of the following properties should necessarily be satisfied ?

A. P_a and P_b are adjacent to each other with respect to their x-coordinate
B. Either P_a or P_b has the largest or the smallest y-coordinate among all the points
C. The difference between x-coordinates P_a and P_b is minimum
D. None of the above

gate2007-it cartesian-coordinates

6.2 Determinant (6)

6.2.1 Determinant: GATE1997-1.3

https://gateoverflow.in/2219

The determinant of the matrix $\begin{bmatrix} 6 & -8 & 1 & 1 \\ 0 & 2 & 4 & 6 \\ 0 & 0 & 4 & 8 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

A. 11 B. -48 C. 0 D. -24

gate1997 linear-algebra normal determinant

6.2.2 Determinant: GATE2000-1.3

https://gateoverflow.in/626

The determinant of the matrix

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 8 & 1 & 7 & 2 \\ 2 & 0 & 2 & 0 \\ 9 & 0 & 6 & 1 \end{bmatrix}$$

A. 4 B. 0 C. 15 D. 20

gate2000 linear-algebra easy determinant

6.2.3 Determinant: GATE2005-IT-3

https://gateoverflow.in/3747

The determinant of the matrix given below is

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$$\begin{bmatrix} 0 & 1 & 0 & 2 \\ -1 & 1 & 1 & 3 \\ 0 & 0 & 0 & 1 \\ 1 & -2 & 0 & 1 \end{bmatrix}$$

A. -1 B. 0 C. 1 D. 2

gate2005-it linear-algebra normal determinant

6.2.4 Determinant: GATE2013-3

https://gateoverflow.in/1412

Which one of the following does NOT equal

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} \quad ?$$

A. $\begin{vmatrix} 1 & x(x+1) & x+1 \\ 1 & y(y+1) & y+1 \\ 1 & z(z+1) & z+1 \end{vmatrix}$

B. $\begin{vmatrix} 1 & x+1 & x^2+1 \\ 1 & y+1 & y^2+1 \\ 1 & z+1 & z^2+1 \end{vmatrix}$

C. $\begin{vmatrix} 0 & x-y & x^2-y^2 \\ 0 & y-z & y^2-z^2 \\ 1 & z & z^2 \end{vmatrix}$

D. $\begin{vmatrix} 2 & x+y & x^2+y^2 \\ 2 & y+z & y^2+z^2 \\ 1 & z & z^2 \end{vmatrix}$

gate2013 linear-algebra normal determinant

6.2.5 Determinant: GATE2014-2-4

https://gateoverflow.in/1956

If the matrix A is such that

$$A = \begin{bmatrix} 2 \\ -4 \\ 7 \end{bmatrix} \begin{bmatrix} 1 & 9 & 5 \end{bmatrix}$$

then the determinant of A is equal to _____.

gate2014-2 linear-algebra numerical-answers easy determinant

6.2.6 Determinant: GATE2019-9

https://gateoverflow.in/302839

Let X be a square matrix. Consider the following two statements on X.

I. X is invertible
II. Determinant of X is non-zero

Which one of the following is TRUE?

A. I implies II; II does not imply I
B. II implies I; I does not imply II
C. I does not imply II; II does not imply I
D. I and II are equivalent statements

gate2019 engineering-mathematics linear-algebra determinant

6.3 Eigen Value (25)

6.3.1 Eigen Value: GATE1993-01.1

https://gateoverflow.in/596

For the below question, one or more of the alternatives are correct. Write the code letter (s) a, b, c, d corresponding to the correct alternative(s) in the answer book. Marks will be given only if all the correct alternatives have been selected and no incorrect alternative is picked up.

The eigen vector (s) of the matrix

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$$\begin{bmatrix} 0 & 0 & \alpha \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \alpha \neq 0$$

is (are)

A. $(0, 0, \alpha)$ B. $(\alpha, 0, 0)$ C. $(0, 0, 1)$ D. $(0, \alpha, 0)$

gate1993 eigen-value linear-algebra easy

6.3.2 Eigen Value: GATE2002-5a

https://gateoverflow.in/858

Obtain the eigen values of the matrix

$$A = \begin{bmatrix} 1 & 2 & 34 & 49 \\ 0 & 2 & 43 & 94 \\ 0 & 0 & -2 & 104 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

gate2002 linear-algebra eigen-value normal descriptive

6.3.3 Eigen Value: GATE2005-49

https://gateoverflow.in/1174

What are the eigenvalues of the following 2×2 matrix?

$$\begin{pmatrix} 2 & -1 \\ -4 & 5 \end{pmatrix}$$

A. -1 and 1 B. 1 and 6 C. 2 and 5 D. 4 and -1

gate2005 linear-algebra eigen-value easy

6.3.4 Eigen Value: GATE2006-IT-26

https://gateoverflow.in/3565

What are the eigenvalues of the matrix P given below

$$P = \begin{pmatrix} a & 1 & 0 \\ 1 & a & 1 \\ 0 & 1 & a \end{pmatrix}$$

A. $a, a-\sqrt{2}, a+\sqrt{2}$ B. a, a, a C. $0, a, 2a$ D. $-a, 2a, 2a$

gate2006-it linear-algebra eigen-value normal

6.3.5 Eigen Value: GATE2007-25

https://gateoverflow.in/254

Let A be a 4×4 matrix with eigen values -5,-2,1,4. Which of the following is an eigen value of the matrix $\begin{bmatrix} A & I \\ I & A \end{bmatrix}$, where I is the 4×4 identity matrix?

A. -5 B. -7 C. 2 D. 1

gate2007 eigen-value linear-algebra difficult

6.3.6 Eigen Value: GATE2007-IT-2

https://gateoverflow.in/3433

Let A be the matrix $\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$. What is the maximum value of $x^T Ax$ where the maximum is taken over all x

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that are the unit eigenvectors of A?

A. 3 B. $\frac{(5+\sqrt{5})}{2}$ C. 3 D. $\frac{(5-\sqrt{5})}{2}$

gate2007-it linear-algebra eigen-value normal

6.3.7 Eigen Value: GATE2008-28

https://gateoverflow.in/426

How many of the following matrices have an eigenvalue 1?
$\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$ and $\begin{bmatrix} -1 & 0 \\ 1 & -1 \end{bmatrix}$

A. one B. two C. three D. four

gate2008 eigen-value linear-algebra

6.3.8 Eigen Value: GATE2010-29

https://gateoverflow.in/1155

Consider the following matrix

$$A = \begin{bmatrix} 2 & 3 \\ x & y \end{bmatrix}$$

If the eigenvalues of A are 4 and 8, then

A. $x = 4, y = 10$ B. $x = 5, y = 8$ C. $x = 3, y = 9$ D. $x = -4, y = 10$

gate2010 linear-algebra eigen-value easy

6.3.9 Eigen Value: GATE2011-40

https://gateoverflow.in/2142

Consider the matrix as given below.

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 7 \\ 0 & 0 & 3 \end{bmatrix}$$

Which one of the following options provides the **CORRECT** values of the eigenvalues of the matrix?

A. $1, 4, 3$ B. $3, 7, 3$ C. $7, 3, 2$ D. $1, 2, 3$

gate2011 linear-algebra eigen-value easy

6.3.10 Eigen Value: GATE2012-11

https://gateoverflow.in/43

Let A be the 2×2 matrix with elements $a_{11} = a_{12} = a_{21} = +1$ and $a_{22} = -1$. Then the eigenvalues of the matrix A^{19} are

A. 1024 and -1024
B. $1024\sqrt{2}$ and $-1024\sqrt{2}$
C. $4\sqrt{2}$ and $-4\sqrt{2}$
D. $512\sqrt{2}$ and $-512\sqrt{2}$

gate2012 linear-algebra eigen-value

6.3.11 Eigen Value: GATE2014-1-5

https://gateoverflow.in/1760

The value of the dot product of the eigenvectors corresponding to any pair of different eigenvalues of a $4 - by - 4$ symmetric positive definite matrix is _____

gate2014-1 linear-algebra eigen-value numerical-answers normal

6.3.12 Eigen Value: GATE2014-2-47

https://gateoverflow.in/2013

The product of the non-zero eigenvalues of the matrix is ____

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$$\begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{pmatrix}$$

gate2014-2 linear-algebra eigen-value normal numerical-answers

6.3.13 Eigen Value: GATE2014-3-4

https://gateoverflow.in/2038

Which one of the following statements is TRUE about every $n \times n$ matrix with only real eigenvalues?

A. If the trace of the matrix is positive and the determinant of the matrix is negative, at least one of its eigenvalues is negative.
B. If the trace of the matrix is positive, all its eigenvalues are positive.
C. If the determinant of the matrix is positive, all its eigenvalues are positive.
D. If the product of the trace and determinant of the matrix is positive, all its eigenvalues are positive.

gate2014-3 linear-algebra eigen-value normal

6.3.14 Eigen Value: GATE2015-1-36

https://gateoverflow.in/8285

Consider the following 2×2 matrix A where two elements are unknown and are marked by a and b. The eigenvalues of this matrix are -1 and 7. What are the values of a and b?

$$A = \begin{pmatrix} 1 & 4 \\ b & a \end{pmatrix}$$

A. $a = 6, b = 4$ B. $a = 4, b = 6$ C. $a = 3, b = 5$ D. $a = 5, b = 3$

gate2015-1 linear-algebra eigen-value normal

6.3.15 Eigen Value: GATE2015-2-5

https://gateoverflow.in/8051

The larger of the two eigenvalues of the matrix $\begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$ is _____.

gate2015-2 linear-algebra eigen-value easy numerical-answers

6.3.16 Eigen Value: GATE2015-3-15

https://gateoverflow.in/8411

In the given matrix $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & 0 \\ 1 & 2 & 1 \end{bmatrix}$, one of the eigenvalues is 1. The eigenvectors corresponding to the eigenvalue 1 are

A. $\{a(4,2,1) \mid a \neq 0, a \in \mathbb{R}\}$
B. $\{a(-4,2,1) \mid a \neq 0, a \in \mathbb{R}\}$
C. $\{a(\sqrt{2},0,1) \mid a \neq 0, a \in \mathbb{R}\}$
D. $\{a(-\sqrt{2},0,1) \mid a \neq 0, a \in \mathbb{R}\}$

gate2015-3 linear-algebra eigen-value normal

6.3.17 Eigen Value: GATE2016-1-05

https://gateoverflow.in/39634

Two eigenvalues of a 3×3 real matrix P are $(2 + \sqrt{-1})$ and 3. The determinant of P is _____

gate2016-1 linear-algebra eigen-value numerical-answers normal

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6.3.18 Eigen Value: GATE2016-2-06

https://gateoverflow.in/39549

Suppose that the eigenvalues of matrix A are $1, 2, 4$. The determinant of $\left(A^{-1}\right)^T$ is _____.

gate2016-2 linear-algebra eigen-value normal numerical-answers

6.3.19 Eigen Value: GATE2017-1-31

https://gateoverflow.in/118312

Let A be $n \times n$ real valued square symmetric matrix of rank 2 with $\sum_{i=1}^{n} \sum_{j=1}^{n} A_{ij}^2 = 50$. Consider the following statements.

I. One eigenvalue must be in $[-5, 5]$
II. The eigenvalue with the largest magnitude must be strictly greater than 5

Which of the above statements about eigenvalues of A is/are necessarily CORRECT?

A. Both I and II B. I only C. II only D. Neither I nor II

gate2017-1 linear-algebra eigen-value normal

6.3.20 Eigen Value: GATE2017-2-22

https://gateoverflow.in/118363

Let $P = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ and $Q = \begin{bmatrix} -1 & -2 & -1 \\ 6 & 12 & 6 \\ 5 & 10 & 5 \end{bmatrix}$ be two matrices.

Then the rank of $P + Q$ is _____ .

gate2017-2 linear-algebra eigen-value numerical-answers

6.3.21 Eigen Value: GATE2017-2-52

https://gateoverflow.in/118618

If the characteristic polynomial of a 3×3 matrix M over $\mathbb{R}$ (the set of real numbers) is $\lambda^3 - 4\lambda^2 + a\lambda + 30, \quad a \in \mathbb{R}$, and one eigenvalue of M is 2, then the largest among the absolute values of the eigenvalues of M is _____

gate2017-2 engineering-mathematics linear-algebra numerical-answers eigen-value

6.3.22 Eigen Value: GATE2018-17

https://gateoverflow.in/204091

Consider a matrix $A = uv^T$ where $u = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, v = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$. Note that v^T denotes the transpose of v. The largest eigenvalue of A is ____

gate2018 linear-algebra eigen-value normal numerical-answers

6.3.23 Eigen Value: GATE2018-26

https://gateoverflow.in/204100

Consider a matrix P whose only eigenvectors are the multiples of $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$.

Consider the following statements.

I. P does not have an inverse
II. P has a repeated eigenvalue
III. P cannot be diagonalized

Which one of the following options is correct?

A. Only I and III are necessarily true
B. Only II is necessarily true
C. Only I and II are necessarily true
D. Only II and III are necessarily true

gate2018 linear-algebra matrices eigen-value normal

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6.3.24 Eigen Value: GATE2019-44

https://gateoverflow.in/302804

Consider the following matrix:

$$R = \begin{bmatrix} 1 & 2 & 4 & 8 \\ 1 & 3 & 9 & 27 \\ 1 & 4 & 16 & 64 \\ 1 & 5 & 25 & 125 \end{bmatrix}$$

The absolute value of the product of Eigen values of R is _____

gate2019 numerical-answers engineering-mathematics linear-algebra eigen-value

6.3.25 Eigen Value: TIFR2019-A-3

https://gateoverflow.in/280507

A is $n \times n$ square matrix for which the entries in every row sum to 1. Consider the following statements:

i. The column vector $[1, 1, \ldots, 1]^T$ is an eigen vector of A.
ii. $\det(A - I) = 0$.
iii. $\det(A) = 0$.

Which of the above statements must be **TRUE**?

A. Only (i) B. Only (ii) C. Only (i) and (ii) D. Only (i) and (iii) E. $(i), (ii)$ and (iii)

tifr2019 engineering-mathematics linear-algebra eigen-value

6.4 Matrices (30)

6.4.1 Matrices: GATE1987-1-xxiii

https://gateoverflow.in/80380

A square matrix is singular whenever

A. The rows are linearly independent
B. The columns are linearly independent
C. The row are linearly dependent
D. None of the above

gate1987 linear-algebra matrices

6.4.2 Matrices: GATE1988-16i

https://gateoverflow.in/94644

Assume that the matrix A given below, has factorization of the form $LU = PA$, where L is lower-triangular with all diagonal elements equal to 1, U is upper-triangular, and P is a permutation matrix. For

$$A = \begin{bmatrix} 2 & 5 & 9 \\ 4 & 6 & 5 \\ 8 & 2 & 3 \end{bmatrix}$$

Compute L, U, and P using Gaussian elimination with partial pivoting.

gate1988 normal descriptive linear-algebra matrices

6.4.3 Matrices: GATE1993-02.7

https://gateoverflow.in/611

I f $A = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & -1 & 0 & -1 \\ 0 & 0 & i & i \\ 0 & 0 & 0 & -i \end{pmatrix}$ the matrix A^4, calculated by the use of Cayley-Hamilton theorem or otherwise, is ____

gate1993 linear-algebra normal matrices numerical-answers

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6.4.4 Matrices: GATE1994-1.2

https://gateoverflow.in/2438

Let A and B be real symmetric matrices of size $n \times n$. Then which one of the following is true?

A. $AA' = I$ B. $A = A^{-1}$ C. $AB = BA$ D. $(AB)' = BA$

gate1994 linear-algebra normal matrices

6.4.5 Matrices: GATE1994-1.9

https://gateoverflow.in/2446

The rank of matrix $\begin{bmatrix} 0 & 0 & -3 \\ 9 & 3 & 5 \\ 3 & 1 & 1 \end{bmatrix}$ is:

A. 0 B. 1 C. 2 D. 3

gate1994 linear-algebra matrices easy

6.4.6 Matrices: GATE1994-3.12

https://gateoverflow.in/2498

Find the inverse of the matrix $\begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

gate1994 linear-algebra matrices easy descriptive

6.4.7 Matrices: GATE1995-1.24

https://gateoverflow.in/2611

The rank of the following $(n+1) \times (n+1)$ matrix, where a is a real number is

$$\begin{bmatrix} 1 & a & a^2 & \dots & a^n \\ 1 & a & a^2 & \dots & a^n \\ \vdots & \vdots & \vdots & & \vdots \\ \vdots & \vdots & \vdots & & \vdots \\ 1 & a & a^2 & \dots & a^n \end{bmatrix}$$

A. 1
B. 2
C. n
D. Depends on the value of a

gate1995 linear-algebra matrices normal

6.4.8 Matrices: GATE1996-10

https://gateoverflow.in/2762

Let $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ and $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$ be two matrices such that $AB = I$. Let $C = A \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $CD = I$. Express the elements of D in terms of the elements of B.

gate1996 linear-algebra matrices normal descriptive

6.4.9 Matrices: GATE1996-2.6

https://gateoverflow.in/2735

The matrices $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ and $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ commute under multiplication

A. if $a = b$ or $\theta = n\pi, n$ an integer
B. always
C. never
D. if $a\cos\theta = b\sin\theta$

gate1996 linear-algebra normal matrices

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6.4.10 Matrices: GATE1997-4.2

https://gateoverflow.in/2243

Let $A = (a_{ij})$ be an n-rowed square matrix and I_{12} be the matrix obtained by interchanging the first and second rows of the n-rowed Identify matrix. Then AI_{12} is such that its first

A. Row is the same as its second row
B. Row is the same as the second row of A
C. Column is the same as the second column of A
D. Row is all zero

gate1997 linear-algebra easy matrices

6.4.11 Matrices: GATE1998-2.1

https://gateoverflow.in/1673

The rank of the matrix given below is:

$$\begin{bmatrix} 1 & 4 & 8 & 7 \\ 0 & 0 & 3 & 0 \\ 4 & 2 & 3 & 1 \\ 3 & 12 & 24 & 21 \end{bmatrix}$$

A. 3
B. 1
C. 2
D. 4

gate1998 linear-algebra matrices normal

6.4.12 Matrices: GATE1998-2.2

https://gateoverflow.in/1674

Consider the following determinant $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$

Which of the following is a factor of Δ?

A. $a+b$
B. $a-b$
C. $a+b+c$
D. abc

gate1998 linear-algebra matrices normal

6.4.13 Matrices: GATE2001-1.1

https://gateoverflow.in/694

Consider the following statements:

- S1: The sum of two singular $n \times n$ matrices may be non-singular
- S2: The sum of two $n \times n$ non-singular matrices may be singular

Which one of the following statements is correct?

A. $S1$ and $S2$ both are true
B. $S1$ is true, $S2$ is false
C. $S1$ is false, $S2$ is true
D. $S1$ and $S2$ both are false

gate2001 linear-algebra normal matrices

6.4.14 Matrices: GATE2002-1.1

https://gateoverflow.in/805

The rank of the matrix $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ is

A. 4
B. 2
C. 1
D. 0

gate2002 linear-algebra easy matrices

6.4.15 Matrices: GATE2004-26

https://gateoverflow.in/1023

The number of different $n \times n$ symmetric matrices with each element being either 0 or 1 is: (Note: power $(2, X)$ is same as 2^X)

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A. $\text{power}(2, n)$
B. $\text{power}\left(2, n^2\right)$
C. $\text{power}\left(2, \frac{(n^2+n)}{2}\right)$
D. $\text{power}\left(2, \frac{(n^2-n)}{2}\right)$

gate2004 linear-algebra normal matrices

6.4.16 Matrices: GATE2004-27

https://gateoverflow.in/1024

Let A, B, C, D be $n \times n$ matrices, each with non-zero determinant. If $ABCD = I$, then B^{-1} is

A. $D^{-1}C^{-1}A^{-1}$
B. CDA
C. ADC
D. Does not necessarily exist

gate2004 linear-algebra normal matrices

6.4.17 Matrices: GATE2004-76

https://gateoverflow.in/1070

In an $M \times N$ matrix all non-zero entries are covered in a rows and b columns. Then the maximum number of non-zero entries, such that no two are on the same row or column, is

A. $\leq a + b$
B. $\leq \max(a, b)$
C. $\leq \min(M - a, N - b)$
D. $\leq \min(a, b)$

gate2004 linear-algebra normal matrices

6.4.18 Matrices: GATE2004-IT-32

https://gateoverflow.in/3675

Let A be an $n \times n$ matrix of the following form.

$$A = \begin{bmatrix} 3 & 1 & 0 & 0 & 0 & \dots & 0 & 0 & 0 \\ 1 & 3 & 1 & 0 & 0 & \dots & 0 & 0 & 0 \\ 0 & 1 & 3 & 1 & 0 & \dots & 0 & 0 & 0 \\ 0 & 0 & 1 & 3 & 1 & \dots & 0 & 0 & 0 \\ \dots & & & & & & & & \\ \dots & & & & & & & & \\ 0 & 0 & 0 & 0 & 0 & \dots & 1 & 3 & 1 \\ 0 & 0 & 0 & 0 & 0 & \dots & 0 & 1 & 3 \end{bmatrix}_{n \times n}$$

What is the value of the determinant of A?

A. $\left(\frac{5+\sqrt{3}}{2}\right)^{n-1}\left(\frac{5\sqrt{3}+7}{2\sqrt{3}}\right) + \left(\frac{5-\sqrt{3}}{2}\right)^{n-1}\left(\frac{5\sqrt{3}-7}{2\sqrt{3}}\right)$
B. $\left(\frac{7+\sqrt{5}}{2}\right)^{n-1}\left(\frac{7\sqrt{5}+3}{2\sqrt{5}}\right) + \left(\frac{7-\sqrt{5}}{2}\right)^{n-1}\left(\frac{7\sqrt{5}-3}{2\sqrt{5}}\right)$
C. $\left(\frac{3+\sqrt{7}}{2}\right)^{n-1}\left(\frac{3\sqrt{7}+5}{2\sqrt{7}}\right) + \left(\frac{3-\sqrt{7}}{2}\right)^{n-1}\left(\frac{3\sqrt{7}-5}{2\sqrt{7}}\right)$
D. $\left(\frac{3+\sqrt{5}}{2}\right)^{n-1}\left(\frac{3\sqrt{5}+7}{2\sqrt{5}}\right) + \left(\frac{3-\sqrt{5}}{2}\right)^{n-1}\left(\frac{3\sqrt{5}-7}{2\sqrt{5}}\right)$

gate2004-it linear-algebra matrices normal

6.4.19 Matrices: GATE2004-IT-36

https://gateoverflow.in/3679

If matrix $X = \begin{bmatrix} a & 1 \\ -a^2 + a - 1 & 1 - a \end{bmatrix}$ and $X^2 - X + I = O$ (I is the identity matrix and O is the zero matrix), then the inverse of X is

A. $\begin{bmatrix} 1 - a & -1 \\ a^2 & a \end{bmatrix}$
B. $\begin{bmatrix} 1 - a & -1 \\ a^2 - a + 1 & a \end{bmatrix}$
C. $\begin{bmatrix} -a & 1 \\ -a^2 + a - 1 & 1 - a \end{bmatrix}$
D. $\begin{bmatrix} a^2 - a + 1 & a \\ 1 & 1 - a \end{bmatrix}$

gate2004-it linear-algebra matrices normal

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6.4.20 Matrices: GATE2006-23

https://gateoverflow.in/984

F is an $n \times n$ real matrix. b is an $n \times 1$ real vector. Suppose there are two $n \times 1$ vectors, u and v such that, $u \neq v$ and $Fu = b, Fv = b$. Which one of the following statements is false?

A. Determinant of F is zero.
B. There are an infinite number of solutions to $Fx = b$
C. There is an $x \neq 0$ such that $Fx = 0$
D. F must have two identical rows

gate2006 linear-algebra normal matrices

6.4.21 Matrices: GATE2008-IT-29

https://gateoverflow.in/3319

If M is a square matrix with a zero determinant, which of the following assertion (s) is (are) correct?

S1: Each row of M can be represented as a linear combination of the other rows
S2: Each column of M can be represented as a linear combination of the other columns
S3: $MX = 0$ has a nontrivial solution
S4: M has an inverse

A. $S3$ and $S2$ B. $S1$ and $S4$ C. $S1$ and $S3$ D. $S1, S2$ and $S3$

gate2008-it linear-algebra normal matrices

6.4.22 Matrices: GATE2015-1-18

https://gateoverflow.in/8241

In the LU decomposition of the matrix $\begin{bmatrix} 2 & 2 \\ 4 & 9 \end{bmatrix}$, if the diagonal elements of U are both 1, then the lower diagonal entry l_{22} of L is_____.

gate2015-1 linear-algebra matrices numerical-answers

6.4.23 Matrices: GATE2015-2-27

https://gateoverflow.in/8131

Perform the following operations on the matrix $\begin{bmatrix} 3 & 4 & 45 \\ 7 & 9 & 105 \\ 13 & 2 & 195 \end{bmatrix}$

i. Add the third row to the second row
ii. Subtract the third column from the first column.

The determinant of the resultant matrix is _____.

gate2015-2 linear-algebra matrices easy numerical-answers

6.4.24 Matrices: TIFR2010-A-16

https://gateoverflow.in/18492

Let the characteristic equation of matrix M be $\lambda^2 - \lambda - 1 = 0$. Then.

a. M^{-1} does not exist.
b. M^{-1} exists but cannot be determined from the data.
c. $M^{-1} = M + I$
d. $M^{-1} = M - I$
e. M^{-1} exists and can be determined from the data but the choices (c) and (d) are incorrect.

tifr2010 linear-algebra matrices

6.4.25 Matrices: TIFR2010-A-5

https://gateoverflow.in/18216

A is symmetric positive definite matrix (i.e., $x^T Ax > 0$ for all non zero x). Which of the following statements is false?

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a. At least one element is positive.
b. All eigen values are positive real.
c. Sum of the diagonal elements is positive.
d. *det* (A) is positive.
e. None of the above.

tifr2010 linear-algebra matrices

6.4.26 Matrices: TIFR2012-B-12

https://gateoverflow.in/25141

Let A be a matrix such that $A^k = 0$. What is the inverse of $I - A$?

a. 0
b. I
c. A
d. $1 + A + A^2 + \ldots + A^{k-1}$
e. Inverse is not guaranteed to exist.

tifr2012 linear-algebra matrices

6.4.27 Matrices: TIFR2013-B-3

https://gateoverflow.in/25659

How many 4×4 matrices with entries from $0, 1$ have odd determinant?

Hint: Use modulo 2 arithmetic.

a. 20160
b. 32767
c. 49152
d. 57343
e. 65520

tifr2013 linear-algebra matrices

6.4.28 Matrices: TIFR2015-A-14

https://gateoverflow.in/29588

Consider the following 3×3 matrices.

$$M_1 = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$$

$$M_2 = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

How may $0 - 1$ column vectors of the form

$$X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

are there such that $M_1 X = M_2 X$ (modulo 2)? (modulo 2 means all operations are done modulo 2, i.e, $3 = 1$ (modulo 2), $4 = 0$ (modulo 2)).

a. None
b. Two
c. Three
d. Four
e. Eight

tifr2015 matrices

6.4.29 Matrices: TIFR2018-A-12

https://gateoverflow.in/179281

An $n \times n$ matrix M with real entries is said to be positive definite if for every non-zero n-dimensional vector x with real entries, we have $x^T M x > 0$. Let A and B be symmetric, positive definite matrices of size $n \times n$ with real entries.

Consider the following matrices, where I denotes the $n \times n$ identity matrix:

1. $A + B$
2. ABA
3. $A^2 + I$

Which of the above matrices must be positive definite?

1. Only (2)
2. Only (3)

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3. Only (1) and (3)
4. None of the above matrices are positive definite
5. All of the above matrices are positive definite

tifr2018 matrices linear-algebra

6.4.30 Matrices: TIFR2018-A-14

https://gateoverflow.in/179377

Let A be an $n \times n$ invertible matrix with real entries whose row sums are all equal to c. Consider the following statements:

1. Every row in the matrix $2A$ sums to $2c$.
2. Every row in the matrix A^2 sums to c^2.
3. Every row in the matrix A^{-1} sums to c^{-1}.

Which of the following is **TRUE**?

A. none of the statements $(1), (2), (3)$ is correct
B. statement (1) is correct but not necessarily statements (2) or (3)
C. statement (2) is correct but not necessarily statements (1) or (3)
D. statement (1) and (2) are correct but not necessarily statement (3)
E. all the three statements $(1), (2),$ and (3) are correct

tifr2018 matrices linear-algebra

6.5 System Of Equations (12)

6.5.1 System Of Equations: GATE1996-1.7

https://gateoverflow.in/2711

Let $Ax = b$ be a system of linear equations where A is an $m \times n$ matrix and b is a $m \times 1$ column vector and X is an $n \times 1$ column vector of unknowns. Which of the following is false?

A. The system has a solution if and only if, both A and the augmented matrix $[Ab]$ have the same rank.
B. If $m < n$ and b is the zero vector, then the system has infinitely many solutions.
C. If $m = n$ and b is a non-zero vector, then the system has a unique solution.
D. The system will have only a trivial solution when $m = n$, b is the zero vector and $\text{rank}(A) = n$.

gate1996 linear-algebra system-of-equations normal

6.5.2 System Of Equations: GATE1998-1.2

https://gateoverflow.in/1639

Consider the following set of equations

$$x + 2y = 54x + 8y = 123x + 6y + 3z = 15$$

This set

A. has unique solution
B. has no solution
C. has finite number of solutions
D. has infinite number of solutions

gate1998 linear-algebra system-of-equations easy

6.5.3 System Of Equations: GATE1998-9

https://gateoverflow.in/1723

Derive the expressions for the number of operations required to solve a system of linear equations in n unknowns using the Gaussian Elimination Method. Assume that one operation refers to a multiplication followed by an addition.

gate1998 linear-algebra system-of-equations descriptive

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6.5.4 System Of Equations: GATE2003-41

https://gateoverflow.in/932

Consider the following system of linear equations

$$\begin{pmatrix} 2 & 1 & -4 \\ 4 & 3 & -12 \\ 1 & 2 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} \alpha \\ 5 \\ 7 \end{pmatrix}$$

Notice that the second and the third columns of the coefficient matrix are linearly dependent. For how many values of α, does this system of equations have infinitely many solutions?

A. 0 B. 1 C. 2 D. 3

gate2003 linear-algebra system-of-equations normal

6.5.5 System Of Equations: GATE2004-71

https://gateoverflow.in/1065

How many solutions does the following system of linear equations have?

- $-x + 5y = -1$
- $x - y = 2$
- $x + 3y = 3$

A. infinitely many
B. two distinct solutions
C. unique
D. none

gate2004 linear-algebra system-of-equations normal

6.5.6 System Of Equations: GATE2004-IT-6

https://gateoverflow.in/3647

What values of x, y and z satisfy the following system of linear equations?

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 4 \\ 2 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 8 \\ 12 \end{bmatrix}$$

A. $x = 6, y = 3, z = 2$
B. $x = 12, y = 3, z = -4$
C. $x = 6, y = 6, z = -4$
D. $x = 12, y = -3, z = 0$

gate2004-it linear-algebra system-of-equations easy

6.5.7 System Of Equations: GATE2005-48

https://gateoverflow.in/1173

Consider the following system of linear equations :

$$2x_1 - x_2 + 3x_3 = 1$$

$$3x_1 + 2x_2 + 5x_3 = 2$$

$$-x_1 + 4x_2 + x_3 = 3$$

The system of equations has

A. no solution
B. a unique solution
C. more than one but a finite number of solutions
D. an infinite number of solutions

gate2005 linear-algebra system-of-equations normal

6.5.8 System Of Equations: GATE2008-3

https://gateoverflow.in/401

The following system of equations

- $x_1 + x_2 + 2x_3 = 1$
- $x_1 + 2x_2 + 3x_3 = 2$
- $x_1 + 4x_2 + \alpha x_3 = 4$

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has a unique solution. The only possible value(s) for α is/are

A. 0 B. either 0 or 1 C. one of $0, 1$, or -1 D. any real number

gate2008 easy linear-algebra system-of-equations

6.5.9 System Of Equations: GATE2014-1-4

https://gateoverflow.in/1757

Consider the following system of equations:

- $3x + 2y = 1$
- $4x + 7z = 1$
- $x + y + z = 3$
- $x - 2y + 7z = 0$

The number of solutions for this system is _____

gate2014-1 linear-algebra system-of-equations numerical-answers normal

6.5.10 System Of Equations: GATE2015-3-33

https://gateoverflow.in/8490

If the following system has non-trivial solution,

- $px + qy + rz = 0$
- $qx + ry + pz = 0$
- $rx + py + qz = 0,$

then which one of the following options is TRUE?

A. $p - q + r = 0$ or $p = q = -r$
B. $p + q - r = 0$ or $p = -q = r$
C. $p + q + r = 0$ or $p = q = r$
D. $p - q + r = 0$ or $p = -q = -r$

gate2015-3 linear-algebra system-of-equations normal

6.5.11 System Of Equations: GATE2016-2-04

https://gateoverflow.in/39545

Consider the system, each consisting of m linear equations in n variables.

I. If $m < n$, then all such systems have a solution.
II. If $m > n$, then none of these systems has a solution.
III. If $m = n$, then there exists a system which has a solution.

Which one of the following is **CORRECT**?

a. I, II and III are true.
b. Only II and III are true.
c. Only III is true.
d. None of them is true.

gate2016-2 linear-algebra system-of-equations normal

6.5.12 System Of Equations: GATE2017-1-3

https://gateoverflow.in/118282

Let $c_1 \ldots\ldots c_n$ be scalars, not all zero, such that $\sum_{i=1}^{n} c_i a_i = 0$ where a_i are column vectors in R^n.

Consider the set of linear equations

$Ax = b$

where $A = [a_1 \ldots\ldots a_n]$ and $b = \sum_{i=1}^{n} a_i$. The set of equations has

A. a unique solution at $x = J_n$ where J_n denotes a n-dimensional vector of all 1.
B. no solution
C. infinitely many solutions
D. finitely many solutions

gate2017-1 linear-algebra system-of-equations normal

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6.6 Vector Space (6)

6.6.1 Vector Space: GATE1995-2.13

https://gateoverflow.in/2625

A unit vector perpendicular to both the vectors $a = 2i - 2j + k$ and $b = 1 + j - 2k$ is:

A. $\frac{1}{\sqrt{3}}(i+j+k)$ B. $\frac{1}{3}(i+j-k)$ C. $\frac{1}{3}(i-j-k)$ D. $\frac{1}{\sqrt{3}}(i+j-k)$

gate1995 linear-algebra normal vector-space

6.6.2 Vector Space: GATE2007-27

https://gateoverflow.in/1225

Consider the set of (column) vectors defined by

$$X = \left\{ x \in R^3 \mid x_1 + x_2 + x_3 = 0, \text{ where } x^T = [x_1, x_2, x_3]^T \right\}$$

.Which of the following is TRUE?

A. $\left\{ [1,-1,0]^T, [1,0,-1]^T \right\}$ is a basis for the subspace X.
B. $\left\{ [1,-1,0]^T, [1,0,-1]^T \right\}$ is a linearly independent set, but it does not span X and therefore is not a basis of X.
C. X is not a subspace of R^3.
D. None of the above

gate2007 linear-algebra normal vector-space

6.6.3 Vector Space: GATE2014-3-5

https://gateoverflow.in/2039

If V_1 and V_2 are 4-dimensional subspaces of a 6-dimensional vector space V, then the smallest possible dimension of $V_1 \cap V_2$ is _____.

gate2014-3 linear-algebra vector-space normal numerical-answers

6.6.4 Vector Space: GATE2017-1-30

https://gateoverflow.in/118311

Let u and v be two vectors in R2 whose Euclidean norms satisfy $\|u\| = 2\|v\|$. What is the value of α such that $w = u + \alpha v$ bisects the angle between u and v?

A. 2 B. $\frac{1}{2}$ C. 1 D. $\frac{-1}{2}$

gate2017-1 linear-algebra normal vector-space

6.6.5 Vector Space: TIFR2010-A-11

https://gateoverflow.in/18503

The length of a vector $x = (x_1, \ldots, x_n)$ is defined as

$\|x\| = \sqrt{\sum_{i=1}^n x_i^2}$.

Given two vectors $x = (x_1, \ldots, x_n)$ and $y = (y_1, \ldots, y_n)$, which of the following measures of discrepancy between x and y is insensitive to the length of the vectors?

A. $\|x - y\|$
B. $\|x - y\| \,/\, \|x\| \, \|y\|$
C. $\|x\| - \|y\|$
D. $\left\| \frac{X}{\|X\|} - \frac{Y}{\|Y\|} \right\|$
E. None of the above.

tifr2010 linear-algebra vector-space

6.6.6 Vector Space: TIFR2017-A-2

https://gateoverflow.in/94938

For vectors $x,\ y$ in $\mathbb{R}^n$, define the inner product $\langle x, y \rangle = \Sigma_{i=1}^n x_i y_i$, and the length of x to be $\|x\| = \sqrt{\langle x, x \rangle}$. Let $a,\ b$ be two vectors in $\mathbb{R}^n$ so that $\|b\| = 1$. Consider the following statements:

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i. $\langle a, b \rangle \leq \|b\|$
ii. $\langle a, b \rangle \leq \|a\|$
iii. $\langle a, b \rangle = \|a\| \|b\|$
iv. $\langle a, b \rangle \geq \|b\|$
v. $\langle a, b \rangle \geq \|a\|$

Which of the above statements must be TRUE of $a,\ b$? Choose from the following options.

A. ii only B. i and ii C. iii only D. iv only E. iv and v

tifr2017 linear-algebra vector-space

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7 Engineering Mathematics: Probability (103)

Syllabus: Random variables, Uniform, Normal, Exponential, Poisson and Binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	2	1	1	0	1	1	0	1	2
2 Marks Count	1	1	0	3	1	0	0	1	3
Total Marks	4	3	1	6	3	1	**1**	**3**	**6**

7.1 Binomial Distribution (7)

7.1.1 Binomial Distribution: GATE2005-52

https://gateoverflow.in/1177

A random bit string of length n is constructed by tossing a fair coin n times and setting a bit to 0 or 1 depending on outcomes head and tail, respectively. The probability that two such randomly generated strings are not identical is:

A. $\frac{1}{2^n}$ B. $1-\frac{1}{n}$ C. $\frac{1}{n!}$ D. $1-\frac{1}{2^n}$

gate2005 probability binomial-distribution easy

7.1.2 Binomial Distribution: GATE2005-IT-32

https://gateoverflow.in/3778

An unbiased coin is tossed repeatedly until the outcome of two successive tosses is the same. Assuming that the trials are independent, the expected number of tosses is

A. 3 B. 4 C. 5 D. 6

gate2005-it probability binomial-distribution expectation normal

7.1.3 Binomial Distribution: GATE2006-21

https://gateoverflow.in/982

For each element in a set of size $2n$, an unbiased coin is tossed. The $2n$ coin tosses are independent. An element is chosen if the corresponding coin toss was a head. The probability that exactly n elements are chosen is

A. $\frac{{}^{2n}C_n}{4^n}$ B. $\frac{{}^{2n}C_n}{2^n}$ C. $\frac{1}{{}^{2n}C_n}$ D. $\frac{1}{2}$

gate2006 probability binomial-distribution normal

7.1.4 Binomial Distribution: GATE2006-IT-22

https://gateoverflow.in/3561

When a coin is tossed, the probability of getting a Head is $p, 0 < p < 1$. Let N be the random variable denoting the number of tosses till the first Head appears, including the toss where the Head appears. Assuming that successive tosses are independent, the expected value of N is

A. $\frac{1}{p}$ B. $\frac{1}{(1-p)}$ C. $\frac{1}{p^2}$ D. $\frac{1}{(1-p^2)}$

gate2006-it probability binomial-distribution expectation normal

7.1.5 Binomial Distribution: TIFR2010-A-6

https://gateoverflow.in/18222

Given 10 tosses of a coin with probability of head = . 4 = (1 - the probability of tail), the probability of at least one head is?

a. $(.4)^{10}$ b. $1-(.4)^{10}$ c. $1-(.6)^{10}$ d. $(.6)^{10}$ e. $10(.4)(.6)^9$

tifr2010 probability binomial-distribution

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7.1.6 Binomial Distribution: TIFR2010-B-38

https://gateoverflow.in/19050

Suppose three coins are lying on a table, two of them with heads facing up and one with tails facing up. One coin is chosen at random and flipped. What is the probability that after the flip the majority of the coins(i.e., at least two of them) will have heads facing up?

a. $\left(\frac{1}{3}\right)$ b. $\left(\frac{1}{8}\right)$ c. $\left(\frac{1}{4}\right)$ d. $\left(\frac{1}{4}+\frac{1}{8}\right)$ e. $\left(\frac{2}{3}\right)$

tifr2010 probability binomial-distribution

7.1.7 Binomial Distribution: TIFR2011-A-3

https://gateoverflow.in/20000

The probability of three consecutive heads in four tosses of a fair coin is.

a. $\left(\frac{1}{4}\right)$ b. $\left(\frac{1}{8}\right)$ c. $\left(\frac{1}{16}\right)$ d. $\left(\frac{3}{16}\right)$ e. None of the above.

tifr2011 probability binomial-distribution

7.2 Conditional Probability (11)

7.2.1 Conditional Probability: GATE1994-1.4, ISRO2017-2

https://gateoverflow.in/2441

Let A and B be any two arbitrary events, then, which one of the following is TRUE?

A. $P(A \cap B) = P(A)P(B)$
B. $P(A \cup B) = P(A) + P(B)$
C. $P(A \mid B) = P(A \cap B)P(B)$
D. $P(A \cup B) \leq P(A) + P(B)$

gate1994 probability conditional-probability normal isro2017

7.2.2 Conditional Probability: GATE1994-2.6

https://gateoverflow.in/2473

The probability of an event B is P_1. The probability that events A and B occur together is P_2 while the probability that A and $\bar{B}$ occur together is P_3. The probability of the event A in terms of P_1, P_2 and P_3 is _____

gate1994 probability normal descriptive conditional-probability

7.2.3 Conditional Probability: GATE2003-3

https://gateoverflow.in/894

Let $P(E)$ denote the probability of the event E. Given $P(A) = 1$, $P(B) = \frac{1}{2}$, the values of $P(A \mid B)$ and $P(B \mid A)$ respectively are

A. $\left(\frac{1}{4}\right), \left(\frac{1}{2}\right)$ B. $\left(\frac{1}{2}\right), \left(\frac{1}{4}\right)$ C. $\left(\frac{1}{2}\right), 1$ D. $1, \left(\frac{1}{2}\right)$

gate2003 probability easy conditional-probability

7.2.4 Conditional Probability: GATE2005-51

https://gateoverflow.in/1176

Box P has 2 red balls and 3 blue balls and box Q has 3 red balls and 1 blue ball. A ball is selected as follows: (i) select a box (ii) choose a ball from the selected box such that each ball in the box is equally likely to be chosen. The probabilities of selecting boxes P and Q are $\frac{1}{3}$ and $\frac{2}{3}$ respectively. Given that a ball selected in the above process is a red ball, the probability that it came from the box P is:

A. $\frac{4}{19}$ B. $\frac{5}{19}$ C. $\frac{2}{9}$ D. $\frac{19}{30}$

gate2005 probability conditional-probability normal

7.2.5 Conditional Probability: GATE2012-33

https://gateoverflow.in/1751

Suppose a fair six-sided die is rolled once. If the value on the die is $1, 2,$ or $3,$ the die is rolled a second time. What is the probability that the sum total of values that turn up is at least 6 ?

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A. $\frac{10}{21}$ B. $\frac{5}{12}$ C. $\frac{2}{3}$ D. $\frac{1}{6}$

gate2012 probability conditional-probability normal

7.2.6 Conditional Probability: GATE2016-2-05

https://gateoverflow.in/39541

Suppose that a shop has an equal number of LED bulbs of two different types. The probability of an LED bulb lasting more than 100 hours given that it is of Type 1 is 0.7, and given that it is of Type 2 is 0.4. The probability that an LED bulb chosen uniformly at random lasts more than 100 hours is _____.

gate2016-2 probability conditional-probability normal numerical-answers

7.2.7 Conditional Probability: GATE2017-2-26

https://gateoverflow.in/118368

P and Q are considering to apply for a job. The probability that P applies for the job is $\frac{1}{4}$, the probability that P applies for the job given that Q applies for the job is $\frac{1}{2}$, and the probability that Q applies for the job given that P applies for the job is $\frac{1}{3}$. Then the probability that P does not apply for the job given that Q does not apply for this job is

A. $\left(\frac{4}{5}\right)$ B. $\left(\frac{5}{6}\right)$ C. $\left(\frac{7}{8}\right)$ D. $\left(\frac{11}{12}\right)$

gate2017-2 probability conditional-probability

7.2.8 Conditional Probability: GATE2018-44

https://gateoverflow.in/204119

Consider Guwahati, (G) and Delhi (D) whose temperatures can be classified as high (H), medium (M) and low (L). Let $P(H_G)$ denote the probability that Guwahati has high temperature. Similarly, $P(M_G)$ and $P(L_G)$ denotes the probability of Guwahati having medium and low temperatures respectively. Similarly, we use $P(H_D)$, $P(M_D)$ and $P(L_D)$ for Delhi.

The following table gives the conditional probabilities for Delhi's temperature given Guwahati's temperature.

	H_D	M_D	L_D
H_G	0.40	0.48	0.12
M_G	0.10	0.65	0.25
L_G	0.01	0.50	0.49

Consider the first row in the table above. The first entry denotes that if Guwahati has high temperature (H_G) then the probability of Delhi also having a high temperature (H_D) is 0.40; i.e., $P(H_D \mid H_G) = 0.40$. Similarly, the next two entries are $P(M_D \mid H_G) = 0.48$ and $P(L_D \mid H_G) = 0.12$. Similarly for the other rows.

If it is known that $P(H_G) = 0.2$, $P(M_G) = 0.5$, and $P(L_G) = 0.3$, then the probability (correct to two decimal places) that Guwahati has high temperature given that Delhi has high temperature is _____

gate2018 probability conditional-probability numerical-answers

7.2.9 Conditional Probability: TIFR2010-A-19, TIFR2014-A-6

https://gateoverflow.in/18499

Karan tells truth with probability $\frac{1}{3}$ and lies with probability $\frac{2}{3}$. Independently, Arjun tells truth with probability $\frac{3}{4}$ and lies with probability $\frac{1}{4}$. Both watch a cricket match. Arjun tells you that India won, Karan tells you that India lost. What probability will you assign to India's win?

a. $\left(\frac{1}{2}\right)$ b. $\left(\frac{2}{3}\right)$ c. $\left(\frac{3}{4}\right)$ d. $\left(\frac{5}{6}\right)$ e. $\left(\frac{6}{7}\right)$

tifr2010 probability conditional-probability tifr2014

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7.2.10 Conditional Probability: TIFR2012-A-1

https://gateoverflow.in/20938

Amar and Akbar both tell the truth with probability $\frac{3}{4}$ and lie with probability $\frac{1}{4}$. Amar watches a test match and talks to Akbar about the outcome. Akbar, in turn, tells Anthony, "Amar told me that India won". What probability should Anthony assign to India's win?

a. $\left(\frac{9}{16}\right)$ b. $\left(\frac{6}{16}\right)$ c. $\left(\frac{7}{16}\right)$ d. $\left(\frac{10}{16}\right)$ e. None of the above

tifr2012 probability conditional-probability

7.2.11 Conditional Probability: TIFR2013-A-6

https://gateoverflow.in/25390

You are lost in the National park of Kabrastan. The park population consists of tourists and Kabrastanis. Tourists comprise two-thirds of the population the park and give a correct answer to requests for directions with probability $\frac{3}{4}$. The air of Kabrastan has an amnesaic quality, however, and so the answers to repeated questions to tourists are independent, even if the question and the person are the same. If you ask a Kabrastani for directions, the answer is always wrong.

Suppose you ask a randomly chosen passer-by whether the exit from the park is East or West. The answer is East. You then ask the same person again, and the reply is again East. What is the probability of East being correct?

A. $\left(\frac{1}{4}\right)$ B. $\left(\frac{1}{3}\right)$ C. $\left(\frac{1}{2}\right)$ D. $\left(\frac{2}{3}\right)$ E. $\left(\frac{3}{4}\right)$

tifr2013 probability conditional-probability

7.3 Continuous Distribution (1)

7.3.1 Continuous Distribution: GATE2016-1-04

https://gateoverflow.in/39661

A probability density function on the interval $[a, 1]$ is given by $1/x^2$ and outside this interval the value of the function is zero. The value of a is _____.

gate2016-1 probability normal numerical-ability numerical-answers continuous-distribution

7.4 Expectation (10)

7.4.1 Expectation: GATE1999-1.1

https://gateoverflow.in/1455

Suppose that the expectation of a random variable X is 5. Which of the following statements is true?

A. There is a sample point at which X has the value 5.
B. There is a sample point at which X has value greater than 5.
C. There is a sample point at which X has a value greater than equal to 5.
D. None of the above

gate1999 probability expectation easy

7.4.2 Expectation: GATE2004-74

https://gateoverflow.in/1068

An examination paper has 150 multiple choice questions of one mark each, with each question having four choices. Each incorrect answer fetches -0.25 marks. Suppose 1000 students choose all their answers randomly with uniform probability. The sum total of the expected marks obtained by all these students is

A. 0 B. 2550 C. 7525 D. 9375

gate2004 probability expectation normal

7.4.3 Expectation: GATE2006-18

https://gateoverflow.in/979

We are given a set $X = \{X_1, \ldots, X_n\}$ where $X_i = 2^i$. A sample $S \subseteq X$ is drawn by selecting each

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X_i independently with probability $P_i = \frac{1}{2}$. The expected value of the smallest number in sample S is:

A. $\left(\frac{1}{n}\right)$ B. 2 C. $\sqrt{n}$ D. n

gate2006 probability expectation normal

7.4.4 Expectation: GATE2011-18

https://gateoverflow.in/2120

If the difference between the expectation of the square of a random variable $\left(E\left[X^2\right]\right)$ and the square of the expectation of the random variable $(E[X])^2$ is denoted by R, then

A. $R = 0$ B. $R < 0$ C. $R \geq 0$ D. $R > 0$

gate2011 probability random-variable expectation normal

7.4.5 Expectation: GATE2013-24

https://gateoverflow.in/1535

Consider an undirected random graph of eight vertices. The probability that there is an edge between a pair of vertices is $\frac{1}{2}$. What is the expected number of unordered cycles of length three?

A. $\frac{1}{8}$ B. 1 C. 7 D. 8

gate2013 probability expectation normal

7.4.6 Expectation: GATE2014-2-2

https://gateoverflow.in/1954

Each of the nine words in the sentence "The quick brown fox jumps over the lazy dog" is written on a separate piece of paper. These nine pieces of paper are kept in a box. One of the pieces is drawn at random from the box. The expected length of the word drawn is _____. (The answer should be rounded to one decimal place.)

gate2014-2 probability expectation numerical-answers easy

7.4.7 Expectation: TIFR2011-A-6

https://gateoverflow.in/20011

Assume that you are flipping a fair coin, i.e. probability of heads or tails is equal. Then the expected number of coin flips required to obtain two consecutive heads for the first time is.

a. 4 b. 3 c. 6 d. 10 e. 5

tifr2011 probability expectation

7.4.8 Expectation: TIFR2012-B-7

https://gateoverflow.in/25107

A bag contains 16 balls of the following colors: 8 red, 4 blue, 2 green, 1 black, and 1 white. Anisha picks a ball randomly from the bag, and messages Babu its color using a string of zeros and ones. She replaces the ball in the bag, and repeats this experiment, many times. What is the minimum expected length of the message she has to convey to Babu per experiment?

a. $\frac{3}{2}$ b. $\log 5$ c. $\frac{15}{8}$ d. $\frac{31}{16}$ e. 2

tifr2012 probability expectation

7.4.9 Expectation: TIFR2014-A-17

https://gateoverflow.in/27111

A fair dice (with faces numbered $1, \ldots, 6$) is independently rolled repeatedly. Let X denote the number of rolls till an even number is seen and let Y denote the number of rolls till 3 is seen. Evaluate $E(Y|X = 2)$.

A. $6\frac{5}{6}$ B. 6 C. $5\frac{1}{2}$ D. $6\frac{1}{3}$ E. $5\frac{2}{3}$

tifr2014 expectation

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7.4.10 Expectation: TIFR2015-A-6

https://gateoverflow.in/29567

Ram has a fair coin, i.e., a toss of the coin results in either head or tail and each event happens with probability exactly half $(1/2)$. He repeatedly tosses the coin until he gets heads in two consecutive tosses. The expected number of coin tosses that Ram does is.

A. 2 B. 4 C. 6 D. 8 E. None of the above.

tifr2015 expectation

7.5 Exponential Distribution (1)

7.5.1 Exponential Distribution: GATE2004-IT-33

https://gateoverflow.in/3676

Let X and Y be two exponentially distributed and independent random variables with mean α and β, respectively. If $Z = \min(X, Y)$, then the mean of Z is given by

A. $\left(\frac{1}{\alpha+\beta}\right)$

B. $\min(\alpha, \beta)$

C. $\left(\frac{\alpha\beta}{\alpha+\beta}\right)$

D. $\alpha+\beta$

gate2004-it probability exponential-distribution random-variable normal

7.6 Independent Events (3)

7.6.1 Independent Events: GATE1994-2.8

https://gateoverflow.in/2475

Let A, B and C be independent events which occur with probabilities $0.8, 0.5$ and 0.3 respectively. The probability of occurrence of at least one of the event is _____

gate1994 probability normal numerical-answers independent-events

7.6.2 Independent Events: GATE1999-2.1

https://gateoverflow.in/1479

Consider two events E_1 and E_2 such that probability of E_1, $P_r[E_1] = \frac{1}{2}$, probability of E_2, $P_r[E_2] = \frac{1}{3}$, and probability of E_1, and E_2, $P_r[E_1 \; and \; E_2] = \frac{1}{5}$. Which of the following statements is/are true?

A. $P_r[E_1 \text{ or } E_2]$ is $\frac{2}{3}$

B. Events E_1 and E_2 are independent

C. Events E_1 and E_2 are not independent

D. $P_r[E_1 \mid E_2] = \frac{4}{5}$

gate1999 probability normal independent-events

7.6.3 Independent Events: GATE2000-2.2

https://gateoverflow.in/649

E_1 and E_2 are events in a probability space satisfying the following constraints:

- $Pr(E_1) = Pr(E_2)$
- $Pr(E_1 \cup E_2) = 1$
- E_1 and E_2 are independent

The value of $Pr(E_1)$, the probability of the event E_1, is

A. 0 B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. 1

gate2000 probability easy independent-events

7.7 Normal Distribution (2)

7.7.1 Normal Distribution: GATE2008-29

https://gateoverflow.in/427

Let X be a random variable following normal distribution with mean $+1$ and variance 4. Let Y be another normal variable with mean -1 and variance unknown. If $P(X \leq -1) = P(Y \geq 2)$, the standard deviation of Y is

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A. 3 B. 2 C. $\sqrt{2}$ D. 1

gate2008 random-variable normal-distribution probability normal

7.7.2 Normal Distribution: GATE2017-1-19

https://gateoverflow.in/118299

Let X be a Gaussian random variable with mean 0 and variance σ^2. Let $Y = \max(X, 0)$ where $\max(a, b)$ is the maximum of a and b. The median of Y is _____ .

gate2017-1 probability numerical-answers normal-distribution

7.8 Poisson Distribution (4)

7.8.1 Poisson Distribution: GATE1989-4-viii

https://gateoverflow.in/88156

Provide short answers to the following questions:

$P_n(t)$ is the probability of n events occurring during a time interval t. How will you express $P_0(t+h)$ in terms of $P_0(h)$, if $P_0(t)$ has stationary independent increments? (Note: $P_t(t)$is the probability density function).

gate1989 descriptive probability poisson-distribution

7.8.2 Poisson Distribution: GATE2007-IT-57

https://gateoverflow.in/3499

In a multi-user operating system on an average, 20 requests are made to use a particular resource per hour. The arrival of requests follows a Poisson distribution. The probability that either one, three or five requests are made in 45 minutes is given by :

A. $6.9 \times 10^6 \times e^{-20}$
B. $1.02 \times 10^6 \times e^{-20}$
C. $6.9 \times 10^3 \times e^{-20}$
D. $1.02 \times 10^3 \times e^{-20}$

gate2007-it probability poisson-distribution normal

7.8.3 Poisson Distribution: GATE2013-2

https://gateoverflow.in/62

Suppose p is the number of cars per minute passing through a certain road junction between 5 PM and 6 PM, and p has a Poisson distribution with mean 3. What is the probability of observing fewer than 3 cars during any given minute in this interval?

A. $\frac{8}{(2e^3)}$ B. $\frac{9}{(2e^3)}$ C. $\frac{17}{(2e^3)}$ D. $\frac{26}{(2e^3)}$

gate2013 probability poisson-distribution normal

7.8.4 Poisson Distribution: GATE2017-2-48

https://gateoverflow.in/118513

If a random variable X has a Poisson distribution with mean 5, then the expectation $E\left[(x+2)^2\right]$ equals ___.

gate2017-2 expectation poisson-distribution numerical-answers probability

7.9 Probability (49)

7.9.1 Probability: GATE-2014-2-1

https://gateoverflow.in/1953

The security system at an IT office is composed of 10 computers of which exactly four are working. To check whether the system is functional, the officials inspect four of the computers picked at random (without replacement). The system is deemed functional if at least three of the four computers inspected are working. Let the probability that the system is deemed functional be denoted by p. Then $100p$ = _____.

gate2014-2 probability numerical-answers normal

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7.9.2 Probability: GATE1995-1.18

https://gateoverflow.in/780

The probability that a number selected at random between 100 and 999 (both inclusive) will not contain the digit 7 is:

A. $\frac{16}{25}$ B. $\left(\frac{9}{10}\right)^3$ C. $\frac{27}{75}$ D. $\frac{18}{25}$

gate1995 probability normal

7.9.3 Probability: GATE1995-2.14

https://gateoverflow.in/2626

A bag contains 10 white balls and 15 black balls. Two balls are drawn in succession. The probability that one of them is black and the other is white is:

A. $\frac{2}{3}$ B. $\frac{4}{5}$ C. $\frac{1}{2}$ D. $\frac{1}{3}$

gate1995 probability normal

7.9.4 Probability: GATE1996-1.5

https://gateoverflow.in/2709

Two dice are thrown simultaneously. The probability that at least one of them will have 6 facing up is

A. $\frac{1}{36}$ B. $\frac{1}{3}$ C. $\frac{25}{36}$ D. $\frac{11}{36}$

gate1996 probability easy

7.9.5 Probability: GATE1996-2.7

https://gateoverflow.in/2736

The probability that top and bottom cards of a randomly shuffled deck are both aces is

A. $\frac{4}{52} \times \frac{4}{52}$ B. $\frac{4}{52} \times \frac{3}{52}$
C. $\frac{4}{52} \times \frac{3}{51}$ D. $\frac{4}{52} \times \frac{4}{51}$

gate1996 probability easy

7.9.6 Probability: GATE1997-1.1

https://gateoverflow.in/2217

The probability that it will rain today is 0.5. The probability that it will rain tomorrow is 0.6. The probability that it will rain either today or tomorrow is 0.7. What is the probability that it will rain today and tomorrow?

A. 0.3 B. 0.25 C. 0.35 D. 0.4

gate1997 probability easy

7.9.7 Probability: GATE1998-1.1

https://gateoverflow.in/1638

A die is rolled three times. The probability that exactly one odd number turns up among the three outcomes is

A. $\frac{1}{6}$ B. $\frac{3}{8}$ C. $\frac{1}{8}$ D. $\frac{1}{2}$

gate1998 probability easy

7.9.8 Probability: GATE2001-2.4

https://gateoverflow.in/722

Seven (distinct) car accidents occurred in a week. What is the probability that they all occurred on the same day?

A. $\frac{1}{7^7}$ B. $\frac{1}{7^6}$ C. $\frac{1}{2^7}$ D. $\frac{7}{2^7}$

gate2001 probability normal

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7.9.9 Probability: GATE2002-2.16

https://gateoverflow.in/846

Four fair coins are tossed simultaneously. The probability that at least one head and one tail turn up is

A. $\frac{1}{16}$ B. $\frac{1}{8}$ C. $\frac{7}{8}$ D. $\frac{15}{16}$

gate2002 probability easy

7.9.10 Probability: GATE2003-60, ISRO2007-45

https://gateoverflow.in/948

A program consists of two modules executed sequentially. Let $f_1(t)$ and $f_2(t)$ respectively denote the probability density functions of time taken to execute the two modules. The probability density function of the overall time taken to execute the program is given by

A. $f_1(t) + f_2(t)$

B. $\int_0^t f_1(x) f_2(x) dx$

C. $\int_0^t f_1(x) f_2(t-x) dx$

D. $\max\{f_1(t), f_2(t)\}$

gate2003 probability normal isro2007

7.9.11 Probability: GATE2004-25

https://gateoverflow.in/1022

If a fair coin is tossed four times. What is the probability that two heads and two tails will result?

A. $\frac{3}{8}$ B. $\frac{1}{2}$ C. $\frac{5}{8}$ D. $\frac{3}{4}$

gate2004 probability easy

7.9.12 Probability: GATE2004-IT-1

https://gateoverflow.in/3642

In a population of N families, 50% of the families have three children, 30% of the families have two children and the remaining families have one child. What is the probability that a randomly picked child belongs to a family with two children?

A. $\left(\frac{3}{23}\right)$ B. $\left(\frac{6}{23}\right)$ C. $\left(\frac{3}{10}\right)$ D. $\left(\frac{3}{5}\right)$

gate2004-it probability normal

7.9.13 Probability: GATE2005-IT-1

https://gateoverflow.in/3745

A bag contains 10 blue marbles, 20 green marbles and 30 red marbles. A marble is drawn from the bag, its colour recorded and it is put back in the bag. This process is repeated 3 times. The probability that no two of the marbles drawn have the same colour is

A. $\left(\frac{1}{36}\right)$ B. $\left(\frac{1}{6}\right)$ C. $\left(\frac{1}{4}\right)$ D. $\left(\frac{1}{3}\right)$

gate2005-it probability normal

7.9.14 Probability: GATE2006-IT-1

https://gateoverflow.in/3538

In a certain town, the probability that it will rain in the afternoon is known to be 0.6. Moreover, meteorological data indicates that if the temperature at noon is less than or equal to $25^\circ C$, the probability that it will rain in the afternoon is 0.4. The temperature at noon is equally likely to be above $25^\circ C$, or at/below $25^\circ C$. What is the probability that it will rain in the afternoon on a day when the temperature at noon is above $25^\circ C$?

A. 0.4 B. 0.6 C. 0.8 D. 0.9

gate2006-it probability normal

7.9.15 Probability: GATE2007-IT-1

https://gateoverflow.in/3432

Suppose there are two coins. The first coin gives heads with probability $\frac{5}{8}$ when tossed, while the second coin

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gives heads with probability $\frac{1}{4}$. One of the two coins is picked up at random with equal probability and tossed. What is the probability of obtaining heads ?

A. $\left(\frac{7}{8}\right)$ B. $\left(\frac{1}{2}\right)$ C. $\left(\frac{7}{16}\right)$ D. $\left(\frac{5}{32}\right)$

gate2007-it probability normal

7.9.16 Probability: GATE2008-27

https://gateoverflow.in/425

Aishwarya studies either computer science or mathematics everyday. If she studies computer science on a day, then the probability that she studies mathematics the next day is 0.6. If she studies mathematics on a day, then the probability that she studies computer science the next day is 0.4. Given that Aishwarya studies computer science on Monday, what is the probability that she studies computer science on Wednesday?

A. 0.24 B. 0.36 C. 0.4 D. 0.6

gate2008 probability normal

7.9.17 Probability: GATE2008-IT-2

https://gateoverflow.in/3224

A sample space has two events A and B such that probabilities $P(A \cap B) = \frac{1}{2}, P(A') = \frac{1}{3}, P(B') = \frac{1}{3}$. What is $P(A \cup B)$?

A. $\left(\frac{11}{12}\right)$ B. $\left(\frac{10}{12}\right)$ C. $\left(\frac{9}{12}\right)$ D. $\left(\frac{8}{12}\right)$

gate2008-it probability easy

7.9.18 Probability: GATE2008-IT-23

https://gateoverflow.in/3284

What is the probability that in a randomly chosen group of r people at least three people have the same birthday?

A. $1 - \frac{365 - 364 \ldots (365 - r + 1)}{365^r}$

B. $\frac{365 \cdot 364 \ldots (365 - r + 1)}{365^r} +^r C_1 \cdot 365 \cdot \frac{364.363 \ldots (364 - (r-2) + 1)}{364^{r+2}}$

C. $1 - \frac{365 \cdot 364 \ldots (365 - r + 1)}{365^r} -^r C_2 \cdot 365 \cdot \frac{364 \cdot 363 \ldots (364 - (r-2) + 1)}{364^{r-2}}$

D. $\frac{365 \cdot 364 \ldots (365 - r + 1)}{365^r}$

gate2008-it probability normal

7.9.19 Probability: GATE2009-21

https://gateoverflow.in/798

An unbalanced dice (with 6 faces, numbered from 1 to 6) is thrown. The probability that the face value is odd is 90% of the probability that the face value is even. The probability of getting any even numbered face is the same. If the probability that the face is even given that it is greater than 3 is 0.75, which one of the following options is closest to the probability that the face value exceeds 3?

A. 0.453 B. 0.468 C. 0.485 D. 0.492

gate2009 probability normal

7.9.20 Probability: GATE2010-26

https://gateoverflow.in/1152

Consider a company that assembles computers. The probability of a faulty assembly of any computer is p. The company therefore subjects each computer to a testing process. This testing process gives the correct result for any computer with a probability of q. What is the probability of a computer being declared faulty?

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A. $pq+(1-p)(1-q)$ B. $(1-q)p$ C. $(1-p)q$ D. pq

gate2010 probability easy

7.9.21 Probability: GATE2010-27

https://gateoverflow.in/1153

What is the probability that divisor of 10^{99} is a multiple of 10^{96}?

A. $\left(\frac{1}{625}\right)$ B. $\left(\frac{4}{625}\right)$ C. $\left(\frac{12}{625}\right)$ D. $\left(\frac{16}{625}\right)$

gate2010 probability normal

7.9.22 Probability: GATE2011-3

https://gateoverflow.in/2105

If two fair coins are flipped and at least one of the outcomes is known to be a head, what is the probability that both outcomes are heads?

A. $\left(\frac{1}{3}\right)$ B. $\left(\frac{1}{4}\right)$ C. $\left(\frac{1}{2}\right)$ D. $\left(\frac{2}{3}\right)$

gate2011 probability easy

7.9.23 Probability: GATE2011-34

https://gateoverflow.in/2136

A deck of 5 cards (each carrying a distinct number from 1 to 5) is shuffled thoroughly. Two cards are then removed one at a time from the deck. What is the probability that the two cards are selected with the number on the first card being one higher than the number on the second card?

A. $\left(\frac{1}{5}\right)$ B. $\left(\frac{4}{25}\right)$ C. $\left(\frac{1}{4}\right)$ D. $\left(\frac{2}{5}\right)$

gate2011 probability normal

7.9.24 Probability: GATE2014-1-48

https://gateoverflow.in/1927

Four fair six-sided dice are rolled. The probability that the sum of the results being 22 is $\frac{X}{1296}$. The value of X is _____

gate2014-1 probability numerical-answers normal

7.9.25 Probability: GATE2014-2-48

https://gateoverflow.in/2014

The probability that a given positive integer lying between 1 and 100 (both inclusive) is NOT divisible by 2, 3 or 5 is _____ .

gate2014-2 probability numerical-answers normal

7.9.26 Probability: GATE2014-3-48

https://gateoverflow.in/2082

Let S be a sample space and two mutually exclusive events A and B be such that $A \cup B = S$. If $P(.)$ denotes the probability of the event, the maximum value of $P(A)P(B)$ is_____.

gate2014-3 probability numerical-answers normal

7.9.27 Probability: GATE2016-1-29

https://gateoverflow.in/39709

Consider the following experiment.

Step 1. Flip a fair coin twice.

Step 2. If the outcomes are (TAILS, HEADS) then output Y and stop.

Step 3. If the outcomes are either (HEADS, HEADS) or (HEADS, TAILS), then output N and stop.

Step 4. If the outcomes are (TAILS, TAILS), then go to Step 1.

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The probability that the output of the experiment is Y is (up to two decimal places)

gate2016-1 probability normal numerical-answers

7.9.28 Probability: GATE2018-15

https://gateoverflow.in/204089

Two people, P and Q, decide to independently roll two identical dice, each with 6 faces, numbered 1 to 6. The person with the lower number wins. In case of a tie, they roll the dice repeatedly until there is no tie. Define a trial as a throw of the dice by P and Q. Assume that all 6 numbers on each dice are equi-probable and that all trials are independent. The probability (rounded to 3 decimal places) that one of them wins on the third trial is _____

gate2018 probability normal numerical-answers

7.9.29 Probability: TIFR2010-A-10

https://gateoverflow.in/26481

A drawer contains 2 Blue, 4 Red and 2 Yellow balls. No two balls have the same radius. If two balls are randomly selected from the drawer, what is the probability that they will be of the same colour?

A. $\left(\frac{2}{7}\right)$
B. $\left(\frac{2}{5}\right)$
C. $\left(\frac{3}{7}\right)$
D. $\left(\frac{1}{2}\right)$
E. $\left(\frac{3}{5}\right)$

tifr2010 probability

7.9.30 Probability: TIFR2010-A-13

https://gateoverflow.in/18392

A cube whose faces are colored is split into 1000 small cubes of equal size. The cubes thus obtained are mixed thoroughly. The probability that a cube drawn at random will have exactly two colored faces is:

a. 0.096
b. 0.12
c. 0.104
d. 0.24
e. None of the above

tifr2010 probability

7.9.31 Probability: TIFR2011-A-19

https://gateoverflow.in/26479

Three dice are rolled independently. What is the probability that the highest and the lowest value differ by 4?

A. $\left(\frac{1}{3}\right)$
B. $\left(\frac{1}{6}\right)$
C. $\left(\frac{1}{9}\right)$
D. $\left(\frac{5}{18}\right)$
E. $\left(\frac{2}{9}\right)$

tifr2011 probability

7.9.32 Probability: TIFR2011-A-9

https://gateoverflow.in/20020

You have to play three games with opponents A and B in a specified sequence. You win the series if you win two consecutive games. A is a stronger player than B. Which sequence maximizes your chance of winning the series?

a. AAB
b. ABA
c. BAB
d. BAA
e. All are the same.

tifr2011 probability

7.9.33 Probability: TIFR2012-A-17

https://gateoverflow.in/25042

A spider is at the bottom of a cliff, and is n inches from the top. Every step it takes brings it one inch closer to the top with probability $1/3$, and one inch away from the top with probability $2/3$, unless it is at the bottom in which case, it always gets one inch closer. What is the expected number of steps for the spider to reach the top as a function of n?

a. It will never reach the top.
b. Linear in n.
c. Polynomial in n.
d. Exponential in n.

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e. Double exponential in n.

tifr2012 probability

7.9.34 Probability: TIFR2012-A-19

https://gateoverflow.in/25044

An electric circuit between two terminals A and B is shown in the figure below, where the numbers indicate the probabilities of failure for the various links, which are all independent.

What is the probability that A and B are connected?

a. $\left(\frac{6}{25}\right)$ b. $\left(\frac{379}{400}\right)$ c. $\left(\frac{1}{1200}\right)$ d. $\left(\frac{1199}{1200}\right)$ e. $\left(\frac{59}{60}\right)$

tifr2012 probability

7.9.35 Probability: TIFR2012-A-20

https://gateoverflow.in/25045

There are 1000 balls in a bag, of which 900 are black and 100 are white. I randomly draw 100 balls from the bag. What is the probability that the 101st ball will be black?

a. $9/10$
b. More than $9/10$ but less than 1.
c. Less than $9/10$ but more than 0.
d. 0
e. 1

tifr2012 probability

7.9.36 Probability: TIFR2012-A-9

https://gateoverflow.in/21008

The probability of throwing six perfect dices and getting six different faces is

a. $1 - \frac{6!}{6^6}$ b. $\frac{6!}{6^6}$ c. 6^{-6} d. $1 - 6^{-6}$ e. None of the above.

tifr2012 probability

7.9.37 Probability: TIFR2013-A-13

https://gateoverflow.in/25435

Doctors A and B perform surgery on patients in stages III and IV of a disease. Doctor A has performed a 100 surgeries (on 80 stage III and 20 stage IV patients) and 80 out of her 100 patients have survived (78 stage III and 2 stage IV survivors). Doctor B has also performed 100 surgeries (on 50 stage III and 50 stage IV patients). Her success rate is $\frac{600}{100}$ (49 stage III survivors and 11 stage IV survivors).A patient has been advised that she is equally likely to be suffering from stage III or stage IV of this disease. Which doctor would you recommend to this patient and why?

a. Doctor A since she has a higher success rate
b. Doctor A since she specializes in stage III patients and the success of surgery in stage IV patients is anyway too low
c. Doctor B since she has performed more stage IV surgeries
d. Doctor B since she appears to be more successful
e. There is not enough data since the choice depends on the stage of the disease the patient is suffering from.

tifr2013 probability

7.9.38 Probability: TIFR2013-A-14

https://gateoverflow.in/25437

An unbiased die is thrown n times. The probability that the product of numbers would be even is

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a. $\frac{1}{(2n)}$ b. $\frac{1}{[(6n)!]}$ c. $1-6^{-n}$ d. 6^{-n} e. None of the above.

tifr2013 probability

7.9.39 Probability: TIFR2013-A-17

https://gateoverflow.in/25497

A stick of unit length is broken into two at a point chosen at random. Then, the larger part of the stick is further divided into two parts in the ratio $4:3$. What is the probability that the three sticks that are left CANNOT form a triangle?

a. $1/4$ b. $1/3$ c. $5/6$ d. $1/2$ e. $\log_e(2)/2$

tifr2013 probability

7.9.40 Probability: TIFR2013-A-4

https://gateoverflow.in/25386

A biased coin is tossed repeatedly. Assume that the outcomes of different tosses are independent and probability of heads is $\frac{2}{3}$ in each toss. What is the probability of obtaining an even number of heads in 5 tosses, zero being treated as an even number?

a. $\left(\frac{121}{243}\right)$ b. $\left(\frac{122}{243}\right)$ c. $\left(\frac{124}{243}\right)$ d. $\left(\frac{125}{243}\right)$ e. $\left(\frac{128}{243}\right)$

tifr2013 probability

7.9.41 Probability: TIFR2013-B-10

https://gateoverflow.in/25771

Let m, n be positive integers with m a power of 2. Let $s = 100n^2 \log m$. Suppose $S_1, S_2, \ldots, S_m$ are subsets of $1, 2, \ldots, s$ such that $|S_i| = 10n \log m$ and $|S_i \cap S_j| \leq \log m$ for all $1 \leq i < j \leq m$. Such a collection of sets $S_1, \ldots, S_m$ is an example of a so-called Nisan-Wigderson design. We now consider the set membership problem, where we have to store an arbitrary subset $T \subseteq \{1, 2, \ldots, m\}, |T| = n$ as an array A of s bits so that given any integer $x, 1 \leq x \leq m$, we can discover whether $x \in T$ by reading only one bit of A. Consider the following strategy to solve this problem. Array A is initialized to all zeroes. Given the set T to be stored, we put a one in all the locations of A indexed by the union $\cup_{t \in T} S_t$. Now, given the integer x, we read a random location in A from S_x and declare that $x \in T$ if the bit in that location is one. This strategy gives the correct answer with probability

a. 1 if $x \in T$ and at most 0.1 if $x \notin T$.
b. At least 0.9 if $x \in T$ and at most 0.1 if $x \notin T$.
c. At least 0.9 if $x \in T$ and at least 0.9 if $x \notin T$.
d. 1 if $x \in T$ and at least 0.9 if $x \notin T$.
e. At least 0.9 if $x \in T$ and 1 if $x \notin T$.

tifr2013 probability

7.9.42 Probability: TIFR2015-A-1

https://gateoverflow.in/29156

Consider a 6-sided die with all sides not necessarily equally likely such that probability of an even number is $P(\{2,4,6\}) = \frac{1}{2}$, probability of a multiple of 3 is $P(\{3,6\}) = 1/3$ and probability of 1 is $P(\{1\}) = \frac{1}{6}$. Given the above conditions, choose the strongest (most stringent) condition of the following that must always hold about $P(\{5\})$, the probability of 5.

A. $P(\{5\}) = \frac{1}{6}$
B. $P(\{5\}) \geq \frac{1}{6}$
C. $P(\{5\}) \leq \frac{1}{6}$
D. $P(\{5\}) \leq \frac{1}{3}$
E. None of the above.

tifr2015 probability

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7.9.43 Probability: TIFR2016-A-12

https://gateoverflow.in/73498

There are two rocks A and B, located close to each other, in a lily pond. There is a frog that jumps randomly between the two rocks at time $t = 0, 1, 2, \ldots$. The location of the frog is determined as follows. Initially, at time $t = 0$, the frog is at A. From then on, the frog's location is determined as follows. If the frog is at A at time t, then at time $t + 1$, with probability $2/3$ it jumps to B and with probability $1/3$, it jumps on the spot and stays at A. If the frog is at B at time t, then at time $t + 1$, with probability $1/2$ it jumps to A and with probability $1/2$ it jumps on the spot and stays at B. What is the probability that the frog is at B at time 3 (just after its third jump)?

A. $\frac{1}{2}$ B. $\frac{31}{54}$ C. $\frac{14}{27}$ D. $\frac{61}{108}$ E. $\frac{2}{3}$

tifr2016 probability

7.9.44 Probability: TIFR2017-A-9

https://gateoverflow.in/95042

Consider the $majority$ function on three bits, $\mathbf{maj} : \{0,1\}^3 \to \{0,1\}$ where $\mathbf{maj}(x_1, x_2, x_3) = 1$ if and only if $x_1 + x_2 + x_3 \geq 2$. Let $p(\alpha)$ be the probability that the output is 1 when each input is set to 1 independently with probability α. What is $p'(\alpha) = \frac{d}{d\alpha}p(\alpha)$?

A. 3α
B. α^2
C. $6\alpha(1-\alpha)$
D. $3\alpha^2(1-\alpha)$
E. $6\alpha(1-\alpha) + \alpha^2$

tifr2017 probability

7.9.45 Probability: TIFR2018-A-10

https://gateoverflow.in/179279

Let C be a biased coin such that the probability of a head turning up is p. Let p_n denote the probability that an odd number of heads occurs after n tosses for $n \in \{0, 1, 2, \ldots\}$, Then which of the following is TRUE ?

A. $p_n = \dfrac{1}{2}$ for all $n \in \{0, 1, 2, \ldots\}$.
B. $p_n = (1-p)(1-p_{n-1}) + p.p_{n-1}$ for $n \geq 1$ and $p_0 = 0$.
C. $p_n = \sum_{i=1}^{n} p(1-2p)^{i-1}$ for $n \geq 1$.
D. If $p = \dfrac{1}{2}$, then $p_n = \dfrac{1}{2}$ for all $n \in \{0, 1, 2, \ldots\}$.
E. $p_n = 1$ if n is odd and 0 otherwise.

tifr2018 probability

7.9.46 Probability: TIFR2018-A-13

https://gateoverflow.in/179371

A hacker knows that the password to the TIFR server is 10-letter string consisting of lower-case letters from the English alphabet. He guesses a set of 5 distinct 10-letter strings (with lower-case letters) uniformly at random. What is the probability that one of the guesses of the hacker is correct password?

A. $\frac{5}{(26)^{10}}$
B. $1 - \left(1 - \frac{1}{(26)^{10}}\right)^5$
C. $1 - \left\{\left(\frac{(26)^{10}-1}{(26)^{10}}\right)\left(\frac{(26)^{10}-2}{(26)^{10}}\right)\left(\frac{(26)^{10}-3}{(26)^{10}}\right)\left(\frac{(26)^{10}-4}{(26)^{10}}\right)\left(\frac{(26)^{10}-5}{(26)^{10}}\right)\right\}$
D. $\frac{1}{(26)^{10}}$
E. None of the above

tifr2018 probability

7.9.47 Probability: TIFR2018-A-15

https://gateoverflow.in/179366

Suppose a box contains 20 balls: each ball has a distinct number in $\{1, \ldots, 20\}$ written on it. We pick 10 balls (without replacement) uniformly at random and throw them out of the box. Then we check if the ball with number ‘‘1 ” on it is present in the box. If it is present, then we throw it out of the box; else we pick a ball from the box uniformly at random and throw it out of the box.

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What is the probability that the ball with number "2" on it is present in the box?

A. $9/20$ B. $9/19$ C. $1/2$ D. $10/19$ E. None of the above

tifr2018 probability

7.9.48 Probability: TIFR2019-A-14

https://gateoverflow.in/280496

A drawer contains 9 pens, of which 3 are red, 3 are blue, and 3 are green. The nine pens are drawn from the drawer one at at time (without replacement) such that each pen is drawn with equal probability from the remaining pens in the drawer. What is the probability that two red pens are drawn in succession ?

A. $7/12$ B. $1/6$ C. $1/12$ D. $1/81$ E. None of the above

tifr2019 engineering-mathematics probability

7.9.49 Probability: TIFR2019-A-4

https://gateoverflow.in/280506

What is the probability that a point $P = (\alpha, \beta)$ picked uniformly at random from the disk $x^2 + y^2 \leq 1$ satisfies $\alpha + \beta \leq 1$?

A. $\frac{1}{\pi}$
B. $\frac{3}{4} + \frac{1}{4} \cdot \frac{1}{\pi}$
C. $\frac{3}{4} + \frac{1}{4} \cdot \frac{2}{\pi}$
D. 1
E. $\frac{2}{\pi}$

tifr2019 engineering-mathematics discrete-mathematics probability

7.10 Random Variable (7)

7.10.1 Random Variable: GATE2005-12, ISRO2009-64

https://gateoverflow.in/1162

Let $f(x)$ be the continuous probability density function of a random variable x, the probability that $a < x \leq b$, is :

A. $f(b-a)$
B. $f(b) - f(a)$
C. $\int_a^b f(x)dx$
D. $\int_a^b xf(x)dx$

gate2005 probability random-variable easy isro2009

7.10.2 Random Variable: GATE2011-33

https://gateoverflow.in/2135

Consider a finite sequence of random values $X = [x_1, x_2, \ldots x_n]$. Let μ_x be the mean and σ_x be the standard deviation of X. Let another finite sequence Y of equal length be derived from this as $y_i = a * x_i + b$, where a and b are positive constants. Let μ_y be the mean and σ_y be the standard deviation of this sequence.

Which one of the following statements is **INCORRECT**?

A. Index position of mode of X in X is the same as the index position of mode of Y in Y
B. Index position of median of X in X is the same as the index position of median of Y in Y
C. $\mu_y = a\mu_x + b$
D. $\sigma_y = a\sigma_x + b$

gate2011 probability random-variable normal

7.10.3 Random Variable: GATE2012-21

https://gateoverflow.in/1577

Consider a random variable X that takes values $+1$ and -1 with probability 0.5 each. The values of the cumulative distribution function $F(x)$ at $x = -1$ and $+1$ are

A. 0 and 0.5 B. 0 and 1 C. 0.5 and 1 D. 0.25 and 0.75

gate2012 probability random-variable easy

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7.10.4 Random Variable: GATE2015-3-37

https://gateoverflow.in/8496

Suppose X_i for $i = 1, 2, 3$ are independent and identically distributed random variables whose probability mass functions are $Pr[X_i = 0] = Pr[X_i = 1] = \frac{1}{2}$ for $i = 1, 2, 3$. Define another random variable $Y = X_1 X_2 \oplus X_3$, where $\oplus$ denotes XOR. Then $Pr[Y = 0 \mid X_3 = 0] =$_____.

gate2015-3 probability random-variable normal numerical-answers

7.10.5 Random Variable: GATE2017-2-31

https://gateoverflow.in/118373

For any discrete random variable X, with probability mass function $P(X = j) = p_j, p_j \geq 0, j \in \{0, \ldots, N\}$, and $\Sigma_{j=0}^{N} p_j = 1$, define the polynomial function $g_x(z) = \Sigma_{j=0}^{N} p_j z^j$. For a certain discrete random variable Y, there exists a scalar $\beta \in [0, 1]$ such that $g_y(z) = (1 - \beta + \beta z)^N$. The expectation of Y is

A. $N\beta(1-\beta)$
B. $N\beta$
C. $N(1-\beta)$
D. Not expressible in terms of N and β alone

gate2017-2 probability random-variable

7.10.6 Random Variable: TIFR2011-A-7

https://gateoverflow.in/20012

Let X and Y be two independent and identically distributed random variables. Then $P(X > Y)$ is.

a. $\frac{1}{2}$
b. 1
c. 0
d. $\frac{1}{3}$
e. Information is insufficient.

tifr2011 probability random-variable

7.10.7 Random Variable: TIFR2014-A-19

https://gateoverflow.in/27130

Consider the following random function of x
$F(x) = 1 + Ux + Vx^2 \bmod 5$,
where U and V are independent random variables uniformly distributed over $\{0, 1, 2, 3, 4\}$. Which of the following is FALSE?

a. $F(1)$ is uniformly distributed over $\{0, 1, 2, 3, 4\}$.
b. $F(1), F(2)$ are independent random variables and both are uniformly distributed over $\{0, 1, 2, 3, 4\}$.
c. $F(1), F(2), F(3)$ are independent and identically distributed random variables.
d. All of the above.
e. None of the above.

tifr2014 probability random-variable

7.11 Uniform Distribution (8)

7.11.1 Uniform Distribution: GATE1998-3a

https://gateoverflow.in/1694

Two friends agree to meet at a park with the following conditions. Each will reach the park between 4:00 pm and 5:00 pm and will see if the other has already arrived. If not, they will wait for 10 minutes or the end of the hour whichever is earlier and leave. What is the probability that the two will not meet?

gate1998 probability normal numerical-answers uniform-distribution

7.11.2 Uniform Distribution: GATE2004-78

https://gateoverflow.in/1072

Two n bit binary strings, S_1 and S_2 are chosen randomly with uniform probability. The probability that the Hamming distance between these strings (the number of bit positions where the two strings differ) is equal to d is

A. $\frac{{}^nC_d}{2^n}$
B. $\frac{{}^nC_d}{2^d}$
C. $\frac{d}{2^n}$
D. $\frac{1}{2^d}$

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gate2004 probability normal uniform-distribution

7.11.3 Uniform Distribution: GATE2004-80

https://gateoverflow.in/1074

A point is randomly selected with uniform probability in the $X-Y$ plane within the rectangle with corners at $(0,0),(1,0),(1,2)$ and $(0,2)$. If p is the length of the position vector of the point, the expected value of p^2 is

A. $\left(\frac{2}{3}\right)$ B. 1 C. $\left(\frac{4}{3}\right)$ D. $\left(\frac{5}{3}\right)$

gate2004 probability uniform-distribution expectation normal

7.11.4 Uniform Distribution: GATE2007-24

https://gateoverflow.in/1222

Suppose we uniformly and randomly select a permutation from the $20!$ permutations of $1,2,3\ldots,20.$ What is the probability that 2 appears at an earlier position than any other even number in the selected permutation?

A. $\left(\frac{1}{2}\right)$ B. $\left(\frac{1}{10}\right)$ C. $\left(\frac{9!}{20!}\right)$ D. None of these

gate2007 probability easy uniform-distribution

7.11.5 Uniform Distribution: GATE2014-1-2

https://gateoverflow.in/1717

Suppose you break a stick of unit length at a point chosen uniformly at random. Then the expected length of the shorter stick is _____ .

gate2014-1 probability uniform-distribution expectation numerical-answers normal

7.11.6 Uniform Distribution: GATE2019-47

https://gateoverflow.in/302801

Suppose Y is distributed uniformly in the open interval $(1,6)$. The probability that the polynomial $3x^2+6xY+3Y+6$ has only real roots is (rounded off to 1 decimal place) _____

gate2019 numerical-answers engineering-mathematics probability uniform-distribution

7.11.7 Uniform Distribution: TIFR2013-A-18

https://gateoverflow.in/25498

Consider three independent uniformly distributed (taking values between 0 and 1) random variables. What is the probability that the middle of the three values (between the lowest and the highest value) lies between a and b where $0 \leq a < b \leq 1$?

a. $3(1-b)a(b-a)$
b. $3((b-a)-(b^2-a^2)/2)$
c. $6(1-b)a(b-a)$
d. $(1-b)a(b-a)$
e. $6((b^2-a^2)/2-(b^3-a^3)/3)$.

tifr2013 probability random-variable uniform-distribution

7.11.8 Uniform Distribution: TIFR2015-A-12

https://gateoverflow.in/29583

Consider two independent and identically distributed random variables X and Y uniformly distributed in $[0,1]$. For $\alpha \in [0,1]$, the probability that $\alpha \max(X,Y) < XY$ is

a. $1/(2\alpha)$ b. $\exp(1-\alpha)$ c. $1-\alpha$ d. $(1-\alpha)^2$ e. $1-\alpha^2$

tifr2015 probability random-variable uniform-distribution

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8 General Aptitude: Numerical Ability (410)

Syllabus: Numerical computation, Numerical estimation, Numerical reasoning and data interpretation

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	2	3	2	3	1	2	1	2.2	3
2 Marks Count	3	4	4	4	3	3	3	3.5	4
Total Marks	8	11	10	11	7	8	**7**	**9.2**	**11**

8.0.1 GATE2015 EC-1: GA-4

https://gateoverflow.in/39492

Operators $\square$, $\lozenge$ and $\rightarrow$ are defined by: $a \square b = \frac{a-b}{a+b}$; $a \lozenge b = \frac{a+b}{a-b}$; $a \rightarrow b = ab$.

Find the value of $(66 \square 6) \rightarrow (66 \lozenge 6)$.

A. -2 B. -1 C. 1 D. 2

gate2015-ec-1 general-aptitude numerical-ability

8.1 Absolute Value (6)

8.1.1 Absolute Value: GATE2011 AG: GA-7

https://gateoverflow.in/312126

Given that $f(y) = \frac{|y|}{y}$, and q is non-zero real number, the value of $|f(q) - f(-q)|$ is

A. 0
B. -1
C. 1
D. 2

general-aptitude numerical-ability gate2011-ag absolute-value

8.1.2 Absolute Value: GATE2013 AE: GA-8

https://gateoverflow.in/40249

If $|-2X + 9| = 3$ then the possible value of $|-X| - X^2$ would be:

A. 30 B. -30 C. -42 D. 42

gate2013-ae numerical-ability absolute-value

8.1.3 Absolute Value: GATE2013 CE: GA-7

https://gateoverflow.in/40275

If $|4X - 7| = 5$ then the values of $2|X| - |-X|$ is:

A. $2, \left(\frac{1}{3}\right)$ B. $\left(\frac{1}{2}\right), 3$ C. $\left(\frac{3}{2}\right), 9$ D. $\left(\frac{2}{3}\right), 9$

gate2013-ce numerical-ability absolute-value

8.1.4 Absolute Value: GATE2014-2-GA-8

https://gateoverflow.in/1950

If x is real and $|x^2 - 2x + 3| = 11$, then possible values of $|-x^3 + x^2 - x|$ include

A. $2, 4$ B. $2, 14$ C. $4, 52$ D. $14, 52$

gate2014-2 numerical-ability normal absolute-value

8.1.5 Absolute Value: GATE2017-1-GA-8

https://gateoverflow.in/118411

The expression $\frac{(x+y)-|x-y|}{2}$ is equal to :

A. The maximum of x and y
B. The minimum of x and y
C. 1
D. None of the above

gate2017-1 general-aptitude numerical-ability maxima-minima absolute-value

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8.1.6 Absolute Value: GATE2018 ME-1: GA-9

https://gateoverflow.in/313654

Which of the following functions describe the graph shown in the below figure?

A. $y = || x \mid +1 \mid -2$
B. $y = || x \mid -1 \mid -1$
C. $y = || x \mid +1 \mid -1$
D. $y = || x - 1 \mid -1|$

gate2018-me-1 general-aptitude numerical-ability functions absolute-value

8.2 Age Relation (3)

8.2.1 Age Relation: GATE2013 CE: GA-10

https://gateoverflow.in/40280

Abhishek is elder to Savar. Savar is younger to Anshul. Which of the given conclusions is logically valid and is inferred from the above statements?

A. Abhishek is elder to Anshul
B. Anshul is elder to Abhishek
C. Abhishek and Anshul are of the same age
D. No conclusion follows

gate2013-ce logical-reasoning age-relation

8.2.2 Age Relation: GATE2018 CE-1: GA-3

https://gateoverflow.in/313272

Hema's age is 5 years more than twice Hari's age. Suresh's age is 13 years less than 10 times Hari's age. If Suresh is 3 times as old as Hema, how old is Hema?

A. 14
B. 17
C. 18
D. 19

gate2018-ce-1 general-aptitude numerical-ability age-relation

8.2.3 Age Relation: GATE2019 ME-1: GA-10

https://gateoverflow.in/313601

M and N had four children P, Q, R and S. Of them, only P and R were married. They had children X and Y respectively. If Y is a legitimate child of W, which of the following statements is necessarily FALSE?

A. M is the grandmother of Y
B. R is the father of Y
C. W is the wife of R
D. W is the wife of P

gate2019-me-1 general-aptitude numerical-ability age-relation

8.3 Algebra (2)

8.3.1 Algebra: GATE2011 MN: GA-61

https://gateoverflow.in/31536

If $\frac{(2y+1)}{(y+2)} < 1$, then which of the following alternatives gives the CORRECT range of y ?

A. $-2 < y < 2$
B. $-2 < y < 1$
C. $-3 < y < 1$
D. $-4 < y < 1$

numerical-ability gate2011-mn algebra

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8.3.2 Algebra: GATE2018 CE-2: GA-3

https://gateoverflow.in/313391

$\underbrace{a+a+a+\cdots+a}_{\text{n times}} = a^2b$ and $\underbrace{b+b+b+\cdots+b}_{\text{m times}} = ab^2$, where a, b, n, m are natural numbers. What is the value of $\left(\left(\underbrace{m+m+m+\cdots+m}_{\text{n times}}\right)\right)\left(\left(\underbrace{n+n+n+\cdots+n}_{\text{m times}}\right)\right)$?

A. $2a^2b^2$ B. a^4b^4 C. $ab(a+b)$ D. a^2+b^2

gate2018-ce-2 algebra numerical-ability

8.4 Arithmetic Series (4)

8.4.1 Arithmetic Series: GATE2011 AG: GA-6

https://gateoverflow.in/312125

The sum of n terms of the series $4+44+444+\ldots\ldots$ is

A. $\frac{4}{81}\left[10^{n+1}-9n-1\right]$
B. $\frac{4}{81}\left[10^{n-1}-9n-1\right]$
C. $\frac{4}{81}\left[10^{n+1}-9n-10\right]$
D. $\frac{4}{81}\left[10^{n}-9n-10\right]$

general-aptitude numerical-ability gate2011-ag arithmetic-series

8.4.2 Arithmetic Series: GATE2013-58

https://gateoverflow.in/1562

What will be the maximum sum of $44, 42, 40, \ldots$?

A. 502 B. 504 C. 506 D. 500

gate2013 numerical-ability easy arithmetic-series

8.4.3 Arithmetic Series: GATE2015-2-GA-6

https://gateoverflow.in/8035

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. 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

gate2015-2 numerical-ability normal arithmetic-series

8.4.4 Arithmetic Series: GATE2019 EE: GA-6

https://gateoverflow.in/313562

How many integers are there between 100 and 1000 all of whose digits are even?

A. 60 B. 80 C. 100 D. 90

gate2019-ee general-aptitude numerical-ability arithmetic-series

8.5 Bar Graph (3)

8.5.1 Bar Graph: GATE2014 EC-1: GA-9

https://gateoverflow.in/41498

The exports and imports (in crores of Rs.) of a country from 2000 to 2007 are given in the following bar chart. If the trade deficit is defined as excess of imports over exports, in which year is the trade deficit $1/5$th of the exports?

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A. 2005 B. 2004 C. 2007 D. 2006

gate2014-ec-1 numerical-ability data-interpretation bar-graph normal

8.5.2 Bar Graph: GATE2017 CE-1: GA-10

https://gateoverflow.in/313480

The bar graph below shows the output of five carpenters over one month. each of whom made different items of furniture: chairs, tables, and beds.

Consider the following statements.

i. The number of beds made by carpenter $C2$ is exactly the same as the number of tables made by carpenter $C3$
ii. The total number of chairs made by all carpenters is less than the total number of tables.

Which one of the following is true?

A. Only i B. Only ii C. Both i and ii D. Neither i nor ii

gate2017-ce-1 general-aptitude numerical-ability data-interpretation bar-graph

8.5.3 Bar Graph: GATE2019 EC: GA-7

https://gateoverflow.in/313528

The bar graph in panel (a) shows the proportion of male and female illiterates in 2001 and 2011. The proportions of males and females in 2001 and 2011 are given in Panel (b) and (c), respectively. The total population did not change during this period. The percentage increase in the total number of literates from 2001 to 2011 is _____.

Panel (a)

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Panel (b)

Panel (c)

A. 30.43 B. 33.43 C. 34.43 D. 35.43

gate2019-ec numerical-ability data-interpretation bar-graph

8.6 Cartesian Coordinates (7)

8.6.1 Cartesian Coordinates: GATE2012 AE: GA-9

https://gateoverflow.in/40220

Two points $(4, p)$ and $(0, q)$ lie on a straight line having a slope of $3/4$. The value of $(p-q)$ is

A. -3 B. 0 C. 3 D. 4

gate2012-ae numerical-ability cartesian-coordinates geometry

8.6.2 Cartesian Coordinates: GATE2014 AE: GA-4

https://gateoverflow.in/40303

If $y = 5x^2 + 3$, then the tangent at $x = 0$, $y = 3$

A. passes through $x = 0, y = 0$
B. has a slope of $+1$
C. is parallel to the x-axis
D. has a slope of -1

gate2014-ae numerical-ability geometry cartesian-coordinates

8.6.3 Cartesian Coordinates: GATE2016 EC-3: GA-10

https://gateoverflow.in/110855

A straight line is fit to a data set (ln x, y). This line intercepts the abscissa at ln $x = 0.1$ and has a slope of -0.02. What is the value of y at $x = 5$ from the fit?

A. -0.030 B. -0.014 C. 0.014 D. 0.030

gate2016-ec-3 numerical-ability cartesian-coordinates

8.6.4 Cartesian Coordinates: GATE2016 EC-3: GA-9

https://gateoverflow.in/110853

Find the area bounded by the lines $3x + 2y = 14, 2x - 3y = 5$ in the first quadrant.

A. 14.95 B. 15.25 C. 15.70 D. 20.35

gate2016-ec-3 cartesian-coordinates geometry normal

8.6.5 Cartesian Coordinates: TIFR2013-B-9

https://gateoverflow.in/25675

Suppose n straight lines are drawn on a plane. When these lines are removed, the plane falls apart into several connected components called regions. A region R is said to be convex if it has the following property: whenever two points are in R, then the entire line segment joining them is in R. Suppose no two of the n lines are parallel. Which of the following is true?

a. $O(n)$ regions are produced, and each region is convex.
b. $O(n^2)$ regions are produced but they need not all be convex.
c. $O(n^2)$ regions are produced, and each region is convex.
d. $O(n \log n)$ regions are produced, but they need not all be convex.
e. All regions are convex but there may be exponentially many of them.

tifr2013 numerical-ability geometry cartesian-coordinates

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8.6.6 Cartesian Coordinates: TIFR2014-A-13

https://gateoverflow.in/26390

Let L be a line on the two dimensional plane. L's intercepts with the X and Y axes are respectively a and b. After rotating the co-ordinate system (and leaving L untouched), the new intercepts are a' and b' respectively. Which of the following is TRUE?

a. $\frac{1}{a}+\frac{1}{b}=\frac{1}{a}+\frac{1}{b}$.
b. $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{a'^2}+\frac{1}{b'^2}$.
c. $\frac{b}{a^2}+\frac{a}{b^2}=\frac{b'}{a'^2}+\frac{a}{b'^2}$.
d. $\frac{b}{a}+\frac{a}{b}=\frac{b'}{a'}+\frac{a'}{b'}$.
e. None of the above.

tifr2014 geometry cartesian-coordinates

8.6.7 Cartesian Coordinates: TIFR2015-A-13

https://gateoverflow.in/29586

Imagine the first quadrant of the real plane as consisting of unit squares. A typical square has 4 corners: $(i,j),(i+1,j),(i+1,j+1)$,and $(i,j+1)$, where (i,j) is a pair of non-negative integers. Suppose a line segment l connecting $(0,0)$ to $(90,1100)$ is drawn. We say that l passes through a unit square if it passes through a point in the interior of the square. How many unit squares does l pass through?

a. $98,990$
b. $9,900$
c. $1,190$
d. $1,180$
e. $1,010$

tifr2015 numerical-ability cartesian-coordinates

8.7 Circle (2)

8.7.1 Circle: GATE2018-GA-3

https://gateoverflow.in/204064

The area of a square is d. What is the area of the circle which has the diagonal of the square as its diameter?

A. πd
B. πd^2
C. $\frac{1}{4}\pi d^2$
D. $\frac{1}{2}\pi d$

gate2018 numerical-ability geometry circle normal

8.7.2 Circle: TIFR2011-A-18

https://gateoverflow.in/20255

The equation of the tangent to the unit circle at point ($\cos\alpha, \sin\alpha$) is

a. $x\cos\alpha - y\sin\alpha = 1$
b. $x\sin\alpha - y\cos\alpha = 1$
c. $x\cos\alpha + y\sin\alpha = 1$
d. $x\sin\alpha - y\cos\alpha = 1$
e. None of the above.

tifr2011 numerical-ability geometry circle

8.8 Clock Time (8)

8.8.1 Clock Time: GATE2014-2-GA-10

https://gateoverflow.in/1952

At what time between 6 a. m. and 7 a. m. will the minute hand and hour hand of a clock make an angle closest to 60°?

A. $6:22$ a.m.
B. $6:27$ a.m.
C. $6:38$ a.m.
D. $6:45$ a.m.

gate2014-2 numerical-ability normal clock-time

8.8.2 Clock Time: GATE2016 EC-2: GA-8

https://gateoverflow.in/108724

Two and quarter hours back, when seen in a mirror, the reflection of a wall clock without number markings seemed to show $1:30$. What is the actual current time shown by the clock?

A. $8:15$
B. $11:15$
C. $12:15$
D. $12:45$

gate2016-ec-2 clock-time

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8.8.3 Clock Time: GATE2018 CE-2: GA-7

https://gateoverflow.in/313387

A faulty wall clock is known to gain 15 minutes every 24 hours. It is synchronized to the correct time at 9 AM on 11th July. What will be the correct time to the nearest minute when the clock shows 2 PM on 15th July of the same year?

A. $12:45$ PM B. $12:58$ PM C. $1:00$ PM D. $2:00$ PM

gate2018-ce-2 general-aptitude numerical-ability clock-time normal

8.8.4 Clock Time: GATE2019 EC: GA-9

https://gateoverflow.in/313527

Two design consultants, P and Q, started working from 8 AM for a client. The client budgeted a total of USD 3000 for the consultants. P stopped working when the hour hand moved by 210 degrees on the clock. Q stopped working when the hour hand moved by 240 degrees. P took two tea breaks of 15 minutes each during her shift, but took no lunch break. Q took only one lunch break for 20 minutes, but no tea breaks. The market rate for consultants is USD 200 per hour and breaks are not paid. After paying the consultants, the client shall have USD _____ remaining in the budget.

A. 000.00 B. 166.67 C. 300.00 D. 433.33

gate2019-ec general-aptitude numerical-ability clock-time

8.8.5 Clock Time: GATE2019 ME-1: GA-3

https://gateoverflow.in/313597

A worker noticed that the hour hand on the factory clock had moved by 225 degrees during her stay at the factory. For how long did she stay in the factory?

A. 3.75 hours B. 4 hours and 15 mins C. 8.5 hours D. 7.5 hours

gate2019-me-1 general-aptitude numerical-ability clock-time

8.8.6 Clock Time: TIFR2010-A-2

https://gateoverflow.in/18206

The hour hand and the minute hands of a clock meet at noon and again at mid-night. In between they meet N times, where N is.:

a. 6 b. 11 c. 12 d. 13 e. None of the above.

tifr2010 numerical-ability clock-time

8.8.7 Clock Time: TIFR2013-A-20

https://gateoverflow.in/25502

Consider a well functioning clock where the hour, minute and the seconds needles are exactly at zero. How much time later will the minutes needle be exactly one minute ahead ($1/60$ th of the circumference) of the hours needle and the seconds needle again exactly at zero?

Hint: When the desired event happens both the hour needle and the minute needle have moved an integer multiple of $1/60$ th of the circumference.

a. 144 minutes b. 66 minutes c. 96 minutes d. 72 minutes e. 132 minutes

tifr2013 numerical-ability clock-time

8.8.8 Clock Time: TIFR2014-A-10

https://gateoverflow.in/25998

A person went out between 4pm and 5pm to chat with her friend and returned between 5pm and 6pm. On her return, she found that the hour-hand and the minute-hand of her (well-functioning) clock had just exchanged their positions with respect to their earlier positions at the time of her leaving. The person must have gone out to chat at

a. Twenty five minutes past 4pm.

b. Twenty six and $\frac{122}{143}$ minutes past 4pm.

c. Twenty seven and $\frac{1}{3}$ minutes past 4pm.

d. Twenty eight minutes past 4pm.

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e. None of the above.

tifr2014 numerical-ability clock-time

8.9 Complex Number (1)

8.9.1 Complex Number: TIFR2011-A-13

https://gateoverflow.in/20223

If $z = \frac{\sqrt{3}-i}{2}$ and $\left(z^{95}+i^{67}\right)^{97} = z^n$, then the smallest value of n is?

a. 1 b. 10 c. 11 d. 12 e. None of the above.

tifr2011 numerical-ability complex-number

8.10 Conditional Probability (4)

8.10.1 Conditional Probability: GATE2012-63

https://gateoverflow.in/2211

An automobile plant contracted to buy shock absorbers from two suppliers X and Y. X supplies 60% and Y supplies 40% of the shock absorbers. All shock absorbers are subjected to a quality test. The ones that pass the quality test are considered reliable. Of $X's$ shock absorbers, 96% are reliable. Of $Y's$ shock absorbers, 72% are reliable.

The probability that a randomly chosen shock absorber, which is found to be reliable, is made by Y is

A. 0.288 B. 0.334 C. 0.667 D. 0.720

gate2012 numerical-ability probability normal conditional-probability

8.10.2 Conditional Probability: GATE2013 AE: GA-10

https://gateoverflow.in/40251

In a factory, two machines $M1$ and $M2$ manufacture 60% and 40% of the autocomponents respectively. Out of the total production, 2% of $M1$ and 3% of $M2$ are found to be defective. If a randomly drawn autocomponent from the combined lot is found defective, what is the probability that it was manufactured by $M2$?

A. 0.35 B. 0.45 C. 0.5 D. 0.4

gate2013-ae numerical-ability conditional-probability

8.10.3 Conditional Probability: GATE2014 AG: GA-10

https://gateoverflow.in/41674

10% of the population in a town is HIV^+. A new diagnostic kit for HIV detection is available; this kit correctly identifies HIV^+ individuals 95% of the time, and HIV^- individuals 89% of the time. A particular patient is tested using this kit and is found to be positive. The probability that the individual is actually positive is _____.

gate2014-ag numerical-ability probability conditional-probability normal numerical-answers

8.10.4 Conditional Probability: GATE2015 ME-3: GA-10

https://gateoverflow.in/40174

A coin is tossed thrice. Let X be the event that head occurs in each of the first two tosses. Let Y be the event that a tail occurs on the third toss. Let Z be the event that two tails occur in three tosses.
Based on the above information, which one of the following statements is TRUE?

A. X and Y are not independent
B. Y and Z are dependent
C. Y and Z are independent
D. X and Z are independent

gate2015-me-3 conditional-probability probability numerical-ability

8.11 Contour Plots (3)

8.11.1 Contour Plots: GATE2017 EC-1: GA-10

https://gateoverflow.in/313596

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.

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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

gate2017-ec-1 general-aptitude numerical-ability data-interpretation contour-plots

8.11.2 Contour Plots: GATE2017 EC-2: GA-10

https://gateoverflow.in/313513

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.

Which of the following is the steepest path leaving from P?

A. P to Q B. P to R C. P to S D. P to T

gate2017-ec-2 general-aptitude numerical-ability data-interpretation contour-plots

8.11.3 Contour Plots: GATE2017-2-GA-10

https://gateoverflow.in/118424

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

gate2017-2 numerical-ability data-interpretation normal contour-plots

8.12 Cost Market Price (5)

8.12.1 Cost Market Price: GATE2011-63

https://gateoverflow.in/2173

The variable cost (V) of manufacturing a product varies according to the equation $V = 4q$, where q is the quantity produced. The fixed cost (F) of production of same product reduces with q according to the equation $F = \frac{100}{q}$. How many units should be produced to minimize the total cost $(V + F)$?

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A. 5 B. 4 C. 7 D. 6

gate2011 numerical-ability cost-market-price normal

8.12.2 Cost Market Price: GATE2012-56

https://gateoverflow.in/2193

The cost function for a product in a firm is given by $5q^2$, where q is the amount of production. The firm can sell the product at a market price of ₹50 per unit. The number of units to be produced by the firm such that the profit is maximized is

A. 5 B. 10 C. 15 D. 25

gate2012 numerical-ability cost-market-price normal

8.12.3 Cost Market Price: GATE2014 AE: GA-5

https://gateoverflow.in/40304

A foundry has a fixed daily cost of $\text{Rs } 50,000$ whenever it operates and a variable cost of $\text{RS } 800Q$,where Q is the daily production in tonnes. What is the cost of production in Rs per tonne for a daily production of 100 tonnes.

gate2014-ae numerical-ability cost-market-price numerical-answers

8.12.4 Cost Market Price: GATE2019-GA-4

https://gateoverflow.in/302869

Ten friends planned to share equally the cost of buying a gift for their teacher. When two of them decided not to contribute, each of the other friends had to pay Rs. 150 more. The cost of the gift was Rs. ____

A. 666 B. 3000 C. 6000 D. 12000

gate2019 general-aptitude numerical-ability cost-market-price

8.12.5 Cost Market Price: TIFR2012-A-6

https://gateoverflow.in/21002

A certain pair of used shoes can be repaired for $Rs.1250$ and will last for 1 year. A pair of the same kind of shoes can be purchased new for $Rs.2800$ and will last for 2 years. The average cost per year of the new shoes is what percent greater than the cost of repairing the used shoes?

a. 5 b. 12 c. 15 d. 3 e. 24

tifr2012 cost-market-price

8.13 Counting (3)

8.13.1 Counting: GATE2017 EC-1: GA-9

https://gateoverflow.in/313518

There are 3 Indians and 3 Chinese in a group of 6 people. How many subgroups of this group can we choose so that every subgroup has at least one Indian?

A. 56 B. 52 C. 48 D. 44

gate2017-ec-1 general-aptitude numerical-ability counting

8.13.2 Counting: GATE2018 CH: GA-8

https://gateoverflow.in/205090

To pass a test, a candidate needs to answer at least 2 out of 3 questions correctly. A total of $6,30,000$ candidates appeared for the test. Question A was correctly answered by $3,30,000$ candidates. Question B was answered correctly by $2,50,000$ candidates. Question C was answered correctly by $2,60,000$ candidates. Both questions A and B were answered correctly by $1,00,000$ candidates. Both questions B and C were answered correctly by $90,000$ candidates. Both questions A and C were answered correctly by $80,000$ candidates. If the number of students answering all questions correctly is the same as the number answering none, how many candidates failed to clear the test?

A. $30,000$ B. $2,70,000$ C. $3,90,000$ D. $4,20,000$

gate2018-ch general-aptitude numerical-ability counting

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8.13.3 Counting: GATE2018 EE: GA-6

https://gateoverflow.in/205186

An e-mail password must contain three characters. The password has to contain one numeral from 0 to 9, one upper case and one lower case character from the English alphabet. How many distinct passwords are possible?

A. $6,760$ B. $13,520$ C. $40,560$ D. $1,05,456$

gate2018-ee general-aptitude numerical-ability normal permutation-and-combination counting

8.14 Data Interpretation (13)

8.14.1 Data Interpretation: GATE2011 GG: GA-9

https://gateoverflow.in/40210

The quality of services delivered by a company consists of six factors as shown below in the radar diagram. The dots in the figure indicate the score for each factor on a scale of 0 to 10. The standardized coefficient for each factor is given in the parentheses. The contribution of each factor to the overall service quality is directly proportional to the factor score and its standardized coefficient.

The lowest contribution among all the above factors to the overall quality of services delivered by the company is

A. 10% B. 20% C. 24% D. 40%

gate2011-gg difficult numerical-ability data-interpretation

8.14.2 Data Interpretation: GATE2011-62

https://gateoverflow.in/2172

P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure below:

A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

A. P B. Q C. R D. S

gate2011 numerical-ability data-interpretation normal

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8.14.3 Data Interpretation: GATE2014-2-GA-9

https://gateoverflow.in/1951

The ratio of male to female students in a college for five years is plotted in the following line graph. If the number of female students doubled in 2009, by what percent did the number of male students increase in 2009?

gate2014-2 numerical-ability data-interpretation numerical-answers normal

8.14.4 Data Interpretation: GATE2015-3-GA-10

https://gateoverflow.in/8389

The exports and imports (in crores of $Rs.$) of a country from the year 2000 to 2007 are given in the following bar chart. In which year is the combined percentage increase in imports and exports the highest?

gate2015-3 numerical-ability data-interpretation normal numerical-answers

8.14.5 Data Interpretation: GATE2016-1-GA06

https://gateoverflow.in/39616

A shaving set company sells 4 different types of razors- Elegance, Smooth, Soft and Executive.

Elegance sells at Rs. 48, Smooth at Rs. 63, Soft at Rs. 78 and Executive at Rs. 173 per piece. The table below shows the numbers of each razor sold in each quarter of a year.

Quarter/Product	Elegance	Smooth	Soft	Executive
Q1	27300	20009	17602	9999
Q2	25222	19392	18445	8942
Q3	28976	22429	19544	10234
Q4	21012	18229	16595	10109

Which product contributes the greatest fraction to the revenue of the company in that year?

A. Elegance B. Executive C. Smooth D. Soft

gate2016-1 numerical-ability data-interpretation easy

8.14.6 Data Interpretation: GATE2016-2-GA-10

https://gateoverflow.in/39535

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A. $f(x) = 1 - |x - 1|$
B. $f(x) = 1 + |x - 1|$
C. $f(x) = 2 - |x - 1|$
D. $f(x) = 2 + |x - 1|$

gate2016-2 numerical-ability data-interpretation normal

8.14.7 Data Interpretation: GATE2017-1-GA-10

https://gateoverflow.in/118413

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 get submerged?

A. P, Q
B. P, Q, T
C. R, S, T
D. Q, R, S

gate2017-1 general-aptitude numerical-ability data-interpretation normal

8.14.8 Data Interpretation: GATE2018 CE-1: GA-5

https://gateoverflow.in/313271

The temperature T in a room varies as a function of the outside temperature T_0 and the number of persons in the room p, according to the relation $T = K(\theta p + T_0)$, where θ and K are constants. What would be the value of θ given the following data?

T_0	**p**	**T**
25	2	32.4
30	5	42.0

A. 0.8
B. 1.0
C. 2.0
D. 10.0

gate2018-ce-1 general-aptitude numerical-ability data-interpretation

8.14.9 Data Interpretation: GATE2018 CH: GA-10

https://gateoverflow.in/205091

In a detailed study of annual crow births in India, it was found that there was relatively no growth during the period 2002 to 2004 and a sudden spike from 2004 to 2005. In another unrelated study, it was found that the revenue from cracker sales in India which remained fairly flat from 2002 to 2004, saw a sudden spike in 2005 before declining again in 2006. The solid line in the graph below refers to annual sale of crackers and the dashed line refers to the annual crow births in India. Choose the most appropriate inference from the above data.

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A. There is a strong correlation between crow birth and cracker sales.
B. Cracker usage increases crow birth rate.
C. If cracker sale declines, crow birth will decline.
D. Increased birth rate of crows will cause an increase in the sale of crackers.

gate2018-ch general-aptitude numerical-ability data-interpretation

8.14.10 Data Interpretation: GATE2018 EC: GA-9

https://gateoverflow.in/205213

A cab was involved in a hit and run accident at night. You are given the following data about the cabs in the city and the accident.

i. 85% of cabs in the city are green and the remaining cabs are blue.
ii. A witness identified the cab involved in the accident as blue.
iii. It is known that a witness can correctly identify the cab colour only 80% of the time.

Which of the following options is closest to the probability that the accident was caused by a blue cab?

A. 12% B. 15% C. 41% D. 80%

gate2018-ec general-aptitude numerical-ability normal data-interpretation

8.14.11 Data Interpretation: GATE2019 EC: GA-10

https://gateoverflow.in/313539

Five people P, Q, R, S and T work in a bank. P and Q don't like each other but have to share an office till T gets a promotion and moves to the big office next to the garden. R, who is currently sharing an office with T wants to move to the adjacent office with S, the handsome new intern. Given the floor plan, what is the current location of Q, R and T?
(O=Office, WR=Washroom)

A.

B.

C.

D.

gate2019-ec general-aptitude data-interpretation

8.14.12 Data Interpretation: GATE2019 ME-1: GA-9

https://gateoverflow.in/313600

A firm hires employees at five different skill levels P, Q, R, S, T. The shares of employment at these skills

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levels of total employment in 2010 is given in the pie chart as shown. There were a total of 600 employees in 2010 and the total employment increased by 15% from 2010 to 2016. The total employment at skill levels P, Q and R remained unchanged during this period. If the employment at skill level S increased by 40% from 2010 to 2016, how many employees were there at skill level T in 2016?

A. 30 B. 35 C. 60 D. 72

gate2019-me-1 general-aptitude numerical-ability data-interpretation

8.14.13 Data Interpretation: GATE2019 ME-2: GA-9

https://gateoverflow.in/313581

Mola is a digital platform for taxis in a city. It offers three types of rides – Pool, Mini and Prime. The table below presents the number of rides for the past four months. The platform earns one US dollar per ride. What is the percentage share of the revenue contributed by Prime to the total revenues of Mola, for the entire duration?

Type	Month			
	January	February	March	April
Pool	170	320	215	190
Mini	110	220	180	170
Prime	75	180	120	90

A. 16.24 B. 23.97 C. 25.86 D. 38.74

gate2019-me-2 general-aptitude numerical-ability data-interpretation

8.15 Direction Sense (7)

8.15.1 Direction Sense: GATE2014 AG: GA-9

https://gateoverflow.in/41673

X is 1 km northeast of Y. Y is 1 km southeast of Z. W is 1 km west of Z. P is 1 km south of W. Q is 1 km east of P. What is the distance between X and Q in km?

A. 1 B. $\sqrt{2}$ C. $\sqrt{3}$ D. 2

gate2014-ag numerical-ability direction-sense normal

8.15.2 Direction Sense: GATE2015 CE-2: GA-4

https://gateoverflow.in/40179

Mr. Vivek walks 6 meters North-east, then turns and walks 6 meters South-east, both at 60 degrees to east. He further moves 2 meters South and 4 meters West. What is the straight distance in meters between the point he started from and the point he finally reached?

A. $2\sqrt{2}$ B. 2 C. $\sqrt{2}$ D. $1/\sqrt{2}$

gate2015-ce-2 numerical-ability general-aptitude direction-sense

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8.15.3 Direction Sense: GATE2015-2-GA-7

https://gateoverflow.in/8036

Four branches of a company are located at M, N, O and P. M is north of N at a distance of $4km$; P is south of O at a distance of $2\ km$; N is southeast of O by $1km$. What is the distance between M and P in km?

A. 5.34 B. 6.74 C. 28.5 D. 45.49

gate2015-2 numerical-ability normal direction-sense

8.15.4 Direction Sense: GATE2016 EC-2: GA-9

https://gateoverflow.in/108726

M and N start from the same location. M travels 10 km East and then 10 km North-East. N travels 5 km South and then 4 km South-East. What is the shortest distance (in km) between M and N at the end of their travel?

A. 18.60 B. 22.50 C. 20.61 D. 25.00

gate2016-ec-2 direction-sense numerical-ability

8.15.5 Direction Sense: GATE2017 EC-2: GA-4

https://gateoverflow.in/313508

Fatima starts from point P, goes North for 3 km, and then East for 4 km to reach point Q. She then turns to face point P and goes 15 km in that direction. She then goes North for 6 km. How far is she from point P, and in which direction should she go to reach point P?

A. 8 km, East B. 12 km, North C. 6k m, East D. 10 km, North

gate2017-ec-2 general-aptitude numerical-ability direction-sense

8.15.6 Direction Sense: GATE2017-2-GA-3

https://gateoverflow.in/118417

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

gate2017-2 numerical-ability direction-sense normal

8.15.7 Direction Sense: GATE2019-GA-10

https://gateoverflow.in/302863

Three of the five students are allocated to a hostel put in special requests to the warden, Given the floor plan of the vacant rooms, select the allocation plan that will accommodate all their requests.

Request by X: Due to pollen allergy, I want to avoid a wing next to the garden.

Request by Y: I want to live as far from the washrooms as possible, since I am very mich sensitive to smell.

Request by Z: I believe in Vaastu and so I want to stay in South-West wing.

The shaded rooms are already occupied. WR is washroom

A.

B.

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C.

D.

gate2019 general-aptitude numerical-ability direction-sense

8.16 Factors (7)

8.16.1 Factors: GATE2010 MN: GA-8

https://gateoverflow.in/312017

Consider the set of integers $\{1, 2, 3, \ldots, 500\}$. The number of integers that is divisible by neither 3 nor 4 is :

A. 1668 B. 2084 C. 2500 D. 2916

general-aptitude numerical-ability gate2010-mn factors

8.16.2 Factors: GATE2013-62

https://gateoverflow.in/1566

Out of all the 2-digit integers between 1 and 100, a 2-digit number has to be selected at random. What is the probability that the selected number is not divisible by 7 ?

A. $\left(\frac{13}{90}\right)$ B. $\left(\frac{12}{90}\right)$ C. $\left(\frac{78}{90}\right)$ D. $\left(\frac{77}{90}\right)$

gate2013 numerical-ability easy probability factors

8.16.3 Factors: GATE2014-2-GA-4

https://gateoverflow.in/1941

What is the average of all multiples of 10 from 2 to 198?

A. 90 B. 100 C. 110 D. 120

gate2014-2 numerical-ability easy numerical-computation factors

8.16.4 Factors: GATE2018-GA-4

https://gateoverflow.in/204065

What would be the smallest natural number which when divided either by 20 or by 42 or by 76 leaves a remainder of 7 in each case?

A. 3047 B. 6047 C. 7987 D. 63847

gate2018 numerical-ability factors

8.16.5 Factors: TIFR2010-A-20

https://gateoverflow.in/18500

How many integers from 1 to 1000 are divisible by 30 but not by 16?

A. 29 B. 31 C. 32 D. 33 E. 25

tifr2010 numerical-ability factors

8.16.6 Factors: TIFR2011-A-15

https://gateoverflow.in/20226

The exponent of 3 in the product $100!$ is

a. 27 b. 33 c. 44 d. 48 e. None of the above.

tifr2011 numerical-ability factors tricky

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8.16.7 Factors: TIFR2013-A-12

https://gateoverflow.in/25434

Among numbers 1 to 1000 how many are divisible by 3 or 7?

a. 333 b. 142 c. 475 d. 428 e. None of the above.

tifr2013 numerical-ability factors normal

8.17 Family Relationships (3)

8.17.1 Family Relationships: GATE2016 EC-3: GA-3

https://gateoverflow.in/110827

M has a son **Q** and a daughter **R**. He has no other children. **E** is the mother of **P** and daughter-inlaw 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**.

gate2016-ec-3 family-relationships logical-reasoning

8.17.2 Family Relationships: GATE2017 EC-2: GA-7

https://gateoverflow.in/313510

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

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

gate2017-ec-2 general-aptitude logical-reasoning family-relationships

8.17.3 Family Relationships: GATE2019 CE-1: GA-10

https://gateoverflow.in/313448

P, Q, R, S and T are related and belong to the same family. P is the brother of S, Q is the wife of P. R and T are the children of the siblings P and S respectively. Which one of the following statement is necessarily FALSE?

A. S is the aunt of R
B. S is the aunt of T
C. S is the sister-in-law of Q
D. S is the brother of P

gate2019-ce-1 general-aptitude logical-reasoning family-relationships

8.18 Fractions (4)

8.18.1 Fractions: GATE2016 EC-1: GA-9

https://gateoverflow.in/108093

If $q^{-a} = \frac{1}{r}$ and $r^{-b} = \frac{1}{s}$ and $s^{-c} = \frac{1}{q}$, the value of abc is _____.

A. $(rqs)^{-1}$ B. 0 C. 1 D. $r+q+s$

gate2016-ec-1 numerical-ability fractions

8.18.2 Fractions: GATE2018-GA-6

https://gateoverflow.in/204067

In appreciation of the social improvements completed in a town, a wealthy philanthropist decided to gift $Rs\ 750$ to each male senior citizen in the town and $Rs\ 1000$ to each female senior citizen. Altogether, there were 300 senior citizens eligible for this gift. However, only $\frac{8}{9}^{th}$ of the eligible men and $\frac{2}{3}^{rd}$ of the eligible women claimed the gift.How much money (in Rupees) did the philanthropist give away in total?

A. $1,50,000$ B. $2,00,000$ C. $1,75,000$ D. $1,51,000$

gate2018 numerical-ability fractions normal

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8.18.3 Fractions: TIFR2014-A-11

https://gateoverflow.in/26329

A large community practices birth control in the following peculiar fashion. Each set of parents continues having children until a son is born; then they stop. What is the ratio of boys to girls in the community if, in the absence of birth control, 51% of the babies are born male?

a. $51:49$ b. $1:1$ c. $49:51$ d. $51:98$ e. $98:51$

tifr2014 numerical-ability fractions tricky

8.18.4 Fractions: TIFR2017-A-1

https://gateoverflow.in/94931

A suitcase weighs one kilogram plus half of its weight. How much does the suitcase weigh?

A. 1.3333... kilograms
B. 1.5 kilograms
C. 1.666... kilograms
D. 2 kilograms
E. cannot be determined from the given data

tifr2017 numerical-ability fractions normal

8.19 Functions (7)

8.19.1 Functions: GATE2010 MN: GA-10

https://gateoverflow.in/312019

Given the following four functions $f_1(n) = n^{100}$, $f_2(n) = (1.2)^n$, $f_3(n) = 2^{n/2}$, $f_4(n) = 3^{n/3}$ which function will have the largest value for sufficiently large values of n $(i.e.\ n \rightarrow \infty)$?

A. f_4 B. f_3 C. f_2 D. f_1

general-aptitude numerical-ability gate2010-mn functions

8.19.2 Functions: GATE2012 AR: GA-7

https://gateoverflow.in/40228

Let $f(x) = x - [x]$, where $x \geq 0$ and $[x]$ is the greatest integer not larger than x. Then $f(x)$ is a

A. monotonically increasing function
B. monotonically decreasing function
C. linearly increasing function between two integers
D. linearly decreasing function between two integers

gate2012-ar numerical-ability functions normal

8.19.3 Functions: GATE2015 EC-3: GA-5

https://gateoverflow.in/39518

If $x > y > 1$, which of the following must be true ?

i. $\ln x > \ln y$
ii. $e^x > e^y$
iii. $y^x > x^y$
iv. $\cos x > \cos y$

A. (i) and (ii) B. (i) and (iii) C. (iii) and (iv) D. (ii) and (iv)

gate2015-ec-3 general-aptitude numerical-ability functions

8.19.4 Functions: GATE2015-3-GA-5

https://gateoverflow.in/8303

A function $f(x)$ is linear and has a value of 29 at $x = -2$ and 39 at $x = 3$. Find its value at $x = 5$.

A. 59 B. 45 C. 43 D. 35

gate2015-3 numerical-ability normal functions

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8.19.5 Functions: GATE2015-3-GA-8

https://gateoverflow.in/8385

Choose the most appropriate equation for the function drawn as thick line, in the plot below.

A. $x = y - |y|$ B. $x = -(y - |y|)$ C. $x = y + |y|$ D. $x = -(y + |y|)$

gate2015-3 numerical-ability normal functions

8.19.6 Functions: GATE2016 ME-2: GA-10

https://gateoverflow.in/108309

Which of the following curves represents the function $y = \ln\left(|e^{[|\sin(|x|)|]}\right)$ for $|x| < 2\pi$? Here, x represents the abscissa and y represents the ordinate.

A.
B.
C.
D.

gate2016-me-2 functions numerical-ability

8.19.7 Functions: GATE2018 EE: GA-5

https://gateoverflow.in/205182

Functions $F(a, b)$ and $G(a, b)$ are defined as follows:
$F(a, b) = (a - b)^2$ and $G(a, b) = | a - b|$, where $|x|$ represents the absolute value of x.

What would be the value of $G(F(1, 3), G(1, 3))$?

A. 2 B. 4 C. 6 D. 36

gate2018-ee general-aptitude numerical-ability easy functions

8.20 Geometric Series (1)

8.20.1 Geometric Series: GATE2018 EC: GA-4

https://gateoverflow.in/205208

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

A. 2 B. $\frac{7}{4}$ C. $\frac{3}{2}$ D. $\frac{4}{3}$

gate2018-ec general-aptitude numerical-ability number-series geometric-series

8.21 Geometry (32)

8.21.1 Geometry: GATE2014-1-GA-10

https://gateoverflow.in/778

When a point inside of a tetrahedron (a solid with four triangular surfaces) is connected by straight lines to its corners, how many (new) internal planes are created with these lines?

gate2014-1 numerical-ability geometry permutation-and-combination normal numerical-answers

8.21.2 Geometry: GATE2015 EC-3: GA-8

https://gateoverflow.in/39521

From a circular sheet of paper of radius 30 cm, a sector of 10% area is removed. If the remaining part is used to make a conical surface, then the ratio of the radius and height of the cone is _____

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gate2015-ec-3 geometry numerical-ability normal

8.21.3 Geometry: GATE2015-2-GA-8

https://gateoverflow.in/8039

In a triangle PQR, PS is the angle bisector of $\angle QPR$ and $\angle QPS = 60^\circ$. What is the length of PS ?

A. $\left(\frac{(q+r)}{qr}\right)$ B. $\left(\frac{qr}{q+r}\right)$ C. $\sqrt{(q^2+r^2)}$ D. $\left(\frac{(q+r)^2}{qr}\right)$

gate2015-2 numerical-ability geometry difficult

8.21.4 Geometry: GATE2016 CE-2: GA-9

https://gateoverflow.in/110921

A square pyramid has a base perimeter x, and the slant height is half of the perimeter. What is the lateral surface area of the pyramid

A. x^2 B. $0.75x^2$ C. $0.50x^2$ D. $0.25x^2$

gate2016-ce-2 geometry numerical-ability

8.21.5 Geometry: GATE2016 EC-2: GA-10

https://gateoverflow.in/108729

A wire of length 340 mm is to be cut into two parts. One of the parts is to be made into a square and the other into a rectangle where sides are in the ratio of $1:2$. What is the length of the side of the square (in mm) such that the combined area of the square and the rectangle is a **MINIMUM**?

A. 30 B. 40 C. 120 D. 180

gate2016-ec-2 geometry numerical-ability

8.21.6 Geometry: GATE2016 ME-2: GA-5

https://gateoverflow.in/108289

A window is made up of a square portion and an equilateral triangle portion above it. The base of the triangular portion coincides with the upper side of the square. If the perimeter of the window is 6 m, the area of the window in m^2 is _____.

A. 1.43 B. 2.06 C. 2.68 D. 2.88

gate2016-me-2 numerical-ability geometry

8.21.7 Geometry: GATE2016-1-GA05

https://gateoverflow.in/39610

A cube is built using 64 cubic blocks of side one unit. After it is built, one cubic block is removed from every corner of the cube. The resulting surface area of the body (in square units) after the removal is _____.

a. 56 b. 64 c. 72 d. 96

gate2016-1 numerical-ability geometry normal

8.21.8 Geometry: GATE2017 ME-1: GA-3

https://gateoverflow.in/313658

A right-angled cone (with base radius 5 cm and height 12 cm), as shown in the figure below, is rolled on the ground keeping the point P fixed until the point Q (at the base of the cone, as shown) touches the ground again.

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By what angle (in radians) about P does the cone travel?

A. $\frac{5\pi}{12}$ B. $\frac{5\pi}{24}$ C. $\frac{24\pi}{5}$ D. $\frac{10\pi}{13}$

gate2017-me-1 general-aptitude numerical-ability geometry

8.21.9 Geometry: GATE2017 ME-1: GA-8

https://gateoverflow.in/313661

Let S_1 be the plane figure consisting of the points (x, y) given by the inequalities $|x-1| \leq 2$ and $|y+2| \leq 3$. Let S_2 be the plane figure given by the inequalities $x - y \geq -2$, $y \geq 1$, and $x \leq 3$. Let S be the union of S_1 and S_2. The area of S is.

A. 26 B. 28 C. 32 D. 34

gate2017-me-1 general-aptitude numerical-ability geometry

8.21.10 Geometry: GATE2018 CE-1: GA-4

https://gateoverflow.in/313259

Tower A is 90 m tall and tower B is 140 m tall. They are 100 m apart. A horizontal skywalk connects the floors at 70 m in both the towers. If a taut rope connects the top of tower A to the bottom tower B, at what distance (in meters) from tower A will the rope intersect the skywalk?

gate2018-ce-1 general-aptitude numerical-ability geometry numerical-answers

8.21.11 Geometry: GATE2018 CH: GA-4

https://gateoverflow.in/205085

The area of an equilateral triangle is $\sqrt{3}$. What is the perimeter of the triangle?

A. 2 B. 4 C. 6 D. 8

gate2018-ch general-aptitude numerical-ability easy geometry

8.21.12 Geometry: GATE2018 CH: GA-5

https://gateoverflow.in/205084

Arrange the following three-dimensional objects in the descending order of their volumes:

i. A cuboid with dimensions 10 cm, 8 cm and 6 cm
ii. A cube of side 8 cm
iii. A cylinder with base radius 7 cm and height 7 cm
iv. A sphere of radius 7 cm

A. i), ii), iii), iv)
B. ii), i), iv), iii)
C. iii), ii), i), iv)
D. iv), iii), ii), i)

gate2018-ch numerical-ability normal geometry

8.21.13 Geometry: GATE2018 CH: GA-7

https://gateoverflow.in/205092

A set of 4 parallel lines intersect with another set of 5 parallel lines. How many parallelograms are formed?

A. 20 B. 48 C. 60 D. 72

gate2018-ch general-aptitude numerical-ability easy geometry

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8.21.14 Geometry: GATE2018 EC: GA-3

https://gateoverflow.in/205207

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

gate2018-ec general-aptitude numerical-ability easy geometry

8.21.15 Geometry: GATE2018 EC: GA-5

https://gateoverflow.in/205209

A $1.5m$ tall person is standing at a distance of $3m$ from a lamp post. The light from the lamp at the top of the post casts her shadow. The length of the shadow is twice her height. What is the height of the lamp post in meters?

A. 1.5 B. 3 C. 4.5 D. 6

gate2018-ec general-aptitude numerical-ability normal geometry

8.21.16 Geometry: GATE2018 ME-1: GA-4

https://gateoverflow.in/313645

A rectangle becomes a square when its length and breadth are reduced by 10 m and 5 m, respectively. During this process, the rectangle loses 650 m^2 of area. What is the area of the original rectangle in square meters?

A. 1125 B. 2250 C. 2924 D. 4500

gate2018-me-1 general-aptitude numerical-ability geometry

8.21.17 Geometry: GATE2018 ME-2: GA-4

https://gateoverflow.in/313636

The perimeters of a circle, a square and an equilateral triangle are equal. Which one of the following statements is true?

A. The circle has the largest area
B. The square has the largest area
C. The equilateral triangle has the largest area
D. All the three shapes have the same area

gate2018-me-2 general-aptitude numerical-ability geometry easy

8.21.18 Geometry: GATE2018 ME-2: GA-7

https://gateoverflow.in/313613

A wire would enclose an area of 1936 m^2, if it is bent to a square. The wire is cut into two pieces. The longer piece is thrice as long as the shorter piece. The long and the short pieces are bent into a square and a circle, respectively. Which of the following choices is closest to the sum of the areas enclosed by the two pieces in square meters?

A. 1096 B. 1111 C. 1243 D. 2486

gate2018-me-2 general-aptitude numerical-ability geometry

8.21.19 Geometry: GATE2018-GA-9

https://gateoverflow.in/204070

In the figure below, $\angle DEC + \angle BFC$ is equal to _____

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A. $\angle BCD - \angle BAD$
B. $\angle BAD + \angle BCF$
C. $\angle BAD + \angle BCD$
D. $\angle CBA + \angle ADC$

gate2018 numerical-ability geometry normal

8.21.20 Geometry: GATE2019 CE-1: GA-3

https://gateoverflow.in/313438

On a horizontal ground, the base of a straight ladder is 6 m away from the base of a vertical pole. The ladder makes an angle of 45° to the horizontal. If the ladder is resting at a point located at one-fifth of the height of the pole from the bottom, the height of the pole is _____ meters.

A. 15
B. 25
C. 30
D. 35

gate2019-ce-1 general-aptitude numerical-ability geometry

8.21.21 Geometry: GATE2019 CE-1: GA-9

https://gateoverflow.in/313441

A square has side 5 cm smaller than the sides of a second square. The area of the larger square is four times the area of the smaller square. The side of the larger square is _____ cm.

A. 18.50
B. 15.10
C. 10.00
D. 8.50

gate2019-ce-1 general-aptitude numerical-ability geometry

8.21.22 Geometry: GATE2019 CE-2: GA-3

https://gateoverflow.in/313370

Suresh wanted to lay a new carpet in his new mansion with an area of 70×55 sq.mts. However an area of 550 sq. mts. had to be left out for flower pots. If the cost carpet is Rs. 50 sq. mts. how much money (in Rs.) will be spent by Suresh for the carpet now?

A. $Rs.1,65,000$
B. $Rs.1,92,500$
C. $Rs.2,75,000$
D. $Rs.1,27,500$

gate2019-ce-2 general-aptitude numerical-ability geometry

8.21.23 Geometry: GATE2019 CE-2: GA-4

https://gateoverflow.in/313371

A retaining wall with measurements 30 m $\times 12$ m $\times 6$ m was constructed with bricks of dimensions 8 cm $\times 6$ cm $\times 6$ cm. If 60% of the wall consists of bricks, the number of bricks used for the construction is _____ lakhs.

A. 30
B. 40
C. 45
D. 75

gate2019-ce-2 general-aptitude numerical-ability geometry

8.21.24 Geometry: TIFR2010-A-17

https://gateoverflow.in/18493

Suppose there is a sphere with diameter **at least** 6 inches. Through this sphere we drill a hole along a diameter. The part of the sphere lost in the process of drilling the hole looks like two caps joined to a cylinder, where the cylindrical part has length 6 inches. It turns out that the volume of the remaining portion of the sphere does not depend on the diameter of the sphere. Using this fact, determine the volume of the remaining part.

a. 24π cu. inches
b. 36π cu. inches
c. 27π cu. inches
d. 32π cu. inches
e. 35π cu. inches

tifr2010 numerical-ability geometry

8.21.25 Geometry: TIFR2012-A-4

https://gateoverflow.in/20984

Let ABC be a triangle with n distinct points inside. A triangulation of ABC with respect to the n points is obtained by connecting as many points as possible, such that no more line segments can be added without intersecting other line segments. In other words ABC has been partitioned into triangles with end points at the n points or at the vertices A,B,C. For example, the following figure gives one possible triangulation of ABC with two points inside it.

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Although there are many different ways to triangulate ABC with the n points inside, the number of triangles depends only on n. In the above figure it is five. How many triangles are there in a triangulation of ABC with n points inside it?

A. $3n-1$ B. n^2+1 C. $n+3$ D. $2n+1$ E. $4n-3$

tifr2012 numerical-ability geometry

8.21.26 Geometry: TIFR2012-A-5

https://gateoverflow.in/21001

What is the maximum number of points of intersection between the diagonals of a convex octagon (8-vertex planar polygon)? Note that a polygon is said to be convex if the line segment joining any two points in its interior lies wholly in the interior of the polygon. Only points of intersection between diagonals that lie in the interior of the octagon are to be considered for this problem.

a. 55 b. 60 c. 65 d. 70 e. 75

tifr2012 numerical-ability geometry

8.21.27 Geometry: TIFR2013-A-5

https://gateoverflow.in/25387

The late painter Maqbool Fida Husain once coloured the surface of a huge hollow steel sphere, of radius 1 metre, using just two colours, Red and Blue. As was his style however, both the red and blue areas were a bunch of highly irregular disconnected regions. The late sculptor Ramkinkar Baij then tried to fit in a cube inside the sphere, the eight vertices of the cube touching only red coloured parts of the surface of the sphere. Assume $\pi = 3.14$ for solving this problem. Which of the following is true?

a. Baij is bound to succeed if the area of the red part is $10 sq. metres$;
b. Baij is bound to fail if the area of the red part is $10 sq. metres$;
c. Baij is bound to fail if the area of the red part is $11 sq. metres$;
d. Baij is bound to succeed if the area of the red part is $11 sq. metres$;
e. None of the above.

tifr2013 geometry numerical-ability

8.21.28 Geometry: TIFR2015-A-2

https://gateoverflow.in/29158

Consider a circle with a circumference of one unit length. Let $d < \frac{1}{6}$. Suppose that we independently throw two arcs, each of length d, randomly on this circumference so that each arc is uniformly distributed along the circle circumference. The arc attaches itself exactly to the circumference so that arc of length d exactly covers length d of the circumference. What can be said about the probability that the two arcs do not intersect each other?

A. It equals $(1-d)$
B. It equals $(1-3d)$
C. It equals $(1-2d)$
D. It equals 1
E. It equals $(1-d)\ (1-d)$

tifr2015 geometry

8.21.29 Geometry: TIFR2015-A-9

https://gateoverflow.in/29575

Consider a square of side length 2. We throw five points into the square. Consider the following statements:

i. There will always be three points that lie on a straight line.
ii. There will always be a line connecting a pair of points such that two points lie on one side of the line and one point on the other.

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iii. There will always be a pair of points which are at distance at most $\sqrt{2}$ from each other.

Which of the above is true:

A. (i) only. B. (ii) only. C. (iii) only. D. (ii) and (iii). E. None of the above.

tifr2015 geometry numerical-ability easy

8.21.30 Geometry: TIFR2017-A-13

https://gateoverflow.in/95307

A set of points $S \subseteq \mathbb{R}^2$ is convex if for any points $x,\ y\ \in S$, every point on the straight line joining x and y is also in S. For two sets of points $S, T \subset \mathbb{R}^2$, define the sum $S+T$ as the set of points obtained by adding a point in S to a point T. That is, $S+T := \{(x_1, x_2) \in \mathbb{R}^2 : x_1 = y_1 + z_1,\ x_2 = y_2 + z_2,\quad (y_1, y_2) \in S, (z_1, z_2) \in T\}$. Similarly, $S-T := \{(x_1, x_2) \in \mathbb{R}^2 : x_1 = y_1 - z_1,\ x_2 = y_2 - z_2,\quad (y_1, y_2) \in S, (z_1, z_2) \in T\}$ is the set of points obtained by subtracting a point in T from a point in S. Which of the following statements is TRUE for all convex sets $S,\ T$?

A. $S+T$ is convex but not $S-T$
B. $S-T$ is convex but not $S+T$
C. exactle one of $S+T$ and $S-T$ is convex, but it depends on S and T which one
D. neither $S+T$ nor $S-T$ is convex
E. both $S+T$ and $S-T$ are convex

tifr2017 numerical-ability geometry

8.21.31 Geometry: TIFR2017-A-8

https://gateoverflow.in/95039

In a tutorial on geometrical constructions, the teacher asks a student to construct a right-angled triangle ABC where the hypotenuse BC is 8 inches and the length of the perpendicular dropped from A onto the hypotenuse is h inches, and offers various choices for teh value of h. For which value of h can such a triangle NOT exist?

A. 3.90 inches
B. $2\sqrt{2}$ inches
C. $2\sqrt{3}$ inches
D. 4.1 inches
E. none of the above

tifr2017 numerical-ability geometry

8.21.32 Geometry: TIFR2018-A-1

https://gateoverflow.in/179270

Consider a point A inside a circle C that is at distance 9 from the centre of a circle. Suppose you told that there is a chord of length 24 passing through A with A as its midpoint. How many distinct chords of C have integer length and pass through A?

A. 2 B. 6 C. 7 D. 12 E. 14

tifr2018 numerical-ability geometry

8.22 Graphical Data (9)

8.22.1 Graphical Data: GATE2011 AG: GA-9

https://gateoverflow.in/312131

The fuel consumed by a motorcycle during a journey while traveling at various speeds is indicated in the graph below.

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The distances covered during four laps of the journey are listed in the table below

Lap	Distance (kilometres)	Average Speed (kilometres per hour)
P	15	15
Q	75	45
R	40	75
S	10	10

From the given data, we can conclude that the fuel consumed per kilometre was least during the lap

A. P B. Q C. R D. S

general-aptitude numerical-ability gate2011-ag data-interpretation graphical-data

8.22.2 Graphical Data: GATE2014 AE: GA-10

https://gateoverflow.in/40310

The monthly rainfall chart based on 50 years of rainfall in Agra is shown in the following figure.

Which of the following are true? (k percentile is the value such that k percent of the data fall below that value)

i. On average, it rains more in July than in December
ii. Every year, the amount of rainfall in August is more than that in January
iii. July rainfall can be estimated with better confidence than February rainfall
iv. In August, there is at least 500 mm of rainfall

A. (i) and (ii) B. (i) and (iii) C. (ii) and (iii) D. (iii) and (iv)

gate2014-ae numerical-ability data-interpretation graphical-data

8.22.3 Graphical Data: GATE2014-3-GA-9

https://gateoverflow.in/2033

The ratio of male to female students in a college for five years is plotted in the following line graph. If the number of female students in 2011 and 2012 is equal, what is the ratio of male students in 2012 to male students in 2011?

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A. $1:1$ B. $2:1$ C. $1.5:1$ D. $2.5:1$

gate2014-3 numerical-ability data-interpretation normal graphical-data

8.22.4 Graphical Data: GATE2016 CE-2: GA-6

https://gateoverflow.in/110905

Two finance companies, P and Q, declared fixed annual rates of interest on the amounts invested with them. The rates of interest offered by these companies may differ from year to year. Year-wise annual rates of interest offered by these companies are shown by the line graph provided below.

If the amounts invested in the companies, P and Q, in 2006 are in the ratio $8:9$, then the amounts received after one year as interests from companies P and Q would be in the ratio:

A. $2:3$ B. $3:4$ C. $6:7$ D. $4:3$

gate2016-ce-2 data-interpretation numerical-ability graphical-data

8.22.5 Graphical Data: GATE2017 CE-2: GA-10

https://gateoverflow.in/313419

The points in the graph below represent the halts of a lift for a durations of 1 minute, over a period of 1 hour.

Which of the following statements are correct?

i. The elevator moves directly from any non-ground floor to another non-ground floor over the one hour period.
ii. The elevator stays on the fourth floor for the longest duration over the one hour period.

A. Only i B. Only ii C. Both i and ii D. Neither i nor ii

gate2017-ce-2 data-interpretation graphical-data

8.22.6 Graphical Data: GATE2017 ME-1: GA-10

https://gateoverflow.in/313662

The growth of bacteria (lactobacillus) in milk leads to curd formation. A minimum bacterial population

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density of 0.8 (in suitable units) is needed to form curd. In the graph below, the population density of lactobacillus in 1 litre of milk is plotted as a function of time, at two different temperatures, 25°C and 37°C.

Consider the following statements based on the data shown above:

i. The growth in bacterial population stops earlier at 37°C as compared to 25°C
ii. The time taken for curd formation at 25°C is twice the time taken at 37°C

Which one of the following options is correct?

A. Only i B. Only ii C. Both i and ii D. Neither i nor ii

gate2017-me-1 general-aptitude numerical-ability data-interpretation graphical-data

8.22.7 Graphical Data: GATE2017 ME-2: GA-10

https://gateoverflow.in/313674

In the graph below, the concentration of a particular pollutant in a lake is plotted over (alternate) days of a month in winter (average temperature $10^\circ C$) and a month in summer (average temperature $30^\circ C$).

Consider the following statements based on the data shown above:

i. Over the given months, the difference between the maximum and the minimum pollutant concentrations is the same in both winter and summer
ii. There are at least four days in the summer month such that the pollutant concentrations on those days are within 1 ppm of the pollutant concentrations on the corresponding days in the winter month.

Which one of the following options is correct?

A. Only i B. Only ii C. Both i and ii D. Neither i nor ii

gate2017-me-2 general-aptitude numerical-ability data-interpretation graphical-data

8.22.8 Graphical Data: GATE2018 CE-1: GA-8

https://gateoverflow.in/313251

Which of the following function(s) is an accurate description of the graph for the range(s) indicated?

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i. $y = 2x + 4$ for $-3 \leq x \leq -1$
ii. $y = | x - 1 |$ for $-1 \leq x \leq 2$
iii. $y = || x | - 1 |$ for $-1 \leq x \leq 2$
iv. $y = 1$ for $2 \leq x \leq 3$

A. i, ii and iii only B. i, ii and iv only C. i and iv only D. ii and iv only

gate2018-ce-1 general-aptitude numerical-ability graphical-data

8.22.9 Graphical Data: GATE2018 CE-2: GA-8

https://gateoverflow.in/313386

The annual average rainfall in a tropical city is 1000 mm. On a particular rainy day (24-hour period), the cumulative rainfall experienced by the city is shown in the graph. Over the 24-hour period, 50% of the rainfall falling on a rooftop, which had an obstruction-free area of $50\ m^2$, was harvested into a tank. What is the total volume of water collected in the tank liters?

A. $25,000$ B. $18,750$ C. $7,500$ D. 3.125

gate2018-ce-2 general-aptitude numerical-ability data-interpretation graphical-data

8.23 Logarithms (9)

8.23.1 Logarithms: GATE2011-57

https://gateoverflow.in/2166

If $\log(\mathrm{P}) = (1/2)\log(\mathrm{Q}) = (1/3)\log(\mathrm{R})$, then which of the following options is **TRUE**?

A. $\mathrm{P}^2 = \mathrm{Q}^3\mathrm{R}^2$ B. $\mathrm{Q}^2 = \mathrm{PR}$ C. $\mathrm{Q}^2 = \mathrm{R}^3\mathrm{P}$ D. $\mathrm{R} = \mathrm{P}^2\mathrm{Q}^2$

gate2011 numerical-ability normal numerical-computation logarithms

8.23.2 Logarithms: GATE2012 AR: GA-6

https://gateoverflow.in/40227

A value of x that satisfies the equation $\log x + \log(x-7) = \log(x+11) + \log 2$ is

A. 1 B. 2 C. 7 D. 11

gate2012-ar numerical-ability numerical-computation logarithms

8.23.3 Logarithms: GATE2015 EC-1: GA-5

https://gateoverflow.in/39493

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

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A. $343/125$ B. $25/343$ C. $-25/49$ D. $-49/25$

gate2015-ec-1 general-aptitude numerical-methods logarithms

8.23.4 Logarithms: GATE2015 EC-3: GA-9

https://gateoverflow.in/39522

$\log \tan 1^o + \log \tan 2^o + \cdots + \log \tan 89^o$ is ...

A. 1 B. $1/\sqrt{2}$ C. 0 D. -1

gate2015-ec-3 summation numerical-ability logarithms

8.23.5 Logarithms: GATE2018 CE-2: GA-5

https://gateoverflow.in/313388

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

gate2018-ce-2 general-aptitude numerical-ability logarithms

8.23.6 Logarithms: GATE2018 CE-2: GA-9

https://gateoverflow.in/313383

Given that $\frac{\log P}{y-z} = \frac{\log Q}{z-x} = \frac{\log R}{x-y} = 10$ for $x \neq y \neq z$, what is the value of the product PQR?

A. 0 B. 1 C. xyz D. 10^{xyz}

gate2018-ce-2 general-aptitude numerical-ability logarithms

8.23.7 Logarithms: GATE2018 ME-1: GA-6

https://gateoverflow.in/313648

For integers, a, b and c, what would be the minimum and maximum values respectively of $a+b+c$ if $\log \mid a \mid + \log \mid b \mid + \log \mid c \mid = 0$?

A. -3 and 3 B. -1 and 1 C. -1 and 3 D. 1 and 3

gate2018-me-1 general-aptitude numerical-ability logarithms

8.23.8 Logarithms: GATE2018 ME-2: GA-5

https://gateoverflow.in/313607

The value of the expression $\frac{1}{1+\log_u vw} + \frac{1}{1+\log_v wu} + \frac{1}{1+\log_w uv}$ is _____

A. -1 B. 0 C. 1 D. 3

gate2018-me-2 general-aptitude numerical-ability logarithms

8.23.9 Logarithms: TIFR2010-A-9

https://gateoverflow.in/18385

A table contains 287 entries. When any one of the entries is requested, it is encoded into a binary string and transmitted. The number of bits required is.

a. 8
b. 9
c. 10
d. Cannot be determined from the given information.
e. None of the above.

tifr2010 numerical-ability theory-of-computation logarithms

8.24 Logical Reasoning (40)

8.24.1 Logical Reasoning: GATE2010-61

https://gateoverflow.in/2369

If $137 + 276 = 435$ how much is $731 + 672$?

A. 534 B. 1403 C. 1623 D. 1513

gate2010 numerical-ability normal logical-reasoning

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8.24.2 Logical Reasoning: GATE2010-62

https://gateoverflow.in/2370

Hari(H), Gita(G), Irfan(I) and Saira(S) are siblings (i.e., brothers and sisters). All were born on 1 st January. The age difference between any two successive siblings (that is born one after another) is less than three years. Given the following facts:

i. Hari's age + Gita's age > Irfan's age + Saira's age
ii. The age difference between Gita and Saira is one year. However Gita is not the oldest and Saira is not the youngest.
iii. There are no twins.

In what order they were born (oldest first)?

A. $HSIG$ B. $SGHI$ C. $IGSH$ D. $IHSG$

gate2010 numerical-ability logical-reasoning normal

8.24.3 Logical Reasoning: GATE2011 GG: GA-8

https://gateoverflow.in/40209

Three sisters $(R, S,$ and $T)$ received a total of 24 toys during Christmas. The toys were initially divided among them in a certain proportion. Subsequently, R gave some toys to S which doubled the share of S. Then S in turn gave some of her toys to T, which doubled T's share. Next, some of T's toys were given to R, which doubled the number of toys that R currently had. As a result of all such exchanges, the three sisters were left with equal number of toys. How many toys did R have originally?

A. 8 B. 9 C. 11 D. 12

gate2011-gg logical-reasoning numerical-ability

8.24.4 Logical Reasoning: GATE2011 MN: GA-63

https://gateoverflow.in/31543

L, M and N are waiting in a queue meant for children to enter the zoo. There are 5 children between L and M, and 8 children between M and N. If there are 3 children ahead of N and 21 children behind L, then what is the minimum number of children in the queue?

A. 28 B. 27 C. 41 D. 40

numerical-ability gate2011-mn logical-reasoning

8.24.5 Logical Reasoning: GATE2012 AR: GA-8

https://gateoverflow.in/40229

Ravi is taller than Arun but shorter than Iqbal. Sam is shorter than Ravi. Mohan is shorter than Arun. Balu is taller than Mohan and Sam. The tallest person can be

A. Mohan B. Ravi C. Balu D. Arun

gate2012-ar logical-reasoning

8.24.6 Logical Reasoning: GATE2012 CY: GA-9

https://gateoverflow.in/40240

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 weighings required to identify the heavier bag is

A. 2 B. 3 C. 4 D. 8

gate2012-cy numerical-ability logical-reasoning

8.24.7 Logical Reasoning: GATE2014 AE: GA-7

https://gateoverflow.in/40307

Anuj, Bhola, Chandan, Dilip, Eswar and Faisal live on different floors in a six-storeyed building (the ground floor is numbered 1, the floor above it 2, and so on) Anuj lives on an even-numbered floor, Bhola does not live on an odd numbered floor. Chandan does not live on any of the floors below Faisal's floor. Dilip does not live on

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floor number 2. Eswar does not live on a floor immediately above or immediately below Bhola. Faisal lives three floors above Dilip. Which of the following floor-person combinations is correct?

	Anuj	Bhola	Chandan	Dilip	Eswar	Faisal
(A)	6	2	5	1	3	4
(B)	2	6	5	1	3	4
(C)	4	2	6	3	1	5
(D)	2	4	6	1	3	5

gate2014-ae logical-reasoning numerical-ability descriptive

8.24.8 Logical Reasoning: GATE2014 AG: GA-6

https://gateoverflow.in/41670

In a group of four children, Som is younger to Riaz. Shiv is elder to Ansu. Ansu is youngest in the group. Which of the following statements is/are required to find the eldest child in the group?

Statements

1. Shiv is younger to Riaz.
2. Shiv is elder to Som.

A. Statement 1 by itself determines the eldest child.
B. Statement 2 by itself determines the eldest child.
C. Statements 1 and 2 are both required to determine the eldest child.
D. Statements 1 and 2 are not sufficient to determine the eldest child.

gate2014-ag numerical-ability logical-reasoning normal

8.24.9 Logical Reasoning: GATE2014 EC-2: GA-7

https://gateoverflow.in/41515

Lights of four colors (red, blue, green, yellow) are hung on a ladder. On every step of the ladder there are two lights. If one of the lights is red, the other light on that step will always be blue. If one of the lights on a step is green, the other light on that step will always be yellow. Which of the following statements is not necessarily correct?

A. The number of red lights is equal to the number of blue lights
B. The number of green lights is equal to the number of yellow lights
C. The sum of the red and green lights is equal to the sum of the yellow and blue lights
D. The sum of the red and blue lights is equal to the sum of the green and yellow lights

gate2014-ec-2 numerical-ability logical-reasoning normal

8.24.10 Logical Reasoning: GATE2014 EC-3: GA-5

https://gateoverflow.in/41144

In which of the following options will the expression $P < M$ be definitely true?

A. $M < R > P > S$
B. $M > S < P < F$
C. $Q < M < F = P$
D. $P = A < R < M$

gate2014-ec-3 logical-reasoning numerical-ability

8.24.11 Logical Reasoning: GATE2015 EC-2: GA- 7

https://gateoverflow.in/39508

Given below are two statements followed by two conclusions. Assuming these statements to be true, decide which one logically follows.

Statements:

I. All film stars are playback singers.
II. All film directors are film stars.

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Conclusions:

I. All film directors are playback singers.
II. Some film stars are film directors.

A. Only conclusion I follows.
B. Only conclusion II follows.
C. Neither conclusion I nor II follows.
D. Both conclusions I and II follow.

gate2015 gate2015-ec-2 logical-reasoning

8.24.12 Logical Reasoning: GATE2015-3-GA-1

https://gateoverflow.in/8298

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

A. $VXDQ$
B. $VZDQ$
C. $VZDP$
D. $UXDQ$

gate2015-3 numerical-ability easy logical-reasoning

8.24.13 Logical Reasoning: GATE2015-3-GA-7

https://gateoverflow.in/8308

The head of 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. R wants either Home or Finance or no portfolio. Q says that if S gets 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

gate2015-3 numerical-ability normal logical-reasoning

8.24.14 Logical Reasoning: GATE2016 CE-2: GA-8

https://gateoverflow.in/110918

Fact 1: Humans are mammals.

Fact 2: Some humans are engineers.

Fact 3: Engineers build houses.

If the above statements are facts, which of the following can be logically inferred?

I. All mammals build houses.

II. Engineers are mammals.

III. Some humans are not engineers.

A. II only.
B. III only.
C. I, II and III.
D. I only.

gate2016-ce-2 logical-reasoning

8.24.15 Logical Reasoning: GATE2016 EC-1: GA-5

https://gateoverflow.in/108077

Michael lives 10 km away from where I live. Ahmed lives 5 km away and Susan lives 7 km away from where I live. Arun is farther away than Ahmed but closer than Susan from where I live. From the information provided here, what is one possible distance (in km) at which I live from Arun's place?

A. 3.00
B. 4.99
C. 6.02
D. 7.01

gate2016-ec-1 logical-reasoning numerical-ability

8.24.16 Logical Reasoning: GATE2016 EC-3: GA-8

https://gateoverflow.in/110849

A flat is shared by four first year undergraduate students. They agreed to allow the oldest of them to enjoy

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some extra space in the flat. Manu is two months older than Sravan, who is three months younger than Trideep. Pavan is one month older than Sravan. Who should occupy the extra space in the flat?

A. Manu B. Sravan C. Trideep D. Pavan

gate2016-ec-3 logical-reasoning

8.24.17 Logical Reasoning: GATE2017 CE-1: GA-7

https://gateoverflow.in/313485

Students applying for hostel rooms are allotted rooms in order of seniority. Students already staying in a room will move if they get a room in their preferred list. Preferences of lower ranked applicants are ignored during allocation.

Given the data below, which room will Ajit stay in ?

Names	Student seniority	Current room	Room preference list
Amar	1	P	R, S, Q
Akbar	2	None	R, S
Anthony	3	Q	P
Ajit	4	S	Q, P, R

A. P B. Q C. R D. S

gate2017-ce-1 logical-reasoning normal

8.24.18 Logical Reasoning: GATE2017 CE-2: GA-3

https://gateoverflow.in/313414

Four cards lie on table. Each card has a number printed on one side and a colour on the other. The faces visible on the cards are $2, 3$, red, and blue.

Proposition: If a card has an even value on one side, then its opposite face is red.

The card which MUST be turned over to verify the above proposition are

A. 2, red B. $2, 3$, red C. 2, blue D. 2, red, blue

gate2017-ce-2 logical-reasoning propositional-logic

8.24.19 Logical Reasoning: GATE2017 EC-2: GA-3

https://gateoverflow.in/313507

A rule states that in order to drink beer, one must be over 18 years old. In a bar, there are 4 people. P is 16 years old. Q is 25 years old. R is drinking milkshake and S is drinking a beer. What must be checked to ensure that the rule is being followed?

A. Only P's drink
B. Only P's drink and S's age
C. Only S's age
D. Only P's drink, Q's drink and S's age

gate2017-ec-2 general-aptitude numerical-ability logical-reasoning

8.24.20 Logical Reasoning: GATE2017 ME-1: GA-5

https://gateoverflow.in/313666

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.

gate2017-me-1 general-aptitude logical-reasoning

8.24.21 Logical Reasoning: GATE2017 ME-2: GA-5

https://gateoverflow.in/313677

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.

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gate2017-me-2 numerical-ability logical-reasoning

8.24.22 Logical Reasoning: GATE2017-1-GA-3

https://gateoverflow.in/118406

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. Srinvas and Murali D. Srinivas and Rahul

gate2017-1 numerical-ability logical-reasoning

8.24.23 Logical Reasoning: GATE2017-2-GA-7

https://gateoverflow.in/118421

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 labeled. 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 labeled 'Apples'
B. The box labeled 'Apples and Oranges'
C. The box labeled 'Oranges'
D. Cannot be determined

gate2017-2 numerical-ability normal tricky logical-reasoning

8.24.24 Logical Reasoning: GATE2018 CE-1: GA-10

https://gateoverflow.in/313273

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

A		D
B	G	E
C		F

A. 4 B. 5 C. 6 D. 9

gate2018-ce-1 general-aptitude numerical-ability logical-reasoning

8.24.25 Logical Reasoning: GATE2018 EE: GA-10

https://gateoverflow.in/205190

$P, Q, R,$ and S crossed a lake in a boat that can hold a maximum of two persons, with only one set of oars. The following additional facts are available.

i. The boat held two persons on each of the three forward trips across the lake and one person on each of the two return trips.
ii. P is unable to row when someone else is in the boat.
iii. Q is unable to row with anyone else except R.
iv. Each person rowed for at least one trip.
v. Only one person can row during a trip.

Who rowed twice?

A. P B. Q C. R D. S

numerical-ability normal gate2018-ee logical-reasoning

8.24.26 Logical Reasoning: GATE2019 CE-1: GA-4

https://gateoverflow.in/313439

If $E = 10, J = 20, O = 30,$ and $T = 40,$ what will be $P + E + S + T$?

A. 51 B. 82 C. 120 D. 164

gate2019-ce-1 general-aptitude numerical-ability logical-reasoning

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8.24.27 Logical Reasoning: GATE2019 CE-2: GA-6

https://gateoverflow.in/313380

Mohan, the manager, wants his four workers to work in pairs. No pair should work for more than 5 hours. Ram and John have worked together for 5 hours. Krishna and Amir have worked as a team for 2 hours. Krishna does not want to work with Ram. Whom should Mohan allot to work with John, if he wants all the workers to continue working?

A. Amir B. Krishna C. Ram D. None of three

gate2019-ce-2 general-aptitude logical-reasoning

8.24.28 Logical Reasoning: GATE2019 EC: GA-6

https://gateoverflow.in/313529

Four people are standing in a line facing you. They are Rahul, Mathew, Seema and Lohit. One is an engineer, one is a doctor, one a teacher and another a dancer. You are told that:

1. Mathew is not standing next to Seema
2. There are two people standing between Lohit and the engineer
3. Rahul is not a doctor
4. The teacher and the dancer are standing next to each other
5. Seema is turning to her right to speak to the doctor standing next to her

Who among them is an engineer?

A. Seema B. Lohit C. Rahul D. Mathew

gate2019-ec general-aptitude numerical-ability logical-reasoning

8.24.29 Logical Reasoning: GATE2019 EE: GA-10

https://gateoverflow.in/313749

Consider five people- Mita, Ganga, Rekha, Lakshmi, and Sana. Ganga is taller than both Rekha and Lakshmi. Lakshmi is taller than Sana. Mita is taller than Ganga.

Which of the following conclusions are true?

1. Lakshmi is taller than Rekha
2. Rekha is shorter than Mita
3. Rekha is taller than Sana
4. Sana is shorter than Ganga

A. 1 and 3 B. 3 only C. 2 and 4 D. 1 only

gate2019-ee general-aptitude logical-reasoning

8.24.30 Logical Reasoning: GATE2019 IN: GA-4

https://gateoverflow.in/313547

Five numbers $10, 7, 5, 4$ and 2 are to be arranged in a sequence from left to right following the directions given below:

1. No two odd or even numbers are next to each other.
2. The second number from the left is exactly half of the left-most number.
3. The middle number is exactly twice the right-most number.

Which is the second number from the right?

A. 2 B. 4 C. 7 D. 10

gate2019-in general-aptitude numerical-ability logical-reasoning

8.24.31 Logical Reasoning: TIFR2010-A-1

https://gateoverflow.in/18202

A box contains 731 black balls and 2000 white balls. The following process is to be repeated as long as possible. Arbitrarily select two balls from the box. If they are of the same color, throw them out and put a black ball into the box (enough extra black balls are available to do this). If they are of different color, place the

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white ball back into the box and throw the black ball away. Which of the following is correct?

A. The process can be applied indefinitely without any prior bound
B. The process will stop with a single white ball in the box
C. The process will stop with a single black ball in the box
D. The process will stop with the box empty
E. None of the above

tifr2010 numerical-ability logical-reasoning

8.24.32 Logical Reasoning: TIFR2013-A-10

https://gateoverflow.in/25432

Three men and three rakhsasas arrive together at a ferry crossing to find a boat with an oar, but no boatman. The boat can carry one or at the most two persons, for example, one man and one rakhsasas, and each man or rakhsasas can row. But if at any time, on any bank, (including those who maybe are in the boat as it touches the bank) rakhsasas outnumber men, the former will eat up the latter. If all have to go to the other side without any mishap, what is the minimum number of times that the boat must cross the river?

a. 7 b. 9 c. 11 d. 13 e. 15

tifr2013 numerical-ability logical-reasoning

8.24.33 Logical Reasoning: TIFR2013-A-11

https://gateoverflow.in/25433

Let there be a pack of 100 cards numbered 1 to 100. The ith card states: "There are at most $i-1$ true cards in this pack". Then how many cards of the pack contain TRUE statements?

a. 0 b. 1 c. 100 d. 50 e. None of the above.

tifr2013 logical-reasoning

8.24.34 Logical Reasoning: TIFR2013-A-2

https://gateoverflow.in/25383

Consider the following two types of elections to determine which of two parties A and B forms the next government in the 2014 Indian elections. Assume for simplicity an Indian population of size $545545 (= 545 * 1001)$. There are only two parties A and B and every citizen votes.

TYPE C: The country is divided into 545 constituencies and each constituency has 1001 voters. Elections are held for each constituency and a party is said to win a constituency if it receive a majority of the vote in that constituency. The party that wins the most constituencies forms the next government.

TYPE P: There are no constituencies in this model. Elections are held throughout the country and the party that wins the most votes (among 545545 voters forms the government.

Which of the following is true?

a. If the party forms the govt. by election TYPE C winning at least two-third of the constituencies, then it will also forms the govt. by election TYPE P.
b. If a party forms govt. by election TYPE C, then it will also form the govt. by election TYPE P.
c. If a party forms govt. by election TYPE P, then it will also form the govt. by election TYPE C.
d. All of the above
e. None of the above.

tifr2013 logical-reasoning

8.24.35 Logical Reasoning: TIFR2016-A-1

https://gateoverflow.in/96822

Suppose the following statements about three persons in a room are true.

Chandni, Sooraj and Tara are in a room. Nobody else is in the room. Chandni is looking at Sooraj. Sooraj is looking at Tara. Chandni is married. Tara is not married. A married person in the room is looking at an unmarried person.

Which of the following is necessarily true?

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A. Sooraj is married
B. Sooraj is unmarried
C. The situation described is impossible
D. There is insufficient information to conclude if Sooraj is married or unmarried
E. None of the above

tifr2016 logical-reasoning

8.24.36 Logical Reasoning: TIFR2017-A-14

https://gateoverflow.in/95657

Consider the following game with two players, Aditi and Bharat. There are n tokens in a bag. The two players know n, and take turns removing tokens from the bag. In each turn, a player can either remove one token or two tokens. The player that removes the last token from the bag loses. Assume that Aditi always goes first. Further, we say that a player has a winning strategy if she or he can win the game, no matter what other player does. Which of the following statements is TRUE?

A. For $n = 3$, Bharath has a winning strategy. For $n = 4$, Aditi has a winning strategy.
B. For $n = 7$, Bharath has a winning strategy. For $n = 8$, Aditi has a winning strategy.
C. For both $n = 3$ and $n = 4$, Aditi has a winning strategy.
D. For both $n = 7$ and $n = 8$, Aditi has a winning strategy.
E. Bharat never has a winning strategy.

tifr2017 numerical-ability logical-reasoning

8.24.37 Logical Reasoning: TIFR2018-A-11

https://gateoverflow.in/179280

We are given a (possibly empty) set of objects. Each object in the set is colored either black or white, is shaped either circular or rectangular, and has a profile that is either fat or thin, Those properties obey the following principles:

1. Each white object is also circular.
2. Not all thin objects are black.
3. Each rectangular object is also either thin or white or both thin and white.

Consider the following statements:

i. If there is a thin object in the set, then there is also a white object.
ii. If there is a rectangular object in the set, then there are at least two objects.
iii. Every fat object in the set is circular.

Which of the above statements must be TRUE for the set?

A. (i) only
B. (i) and (ii) only
C. (i) and (iii) only
D. None of the statements must be TRUE
E. All of the statements must be TRUE

tifr2018 numerical-ability logical-reasoning

8.24.38 Logical Reasoning: TIFR2018-A-8

https://gateoverflow.in/179277

A crime has been committed with four people at the scene of the crime. You are responsible for finding out who did it. You have recorded the following statements from the four witnesses, and you know one of them has committed the crime.

1. Anuj says that Binky did it.
2. Binky says that Anuj did it.
3. Chacko says that Binky is telling the truth.
4. Desmond says that Chacko is not lying.

You know that exactly three of the statements recorded are FALSE. Who committed the crime?

A. Anuj
B. Binky

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C. Chacko
D. Desmond
E. Either Anuj or Binky; the information is insufficient to pinpoint the criminal

tifr2018 logical-reasoning

8.24.39 Logical Reasoning: TIFR2019-A-10

https://gateoverflow.in/280500

Avni and Badal alternately choose numbers from the set $\{1,2,3,4,5,6,7,8,9\}$ without replacement (starting with Avni). The first person to choose numbers of which any 3 sum to 15 wins the game (for example, Avni wins if she chooses the numbers $8,3,5,2$ since $8+5+2=15$). A player is said to have a winning strategy if the player can always win the game, no matter what the other player does. Which of the following statements is TRUE?

As a hint, there are exactly 8 ways in which 3 numbers from the set $\{1,2,3,4,5,6,7,8,9\}$ can sum up to 15, shown as the three rows, the three columns, and the two diagonals in the following square:

$$\begin{matrix} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{matrix}$$

A. Avni has a winning strategy
B. Badal has a winning strategy
C. Both of them have a winning strategy
D. Neither of them has a winning strategy
E. The Player that picks 9 has a winning strategy

tifr2019 general-aptitude numerical-ability logical-reasoning

8.24.40 Logical Reasoning: TIFR2019-A-11

https://gateoverflow.in/280499

Suppose there are n guests at a party (and no hosts). As the night progresses, the guests meet each other and shake hands. The same pair of guests might shake hands multiple times. for some parties stretch late into the night , and it is hard to keep track.Still, they don't shake hands with themselves. Let Odd be the set of guests who have shaken an odd number of hands, and let even be the set of guests who have shaken an even number of hands. Which of the following stays invariant throughout the night?

A. $|\text{Odd}| \mod 2$
B. $|\text{Even}|$
C. $|\text{Even}| - |\text{Odd}|$
D. $2 \mid \text{Even}| - |\text{Odd}|$
E. $2 \mid \text{Odd}| - |\text{Even}|$

tifr2019 general-aptitude numerical-ability logical-reasoning

8.25 Maxima Minima (4)

8.25.1 Maxima Minima: GATE2010 TF: GA-5

https://gateoverflow.in/312024

Consider the function $f(x) = \max(7-x, x+3)$. In which range does f take its minimum value?

A. $-6 \leq x < -2$
B. $-2 \leq x < 2$
C. $2 \leq x < 6$
D. $6 \leq x < 10$

general-aptitude numerical-ability gate2010-tf maxima-minima functions

8.25.2 Maxima Minima: GATE2012-62

https://gateoverflow.in/2210

A political party orders an arch for the entrance to the ground in which the annual convention is being held. The profile of the arch follows the equation $y = 2x - 0.1x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is

A. 8 meters
B. 10 meters
C. 12 meters
D. 14 meters

gate2012 numerical-ability normal maxima-minima

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8.25.3 Maxima Minima: GATE2013 CE: GA-6

https://gateoverflow.in/40274

X and Y are two positive real numbers such that $2X+Y \leq 6$ and $X+2Y \leq 8.$ For which of the following values of

(X,Y) the function $f(X,Y)=3X+6Y$ will give maximum value ?

A. $\left(\frac{4}{3},\frac{10}{3}\right)$ B. $\left(\frac{8}{3},\frac{20}{3}\right)$ C. $\left(\frac{8}{3},\frac{10}{3}\right)$ D. $\left(\frac{4}{3},\frac{20}{3}\right)$

gate2013-ce numerical-ability maxima-minima

8.25.4 Maxima Minima: GATE2017-2-GA-9

https://gateoverflow.in/118423

The number of roots of $e^x+0.5x^2-2=0$ in the range $[-5,5]$ is

A. 0 B. 1 C. 2 D. 3

gate2017-2 numerical-ability normal maxima-minima calculus

8.26 Modular Arithmetic (5)

8.26.1 Modular Arithmetic: GATE2012 CY: GA-1

https://gateoverflow.in/40232

If $(1.001)^{1259}$= 3.52 and $(1.001)^{2062}$= 7.85, then $(1.001)^{3321}$=

A. 2.23 B. 4.33 C. 11.37 D. 27.64

gate2012-cy numerical-ability modular-arithmetic

8.26.2 Modular Arithmetic: GATE2017 CE-1: GA-8

https://gateoverflow.in/313482

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

A. 2 B. 4 C. 6 D. 8

gate2017-ce-1 modular-arithmetic numerical-ability numerical-computation

8.26.3 Modular Arithmetic: TIFR2019-A-2

https://gateoverflow.in/280508

How many proper divisors (that is, divisors other than 1 or 7200) does 7200 have ?

A. 18 B. 20 C. 52 D. 54 E. 60

tifr2019 modular-arithmetic numerical-ability

8.26.4 Modular Arithmetic: TIFR2019-A-7

https://gateoverflow.in/280503

What are the last two digits of $1!+2!+\cdots+100!$?

A. 00 B. 13 C. 30 D. 33 E. 73

tifr2019 modular-arithmetic numerical-ability

8.26.5 Modular Arithmetic: TIFR2019-B-14

https://gateoverflow.in/280481

Let m and n be two positive integers. Which of the following is NOT always true?

A. If m and n are co-prime, there exist integers a and b such that $am+bn=1$
B. $m^{n-1} \equiv 1(\bmod n)$
C. The rational number $\frac{n}{m} \cdot \frac{n-1}{m-1} \cdot \frac{n-2}{m-2} \cdots \frac{n-(m-2)}{m-(m-2)} \cdot \frac{n-(m-1)}{m-(m-1)}$ is an integer
D. $m+1$ is a factor of $m^{n(n+1)}-1$
E. If 2^n-1 is prime, then n is prime

tifr2019 general-aptitude numerical-ability modular-arithmetic

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8.27 Number Representation (2)

8.27.1 Number Representation: GATE2014-3-GA-10

https://gateoverflow.in/2034

Consider the equation: $(7526)_8 - (Y)_8 = (4364)_8$, where $(X)_N$ stands for X to the base N. Find Y.

A. 1634 B. 1737 C. 3142 D. 3162

gate2014-3 numerical-ability number-representation normal digital-logic

8.27.2 Number Representation: TIFR2012-A-11

https://gateoverflow.in/25015

Let N be the sum of all numbers from 1 to 1023 except the five primes numbers: $2, 3, 11, 17, 31$. Suppose all numbers are represented using two bytes (sixteen bits). What is the value of the least significant byte (the least significant eight bits) of N?

a. 00000000 b. 10101110 c. 01000000 d. 10000000 e. 11000000

tifr2012 numerical-ability number-representation

8.28 Number Series (15)

8.28.1 Number Series: GATE2010 TF: GA-7

https://gateoverflow.in/312026

Consider the series $\frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{8} + \frac{1}{9} - \frac{1}{16} + \frac{1}{32} + \frac{1}{27} - \frac{1}{64} + \ldots$. The sum of the infinite series above is:

A. ∞ B. $\frac{5}{6}$ C. $\frac{1}{2}$ D. 0

general-aptitude numerical-ability gate2010-tf number-series

8.28.2 Number Series: GATE2013 EE: GA-10

https://gateoverflow.in/40297

Find the sum to $'n'$ terms of the series $10 + 84 + 734 + \ldots$

A. $\frac{9(9^n+1)}{10} + 1$ B. $\frac{9(9^n-1)}{8} + 1$ C. $\frac{9(9^n-1)}{8} + n$ D. $\frac{9(9^n-1)}{8} + n^2$

gate2013-ee numerical-ability number-series

8.28.3 Number Series: GATE2013-61

https://gateoverflow.in/1565

Find the sum of the expression

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

A. 7 B. 8 C. 9 D. 10

gate2013 numerical-ability normal number-series

8.28.4 Number Series: GATE2014 EC-1: GA-5

https://gateoverflow.in/41494

What is the next number in the series?

12 35 81 173 357 _____.

gate2014-ec-1 number-series numerical-ability numerical-answers

8.28.5 Number Series: GATE2014 EC-2: GA-5

https://gateoverflow.in/41512

Fill in the missing number in the series.

2 3 6 15 ___ 157.5 630

gate2014-ec-2 number-series numerical-ability numerical-answers

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8.28.6 Number Series: GATE2014 EC-3: GA-4

https://gateoverflow.in/41143

The next term in the series $81, 54, 36, 24, \ldots$ is_____.

gate2014-ec-3 number-series numerical-ability numerical-answers

8.28.7 Number Series: GATE2014 EC-3: GA-6

https://gateoverflow.in/41145

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

A. $15Q$ B. $17Q$ C. $15P$ D. $17P$

gate2014-ec-3 number-series logical-reasoning numerical-ability

8.28.8 Number Series: GATE2014-2-GA-5

https://gateoverflow.in/1942

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

A. 3.464 B. 3.932 C. 4.000 D. 4.444

gate2014-2 numerical-ability easy number-series

8.28.9 Number Series: GATE2014-3-GA-4

https://gateoverflow.in/2027

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

gate2014-3 numerical-ability number-series easy

8.28.10 Number Series: GATE2018 CE-1: GA-9

https://gateoverflow.in/313256

Consider a sequence of numbers $a_1, a_2, a_3, \ldots, a_n$ where $a_n = \frac{1}{n} - \frac{1}{n+2}$, for each integer $n > 0$. Whart is the sum of the first 50 terms?

A. $\left(1+\frac{1}{2}\right) - \frac{1}{50}$
B. $\left(1+\frac{1}{2}\right) + \frac{1}{50}$
C. $\left(1+\frac{1}{2}\right) - \left(\frac{1}{51}+\frac{1}{52}\right)$
D. $1 - \left(\frac{1}{51}+\frac{1}{52}\right)$

gate2018-ce-1 general-aptitude numerical-ability number-series

8.28.11 Number Series: TIFR2011-A-8

https://gateoverflow.in/20014

The sum of the first n terms of the series $1, 11, 111, 1111, \ldots,$ is.

a. $\frac{1}{81}\left(10^{n+1} - 9n - 10\right)$
b. $\frac{1}{81}\left(10^{n} - 9n\right)$
c. $\frac{1}{9}\left(10^{n+1} - 1\right)$
d. $\frac{1}{9}\left(10^{n+1} - n10^{n}\right)$
e. None of the above.

tifr2011 numerical-ability number-series

8.28.12 Number Series: TIFR2013-A-15

https://gateoverflow.in/25438

Let $\operatorname{sgn}(x) = \begin{cases} +1 & \text{if } x \geq 0 \\ -1 & \text{if } x < 0 \end{cases}$

What is the value of the following summation?

$$\sum_{i=0}^{50} \operatorname{sgn}((2i-1)(2i-3)\ldots(2i-99))$$

a. 0 b. -1 c. $+1$ d. 25 e. 50

tifr2013 numerical-ability number-series

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8.28.13 Number Series: TIFR2013-A-8

https://gateoverflow.in/25430

Find the sum of the infinite series

$$\frac{1}{1\times 3\times 5}+\frac{1}{3\times 5\times 7}+\frac{1}{5\times 7\times 9}+\frac{1}{7\times 9\times 11}+\ldots\ldots$$

A. ∞ B. $\left(\frac{1}{2}\right)$ C. $\left(\frac{1}{6}\right)$ D. $\left(\frac{1}{12}\right)$ E. $\left(\frac{1}{14}\right)$

tifr2013 numerical-ability number-series

8.28.14 Number Series: TIFR2014-A-7

https://gateoverflow.in/25992

Consider a sequence of non-negative numbers $x_n : n = 1, 2, \ldots$. Which of the following statements cannot be true?

a. $\sum_{n=1}^{\infty} x_n = \infty$ and $\sum_{n=1}^{\infty} x_n^2 = \infty$.
b. $\sum_{n=1}^{\infty} x_n = \infty$ and $\sum_{n=1}^{\infty} x_n^2 < \infty$.
c. $\sum_{n=1}^{\infty} x_n < \infty$ and $\sum_{n=1}^{\infty} x_n^2 < \infty$.
d. $\sum_{n=1}^{\infty} x_n \leq 5$ and $\sum_{n=1}^{\infty} x_n^2 \geq 25$.
e. $\sum_{n=1}^{\infty} x_n < \infty$ and $\sum_{n=1}^{\infty} x_n^2 = \infty$.

tifr2014 numerical-ability number-series

8.28.15 Number Series: TIFR2015-A-3

https://gateoverflow.in/29159

Let $|z| < 1$. Define $M_n(z) = \sum_{i=1}^{10} z^{10^n(i-1)}$? what is

$$\prod_{i=0}^{\infty} M_i(z) = M_0(z) \times M_1(z) \times M_2(z) \times \ldots ?$$

A. Can't be determined. B. $1/(1-z)$ C. $1/(1+z)$ D. $1-z^9$ E. None of the above.

tifr2015 numerical-ability numerical-computation number-series

8.29 Number Theory (4)

8.29.1 Number Theory: GATE2012 AE: GA-8

https://gateoverflow.in/40219

If a prime number on division by 4 gives a remainder of 1, then that number can be expressed as

A. sum of squares of two natural numbers
B. sum of cubes of two natural numbers
C. sum of square roots of two natural numbers
D. sum of cube roots of two natural numbers

gate2012-ae number-theory numerical-ability

8.29.2 Number Theory: GATE2016 ME-2: GA-9

https://gateoverflow.in/108304

The binary operation $\square$ is defined as $a\square b = ab + (a+b)$, where a and b are any two real numbers. The value of the identity element of this operation, defined as the number x such that $a\square x = a$, for any a, is

A. 0 B. 1 C. 2 D. 10

gate2016-me-2 numerical-ability number-theory easy

8.29.3 Number Theory: GATE2017 ME-2: GA-3

https://gateoverflow.in/313669

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. $ab-b$

gate2017-me-2 general-aptitude numerical-ability number-theory

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8.29.4 Number Theory: TIFR2014-A-20

https://gateoverflow.in/27132

Consider the equation $x^2 + y^2 - 3z^2 - 3t^2 = 0$. The total number of integral solutions of this equation in the range of the first 10000 numbers, i.e., $1 \leq x, y, z, t \leq 10000$, is

A. 200 B. 55 C. 100 D. 1 E. None of the above

tifr2014 number-theory numerical-ability

8.30 Numerical Computation (25)

8.30.1 Numerical Computation: GATE2010 MN: GA-9

https://gateoverflow.in/312018

A positive integer m in base 10 when represented in base 2 has the representation p and in base 3 has the representation q. We get $p - q = 990$ where the subtraction is done in base 10. Which of the following is necessarily true:

A. $m \geq 14$ B. $9 \leq m \leq 13$ C. $6 \leq m \leq 8$ D. $m < 6$

general-aptitude numerical-ability gate2010-mn numerical-computation

8.30.2 Numerical Computation: GATE2010 TF: GA-10

https://gateoverflow.in/312029

A student is answering a multiple choice examination with 65 questions with a marking scheme as follows: $i)$ 1 marks for each correct answer , $ii)$ $-\frac{1}{4}$ for a wrong answer , $iii)$ $-\frac{1}{8}$ for a question that has not been attempted. If the student gets 37 marks in the test then the least possible number of questions the student has NOT answered is:

A. 6 B. 5 C. 7 D. 4

general-aptitude numerical-ability gate2010-tf numerical-computation

8.30.3 Numerical Computation: GATE2010 TF: GA-9

https://gateoverflow.in/312028

A tank has 100 liters of water. At the end of every hour, the following two operations are performed in sequence: $i)$ water equal to $m\%$ of the current contents of the tank is added to the tank , $ii)$ water equal to $n\%$ of the current contents of the tank is removed from the tank . At the end of 5 hours, the tank contains exactly 100 liters of water . The relation between m and n is :

A. $m = n$ B. $m > n$ C. $m < n$ D. None of the previous

general-aptitude numerical-ability gate2010-tf numerical-computation

8.30.4 Numerical Computation: GATE2011-65

https://gateoverflow.in/2175

A container originally contains 10 litres of pure spirit. From this container, 1 litre of spirit replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?

A. 7.58 litres B. 7.84 litres
C. 7 litres D. 7.29 litres

gate2011 numerical-ability normal numerical-computation

8.30.5 Numerical Computation: GATE2012 CY: GA-10

https://gateoverflow.in/40241

Raju has 14 currency notes in his pocket consisting of only Rs. 20 notes and Rs. 10 notes. The total money value of the notes is Rs. 230. The number of Rs. 10 notes that Raju has is

A. 5 B. 6 C. 9 D. 10

gate2012-cy numerical-ability numerical-computation

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8.30.6 Numerical Computation: GATE2013 CE: GA-1

https://gateoverflow.in/40268

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

gate2013-ce numerical-ability numerical-computation

8.30.7 Numerical Computation: GATE2014 EC-2: GA-8

https://gateoverflow.in/41516

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?

gate2014-ec-2 numerical-ability numerical-answers numerical-computation

8.30.8 Numerical Computation: GATE2014 EC-4: GA-4

https://gateoverflow.in/41466

Let $f(x,y) = x^n y^m = P$. If x is doubled and y is halved, the new value of f is

A. $2^{n-m}P$ B. $2^{m-n}P$ C. $2(n-m)P$ D. $2(m-n)P$

gate2014-ec-4 numerical-ability easy numerical-computation

8.30.9 Numerical Computation: GATE2014-1-GA-4

https://gateoverflow.in/773

If $\left(z+\frac{1}{z}\right)^2 = 98$, compute $\left(z^2+\frac{1}{z^2}\right)$.

gate2014-1 numerical-ability easy numerical-answers numerical-computation

8.30.10 Numerical Computation: GATE2016 CE-2: GA-5

https://gateoverflow.in/110889

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

gate2016-ce-2 numerical-ability numerical-computation

8.30.11 Numerical Computation: GATE2017 ME-1: GA-7

https://gateoverflow.in/313660

What is the sum of the missing digits in the subtraction problem below?

$$\begin{array}{rccccc} & 5 & _ & _ & _ & _ \\ - & 4 & 8 & _ & 8 & 9 \\ \hline & & 1 & 1 & 1 & 1 \end{array}$$

A. 8 B. 10 C. 11 D. Cannot be determined.

gate2017-me-1 general-aptitude numerical-ability numerical-computation

8.30.12 Numerical Computation: GATE2017-1-GA-4

https://gateoverflow.in/118407

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

A. 24 B. 27 C. 32 D. 36

gate2017-1 general-aptitude numerical-ability numerical-computation

8.30.13 Numerical Computation: GATE2017-2-GA-4

https://gateoverflow.in/118418

A test has twenty questions worth 100 marks in total. There are two types of questions. Multiple choice questions are worth 3 marks each and essay questions are worth 11 marks each. How many multiple choice

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questions does the exam have?

A. 12 B. 15 C. 18 D. 19

gate2017-2 numerical-ability numerical-computation

8.30.14 Numerical Computation: GATE2017-2-GA-8

https://gateoverflow.in/118422

X is a 30 digit number starting with the digit 4 followed by the digit 7. Then the number X^3 will have

A. 90 digits B. 91 digits C. 92 digits D. 93 digits

gate2017-2 numerical-ability numerical-computation number-representation

8.30.15 Numerical Computation: GATE2018 CE-2: GA-10

https://gateoverflow.in/313382

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 $(A+B+C), (C+D+E), (E+F+G)$ and $(G+H+K)$ is equal to 13. Which integer does E represent?

A. 1 B. 4 C. 6 D. 7

gate2018-ce-2 general-aptitude numerical-ability numerical-computation

8.30.16 Numerical Computation: GATE2018 ME-1: GA-5

https://gateoverflow.in/313646

A number consists of two digits. The sum of the 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

gate2018-me-1 general-aptitude numerical-ability numerical-computation

8.30.17 Numerical Computation: GATE2018 ME-2: GA-9

https://gateoverflow.in/313630

A house has a number which need to be identified. The following three statements are given that can help in identifying the house number?

i. If the house number is a multiple of 3, then it is a number from 50 to 59.
ii. If the house number is NOT a multiple of 4, then it is a number from 60 to 69.
iii. If the house number is NOT a multiple of 6, then it is a number from 70 to 79.

What is the house number?

A. 54 B. 65 C. 66 D. 76

gate2018-me-2 general-aptitude numerical-ability numerical-computation

8.30.18 Numerical Computation: GATE2019 EE: GA-9

https://gateoverflow.in/313566

Given two sets $X = \{1, 2, 3\}$ and $Y = \{2, 3, 4\}$, we construct a set Z of all possible fractions where the numerators belong to set X and the denominators belong to set Y. The product of elements having minimum and maximum values in the set Z is _____.

A. $1/12$ B. $1/8$ C. $1/6$ D. $3/8$

gate2019-ee general-aptitude numerical-ability numerical-computation

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8.30.19 Numerical Computation: GATE2019 ME-1: GA-4

https://gateoverflow.in/313598

The sum and product of two integers are 26 and 165 respectively. The difference between these two integers is _____

A. 2 B. 3 C. 4 D. 6

gate2019-me-1 general-aptitude numerical-ability numerical-computation

8.30.20 Numerical Computation: GATE2019 ME-2: GA-4

https://gateoverflow.in/313573

The product of three integers X, Y and Z is 192. Z is equal to 4 and P is equal to the average of X and Y. What is the minimum possible value of P?

A. 6 B. 7 C. 8 D. 9.5

gate2019-me-2 general-aptitude numerical-ability numerical-computation

8.30.21 Numerical Computation: TIFR2010-A-14

https://gateoverflow.in/18393

A marine biologist wanted to estimate the number of fish in a large lake. He threw a net and found 30 fish in the net. He marked all these fish and released them into the lake. The next morning he again threw the net and this time caught 40 fish, of which two were found to be marked. The (approximate) number of fish in the lake is:

a. 600 b. 1200 c. 68 d. 800 e. 120

tifr2010 numerical-ability numerical-computation

8.30.22 Numerical Computation: TIFR2014-A-1

https://gateoverflow.in/25979

Consider the reactions

$$X + 2Y \rightarrow 3Z$$

$$2X + Z \rightarrow Y.$$

Let n_X, n_Y, n_Z denote the numbers of molecules of chemicals X, Y, Z in the reaction chamber. Then which of the following is conserved by both reactions?

a. $n_X + n_Y + n_Z$.
b. $n_X + 7n_Y + 5n_Z$.
c. $2n_X + 9n_Y - 3n_Z$.
d. $3n_X - 3n_Y + 13n_Z$.
e. None of the above.

tifr2014 numerical-ability numerical-computation

8.30.23 Numerical Computation: TIFR2014-A-4

https://gateoverflow.in/25989

Consider numbers greater than one that satisfy the following properties:

i. They have no repeated prime factors;
ii. For all primes $p \geq 2$, p divides the number if and only if $p - 1$ divides the number.

The number of such numbers is

a. 0. b. 5. c. 100. d. Infinite. e. None of the above.

tifr2014 numerical-ability difficult numerical-computation

8.30.24 Numerical Computation: TIFR2015-B-12

https://gateoverflow.in/30046

Let t_n be the sum of the first n natural numbers, for $n > 0$. A number is called triangular if it is equal to t_n for some n. Which of the following statements are true:

(i) There exists three successive triangular numbers whose product is a perfect square.

(ii) If the triangular number t_n is a perfect square, then so is $t_{4n(n+1)}$.

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(iii) The sum of the reciprocals of the first n triangular numbers is less than 2, i.e.

$$\frac{1}{1}+\frac{1}{3}+\frac{1}{6}+\ldots+\frac{1}{t_n}<2$$

a. (i) only.
b. (ii) only.
c. (iii) only.
d. All of the above.
e. None of the above.

tifr2015 numerical-ability normal numerical-computation

8.30.25 Numerical Computation: TIFR2019-A-9

https://gateoverflow.in/280501

Let A and B be two containers. Container A contains 50 litres of liquid X and container B contains 100 litres of liquid Y. Liquids X and Y are soluble in each other.

We now take 30 ml of liquid X from container A and put it into container B. The mixture in container B is then thoroughly mixed and 20 ml of the resulting mixture is put back into container A.At the end of this process let V_{AY} be the volume of liquid Y and V_{BX} be the volume of liquid X in container B. Which of the following must be TRUE ?

A. $V_{AY}<V_{BX}$
B. $V_{AY}>V_{BX}$
C. $V_{AY}=V_{BX}$
D. $V_{AY}+V_{BX}=30$
E. $V_{AY}+V_{BX}=20$

tifr2019 general-aptitude numerical-ability numerical-computation

8.31 Odd One (5)

8.31.1 Odd One: GATE2014 AE: GA-6

https://gateoverflow.in/40306

Find the odd one in the following group: ALRVX, EPVZB, ITZDF,OYEIK

A. ALRVX
B. EPVZB
C. ITZDF
D. OYEIK

gate2014-ae odd-one numerical-ability

8.31.2 Odd One: GATE2014 EC-1: GA-6

https://gateoverflow.in/41495

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

gate2014-ec-1 odd-one normal

8.31.3 Odd One: GATE2014 EC-2: GA-6

https://gateoverflow.in/41513

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

gate2014-ec-2 numerical-ability odd-one normal

8.31.4 Odd One: GATE2016 EC-3: GA-4

https://gateoverflow.in/110830

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

A. 324
B. 441
C. 97
D. 64

gate2016-ec-3 odd-one numerical-ability

8.31.5 Odd One: GATE2016-2-GA-04

https://gateoverflow.in/39528

Pick the odd one from the following options.

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A. $CADBE$ B. $JHKIL$ C. $XVYWZ$ D. $ONPMQ$

gate2016-2 numerical-ability odd-one normal

8.32 Percentage (18)

8.32.1 Percentage: GATE2011 AG: GA-4

https://gateoverflow.in/312121

There are two candidates P and Q in an election. During the campaign, 40% of the voters promised to vote for P, and rest for Q. However, on the day of election 15% of the voters went back on their promise to vote for P and instead voted for Q. 25% of the voters went back on their promise to vote for Q and instead voted for P. Suppose, P lost by 2 votes, then what was the total number of voters?

A. 100 B. 110 C. 90 D. 95

general-aptitude numerical-ability gate2011-ag percentage

8.32.2 Percentage: GATE2012 AE: GA-7

https://gateoverflow.in/40218

The total runs scored by four cricketers P, Q, R and S in years 2009 and 2010 are given in the following table;

Player	2009	2010
P	802	1008
Q	765	912
R	429	619
S	501	701

The player with the lowest percentage increase in total runs is

A. P B. Q C. R D. S

gate2012-ae numerical-ability percentage

8.32.3 Percentage: GATE2012 CY: GA-8

https://gateoverflow.in/40239

The data given in the following table summarizes the monthly budget of an average household.

Category	Amount(Rs.)
Food	4000
Rent	2000
Savings	1500
Other expenses	1800
Clothing	1200

The approximate percentage of the monthly budget **NOT** spent on savings is

A. 10% B. 14% C. 81% D. 86%

gate2012-cy numerical-ability percentage

8.32.4 Percentage: GATE2013 EE: GA-2

https://gateoverflow.in/40289

In the summer of 2012, in New Delhi, the mean temperature of Monday to Wednesday was $41^{\circ}C$ and of Tuesday to Thursday was $43^{\circ}C$. If the temperature on Thursday was 15 higher than that of Monday, then the temperature in $^{\circ}C$ on Thursday was

A. 40 B. 43 C. 46 D. 49

gate2013-ee numerical-ability percentage

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8.32.5 Percentage: GATE2014 AE: GA-9

https://gateoverflow.in/40309

One percent of the people of country X are taller than 6 ft. Two percent of the people of country Y are taller than 6 ft. There are thrice as many people in country X as in country Y. Taking both countries together, what is the percentage of people taller than 6 ft?

A. 3.0 B. 2.5 C. 1.5 D. 1.25

gate2014-ae percentage numerical-ability

8.32.6 Percentage: GATE2014 EC-4: GA-8

https://gateoverflow.in/41470

Industrial consumption of power doubled from $2000-2001$ to $2010-2011$. Find the annual rate of increase in percent assuming it to be uniform over the years.

A. 5.6 B. 7.2 C. 10.0 D. 12.2

gate2014-ec-4 percentage normal numerical-ability

8.32.7 Percentage: GATE2014-1-GA-8

https://gateoverflow.in/776

Round-trip tickets to a tourist destination are eligible for a discount of 10% on the total fare. In addition, groups of 4 or more get a discount of 5% on the total fare. If the one way single person fare is Rs 100, a group of 5 tourists purchasing round-trip tickets will be charged Rs _____

gate2014-1 numerical-ability easy numerical-answers percentage

8.32.8 Percentage: GATE2014-3-GA-8

https://gateoverflow.in/2032

The Gross Domestic Product (GDP) in Rupees grew at 7% during $2012-2013$. For international comparison, the GDP is compared in US Dollars (USD) after conversion based on the market exchange rate. During the period $2012-2013$ the exchange rate for the USD increased from $Rs.\ 50/USD$ to $Rs.60/\ USD$. India's GDP in USD during the period $2012-2013$

A. increased by 5%
B. decreased by 13%
C. decreased by 20%
D. decreased by 11%

gate2014-3 numerical-ability normal percentage

8.32.9 Percentage: GATE2015 CE-2: GA-7

https://gateoverflow.in/40182

The given question is followed by two statements; select the most appropriate option that solves the question.
Capacity of a solution tank A is 70% of the capacity of tank B. How many gallons of solution are in tank A and tank B?
Statements:

I. Tank A is 80% full and tank B is 40% full.
II. Tank A if full contains $14,000$ gallons of solution.

A. Statement I alone is sufficient.
B. Statement II alone is sufficient.
C. Either statement I or II alone is sufficient.
D. Both the statements I and II together are sufficient.

gate2015-ce-2 numerical-ability general-aptitude percentage

8.32.10 Percentage: GATE2016 CE-2: GA-4

https://gateoverflow.in/110885

$(x\%$ of $y)$ + $(y\%$ of $x)$ is equivalent to _____ .

A. 2% of xy B. 2% of $(xy/100)$ C. $xy\%$ of 100 D. 100% of xy

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gate2016-ce-2 numerical-ability percentage

8.32.11 Percentage: GATE2016 EC-1: GA-4

https://gateoverflow.in/108074

In a huge pile of apples and oranges, both ripe and unripe mixed together, 15% are unripe fruits. Of the unripe fruits, 45% are apples. Of the ripe ones, 66% are oranges. If the pile contains a total of 5692000 fruits, how many of them are apples?

A. 2029198 B. 2467482 C. 2789080 D. 3577422

gate2016-ec-1 percentage numerical-ability

8.32.12 Percentage: GATE2017 CE-1: GA-4

https://gateoverflow.in/313484

If the radius of a right circular cone is increased by 50% its volume increases by

A. 75% B. 100% C. 125% D. 237.5%

gate2017-ce-1 general-aptitude numerical-ability percentage geometry

8.32.13 Percentage: GATE2017 EC-1: GA-3

https://gateoverflow.in/313519

In the summer, water consumption is known to decrease overall by 25%. A Water Board official states that in the summer household consumption decreases by 20%, while other consumption increases by 70%. Which of the following statement is correct?

A. The ratio of household to other consumption is $8/17$
B. The ratio of household to other consumption is $1/17$
C. The ratio of household to other consumption is $17/8$
D. There are errors in the official's statement.

gate2017-ec-1 general-aptitude numerical-ability percentage

8.32.14 Percentage: GATE2018 EE: GA-9

https://gateoverflow.in/205189

A designer uses marbles of four different colours for his designs. The cost of each marble is the same, irrespective of the colour. The table below shows the percentage of marbles of each colour used in the current design. The cost of each marble increased by 25%. Therefore, the designer decided to reduce equal numbers of marbles of each colour to keep the total cost unchanged. What is the percentage of blue marbles in the new design?

Blue	**Black**	**Red**	**Yellow**
40%	25%	20%	15%

A. 35.75 B. 40.25 C. 43.75 D. 46.25

gate2018-ee general-aptitude numerical-ability normal percentage

8.32.15 Percentage: GATE2019 CE-2: GA-7

https://gateoverflow.in/313372

Population of state X increased by x$\%$ and the population of state Y increased by y$\%$ from 2001 to 2011. Assume that x is greater than y. Let P be the ratio of the population of state X to state Y in a given year. The percentage increase in P from 2001 to 2011 is _____

A. $\frac{x}{y}$ B. $x-y$ C. $\frac{100(x-y)}{100+x}$ D. $\frac{100(x-y)}{100+y}$

gate2019-ce-2 general-aptitude numerical-ability percentage

8.32.16 Percentage: GATE2019 IN: GA-3

https://gateoverflow.in/313546

The radius as well as the height of a circular cone increases by 10%. The percentage increase in its volume is _____.

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A. 17.1 B. 21.0 C. 33.1 D. 72.8

gate2019-in general-aptitude numerical-ability geometry percentage

8.32.17 Percentage: GATE2019 IN: GA-7

https://gateoverflow.in/313548

In a country of 1400 million population, 70% own mobile phones. Among the mobile phone owners, only 294 million access the Internet. Among these Internet users, only half buy goods from e-commerce portals. What is the percentage of these buyers in the country?

A. 10.50 B. 14.70 C. 15.00 D. 50.00

gate2019-in general-aptitude numerical-ability percentage

8.32.18 Percentage: GATE2019 ME-2: GA-6

https://gateoverflow.in/313578

Fiscal deficit was 4% of the GDP in 2015 and that increased to 5% in 2016. If the GDP increased by 10% from 2015 to 2016, the percentage increase in the actual fiscal deficit is ____

A. 37.50 B. 35.70 C. 25.00 D. 10.00

gate2019-me-2 general-aptitude numerical-ability percentage

8.33 Permutation And Combination (14)

8.33.1 Permutation And Combination: GATE2010-65

https://gateoverflow.in/2373

Given digits $2, 2, 3, 3, 3, 4, 4, 4, 4$ how many distinct 4 digit numbers greater than 3000 can be formed?

A. 50 B. 51 C. 52 D. 54

gate2010 numerical-ability permutation-and-combination normal

8.33.2 Permutation And Combination: GATE2011 MN: GA-59

https://gateoverflow.in/31531

In how many ways 3 scholarships can be awarded to 4 applicants, when each applicant can receive any number of scholarships?

A. 4 B. 12 C. 64 D. 81

numerical-ability gate2011-mn permutation-and-combination

8.33.3 Permutation And Combination: GATE2012 AR: GA-5

https://gateoverflow.in/40226

Ten teams participate in a tournament. Every team plays each of the other teams twice. The total number of matches to be played is

A. 20 B. 45 C. 60 D. 90

gate2012-ar numerical-ability permutation-and-combination

8.33.4 Permutation And Combination: GATE2014 EC-4: GA-10

https://gateoverflow.in/41472

A five digit number is formed using the digits $1, 3, 5, 7$ and 9 without repeating any of them. What is the sum of all such possible five digit numbers?

A. 6666660 B. 6666600 C. 6666666 D. 6666606

gate2014-ec-4 numerical-ability normal permutation-and-combination

8.33.5 Permutation And Combination: GATE2015 CE-2: GA-8

https://gateoverflow.in/40183

How many four digit numbers can be formed with the 10 digits $0, 1, 2, \ldots, 9$ if no number can start with 0 and if repetitions are not allowed?

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gate2015-ce-2 numerical-ability permutation-and-combination

8.33.6 Permutation And Combination: GATE2015 ME-3: GA-5

https://gateoverflow.in/40170

Five teams have to compete in a league, with every team playing every other team exactly once, before going to the next round. How many matches will have to be held to complete the league round of matches?

A. 20 B. 10 C. 8 D. 5

gate2015-me-3 numerical-ability permutation-and-combination

8.33.7 Permutation And Combination: GATE2016-2-GA-09

https://gateoverflow.in/39537

In a 2×4 rectangle grid shown below, each cell is rectangle. How many rectangles can be observed in the grid?

A. 21 B. 27 C. 30 D. 36

gate2016-2 numerical-ability normal permutation-and-combination

8.33.8 Permutation And Combination: GATE2017 EC-2: GA-9

https://gateoverflow.in/313512

The number of 3-digit numbers such that the digit 1 is never to the immediate right of 2 is

A. 781 B. 791 C. 881 D. 891

gate2017-ec-2 numerical-ability permutation-and-combination

8.33.9 Permutation And Combination: GATE2017 ME-2: GA-8

https://gateoverflow.in/313680

There are 4 women P, Q, R, S and 5 men V, W, X, Y, Z in a group. We are required to form pairs each consisting of one woman and one man. P is not to be paired with Z, and Y must necessarily be paired with someone. In how many ways can 4 such pairs be formed?

A. 74 B. 76 C. 78 D. 80

gate2017-me-2 numerical-ability permutation-and-combination

8.33.10 Permutation And Combination: GATE2017-1-GA-9

https://gateoverflow.in/118412

Arun, Gulab, Neel and Shweta must choose one shirt each from a pile of four shirts coloured red, pink, blue and white respectively. Arun dislikes the colour red and Shweta dislikes the colour white. Gulab and Neel like all the colours. In how many different ways can they choose the shirts so that no one has a shirt with a colour he or she dislikes?

A. 21 B. 18 C. 16 D. 14

gate2017-1 permutation-and-combination numerical-ability

8.33.11 Permutation And Combination: GATE2018 CE-2: GA-4

https://gateoverflow.in/313393

A three-member committee has to be formed from a group of 9 people. How many such distinct committees can be formed?

A. 27 B. 72 C. 81 D. 84

gate2018-ce-2 numerical-ability permutation-and-combination

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8.33.12 Permutation And Combination: GATE2019 EC: GA-4

https://gateoverflow.in/313530

Five different books (P, Q, R, S, T) are to be arranged on a shelf. The books R and S are to be arranged first and second, respectively from the right side of the shelf. The number of different orders in which P, Q and T may be arranged is _____.

A. 2 B. 6 C. 12 D. 120

gate2019-ec numerical-ability permutation-and-combination

8.33.13 Permutation And Combination: TIFR2011-A-20

https://gateoverflow.in/20260

Let $n > 1$ be an odd integer. The number of zeros at the end of the number $99^n + 1$ is.

a. 1 b. 2 c. 3 d. 4 e. None of the above.

tifr2011 numerical-ability permutation-and-combination

8.33.14 Permutation And Combination: TIFR2013-A-1

https://gateoverflow.in/25382

An infinite two-dimensional pattern is indicated below.

The smallest closed figure made by the lines is called a unit triangle. Within every unit triangle, there is a mouse. At every vertex there is a laddoo. What is the average number of laddoos per mouse?

A. 3 B. 2 C. 1 D. $\left(\frac{1}{2}\right)$ E. $\left(\frac{1}{3}\right)$

tifr2013 numerical-ability permutation-and-combination

8.34 Pie Chart (7)

8.34.1 Pie Chart: GATE2014 AG: GA-8

https://gateoverflow.in/41672

The total exports and revenues from the exports of a country are given in the two pie charts below. The pie chart for exports shows the quantity of each item as a percentage of the total quantity of exports. The pie chart for the revenues shows the percentage of the total revenue generated through export of each item. The total quantity of exports of all the items is 5 lakh tonnes and the total revenues are 250 crore rupees. What is the ratio of the revenue generated through export of Item 1 per kilogram to the revenue generated through export of Item 4 per kilogram?

A. 1 : 2 B. 2 : 1 C. 1 : 4 D. 4 : 1

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gate2014-ag numerical-ability data-interpretation pie-chart ratio-proportion normal

8.34.2 Pie Chart: GATE2014 EC-2: GA-9

https://gateoverflow.in/41517

The total exports and revenues from the exports of a country are given in the two charts shown below. The pie chart for exports shows the quantity of each item exported as a percentage of the total quantity of exports. The pie chart for the revenues shows the percentage of the total revenue generated through export of each item. The total quantity of exports of all the items is 500 thousand tonnes and the total revenues are 250 crore rupees. Which item among the following has generated the maximum revenue per kg?

A. Item 2 B. Item 3 C. Item 6 D. Item 5

gate2014-ec-2 numerical-ability data-interpretation pie-chart normal

8.34.3 Pie Chart: GATE2014 EC-3: GA-7

https://gateoverflow.in/41459

The multi-level hierarchical pie chart shows the population of animals in a reserve forest. The correct conclusions from this information are:

(i) Butterflies are birds

(ii) There are more tigers in this forest than red ants

(iii) All reptiles in this forest are either snakes or crocodiles

(iv) Elephants are the largest mammals in this forest

A. (i) and (ii) only
B. (i), (ii), (iii) and (iv)
C. (i), (iii) and (iv) only
D. (i), (ii) and (iii) only

gate2014-ec-3 numerical-ability data-interpretation pie-chart normal

8.34.4 Pie Chart: GATE2014 EC-3: GA-9

https://gateoverflow.in/41461

A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy, plant & machinery, and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs.4,50,000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. If the company registered a profit of Rs. 10 lakhs in 2012, at what price (in Rs) was each air purifier sold?

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gate2014-ec-3 numerical-ability data-interpretation pie-chart numerical-answers

8.34.5 Pie Chart: GATE2014 EC-4: GA-9

https://gateoverflow.in/41471

A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy, plant & machinery, and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs. 4,50,000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. What is the percentage increase in total cost for the company in 2013?

gate2014-ec-4 numerical-ability data-interpretation pie-chart numerical-answers

8.34.6 Pie Chart: GATE2015-1-GA-9

https://gateoverflow.in/8013

The pie chart below has the breakup of the number of students from different departments in an engineering college for the year 2012. The proportion of male to female students in each department is $5:4$. There are 40 males in Electrical Engineering. What is the difference between the numbers of female students in the civil department and the female students in the Mechanical department?

gate2015-1 numerical-ability data-interpretation numerical-answers pie-chart

8.34.7 Pie Chart: GATE2017 EC-1: GA-4

https://gateoverflow.in/313520

40% of deaths on city roads may be attributed to drunken driving. The number of degrees needed to represent this as a slice of a pie chart is

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A. 120 B. 144 C. 160 D. 212

gate2017-ec-1 general-aptitude numerical-ability percentage pie-chart

8.35 Polynomials (3)

8.35.1 Polynomials: GATE2016-1-GA09

https://gateoverflow.in/39611

If $f(x) = 2x^7 + 3x - 5$, which of the following is a factor of $f(x)$?

A. $(x^3 + 8)$ B. $(x - 1)$ C. $(2x - 5)$ D. $(x + 1)$

gate2016-1 numerical-ability polynomials normal

8.35.2 Polynomials: GATE2018 CH: GA-9

https://gateoverflow.in/205082

If $x^2 + x - 1 = 0$ what is the value of $x^4 + \frac{1}{x^4}$?

A. 1 B. 5 C. 7 D. 9

gate2018-ch numerical-ability easy polynomials

8.35.3 Polynomials: GATE2018 EE: GA-3

https://gateoverflow.in/205099

The three roots of the equation $f(x) = 0$ are $x = \{-2, 0, 3\}$. What are the three values of x for which $f(x - 3) = 0$?

A. $-5, -3, 0$ B. $-2, 0, 3$ C. $0, 6, 8$ D. $1, 3, 6$

gate2018-ee general-aptitude numerical-ability easy polynomials

8.36 Probability (19)

8.36.1 Probability: GATE2012 AE: GA-6

https://gateoverflow.in/40217

Two policemen, A and B, fire once each at the same time at an escaping convict. The probability that A hits the convict is three times the probability that B hits the convict. If the probability of the convict not getting injured is 0.5, the probability that B hits the convict is

A. 0.14 B. 0.22 C. 0.33 D. 0.40

gate2012-ae numerical-ability probability

8.36.2 Probability: GATE2012 AR: GA-9

https://gateoverflow.in/40230

A smuggler has 10 capsules in which five are filled with narcotic drugs and the rest contain the original medicine. All the 10 capsules are mixed in a single box, from which the customs officials picked two capsules at random and tested for the presence of narcotic drugs. The probability that the smuggler will be caught is

A. 0.50 B. 0.67 C. 0.78 D. 0.82

gate2012-ar numerical-ability probability

8.36.3 Probability: GATE2012 CY: GA-7

https://gateoverflow.in/4173

A and B are friends. They decide to meet between 1:00 pm and 2:00 pm on a given day. There is a condition that whoever arrives first will not wait for the other for more than 15 minutes. The probability that they will meet on that day is

A. $1/4$ B. $1/16$ C. $7/16$ D. $9/16$

gate2012-cy numerical-ability probability

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8.36.4 Probability: GATE2013 EE: GA-6

https://gateoverflow.in/40293

What is the chance that a leap year, selected at random, will contain 53 Saturdays?

A. $2/7$ B. $3/7$ C. $1/7$ D. $5/7$

gate2013-ee numerical-ability probability

8.36.5 Probability: GATE2014 AG: GA-4

https://gateoverflow.in/41668

In any given year, the probability of an earthquake greater than Magnitude 6 occurring in the Garhwal Himalayas is 0.04. The average time between successive occurrences of such earthquakes is ____ years.

gate2014-ag numerical-ability probability numerical-answers normal

8.36.6 Probability: GATE2014 EC-2: GA-4

https://gateoverflow.in/41511

A regular die has six sides with numbers 1 to 6 marked on its sides. If a very large number of throws show the following frequencies of occurrence: $1 \rightarrow 0.167; 2 \rightarrow 0.167; 3 \rightarrow 0.152; 4 \rightarrow 0.166; 5 \rightarrow 0.168; 6 \rightarrow 0.180.$ We call this die:

A. Irregular B. Biased C. Gaussian D. Insufficient

gate2014-ec-2 numerical-ability probability normal

8.36.7 Probability: GATE2014 EC-3: GA-10

https://gateoverflow.in/41462

A batch of one hundred bulbs is inspected by testing four randomly chosen bulbs. The batch is rejected if even one of the bulbs is defective. A batch typically has five defective bulbs. The probability that the current batch is accepted is_____.

gate2014-ec-3 numerical-ability probability numerical-answers normal

8.36.8 Probability: GATE2015 CE-2: GA-5

https://gateoverflow.in/40180

Four cards are randomly selected from a pack of 52 cards. If the first two cards are kings, what is the probability that the third card is a king?

A. $4/52$
B. $2/50$
C. $(1/52) \times (1/52)$
D. $(1/52) \times (1/51) \times (1/50)$

gate2015-ce-2 numerical-ability probability easy

8.36.9 Probability: GATE2015 EC-2: GA- 5

https://gateoverflow.in/39506

Ram and Ramesh appeared in an interview for two vacancies in the same department. The probability of Ram's selection is $1/6$ and that of Ramesh is $1/8$. What is the probability that only one of them will be selected?

A. $47/48$ B. $1/4$ C. $13/48$ D. $35/48$

gate2015-ec-2 numerical-ability probability

8.36.10 Probability: GATE2015-1-GA-10

https://gateoverflow.in/8014

The probabilities that a student passes in mathematics, physics and chemistry are m, p and c respectively. Of these subjects, the student has 75% chance of passing in at least one, a 50% chance of passing in at least two and a 40% chance of passing in exactly two. Following relations are drawn in m, p, c:

I. $p + m + c = 27/20$
II. $p + m + c = 13/20$
III. $(p) \times (m) \times (c) = 1/10$

A. Only relation I is true.
B. Only relation II is true.
C. Relations II and III are true.
D. Relations I and III are true.

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gate2015-1 numerical-ability probability

8.36.11 Probability: GATE2015-1-GA-3

https://gateoverflow.in/8004

Given Set $A = 2, 3, 4, 5$ and Set $B = 11, 12, 13, 14, 15$, two numbers are randomly selected, one from each set. What is the probability that the sum of the two numbers equals 16?

A. 0.20 B. 0.25 C. 0.30 D. 0.33

gate2015-1 numerical-ability probability normal

8.36.12 Probability: GATE2016 EC-1: GA-6

https://gateoverflow.in/108086

A person moving through a tuberculosis prone zone has a 50% probability of becoming infected. However, only 30% of infected people develop the disease. What percentage of people moving through a tuberculosis prone zone remains infected but does not show symptoms of disease?

A. 15 B. 33 C. 35 D. 37

gate2016-ec-1 numerical-ability probability

8.36.13 Probability: GATE2017 CE-2: GA-5

https://gateoverflow.in/313416

Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the top faces of the dice is a perfect square is

A. $\frac{1}{9}$ B. $\frac{2}{9}$ C. $\frac{1}{3}$ D. $\frac{4}{9}$

gate2017-ce-2 numerical-ability probability

8.36.14 Probability: GATE2017 ME-2: GA-4

https://gateoverflow.in/313671

A couple has 2 children. The probability that both children are boys if the older one is a boy is

A. $1/4$ B. $1/3$ C. $1/2$ D. 1

gate2017-me-2 numerical-ability probability

8.36.15 Probability: GATE2017-1-GA-5

https://gateoverflow.in/118408

The probability that a k-digit number does NOT contain the digits $0, 5,$ or 9 is

A. 0.3^k B. 0.6^k C. 0.7^k D. 0.9^k

gate2017-1 general-aptitude numerical-ability probability easy

8.36.16 Probability: GATE2017-2-GA-5

https://gateoverflow.in/118419

There are 3 red socks, 4 green socks and 3 blue socks.You choose 2 socks. The probability that they are of the same colour is

A. $\frac{1}{5}$ B. $\frac{7}{30}$ C. $\frac{1}{4}$ D. $\frac{4}{15}$

gate2017-2 numerical-ability probability

8.36.17 Probability: GATE2018 EE: GA-8

https://gateoverflow.in/205188

A class of twelve children has two more boys than girls. A group of three children are randomly picked from this class to accompany the teacher on a field trip. What is the probability that the group accompanying the teacher contains more girls than boys?

A. 0 B. $\frac{325}{864}$ C. $\frac{525}{864}$ D. $\frac{5}{12}$

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gate2018-ee numerical-ability probability

8.36.18 Probability: GATE2018 ME-2: GA-10

https://gateoverflow.in/313632

An unbiased coin is tossed six times in a row and four different such trials are conducted. One trial implies six tosses of the coin. If H stands for head ans T stands for tail, the following are the observations from the four trials.

1. HTHTHT
2. TTHHHT
3. HTTHHT
4. HHHT_ _

Which statement describing the last two coin tosses of the fourth trial has the highest probability of being correct?

A. Two T will occur.
B. One H and one T will occur.
C. Two H will occur.
D. One H will be followed by one T.

gate2018-me-2 numerical-ability probability

8.36.19 Probability: GATE2018-GA-10

https://gateoverflow.in/204071

A six sided unbiased die with four green faces and two red faces is rolled seven times. Which of the following combinations is the most likely outcome of the experiment?

A. Three green faces and four red faces.
B. Four green faces and three red faces.
C. Five green faces and two red faces.
D. Six green faces and one red face

gate2018 numerical-ability probability normal

8.37 Profit Loss (3)

8.37.1 Profit Loss: GATE2013 CE: GA-9

https://gateoverflow.in/40278

A firm is selling its product at Rs. 60 per unit. The total cost of production is Rs. 100 and firm is earning total profit of Rs. 500. Later, the total cost increased by 30%. By what percentage the price should be increased to maintained the same profit level.

A. 5
B. 10
C. 15
D. 30

numerical-ability gate2013-ce profit-loss

8.37.2 Profit Loss: GATE2018 CE-1: GA-6

https://gateoverflow.in/313249

A fruit seller sold a basket of fruits at 12.5% loss. Had he sold it for Rs. 108 more, he would have made a 10% gain. What is the loss in Rupees incurred by the fruit seller?

A. 48
B. 52
C. 60
D. 108

gate2018-ce-1 general-aptitude numerical-ability profit-loss

8.37.3 Profit Loss: GATE2019 ME-1: GA-7

https://gateoverflow.in/313599

A person divided an amount of Rs. $100,000$ into two parts and invested in two different schemes. In one he got 10% profit and in the other he got 12%. If the profit percentages are interchanged with these investments he would have got Rs. 120 less. Find the ratio between his investments in the two schemes.

A. $9 : 16$
B. $11 : 14$
C. $37 : 63$
D. $47 : 53$

gate2019-me-1 general-aptitude numerical-ability ratio-proportion profit-loss

8.38 Quadratic Equations (8)

8.38.1 Quadratic Equations: GATE2011 MN: GA-62

https://gateoverflow.in/31540

A student attempted to solve a quadratic equation in x twice. However, in the first attempt, he incorrectly

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wrote the constant term and ended up with the roots as $(4,3)$. In the second attempt, he incorrectly wrote down the coefficient of x and got the roots as $(3,2)$. Based on the above information, the roots of the correct quadratic equation are

A. $(-3,4)$ B. $(3,-4)$ C. $(6,1)$ D. $(4,2)$

gate2011-mn quadratic-equations numerical-ability

8.38.2 Quadratic Equations: GATE2013 EE: GA-8

https://gateoverflow.in/40295

The set of values of p for which the roots of the equation $3x^2+2x+p(p-1)=0$ are of opposite sign is

A. $(-\infty,0)$ B. $(0,1)$ C. $(1,\infty)$ D. $(0,\infty)$

gate2013-ee numerical-ability quadratic-equations

8.38.3 Quadratic Equations: GATE2014-1-GA-5

https://gateoverflow.in/770

The roots of $ax^2+bx+c=0$ are real and positive. a,b and c are real. Then $ax^2+b\mid x\mid+c=0$ has

A. no roots B. 2 real roots C. 3 real roots D. 4 real roots

gate2014-1 numerical-ability quadratic-equations normal

8.38.4 Quadratic Equations: GATE2015 EC-2: GA-9

https://gateoverflow.in/39510

if $a^2+b^2+c^2=1$ then $ab+bc+ac$ lies in the interval

A. $[1,2/3]$ B. $[-1/2,1]$ C. $[-1,1/2]$ D. $[2,-4]$

gate2015-ec-2 numerical-answers numerical-ability quadratic-equations

8.38.5 Quadratic Equations: GATE2016 EC-2: GA-4

https://gateoverflow.in/108482

Given $(9\text{ inches})^{\frac{1}{2}}=(0.25\text{ yards})^{\frac{1}{2}}$, which one of the following statements is TRUE?

A. 3 inches = 0.5 yards
B. 9 inches = 1.5 yards
C. 9 inches = 0.25 yards
D. 81 inches = 0.0625 yards

gate2016-ec-2 numerical-ability quadratic-equations

8.38.6 Quadratic Equations: GATE2016-2-GA-05

https://gateoverflow.in/39532

In a quadratic function, the value of the product of the roots (α,β) is 4. Find the value of

$$\frac{\alpha^n+\beta^n}{\alpha^{-n}+\beta^{-n}}$$

A. n^4 B. 4^n C. 2^{2n-1} D. 4^{n-1}

gate2016-2 numerical-ability quadratic-equations normal

8.38.7 Quadratic Equations: GATE2018 EE: GA-4

https://gateoverflow.in/205181

For what values of k given below is $\dfrac{(k+2)^2}{(k-3)}$ an integer?

A. $4,8,18$ B. $4,10,16$ C. $4,8,28$ D. $8,26,28$

gate2018-ee general-aptitude numerical-ability easy quadratic-equations

8.38.8 Quadratic Equations: GATE2018 ME-1: GA-7

https://gateoverflow.in/313650

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

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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

gate2018-me-1 general-aptitude numerical-ability quadratic-equations system-of-equations

8.39 Ratio Proportion (15)

8.39.1 Ratio Proportion: GATE2011 AG: GA-8

https://gateoverflow.in/312128

Three friends, R, S and T shared toffee from a bowl. R took $\frac{1}{3}^{\text{rd}}$ of the toffees, but returned four to the bowl. S took $\frac{1}{4}^{\text{th}}$ of what was left but returned three toffees to the bowl. T took half of the remainder but returned two back into the bowl. If the bowl had 17 toffees left, how may toffees were originally there in the bowl?

A. 38
B. 31
C. 48
D. 41

general-aptitude numerical-ability gate2011-ag ratio-proportion

8.39.2 Ratio Proportion: GATE2011 GG: GA-4

https://gateoverflow.in/40205

If m students require a total of m pages of stationery in m days, then 100 students will require 100 pages of stationery in

A. 100 days
B. $m/100$ days
C. $100/m$ days
D. m days

gate2011-gg numerical-ability ratio-proportion

8.39.3 Ratio Proportion: GATE2013 AE: GA-1

https://gateoverflow.in/40242

If $3 \leq X \leq 5$ and $8 \leq Y \leq 11$ then which of the following options is TRUE?

A. $\left(\frac{3}{5} \leq \frac{X}{Y} \leq \frac{8}{5}\right)$
B. $\left(\frac{3}{11} \leq \frac{X}{Y} \leq \frac{5}{8}\right)$
C. $\left(\frac{3}{11} \leq \frac{X}{Y} \leq \frac{8}{5}\right)$
D. $\left(\frac{3}{5} \leq \frac{X}{Y} \leq \frac{8}{11}\right)$

gate2013-ae numerical-ability ratio-proportion normal

8.39.4 Ratio Proportion: GATE2014 AE: GA-8

https://gateoverflow.in/40308

The smallest angle of a triangle is equal to two thirds of the smallest angle of a quadrilateral. The ratio between the angles of the quadrilateral is $3:4:5:6$. The largest angle of the triangle is twice its smallest angle. What is the sum, in degrees, of the second largest angle of the triangle and the largest angle of the quadrilateral?

gate2014-ae numerical-ability ratio-proportion numerical-answers

8.39.5 Ratio Proportion: GATE2015 EC-1: GA-9

https://gateoverflow.in/39496

A cube of side 3 units is formed using a set of smaller cubes of side 1 unit. Find the proportion of the number of faces of the smaller cubes visible to those which are NOT visible.

A. $1:4$
B. $1:3$
C. $1:2$
D. $2:3$

gate2015-ec-1 general-aptitude numerical-ability geometry ratio-proportion

8.39.6 Ratio Proportion: GATE2016-1-GA10

https://gateoverflow.in/39612

In a process, the number of cycles to failure decreases exponentially with an increase in load. At a load of 80 units, it takes 100 cycles for failure. When the load is halved, it takes 10000 cycles for failure.The load for which the failure will happen in 5000 cycles is _____.

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A. 40.00 B. 46.02 C. 60.01 D. 92.02

gate2016-1 numerical-ability ratio-proportion normal

8.39.7 Ratio Proportion: GATE2017 CE-2: GA-4

https://gateoverflow.in/313415

What is the value of x when $81 \times \left(\frac{16}{25}\right)^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144$?

A. 1 B. -1 C. -2 D. Can not be determined

gate2017-ce-2 ratio-proportion numerical-ability

8.39.8 Ratio Proportion: GATE2018 CE-1: GA-7

https://gateoverflow.in/313254

The price of a wire made of a super alloy material is proportional to the square of its length. The price of $10m$ length of the wire is Rs. 1600. What would be the total price (in Rs.) of two wires of length $4m$ and $6m$?

A. 768 B. 832 C. 1440 D. 1600

gate2018-ce-1 general-aptitude numerical-ability ratio-proportion

8.39.9 Ratio Proportion: GATE2018 CE-2: GA-6

https://gateoverflow.in/313385

In manufacturing industries, loss is usually taken to be proportional to the square of the deviation from a target. If the loss is Rs. 4900 for a deviation of 7 units, what would be the loss in Rupees for a deviation of 4 units from the target?

A. 400 B. 1200 C. 1600 D. 2800

gate2018-ce-2 general-aptitude numerical-ability ratio-proportion

8.39.10 Ratio Proportion: GATE2018 EC: GA-7

https://gateoverflow.in/205211

Two alloys A and B contain gold and copper in the ratios of $2:3$ and $3:7$ by mass, respectively. Equal masses of alloys A and B are melted to make an alloy C. The ratio of gold to copper in alloy C is _____.

A. $5:10$ B. $7:13$ C. $6:11$ D. $9:13$

gate2018-ec general-aptitude numerical-ability normal ratio-proportion

8.39.11 Ratio Proportion: GATE2018-GA-7

https://gateoverflow.in/204068

If $pqr \neq 0$ and $p^{-x} = \frac{1}{q}, q^{-y} = \frac{1}{r}, r^{-z} = \frac{1}{p}$, what is the value of the product xyz ?

A. -1 B. $\frac{1}{pqr}$ C. 1 D. pqr

gate2018 numerical-ability ratio-proportion

8.39.12 Ratio Proportion: GATE2018-GA-8

https://gateoverflow.in/204069

In a party, 60% of the invited guests are male and 40% are female.If 80% of the invited guests attended the party and if all the invited female guests attended, what would be the ratio of males to females among the attendees in the party?

A. $2:3$ B. $1:1$ C. $3:2$ D. $2:1$

gate2018 numerical-ability ratio-proportion

8.39.13 Ratio Proportion: GATE2019 EE: GA-7

https://gateoverflow.in/313564

The ratio of the number of boys and girls who participated in an examination is $4:3$. The total percentage of candidates who passed the examination is 80 and the percentage of girls who passed the exam is 90. The

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percentage of boys who passed is _____.

A. 55.50 B. 72.50 C. 80.50 D. 90.00

gate2019-ee general-aptitude numerical-ability ratio-proportion percentage

8.39.14 Ratio Proportion: TIFR2012-A-18

https://gateoverflow.in/25043

A large community practices birth control in the following peculiar fashion. Each set of parents continues having children until a son is born; then they stop. What is the ratio of boys to girls in the community if, in the absence of birth control, 51% of the babies are born male?

a. 51 : 49 b. 1 : 1 c. 49 : 51 d. 51 : 98 e. 98 : 51

tifr2012 numerical-ability ratio-proportion

8.39.15 Ratio Proportion: TIFR2014-A-2

https://gateoverflow.in/25987

A body at a temperature of 30 Celsius is immersed into a heat bath at 0 Celsius at time $t = 0$. The body starts cooling at a rate proportional to the temperature difference. Assuming that the heat bath does not change in temperature throughout the process, calculate the ratio of the time taken for the body to reach 1 Celsius divided by the time taken for the body to reach 5 Celsius.

A. $\log 5$.

B. $\frac{\log 29}{\log 25}$.

C. e^5.

D. $1 + \log_6 5$.

E. None of the above.

tifr2014 numerical-ability ratio-proportion

8.40 Round Table Arrangement (3)

8.40.1 Round Table Arrangement: GATE2017 CE-2: GA-8

https://gateoverflow.in/313417

P, Q, R, S, T, and U are seated around a circular table R is seated two places to the right of Q. P is seated three places to the left of R. S is seated opposite U. If P and U now switch seats, which of the following must necessarily be true?

A. P is immediately to the right of R
B. T is immediately to the left of P
C. T is immediately to the left of P or P is immediately to the right of Q
D. U is immediately to the right of R or P is immediately to the left of T

gate2017-ce-2 logical-reasoning round-table-arrangement

8.40.2 Round Table Arrangement: GATE2017 EC-1: GA-7

https://gateoverflow.in/313521

S, T, U, V, W, X, Y and Z are seated around a circular table. $T's$ neighbors are Y and V. Z is seated third to the left of T and second to the right of S. $U's$ neighbors are S and Y; and T and W are not seated opposite each other. Who is third to the left of V?

A. X B. W C. U D. T

gate2017-ec-1 round-table-arrangement

8.40.3 Round Table Arrangement: GATE2017-1-GA-7

https://gateoverflow.in/118410

Six people are seated around a circular table. There are at least two men and two women. There are at least three right-handed persons. Every woman has a left-handed person to her immediate right. None of the women are right-handed. The number of women at the table is

A. 2 B. 3 C. 4 D. Cannot be determined

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gate2017-1 numerical-ability round-table-arrangement

8.41 Sequence Series (11)

8.41.1 Sequence Series: GATE2010 MN: GA-7

https://gateoverflow.in/312016

Given the sequence $A, B, B, C, C, C, D, D, D, D, \ldots$ etc., that is one A, two $B's$, three $C's$, four $D's$, five $E's$ and so on, the 240th latter in the sequence will be :

A. V B. U C. T D. W

general-aptitude logical-reasoning gate2010-mn sequence-series

8.41.2 Sequence Series: GATE2012-65

https://gateoverflow.in/2213

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

A. OV B. OW C. PV D. PW

gate2012 numerical-ability sequence-series easy

8.41.3 Sequence Series: GATE2014 EC-4: GA-5

https://gateoverflow.in/41467

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?

gate2014-ec-4 numerical-ability sequence-series normal numerical-answers

8.41.4 Sequence Series: GATE2014 EC-4: GA-6

https://gateoverflow.in/41468

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

A. 21W B. 21V C. 23W D. 23V

gate2014-ec-4 numerical-ability sequence-series normal

8.41.5 Sequence Series: GATE2015 EC-1: GA-8

https://gateoverflow.in/313226

Fill in the missing value

gate2015-ec-1 general-aptitude numerical-ability sequence-series

8.41.6 Sequence Series: GATE2015 EC-3: GA-4

https://gateoverflow.in/39517

Find the missing sequence in the letter series below:
$A, CD, GHI, ?, UVWXY$

A. LMN B. MNO C. $MNOP$ D. $NOPQ$

gate2015-ec-3 general-aptitude logical-reasoning sequence-series

8.41.7 Sequence Series: GATE2016 ME-2: GA-8

https://gateoverflow.in/108300

Find the missing sequence in the letter series. $B, FH, LNP,$ _____.

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A. $SUWY$ B. $TUVW$ C. $TVXZ$ D. $TWXZ$

gate2016-me-2 sequence-series numerical-ability

8.41.8 Sequence Series: GATE2018-GA-5

https://gateoverflow.in/204066

What is the missing number in the following sequence?

$$2, 12, 60, 240, 720, 1440, ____, 0$$

A. 2880 B. 1440 C. 720 D. 0

gate2018 numerical-ability sequence-series easy

8.41.9 Sequence Series: GATE2019 EE: GA-3

https://gateoverflow.in/313558

The missing number in the given sequence $343, 1331, ____, 4913$ is

A. 3375 B. 2744 C. 2197 D. 4096

gate2019-ee general-aptitude numerical-ability sequence-series

8.41.10 Sequence Series: GATE2019 ME-2: GA-3

https://gateoverflow.in/313588

If IMHO=JNIP; IDK=JEL; and SO=TP, then IDC=_____

A. JDE B. JED C. JDC D. JCD

gate2019-me-2 general-aptitude numerical-ability sequence-series easy

8.41.11 Sequence Series: TIFR2013-A-19

https://gateoverflow.in/25500

Consider a sequence of numbers $(\epsilon_n : n = 1, 2, \ldots)$, such that $\epsilon_1 = 10$ and

$$\epsilon_{n+1} = \frac{20\epsilon_n}{20 + \epsilon_n}$$

for $n \geq 1$. Which of the following statements is true?

Hint: Consider the sequence of reciprocals.

1. The sequence $(\epsilon_n : n = 1, 2, \ldots)$ converges to zero.
2. $\epsilon_n \geq 1$ for all n
3. The sequence $(\epsilon_n : n = 1, 2, \ldots)$ is decreasing and converges to 1.
4. The sequence $(\epsilon_n : n = 1, 2, \ldots)$ is decreasing and then increasing. Finally it converges to 1.
5. None of the above.

tifr2013 numerical-ability sequence-series

8.42 Simple Compound Interest (3)

8.42.1 Simple Compound Interest: GATE2010 MN: GA-5

https://gateoverflow.in/312013

A person invest Rs.1000 at 10% annual compound interest for 2 years. At the end of two years, the whole amount is invested at an annual simple interest of 12% for 5 years. The total value of the investment finally is :

A. 1776 B. 1760 C. 1920 D. 1936

general-aptitude numerical-ability gate2010-mn simple-compound-interest

8.42.2 Simple Compound Interest: GATE2014 AG: GA-5

https://gateoverflow.in/41669

The population of a new city is 5 million and is growing at 20% annually. How many years would it take to

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double at this growth rate?

A. $3-4$ years B. $4-5$ years C. $5-6$ years D. $6-7$ years

gate2014-ag numerical-ability simple-compound-interest normal

8.42.3 Simple Compound Interest: GATE2018 EC: GA-6

https://gateoverflow.in/205210

Leila aspires to buy a car worth $Rs.10,00,000$ after 5 years. What is the minimum amount in Rupees that she should deposit now in a bank which offers 10% annual rate of interest, if the interest was compounded annually?

A. $5,00,000$ B. $6,21,000$ C. $6,66,667$ D. $7,50,000$

gate2018-ec general-aptitude numerical-ability simple-compound-interest normal

8.43 Speed Time Distance (17)

8.43.1 Speed Time Distance: GATE2013 AE: GA-6

https://gateoverflow.in/40247

Velocity of an object fired directly in upward direction is given by $V=80-32t$, where t (time) is in seconds. When will the velocity be between $32\ m/sec$ and $64\ m/sec$?

A. $\left(1,\frac{3}{2}\right)$ B. $\left(\frac{1}{2},1\right)$
C. $\left(\frac{1}{2},\frac{3}{2}\right)$ D. $(1,3)$

gate2013-ae numerical-ability speed-time-distance

8.43.2 Speed Time Distance: GATE2013 EE: GA-9

https://gateoverflow.in/40296

A car travels $8\ km$ in the first quarter of an hour, $6\ km$ in the second quarter and $16\ km$ in the third quarter. The average speed of the car in km per hour over the entire journey is

A. 30 B. 36 C. 40 D. 24

gate2013-ee speed-time-distance numerical-ability

8.43.3 Speed Time Distance: GATE2013-64

https://gateoverflow.in/1568

A tourist covers half of his journey by train at $60\ km/h$, half of the remainder by bus at $30\ km/h$ and the rest by cycle at $10\ km/h$. The average speed of the tourist in km/h during his entire journey is

A. 36 B. 30 C. 24 D. 18

gate2013 numerical-ability easy speed-time-distance

8.43.4 Speed Time Distance: GATE2014 EC-1: GA-8

https://gateoverflow.in/41497

A train that is 280 metres long, travelling at a uniform speed, crosses a platform in 60 seconds and passes a man standing on the platform in 20 seconds. What is the length of the platform in metres?

gate2014-ec-1 numerical-ability speed-time-distance normal numerical-answers

8.43.5 Speed Time Distance: GATE2014 EC-2: GA-10

https://gateoverflow.in/41518

It takes 30 minutes to empty a half-full tank by draining it at a constant rate. It is decided to simultaneously pump water into the half-full tank while draining it. What is the rate at which water has to be pumped in so that it gets fully filled in 10 minutes?

A. 4 times the draining rate B. 3 times the draining rate
C. 2.5 times the draining rate D. 2 times the draining rate

gate2014-ec-2 numerical-ability speed-time-distance normal

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8.43.6 Speed Time Distance: GATE2014 EC-3: GA-8

https://gateoverflow.in/41460

A man can row at 8 km per hour in still water. If it takes him thrice as long to row upstream, as to row downstream, then find the stream velocity in km per hour.

gate2014-ec-3 numerical-ability speed-time-distance normal numerical-answers

8.43.7 Speed Time Distance: GATE2015 EC-2: GA- 8

https://gateoverflow.in/39509

A tiger is 50 leaps of its own behind a tree. The tiger takes 5 leaps per minute to the deer's 4. If the tiger and the deer cover 8 meter and 5 meter per leap respectively, what distance in meters will the tiger have to run before it catches the deer?

gate2015-ec-2 numerical-ability numerical-answers speed-time-distance

8.43.8 Speed Time Distance: GATE2016 EC-3: GA-5

https://gateoverflow.in/110832

It takes 10 s and 15 s, respectively, for two trains travelling at different constant speeds to completely pass a telegraph post. The length of the first train is 120 m and that of the second train is 150 m. The magnitude of the difference in the speeds of the two trains (in m/s) is _____.

A. 2.0 B. 10.0 C. 12.0 D. 22.0

gate2016-ec-3 speed-time-distance numerical-ability

8.43.9 Speed Time Distance: GATE2016 EC-3: GA-6

https://gateoverflow.in/110834

The velocity V of a vehicle along a straight line is measured in m/s and plotted as shown with respect to time in seconds. At the end of the 7 seconds, how much will the odometer reading increase by (in m)?

A. 0 B. 3 C. 4 D. 5

gate2016-ec-3 numerical-ability speed-time-distance data-interpretation

8.43.10 Speed Time Distance: GATE2017 CE-2: GA-9

https://gateoverflow.in/313418

Budhan covers a distance of 19 km in 2 hours by cycling one fourth of the time and walking the rest. The next day he cycles (at the same speed as before) for half the time and walks the rest (at the same speed as before) and covers 26 km in 2 hours. The speed in km/h at which Budhan walk is

A. 1 B. 4 C. 5 D. 6

gate2017-ce-2 speed-time-distance numerical-ability

8.43.11 Speed Time Distance: GATE2017 EC-1: GA-8

https://gateoverflow.in/313517

Trucks (10 m long) and cars (5 m long) go on a single lane bridge. There must be a gap of at least 20 m after each truck and a gap of at least 15 m after each car. Trucks and cars travel at a speed of 36 km/h. If cars and trucks go alternately, what is the maximum number of vehicles that can use the bridge in one hour?

A. 1440 B. 1200 C. 720 D. 600

gate2017-ec-1 general-aptitude numerical-ability speed-time-distance

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8.43.12 Speed Time Distance: GATE2018 CH: GA-6

https://gateoverflow.in/205089

An automobile travels from city A to city B and returns to city A by the same route. The speed of the vehicle during the onward and return journeys were constant at $60km/h$ and $90km/h$, respectively. What is the average speed in km/h for the entire journey?

A. $72\ km/h$
B. $73\ km/h$
C. $74\ km/h$
D. $75\ km/h$

gate2018-ch general-aptitude numerical-ability normal speed-time-distance

8.43.13 Speed Time Distance: GATE2018 ME-1: GA-8

https://gateoverflow.in/313652

From the time the front of a train enters a platform, it takes 25 seconds for the back of the train to leave the platform, while traveling at a constant speed of 54 km/h. At the same speed, it takes 14 seconds to pass a man running at 9 km/h in the same direction as the train. What is the length of the train and that of the platform in meters, respectively?

A. 210 and 140
B. 162.5 and 187.5
C. 245 and 130
D. 175 and 200

gate2018-me-1 general-aptitude numerical-ability speed-time-distance

8.43.14 Speed Time Distance: GATE2019 IN: GA-9

https://gateoverflow.in/313549

Two trains started at 7AM from the same point. The first train travelled north at a speed of 80km/h and the second train travelled south at a speed of 100km/h. The time at which they were 540 km apart is _____ AM.

A. 9
B. 10
C. 11
D. 11.30

gate2019-in general-aptitude numerical-ability speed-time-distance

8.43.15 Speed Time Distance: GATE2019-GA-3

https://gateoverflow.in/302870

Two cars at the same time from the same location and go in the same direction. The speed of the first car is 50 km/h and the speed of the second car is 60 km/h. The number of hours it takes for the distance between the two cars to be 20 km is _____.

A. 1
B. 2
C. 3
D. 6

gate2019 general-aptitude numerical-ability speed-time-distance

8.43.16 Speed Time Distance: TIFR2012-A-16

https://gateoverflow.in/25041

Walking at $4/5$ is normal speed a man is 10 minute too late. Find his usual time in minutes.

a. 81
b. 64
c. 52
d. 40
e. It is not possible to determine the usual time from given data.

tifr2012 numerical-ability speed-time-distance

8.43.17 Speed Time Distance: TIFR2017-A-3

https://gateoverflow.in/94941

On planet TIFR, the acceleration of an object due to gravity is half that on planet earth. An object on planet earth dropped from a height h takes time t to reach the ground. On planet TIFR, how much time would an object dropped from height h take to reach the ground?

A. $\left(\frac{t}{\sqrt{2}}\right)$
B. $\sqrt{2t}$
C. $2t$
D. $\left(\frac{h}{t}\right)$
E. $\left(\frac{h}{2t}\right)$

tifr2017 numerical-ability speed-time-distance

8.44 Statistics (7)

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8.44.1 Statistics: GATE2012 AE: GA-5

https://gateoverflow.in/40216

The arithmetic mean of five different natural numbers is 12. The largest possible value among the numbers is

A. 12 B. 40 C. 50 D. 60

gate2012-ae statistics numerical-ability

8.44.2 Statistics: GATE2012-64

https://gateoverflow.in/2212

Which of the following assertions are **CORRECT**?

- P: Adding 7 to each entry in a list adds 7 to the mean of the list
- Q: Adding 7 to each entry in a list adds 7 to the standard deviation of the list
- R: Doubling each entry in a list doubles the mean of the list
- S: Doubling each entry in a list leaves the standard deviation of the list unchanged

A. P, Q B. Q, R C. P, R D. R, S

gate2012 numerical-ability statistics normal

8.44.3 Statistics: GATE2014 EC-1: GA-4

https://gateoverflow.in/41493

The statistics of runs scored in a series by four batsmen are provided in the following table. Who is the most consistent batsman of these four?

Batsman	Average	Standard deviation
K	31.2	5.21
L	46.0	6.35
M	54.4	6.22
N	17.9	5.90

A. K B. L C. M D. N

gate2014-ec-1 statistics numerical-ability

8.44.4 Statistics: GATE2016 ME-2: GA-6

https://gateoverflow.in/108297

Students taking an exam are divided into two groups, **P** and **Q** such that each group has the same number of students. The performance of each of the students in a test was evaluated out of 200 marks. It was observed that the mean of group **P** was 105, while that of group **Q** was 85. The standard deviation of group **P** was 25, while that of group **Q** was 5. Assuming that the marks were distributed on a normal distribution, which of the following statements will have the highest probability of being **TRUE**?

A. No student in group **Q** scored less marks than any student in group **P**.
B. No student in group **P** scored less marks than any student in group **Q**.
C. Most students of group **Q** scored marks in a narrower range than students in group **P**.
D. The median of the marks of group **P** is 100.

gate2016-me-2 probability statistics

8.44.5 Statistics: GATE2017 CE-1: GA-5

https://gateoverflow.in/313483

The following sequence of numbers is arranged in increasing order: $1, x, x, x, y, y, 9, 16, 18$. Given that the mean and median are equal, and are also equal to twice the mode, the value of y is

A. 5 B. 6 C. 7 D. 8

gate2017-ce-1 general-aptitude numerical-ability statistics

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8.44.6 Statistics: GATE2017 ME-1: GA-4

https://gateoverflow.in/313659

In a company with 100 employees, 45 earn $Rs.\,20,000$ per month, 25 earn $Rs.\,30000$, 20 earn $Rs.\,40000$, 8 earn $Rs.\,60000$, and 2 earn $Rs.\,150,000$. The median of the salaries is

A. $Rs.\,20,000$ B. $Rs.\,30,000$ C. $Rs.\,32,300$ D. $Rs.\,40,000$

gate2017-me-1 general-aptitude numerical-ability statistics

8.44.7 Statistics: TIFR2015-A-15

https://gateoverflow.in/29611

Let A and B be non-empty disjoint sets of real numbers. Suppose that the average of the numbers in the first set is μ_A and the average of the numbers in the second set is μ_B; let the corresponding variances be v_A and v_B respectively. If the average of the elements in $A \cup B$ is $\mu = p.\,\mu_A + (1-p).\,\mu_B$, what is the variance of the elements in $A \cup B$?

a. $p.\,v_A + (1-p).\,v_B$
b. $(1-p).\,v_A + p.\,v_B$
c. $p.\,[v_A + (\mu_A - \mu)^2] + (1-p).\,[v_B + (\mu_B - \mu)^2]$
d. $(1-p).\,[v_A + (\mu_A - \mu)^2] + p.\,[v_B + (\mu_B - \mu)^2]$
e. $p.\,v_A + (1-p).\,v_B + (\mu_A - \mu_B)^2$

tifr2015 statistics

8.45 System Of Equations (1)

8.45.1 System Of Equations: GATE2011 GG: GA-6

https://gateoverflow.in/40207

The number of solutions for the following system of inequalities is

- $X_1 \geq 0$
- $X_2 \geq 0$
- $X_1 + X_2 \leq 10$
- $2X_1 + 2X_2 \geq 22$

A. 0 B. infinite C. 1 D. 2

gate2011-gg numerical-ability system-of-equations

8.46 Tabular Data (8)

8.46.1 Tabular Data: GATE2011 MN: GA-64

https://gateoverflow.in/313211

Four archers P, Q, R, and S try to hit a bull's eye during a tournament consisting of seven rounds. As illustrated in the figure below, a player receives 10 points for hitting the bull's eye, 5 points for hitting within the inner circle and 1 point for hitting within the outer circle.

The final scores received by the players during the tournament are listed in the table below.

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Round	P	Q	R	S
1	1	5	1	10
2	5	10	10	1
3	1	1	1	5
4	10	10	1	1
5	1	5	5	10
6	10	5	1	1
7	5	10	1	1

The most accurate and the most consistent players during the tournament are respectively

A. P and S B. Q and R C. Q and Q D. R and Q

gate2011-mn data-interpretation numerical-ability tabular-data

8.46.2 Tabular Data: GATE2013 AE: GA-7

https://gateoverflow.in/40248

Following table gives data on tourist from different countries visiting India in the year 2011

Country	Number of tourists
USA	2000
England	3500
Germany	1200
Italy	1100
Japan	2400
Australia	2300
France	1000

Which two countries contributed to the one third of the total number of tourists who visited India in 2011?

A. USA and Japan B. USA and Australia C. England and France D. Japan and Australia

gate2013-ae numerical-ability data-interpretation normal tabular-data

8.46.3 Tabular Data: GATE2013 CE: GA-8

https://gateoverflow.in/40276

Following table provides figures(in rupees) on annual expenditure of a firm for two years - 2010 and 2011.

Category	2010	2011
Raw material	5200	6240
Power & fuel	7000	9450
Salary & wages	9000	12600
Plant & machinery	20000	25000
Advertising	15000	19500
Research & Development	22000	26400

In 2011, which of the two categories have registered increase by same percentage?

A. Raw material and Salary & wages.
B. Salary & wages and Advertising.
C. Power & fuel and Advertising.
D. Raw material and research & Development.

numerical-ability gate2013-ce data-interpretation normal tabular-data

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8.46.4 Tabular Data: GATE2014-1-GA-9

https://gateoverflow.in/777

In a survey, 300 respondents were asked whether they own a vehicle or not. If yes, they were further asked to mention whether they own a car or scooter or both. Their responses are tabulated below. What percent of respondents do not own a scooter?

		Men	Women
Own vehicle	Car	40	34
Own vehicle	Scooter	30	20
Own vehicle	Both	60	46
Do not own vehicle		20	50

gate2014-1 numerical-ability normal numerical-answers data-interpretation tabular-data

8.46.5 Tabular Data: GATE2014-3-GA-5

https://gateoverflow.in/2028

The table below has question-wise data on the performance of students in an examination. The marks for each question are also listed. There is no negative or partial marking in the examination.

Q No.	Marks	Answered Correctly	Answered Wrongly	Not Attempted
1	2	21	17	6
2	3	15	27	2
3	2	23	18	3

What is the average of the marks obtained by the class in the examination?

A. 1.34 B. 1.74 C. 3.02 D. 3.91

gate2014-3 numerical-ability normal data-interpretation tabular-data

8.46.6 Tabular Data: GATE2015 CE-2: GA-9

https://gateoverflow.in/40185

Read the following table giving sales data of five types of batteries for years 2006 to 2012:

Year	Type I	Type II	Type III	Type IV	Type V
2006	75	144	114	102	108
2007	90	126	102	84	126
2008	96	114	75	105	135
2009	105	90	150	90	75
2010	90	75	135	75	90
2011	105	60	165	45	120
2012	115	85	160	100	145

Out of the following , which type of battery achieved highest growth between the years 2006 and 2012?

A. Type V B. Type III C. Type II D. Type I

gate2015-ce-2 general-aptitude numerical-ability data-interpretation tabular-data

8.46.7 Tabular Data: GATE2015 EC-2: GA-4

https://gateoverflow.in/39505

An electric bus has onboard instruments that report the total electricity consumed since the start of the trip, as well as the total distance, covered. During a single day of operation, the bus travels on stretches M, N, O, and P, in that order. The cumulative distances travelled and the corresponding electricity consumption are shown in the Table below:

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Stretch	Cumulative distance (km)	Electricity used (kWh)
M	20	12
N	45	25
O	75	45
P	100	57

The stretch where the electricity consumption per km is minimum is

A. M B. N C. O D. P

gate2015-ec-2 numerical-ability data-interpretation tabular-data

8.46.8 Tabular Data: GATE2015-1-GA-6

https://gateoverflow.in/8010

The number of students in a class who have answered correctly, wrongly, or not attempted each question in an exam, are listed in the table below. The marks for each question are also listed. There is no negative or partial marking.

Q No.	Marks	Answered Correctly	Answered Wrongly	Not Attempted
1	2	21	17	6
2	3	15	27	2
3	1	11	29	4
4	2	23	18	3
5	5	31	12	1

What is the average of the marks obtained by the class in the examination?

A. 2.290 B. 2.970 C. 6.795 D. 8.795

gate2015-1 numerical-ability easy data-interpretation tabular-data

8.47 Triangles (2)

8.47.1 Triangles: GATE2015 ME-3: GA-8

https://gateoverflow.in/40175

In the given figure angle Q is a right angle, $PS : QS = 3 : 1, RT : QT = 5 : 2$ and $PU : UR = 1 : 1$. If area of triangle QTS is $20cm^2$, then the area of triangle PQR in cm^2 is _____

gate2015-me-3 numerical-ability numerical-answers triangles

8.47.2 Triangles: GATE2015 ME-3: GA-9

https://gateoverflow.in/40173

Right triangle PQR is to be constructed in the xy - plane so that the right angle is at P and line PR is parallel to the x-axis. The x and y coordinates of P, Q, and R are to be integers that satisfy the inequalities: $-4 \leq x \leq 5$ and $6 \leq y \leq 16$. How many different triangles could be constructed with these properties?

A. 110 B. $1,100$ C. $9,900$ D. $10,000$

gate2015-me-3 numerical-ability triangles

8.48 Trigonometry (1)

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8.48.1 Trigonometry: GATE2018 CH: GA-3

https://gateoverflow.in/205083

For $0 \leq x \leq 2\pi$, $\sin x$ and $\cos x$ are both decreasing functions in the interval _____ .

A. $\left(0, \frac{\pi}{2}\right)$ B. $\left(\frac{\pi}{2}, \pi\right)$ C. $\left(\pi, \frac{3\pi}{2}\right)$ D. $\left(\frac{3\pi}{2}, 2\pi\right)$

gate2018-ch numerical-ability functions trigonometry

8.49 Venn Diagrams (11)

8.49.1 Venn Diagrams: GATE2010 TF: GA-8

https://gateoverflow.in/312027

A gathering of 50 linguists discovered that 4 knew Kannada, Telugu and Tamil , 7 knew only Telugu and Tamil , 5 knew only Kannada and Tamil , 6 knew only Telugu and Kannada . If the number of linguists who knew Tamil is 24 and those who knew Kannada is also 24, how many linguists knew only Telugu ?

A. 9 B. 10 C. 11 D. 8

general-aptitude numerical-ability gate2010-tf venn-diagrams

8.49.2 Venn Diagrams: GATE2010-59

https://gateoverflow.in/2367

25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is:

A. 2 B. 17 C. 13 D. 3

gate2010 numerical-ability easy set-theory&algebra venn-diagrams

8.49.3 Venn Diagrams: GATE2011 GG: GA-7

https://gateoverflow.in/40208

In a class of 300 students in an M.Tech programme, each student is required to take at least one subject from the following three:

- M600: Advanced Engineering Mathematics
- C600: Computational Methods for Engineers
- E600: Experimental Techniques for Engineers

The registration data for the M.Tech class shows that 100 students have taken M600, 200 students have taken C600, and 60 students have taken E600. What is the maximum possible number of students in the class who have taken all the above three subjects?

A. 20 B. 30 C. 40 D. 50

gate2011-gg numerical-ability set-theory&algebra venn-diagrams

8.49.4 Venn Diagrams: GATE2015 CE-2: GA-10

https://gateoverflow.in/40184

There are 16 teachers who can teach Thermodynamics (TD), 11 who can teach Electrical Sciences (ES), and 5 who can teach both TD and Engineering Mechanics (EM). There are a total of 40 teachers. 6 cannot teach any of the three subjects, i.e. EM, ES or TD. 6 can teach only ES. 4 can teach all three subjects, i.e. EM, ES and TD. 4 can teach ES and TD. How many can teach both ES and EM but not TD?

A. 1 B. 2 C. 3 D. 4

gate2015-ce-2 numerical-ability venn-diagrams

8.49.5 Venn Diagrams: GATE2016 EC-2: GA-6

https://gateoverflow.in/108484

The Venn diagram shows the preference of the student population for leisure activities.

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From the data given, the number of students who like to read books or play sports is _____.

A. 44 B. 51 C. 79 D. 108

gate2016-ec-2 venn-diagrams logical-reasoning

8.49.6 Venn Diagrams: GATE2016-2-GA-06

https://gateoverflow.in/39536

Among 150 faculty members in an institute, 55 are connected with each other through Facebook and 85 are connected through Whatsapp. 30 faculty members do not have Facebook or Whatsapp accounts. The numbers of faculty members connected only through Facebook accounts is _____.

A. 35 B. 45 C. 65 D. 90

gate2016-2 numerical-ability venn-diagrams easy

8.49.7 Venn Diagrams: GATE2017 EC-2: GA-5

https://gateoverflow.in/313509

500 students are taking one or more course out of Chemistry, Physics, and Mathematics. Registration records indicate course enrollment as follows: Chemistry (329), Physics (186), and Mathematics (295). Chemistry and Physics (83), Chemistry and Mathematics (217), and Physics and Mathematics (63). How many students are taking all 3 subjects?

A. 37 B. 43 C. 47 D. 53

gate2017-ec-2 general-aptitude numerical-ability venn-diagrams

8.49.8 Venn Diagrams: GATE2018 ME-2: GA-6

https://gateoverflow.in/313609

Forty students watched films A, B and C over a week. Each student watched either only one film or all three. Thirteen students watched film A, sixteen students watched film B and nineteen students watched film C. How many students watched all three films?

A. 0 B. 2 C. 4 D. 8

gate2018-me-2 general-aptitude numerical-ability venn-diagrams

8.49.9 Venn Diagrams: GATE2019 CE-1: GA-7

https://gateoverflow.in/313440

In a sports academy of 300 peoples, 105 play only cricket, 70 play only hockey, 50 play only football, 25 play both cricket and hockey, 15 play both hockey and football and 30 play both cricket and football. The rest of them play all three sports. What is the percentage of people who play at least two sports?

A. 23.30 B. 25.00 C. 28.00 D. 50.00

gate2019-ce-1 general-aptitude numerical-ability venn-diagrams easy

8.49.10 Venn Diagrams: GATE2019-GA-7

https://gateoverflow.in/302866

In the given diagram, teachers are represented in the triangle, researchers in the circle and administrators in the rectangle. Out of the total number of the people, the percentage of administrators shall be in the range of _____

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A. 0 to 15 B. 16 to 30 C. 31 to 45 D. 46 to 60

gate2019 general-aptitude numerical-ability venn-diagrams

8.49.11 Venn Diagrams: GATE2019-GA-9

https://gateoverflow.in/302864

In a college, there are three student clubs, 60 students are only in the Drama club, 80 students are only in the Dance club, 30 students are only in Maths club, 40 students are in both Drama and Dance clubs, 12 students are in both Dance and Maths clubs, 7 students are in both Drama and Maths clubs, and 2 students are in all clubs. If 75% of the students in the college are not in any of these clubs, then the total number of students in the college is _____.

A. 1000 B. 975 C. 900 D. 225

gate2019 general-aptitude numerical-ability venn-diagrams

8.50 Work Time (15)

8.50.1 Work Time: GATE2010-64

https://gateoverflow.in/2372

5 skilled workers can build a wall in 20 days; 8 semi-skilled workers can build a wall in 25 days; 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled, 6 semi-skilled and 5 unskilled workers, how long it will take to build the wall?

A. 20 days B. 18 days C. 16 days D. 15 days

gate2010 numerical-ability normal work-time

8.50.2 Work Time: GATE2011-64

https://gateoverflow.in/2174

A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the orders. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of 5th day?

A. 4 B. 5 C. 6 D. 7

gate2011 numerical-ability normal work-time

8.50.3 Work Time: GATE2013-65

https://gateoverflow.in/1569

The current erection cost of a structure is Rs. 13,200. If the labour wages per day increase by 1/5 of the current wages and the working hours decrease by 1/24 of the current period, then the new cost of erection in Rs. is

A. 16,500 B. 15,180 C. 11,000 D. 10,120

gate2013 numerical-ability normal work-time

8.50.4 Work Time: GATE2016 CE-2: GA-10

https://gateoverflow.in/110924

Ananth takes 6 hours and Bharath takes 4 hours to read a book. Both started reading copies of the book at the same time. After how many hours is the number of pages to be read by Ananth, twice that to be read by

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Bharath? Assume Ananth and Bharath read all the pages with constant pace.

A. 1 B. 2 C. 3 D. 4

gate2016-ce-2 work-time numerical-ability

8.50.5 Work Time: GATE2016 EC-1: GA-10

https://gateoverflow.in/108094

P, Q, R and **S** are working on a project. **Q** can finish the task in 25 days, working alone for 12 hours a day. **R** can finish the task in 50 days, working alone for 12 hours per day. **Q** worked 12 hours a day but took sick leave in the beginning for two days. **R** worked 18 hours a day on all days. What is the ratio of work done by **Q** and **R** after 7 days from the start of the project?

A. 10 : 11 B. 11 : 10 C. 20 : 21 D. 21 : 20

gate2016-ec-1 numerical-ability work-time

8.50.6 Work Time: GATE2016 EC-2: GA-5

https://gateoverflow.in/108483

S, M, E and **F** are working in shifts in a team to finish a project. **M** works with twice the efficiency of others but for half as many days as **E** worked. **S** and **M** have 6 hour shifts in a day, whereas **E** and **F** have 12 hours shifts. What is the ratio of contribution of **M** to contribution of **E** in the project?

A. 1 : 1 B. 1 : 2 C. 1 : 4 D. 2 : 1

gate2016-ec-2 numerical-ability work-time

8.50.7 Work Time: GATE2017 CE-1: GA-9

https://gateoverflow.in/313481

Two machine $M1$ and $M2$ are able to execute any of four jobs P, Q, R and S. The machines can perform one job on one object at a time. Jobs P, Q, R and S take 30 minutes, 20 minutes, 60 minutes and 15 minutes each respectively. There are 10 objects each requiring exactly 1 job. Job P is to be performed on 2 objects. Job Q on 3 objects, Job R on 1 object and Job S on 4 objects. What is the minimum time needed to complete all the jobs?

A. 2 hours B. 2.5 hours C. 3 hours D. 3.5 hours

gate2017-ce-1 general-aptitude numerical-ability work-time

8.50.8 Work Time: GATE2017 EC-2: GA-8

https://gateoverflow.in/313511

1200 men and 500 women can build a bridge in 2 weeks. 900 men and 250 women will take 3 weeks to build the same bridge. How many men will be needed to build the bridge in one week?

A. 3000 B. 3300 C. 3600 D. 3900

gate2017-ec-2 general-aptitude numerical-ability work-time

8.50.9 Work Time: GATE2017 ME-2: GA-7

https://gateoverflow.in/313672

X bullocks and Y tractors take 8 days to plough a field. If we have half the number of bullocks and double the number of tractors, it takes 5 days to plough the same field. How many days will it take X bullocks alone to plough the field?

A. 30 B. 35 C. 40 D. 45

gate2017-me-2 general-aptitude numerical-ability work-time

8.50.10 Work Time: GATE2018 ME-1: GA-3

https://gateoverflow.in/313643

Seven machines take 7 minutes to make 7 identical toys. At the same rate, how many minutes would it take for 100 machine to make 100 toys?

A. 1 B. 7 C. 100 D. 700

gate2018-me-1 general-aptitude numerical-ability work-time

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8.50.11 Work Time: GATE2018 ME-2: GA-8

https://gateoverflow.in/313615

A contract is to be completed in 52 days and 125 identical robots were employed, each operational for 7 hours a day. After 39 days, five-seventh of the work was completed. How many additional robots would be required to complete the work on time, if each robot is now operational for 8 hours a day?

A. 50 B. 89 C. 146 D. 175

gate2018-me-2 general-aptitude numerical-ability work-time

8.50.12 Work Time: GATE2019 CE-2: GA-9

https://gateoverflow.in/313374

An oil tank can be filled by pipe X in 5 hours and pipe Y in 4 hours, each pump working on its own. When the oil tank is full and the drainage hole is open, the oil is drained in 20 hours. If initially the tank was empty and someone started the two pups together but left the drainage hole open, how many hours will it take for the tank to be filled? (Assume that the rate of drainage is independent of the Head)

A. 1.50 B. 2.00 C. 2.50 D. 4.00

gate2019-ce-2 general-aptitude numerical-ability work-time

8.50.13 Work Time: GATE2019 EC: GA-3

https://gateoverflow.in/313531

It would take one machine 4 hours to complete a production order and another machine 2 hours to complete the same order. If both machines work simultaneously at their respective constant rates, the time taken to complete the same order is _____ hours.

A. $2/3$ B. $3/4$ C. $4/3$ D. $7/3$

gate2019-ec general-aptitude numerical-ability work-time

8.50.14 Work Time: GATE2019 EE: GA-4

https://gateoverflow.in/313560

It takes two hours for a person X to mow the lawn. Y can mow the same lawn in four hours. How long (in minutes) will it take X and Y, if they work together to mow the lawn ?

A. 60 B. 80 C. 90 D. 120

gate2019-ee general-aptitude numerical-ability work-time

8.50.15 Work Time: GATE2019 ME-2: GA-7

https://gateoverflow.in/313579

Two pipes P and Q can fill a tank in 6 hours and 9 hours respectively, while a third pipe R can empty the tank in 12 hours. Initially, P and R are open for 4 hours, Then P is closed and Q is opened. After 6 more hours R is closed. The total time taken to fill the tank (in hours) is ____

A. 13.50 B. 14.50 C. 15.50 D. 16.50

gate2019-me-2 general-aptitude numerical-ability work-time

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9 General Aptitude: Verbal Ability (274)

Syllabus: English grammar, Sentence completion. Verbal analogies, Word groups. Instructions, Critical reasoning and Verbal deduction

Mark Distribution in Previous GATE

Year	2019	2018	2017-1	2017-2	2016-1	2016-2	Minimum	Average	Maximum
1 Mark Count	3	2	3	2	4	3	2	2.8	4
2 Marks Count	2	0	1	1	2	2	0	1.3	2
Total Marks	7	2	5	4	8	7	**2**	**5.5**	**8**

9.1 Closest Word (3)

9.1.1 Closest Word: GATE2013 CE: GA-3

https://gateoverflow.in/40270

Which of the following options is the closest in meaning to the word given below: **Primeval**

A. Modern B. Historic C. Primitive D. Antique

gate2013-ce closest-word most-appropriate-word

9.1.2 Closest Word: GATE2013 EE: GA-1

https://gateoverflow.in/40288

They were requested not to **quarrel** with others.

Which one of the following options is the closest in meaning to the word **quarrel**?

A. make out B. call out C. dig out D. fall out

gate2013-ee verbal-ability closest-word

9.1.3 Closest Word: GATE2014 AE: GA-1

https://gateoverflow.in/40300

A student is required to demonstrate a high level of comprehension of the subject, especially in the social sciences.

The word closest in meaning to **comprehension** is

A. understanding B. meaning C. concentration D. stability

gate2014-ae closest-word verbal-ability

9.2 English Grammar (30)

9.2.1 English Grammar: GATE2012 AR: GA-4

https://gateoverflow.in/40225

Which one of the parts (A, B, C, D) in the sentence contains an **ERROR**?

No sooner had the doctor seen the results of the blood test, than he suggested the patient to see the specialist.

A. no sooner had
B. results of the blood test
C. suggested the patient
D. see the specialist

gate2012-ar verbal-ability english-grammar

9.2.2 English Grammar: GATE2012 CY: GA-2

https://gateoverflow.in/40233

One of the parts (A, B, C, D) in the sentence given below contains an ERROR. Which one of the following is **INCORRECT**?

I requested that he should be given the driving test today instead of tomorrow .

A. requested that
B. should be given
C. the driving test
D. instead of tomorrow

gate2012-cy verbal-ability english-grammar

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9.2.3 English Grammar: GATE2013 AE: GA-4

https://gateoverflow.in/40245

All engineering students (I) should learn mechanics, (II) mathematics and (III) how to do computation. (IV)

Which of the above underlined parts of the sentence is not appropriate?

a. I b. II c. III d. IV

gate2013-ae english-grammar verbal-ability

9.2.4 English Grammar: GATE2013 CE: GA-2

https://gateoverflow.in/40269

The professor (I) ordered to (II) the students to go (III) out of the class. (IV)

Which of the above underlined parts of the sentence is grammatically incorrect?

A. I B. II C. III D. IV

gate2013-ce english-grammar verbal-ability

9.2.5 English Grammar: GATE2014 EC-2: GA-2

https://gateoverflow.in/41509

Which of the options given below best completes the following sentence?

She will feel much better if she _____.

A. Will get some rest
B. Gets some rest
C. Will be getting some rest
D. Is getting some rest

gate2014-ec-2 verbal-ability english-grammar normal

9.2.6 English Grammar: GATE2014-3-GA-1

https://gateoverflow.in/2024

While trying to collect (I) an envelope from under the table, (II) Mr. X fell down (III) and was losing consciousness. (IV)

Which one of the above underlined parts of the sentence is NOT appropriate?

A. I B. II C. III D. IV

gate2014-3 verbal-ability easy english-grammar

9.2.7 English Grammar: GATE2015 EC-1: GA-6

https://gateoverflow.in/39494

The following question presents a sentence, part of which is underlined. Beneath the sentence, you find four ways of phrasing the underlined part. Following the requirements of the standard written English, select the answer that produces the most effective sentence.

Tuberculosis, together with its effects, ranks one of the leading causes of death in India.

A. ranks as one of the leading causes of death
B. rank as one of the leading causes of death
C. has the rank of one of the leading causes of death
D. are one of the leading causes of death

gate2015-ec-1 general-aptitude verbal-ability english-grammar

9.2.8 English Grammar: GATE2015 EC-3: GA-6

https://gateoverflow.in/39519

Ram and Shyam shared a secret and promised to each other that it would remain between them. Ram expressed himself in one of the following ways as given in the choices below. Identify the correct way as per standard English.

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A. It would remain between you and me.
B. It would remain between I and you.
C. It would remain between you and I.
D. It would remain with me.

gate2015-ec-3 english-grammar verbal-ability

9.2.9 English Grammar: GATE2015 ME-3: GA-6

https://gateoverflow.in/40171

Select the appropriate option in place of underlined part of the sentence.

<u>Increased productivity necessary</u> reflects greater efforts made by the employees.

A. Increase in productivity necessary
B. Increase productivity is necessary
C. Increase in productivity necessarily
D. No improvement required

gate2015-me-3 verbal-ability english-grammar

9.2.10 English Grammar: GATE2015-1-GA-1

https://gateoverflow.in/7995

Didn't you buy ____ when you went shopping?

A. any paper
B. much paper
C. no paper
D. a few paper

gate2015-1 verbal-ability easy english-grammar

9.2.11 English Grammar: GATE2015-2-GA-1

https://gateoverflow.in/8028

We _____ our friends's birthday and we _____ how to make it up to him.

A. completely forgot --- don't just know
B. forgot completely --- don't just know
C. completely forgot --- just don't know
D. forgot completely --- just don't know

gate2015-2 verbal-ability easy english-grammar

9.2.12 English Grammar: GATE2015-3-GA-2

https://gateoverflow.in/8300

The Tamil version of _____ John Abraham-starrer *Madras Cafe* _____ cleared by the Censor Board with no cuts last week, but the film's distributor _____ no takers among the exhibitors for a release in Tamilnadu _____ this Friday.

A. Mr., was, found, on
B. a, was, found, at
C. the, was, found, on
D. a, being, find at

gate2015-3 verbal-ability normal english-grammar

9.2.13 English Grammar: GATE2016 CE-2: GA-1

https://gateoverflow.in/110868

If I were you, I _____ that laptop. It’s much too expensive.

A. Won’t buy
B. Shan’t buy
C. Wouldn’t buy
D. Would buy

gate2016-ce-2 verbal-ability english-grammar most-appropriate-word

9.2.14 English Grammar: GATE2016 EC-1: GA-1

https://gateoverflow.in/108061

Which of the following is CORRECT with respect to grammar and usage?

Mount Everest is _____.

A. The highest peak in the world
B. Highest peak in the world
C. One of highest peak in the world
D. One of the highest peak in the world

gate2016-ec-1 verbal-ability english-grammar

9.2.15 English Grammar: GATE2016 EC-2: GA-1

https://gateoverflow.in/108474

Based on the given statements, select the appropriate option with respect to grammar and usage.

Statements

(i) The height of Mr. X is 6 feet.

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(ii) The height of Mr. Y is 5 feet.

A. Mr. X is longer than Mr. Y.
B. Mr. X is more elongated than Mr. Y.
C. Mr. X is taller than Mr. Y.
D. Mr. X is lengthier than Mr. Y.

gate2016-ec-2 verbal-ability english-grammar

9.2.16 English Grammar: GATE2016 EC-3: GA-1

https://gateoverflow.in/110820

An apple costs Rs. 10. An onion costs Rs. 8.

Select the most suitable sentence with respect to grammar and usage.

A. The price of an apple is greater than an onion.
B. The price of an apple is more than onion.
C. The price of an apple is greater than that of an onion.
D. Apples are more costlier than onions.

gate2016-ec-3 verbal-ability english-grammar

9.2.17 English Grammar: GATE2016-1-GA03

https://gateoverflow.in/39606

Archimedes said, "Give me a lever long enough and a fulcrum on which to place it, and I will move the world."

The sentence above is an example of a _____ statement.

A. figurative
B. collateral
C. literal
D. figurine

gate2016-1 verbal-ability normal english-grammar

9.2.18 English Grammar: GATE2016-2-GA-01

https://gateoverflow.in/39529

The man who is now Municipal Commissioner worked as _____.

A. the security guard at a university
B. a security guard at the university
C. a security guard at university
D. the security guard at the university

gate2016-2 verbal-ability english-grammar normal

9.2.19 English Grammar: GATE2017 EC-2: GA-2

https://gateoverflow.in/313515

It is _____ to read this year's textbook _____ the last year's.

A. easier, than
B. most easy, than
C. easier, from
D. easiest, from

gate2017-ec-2 general-aptitude verbal-ability english-grammar

9.2.20 English Grammar: GATE2017 ME-1: GA-1

https://gateoverflow.in/313663

He was one of my best _____ and I felt his loss _____.

A. friend, keenly
B. friends, keen
C. friend, keener
D. friends, keenly

gate2017-me-1 general-aptitude verbal-ability english-grammar

9.2.21 English Grammar: GATE2017 ME-2: GA-1

https://gateoverflow.in/313675

The ways in which this game can be played _____ potentially infinite.

A. is
B. is being
C. are
D. are being

gate2017-me-2 general-aptitude verbal-ability english-grammar

9.2.22 English Grammar: GATE2017-1-GA-2

https://gateoverflow.in/118405

Research in the workplace reveals that people work for many reasons _____ .

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A. money beside
B. beside money
C. money besides
D. besides money

gate2017-1 general-aptitude verbal-ability english-grammar

9.2.23 English Grammar: GATE2017-2-GA-2

https://gateoverflow.in/118416

Saturn is _____ to be seen on a clear night with the naked eye.

A. enough bright
B. bright enough
C. as enough bright
D. bright as enough

gate2017-2 verbal-ability english-grammar

9.2.24 English Grammar: GATE2018 ME-1: GA-1

https://gateoverflow.in/313655

"Going by the _____ that many hands make light work, the school ____ involved all the students in the task."
The words that best fill the blanks in the above sentence are

A. principle, principal
B. principal, principle
C. principle, principle
D. principal, principal

gate2018-me-1 general-aptitude verbal-ability english-grammar

9.2.25 English Grammar: GATE2019 CE-1: GA-1

https://gateoverflow.in/313442

The lecture was attended by quite _____ students, so the hall was not very _____.

A. a few, quite
B. few, quiet
C. a few, quiet
D. few, quite

gate2019-ce-1 general-aptitude verbal-ability english-grammar

9.2.26 English Grammar: GATE2019 CE-1: GA-2

https://gateoverflow.in/313443

They have come a long way in _____ trust among the users.

A. creating
B. created
C. creation
D. create

gate2019-ce-1 general-aptitude verbal-ability english-grammar easy

9.2.27 English Grammar: GATE2019 CE-1: GA-5

https://gateoverflow.in/313444

The CEO's decision to quit was as shocking to the Board as it was to _____.

A. I
B. me
C. my
D. myself

gate2019-ce-1 general-aptitude verbal-ability english-grammar

9.2.28 English Grammar: GATE2019 EC: GA-1

https://gateoverflow.in/313543

The strategies that the company _____ to sell its products _____ house-to-house marketing.

A. use, includes
B. uses, include
C. used, includes
D. uses, including

gate2019-ec general-aptitude verbal-ability english-grammar

9.2.29 English Grammar: GATE2019 IN: GA-1

https://gateoverflow.in/313550

The fisherman, _____ the flood victims owed their lives, were rewarded by the government.

A. whom
B. to which
C. to whom
D. that

gate2019-in general-aptitude verbal-ability english-grammar

9.2.30 English Grammar: GATE2019-GA-2

https://gateoverflow.in/302871

The search engine's business model ____ around the fulcrum of trust.

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A. revolves B. plays C. sinks D. bursts

gate2019 general-aptitude verbal-ability english-grammar

9.3 Grammatical Sentence (6)

9.3.1 Grammatical Sentence: GATE2012 AR: GA-3

https://gateoverflow.in/40224

Choose the grammatically CORRECT sentence:

A. He laid in bed till 8 o'clock in the morning.
B. He layed in bed till 8 o'clock in the morning.
C. He lain in bed till 8 o'clock in the morning.
D. He lay in bed till 8 o'clock in the morning.

gate2012-ar verbal-ability english-grammar easy grammatical-sentence

9.3.2 Grammatical Sentence: GATE2012-59

https://gateoverflow.in/2198

Choose the grammatically **INCORRECT** sentence:

A. They gave us the money back less the service charges of Three Hundred rupees.
B. This country's expenditure is not less than that of Bangladesh.
C. The committee initially asked for a funding of Fifty Lakh rupees, but later settled for a lesser sum.
D. This country's expenditure on educational reforms is very less.

gate2012 verbal-ability grammatical-sentence normal

9.3.3 Grammatical Sentence: GATE2013 EE: GA-4

https://gateoverflow.in/40291

Choose the grammatically **CORRECT** sentence:

A. Two and two add four.
B. Two and two become four.
C. Two and two are four.
D. Two and two make four.

gate2013-ee english-grammar verbal-ability grammatical-sentence

9.3.4 Grammatical Sentence: GATE2013-60

https://gateoverflow.in/1564

Choose the grammatically **INCORRECT** sentence:

A. He is of Asian origin.
B. They belonged to Africa.
C. She is an European.
D. They migrated from India to Australia.

gate2013 verbal-ability grammatical-sentence normal

9.3.5 Grammatical Sentence: GATE2015-2-GA-10

https://gateoverflow.in/8041

Out of the following 4 sentences, select the most suitable sentence with respect to grammar and usage:

A. Since the report lacked needed information, it was of no use to them.
B. The report was useless to them because there were no needed information in it.
C. Since the report did not contain the needed information, it was not real useful to them.
D. Since the report lacked needed information, it would not had been useful to them.

gate2015-2 verbal-ability normal english-grammar grammatical-sentence

9.3.6 Grammatical Sentence: GATE2016-1-GA01

https://gateoverflow.in/39608

Out of the following four sentences, select the most suitable sentence with respect to grammar and usage.

A. I will not leave the place until the minister does not meet me.
B. I will not leave the place until the minister doesn't meet me.
C. I will not leave the place until the minister meet me.

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D. I will not leave the place until the minister meets me.

gate2016-1 verbal-ability english-grammar easy grammatical-sentence

9.4 Logical Reasoning (1)

9.4.1 Logical Reasoning: GATE2016-1-GA04

https://gateoverflow.in/39609

If 'relftaga' means carefree, 'otaga' means careful and 'fertaga' means careless, which of the following could mean 'aftercare'?

A. zentaga B. tagafer. C. tagazen. D. relffer.

gate2016-1 verbal-ability logical-reasoning normal

9.5 Meaning (34)

9.5.1 Meaning: GATE2010 MN: GA-1

https://gateoverflow.in/312009

Which of the following options is the closest in meaning to the word below :

Exhort

A. urge B. condemn C. restrain D. scold

general-aptitude verbal-ability gate2010-mn meaning

9.5.2 Meaning: GATE2010 TF: GA-1

https://gateoverflow.in/312020

Which of the following options is the closest in meaning to the word below :

Ephemeral

A. effeminate B. ghostlike C. soft D. short-lived

general-aptitude verbal-ability gate2010-tf meaning

9.5.3 Meaning: GATE2010-57

https://gateoverflow.in/2365

Which of the following options is the closest in meaning to the word given below:

Circuitous

A. cyclic B. indirect C. confusing D. crooked

gate2010 verbal-ability meaning normal

9.5.4 Meaning: GATE2011-56

https://gateoverflow.in/2165

Which of the following options is the closest in the meaning to the word below:

Inexplicable

A. Incomprehensible B. Indelible
C. Inextricable D. Infallible

gate2011 verbal-ability meaning normal

9.5.5 Meaning: GATE2012 AR: GA-1

https://gateoverflow.in/40222

Which one of the following options is the closest in meaning to the word given below?

Pacify

A. Excite B. Soothe C. Deplete D. Tire

gate2012-ar verbal-ability meaning

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9.5.6 Meaning: GATE2012 CY: GA-3

https://gateoverflow.in/40234

Which one of the following options is the closest in meaning to the word given below?

Latitude

A. Eligibility B. Freedom C. Coercion D. Meticulousness

gate2012-cy verbal-ability meaning

9.5.7 Meaning: GATE2012-58

https://gateoverflow.in/2197

Which one of the following options is the closest in meaning to the word given below?

Mitigate

A. Diminish B. Divulge C. Dedicate D. Denote

gate2012 verbal-ability meaning easy

9.5.8 Meaning: GATE2013-56

https://gateoverflow.in/1559

Which one of the following options is the closest in meaning to the word given below?

Nadir

A. Highest B. Lowest C. Medium D. Integration

gate2013 verbal-ability meaning normal

9.5.9 Meaning: GATE2014 EC-4: GA-1

https://gateoverflow.in/41463

Which of the following options is the closest in meaning to the word underlined in the sentence below?

In a democracy, everybody has the freedom to ***disagree*** with the government.

A. Dissent B. Descent C. Decent D. Decadent

gate2014-ec-4 verbal-ability meaning normal

9.5.10 Meaning: GATE2014 EC-4: GA-2

https://gateoverflow.in/41464

After the discussion, Tom said to me, 'Please revert!'. He expects me to _____.

A. Retract
B. Get back to him
C. Move in reverse
D. Retreat

gate2014-ec-4 verbal-ability meaning easy

9.5.11 Meaning: GATE2014 EC-4: GA-3

https://gateoverflow.in/41465

While receiving the award, the scientist said, "I feel vindicated". Which of the following is closest in meaning to the word 'vindicated'?

A. Punished
B. Substantiated
C. Appreciated
D. Chastened

gate2014-ec-4 verbal-ability meaning normal

9.5.12 Meaning: GATE2014-1-GA-1

https://gateoverflow.in/56

Which of the following options is the closest in meaning to the phrase in bold in the sentence below?

It is fascinating to see life forms **cope with** varied environmental conditions.

A. Adopt to B. Adapt to C. Adept in D. Accept with

verbal-ability gate2014-1 meaning easy

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9.5.13 Meaning: GATE2014-1-GA-3

https://gateoverflow.in/772

In a press meet on the recent scam, the minister said, "The buck stops here". What did the minister convey by the statement?

A. He wants all the money
B. He will return the money
C. He will assume final responsibility
D. He will resist all enquiries

gate2014-1 verbal-ability normal meaning

9.5.14 Meaning: GATE2014-2-GA-3

https://gateoverflow.in/1940

Match the columns.

	Column 1		Column 2
1.	eradicate	P.	misrepresent
2.	distort	Q.	soak completely
3.	saturate	R.	use
4.	utilize	S.	destroy utterly

A. 1:S, 2:P, 3:Q, 4:R
B. 1:P, 2:Q, 3:R, 4:S
C. 1:Q, 2:R, 3:S, 4:P
D. 1:S, 2:P, 3:R, 4:Q

gate2014-2 verbal-ability meaning normal

9.5.15 Meaning: GATE2015 CE-2: GA-2

https://gateoverflow.in/40177

Choose the statement where underlined word is used correctly.

A. The minister <u>insured</u> the victims that everything would be all right.
B. He <u>ensured</u> that the company will not have to bear any loss.
C. The actor got himself <u>ensured</u> against any accident.
D. The teacher <u>insured</u> students of good results.

gate2015-ce-2 general-aptitude verbal-ability meaning

9.5.16 Meaning: GATE2015 CE-2: GA-3

https://gateoverflow.in/40178

Which word is not a synonym for the word ***vernacular***?

A. regional
B. indigenous
C. indigent
D. colloquial

gate2015-ce-2 general-aptitude verbal-ability meaning

9.5.17 Meaning: GATE2015 CE-2: GA-6

https://gateoverflow.in/40181

The word similar in meaning to '**dreary**' is

A. cheerful
B. dreamy
C. hard
D. dismal

gate2015-ce-2 general-aptitude verbal-ability meaning

9.5.18 Meaning: GATE2015 EC-2: GA- 2

https://gateoverflow.in/39503

Choose the word most similar in meaning to the given word:
Awkward

A. Inept
B. Graceful
C. Suitable
D. Dreadful

gate2015 gate2015-ec-2 verbal-ability meaning

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9.5.19 Meaning: GATE2015 EC-3: GA- 2

https://gateoverflow.in/39515

Choose the most suitable one word substitute for the following expression:
Connotation of a road or way

A. Pertinacious B. Viaticum C. Clandestine D. Ravenous

gate2015-ec-3 gate2015 meaning

9.5.20 Meaning: GATE2015 ME-3: GA-3

https://gateoverflow.in/40168

Choose the statement where underlined word is used correctly.

A. When the teacher eludes to different authors, he is being elusive.
B. When the thief keeps eluding the police, he is being elusive.
C. Matters that are difficult to understand, identify or remember are allusive.
D. Mirages can be allusive, but a better way to express them is illusory.

gate2015-me-3 verbal-ability meaning

9.5.21 Meaning: GATE2015-1-GA-2

https://gateoverflow.in/8003

Which of the following options is the closest in meaning of the sentence below?

She enjoyed herself immensely at the party.

A. She had a terrible time at the party
B. She had a horrible time at the party
C. She had a terrific time at the party
D. She had a terrifying time at the party

gate2015-1 verbal-ability easy meaning

9.5.22 Meaning: GATE2015-1-GA-7

https://gateoverflow.in/8011

Select the alternative meaning of the underlined part of the sentence.

The chain snatchers took to their heels when the police party arrived.

A. Took shelter in a thick jungle
B. Open indiscriminate fire
C. Took to flight
D. Unconditionally surrendered

gate2015-1 verbal-ability meaning easy

9.5.23 Meaning: GATE2015-2-GA-2

https://gateoverflow.in/8029

Choose the statement where underlined word is used correctly.

A. The industrialist had a personnel jet.
B. I write my experience in my personnel diary.
C. All personnel are being given the day off.
D. Being religious is a personnel aspect.

gate2015-2 verbal-ability meaning normal

9.5.24 Meaning: GATE2016 EC-1: GA-2

https://gateoverflow.in/108064

The policeman asked the victim of a theft, "What did you ___ ?"

A. Loose B. Lose C. Loss D. Louse

gate2016-ec-1 verbal-ability meaning

9.5.25 Meaning: GATE2016 EC-3: GA-2

https://gateoverflow.in/110821

The Buddha said, "Holding on to anger is like grasping a hot coal with the intent of throwing it at someone else; you are the one who gets burnt." Select the word below which is closest in meaning to the word underlined above.

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A. Burning B. Igniting C. Clutching D. Flinging

gate2016-ec-3 meaning

9.5.26 Meaning: GATE2016 ME-2: GA-3

https://gateoverflow.in/108259

Choose the statement(s) where the underlined word is used correctly:

i. A prone is a dried plum.
ii. He was lying prone on the floor.
iii. People who eat a lot of fat are prone to heart disease.

A. (i) and (iii) only B. (iii) only C. (i) and (ii) only D. (ii) and (iii) only

gate2016-me-2 meaning verbal-ability

9.5.27 Meaning: GATE2016-1-GA02

https://gateoverflow.in/39607

A rewording of something written or spoken is a _____.

A. paraphrase B. paradox C. paradigm D. paraffin

gate2016-1 verbal-ability meaning normal

9.5.28 Meaning: GATE2016-2-GA-02

https://gateoverflow.in/39531

Nobody knows how the Indian cricket team is going to cope with the difficult and seamer-friendly wickets in Australia.

Choose the option which is closest in meaning to the underlined phrase in the above sentence.

A. Put up with. B. Put in with.
C. Put down to. D. Put up against.

gate2016-2 verbal-ability meaning normal

9.5.29 Meaning: GATE2016-2-GA-03

https://gateoverflow.in/39530

Find the odd one in the following group of words.

mock, deride, praise, jeer

A. Mock B. Deride C. Praise D. Jeer

gate2016-2 verbal-ability meaning easy

9.5.30 Meaning: GATE2017 CE-2: GA-2

https://gateoverflow.in/313421

There was no doubt that their work was through.

Which of the words below is closest in meaning to the underlined word above?

A. pretty B. complete C. sloppy D. haphazard

gate2017-ce-2 meaning verbal-ability

9.5.31 Meaning: GATE2017 EC-1: GA-6

https://gateoverflow.in/313526

"If you are looking for a history of India, or for an account of the rise and fall of the British Raj, or for all reason of the cleaving of the subcontinent into two mutually antagonistic parts and the effects this mutilation will have in the respective sections, and ultimately on Asia, you will not find it in these pages; for though I have spent a lifetime in the country, I lived too near the seat of events, and was too intimately associated with the actors, to get the perspective needed for impartial recording of these matters".

Here, the word 'antagonistic' is closest in meaning to,

A. Impartial B. Argumentative C. Separated D. Hostile

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gate2017-ec-1 verbal-ability meaning

9.5.32 Meaning: GATE2017 EC-2: GA-1

https://gateoverflow.in/313514

The ninth and the tenth of this month are Monday and Tuesday_____.

A. figuratively B. retrospectively C. respectively D. rightfully

gate2017-ec-2 general-aptitude verbal-ability meaning

9.5.33 Meaning: GATE2017-2-GA-1

https://gateoverflow.in/118415

Choose the option with words that are not synonyms.

A. aversion, dislike
B. luminous, radiant
C. plunder, loot
D. yielding, resistant

gate2017-2 verbal-ability meaning

9.5.34 Meaning: GATE2019 CE-1: GA-8

https://gateoverflow.in/313447

"The increasing interest in tribal characters might be a mere coincidence, but the timing is of interest. None of this, though, is to say that the tribal hero has arrived in Hindi cinema, or that the new crop of characters represents the acceptance of the tribal character in the industry. The films and characters are too few to be described as a pattern."

What does the word 'arrived' mean in the paragraph above?

A. reached a terminus
B. came to a conclusion
C. attained a status
D. went to a place

gate2019-ce-1 general-aptitude verbal-ability passage-reading meaning

9.6 Most Appropriate Alternative (4)

9.6.1 Most Appropriate Alternative: GATE2012 AE: GA-2

https://gateoverflow.in/40213

Choose the most appropriate alternative from the options given below to complete the following sentence:

Food prices ___ again this month.

A. have raised
B. have been raising
C. have been rising
D. have arose

gate2012-ae verbal-ability most-appropriate-alternative

9.6.2 Most Appropriate Alternative: GATE2012 CY: GA-5

https://gateoverflow.in/40236

Choose the most appropriate alternative from the options given below to complete the following sentence:

If the tired soldier wanted to lie down, he ___ the mattress out on the balcony.

A. should take
B. shall take
C. should have taken
D. will have taken

gate2012-cy most-appropriate-alternative english-grammar verbal-ability

9.6.3 Most Appropriate Alternative: GATE2012-57

https://gateoverflow.in/2195

Choose the most appropriate alternative from the options given below to complete the following sentence:

Despite several _____ the mission succeeded in its attempt to resolve the conflict.

A. attempts B. setbacks C. meetings D. delegations

gate2012 verbal-ability easy most-appropriate-alternative

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9.6.4 Most Appropriate Alternative: GATE2015 EC-1: GA-3

https://gateoverflow.in/39491

Choose the word most similar in meaning to the given word:

Educe

A. Exert B. Educate C. Extract D. Extend

gate2015-ec-1 meaning most-appropriate-alternative

9.7 Most Appropriate Word (72)

9.7.1 Most Appropriate Word: GATE2010 MN: GA-3

https://gateoverflow.in/312011

Choose the most appropriate word from the options given below to complete the following sentence :

The committee wrote a _____ report, extolling only the strengths of the proposal.

A. reasonable B. supportive C. biased D. fragmented

general-aptitude verbal-ability gate2010-mn most-appropriate-word

9.7.2 Most Appropriate Word: GATE2010 MN: GA-4

https://gateoverflow.in/312012

Choose the most appropriate word from the options given below to complete the following sentence :

If the country has to achieve real prosperity, it is _____ that the fruits of progress reach all, and in equal measure.

A. inevitable B. contingent C. oblivious D. imperative

general-aptitude verbal-ability gate2010-mn most-appropriate-word

9.7.3 Most Appropriate Word: GATE2010 TF: GA-3

https://gateoverflow.in/312022

Choose the most appropriate word from the options given below to complete the following sentence:

The two child norm with _____ for the violators will have significant implications for oar demographic profile.

A. disincentives B. incitements C. restrictions D. restraints

general-aptitude verbal-ability gate2010-tf most-appropriate-word

9.7.4 Most Appropriate Word: GATE2010 TF: GA-4

https://gateoverflow.in/312023

Choose the most appropriate word from the options given below to complete the following sentence :

There is no fixed relation between food and famine; famines can occur with or without a substantial _____ in food output.

A. aberration B. weakening C. decline D. deterioration

general-aptitude verbal-ability gate2010-tf most-appropriate-word

9.7.5 Most Appropriate Word: GATE2010-56

https://gateoverflow.in/2364

Choose the most appropriate word from the options given below to complete the following sentence:

His rather casual remarks on politics _____ his lack of seriousness about the subject.

A. masked B. belied C. betrayed D. suppressed

gate2010 verbal-ability most-appropriate-word normal

9.7.6 Most Appropriate Word: GATE2010-58

https://gateoverflow.in/2366

Choose the most appropriate word from the options given below to complete the following sentence:

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If we manage to _____ our natural resources, we would leave a better planet for our children.

A. uphold B. restrain C. cherish D. conserve

gate2010 verbal-ability most-appropriate-word easy

9.7.7 Most Appropriate Word: GATE2011 AG: GA-1

https://gateoverflow.in/312112

Choose the most appropriate word from the options given below to complete the following sentence:

Under ethical guidelines recently adopted by the India Medical Association, human genes are to be manipulated only to correct diseases for which _____ treatments are unsatisfactory.

A. similar B. most C. uncommon D. available

general-aptitude verbal-ability gate2011-ag most-appropriate-word

9.7.8 Most Appropriate Word: GATE2011 AG: GA-3

https://gateoverflow.in/312114

Choose the most appropriate word from the options given below to complete the following sentence:

It was her view that the country's problem had been _____ by foreign technocrats, so that to invite them to come back would be counter-productive.

A. identified
B. ascertained
C. exacerbated
D. analysed

general-aptitude verbal-ability gate2011-ag most-appropriate-word

9.7.9 Most Appropriate Word: GATE2011 GG: GA-1

https://gateoverflow.in/40202

Choose the most appropriate word or phrase from the options given below to complete the following sentence.

The environmentalists hope _____ the lake to its pristine condition.

A. in restoring
B. in the restoration of
C. to restore
D. restoring

gate2011-gg verbal-ability most-appropriate-word

9.7.10 Most Appropriate Word: GATE2011 GG: GA-3

https://gateoverflow.in/40204

Choose the most appropriate word from the options given below to complete the following sentence.

Despite the mixture's _____ nature, we found that by lowering its temperature in the laboratory we could dramatically reduce its tendency to vaporize.

A. acerbic B. resilient C. volatile D. heterogeneous

gate2011-gg verbal-ability most-appropriate-word normal

9.7.11 Most Appropriate Word: GATE2011 GG: GA-5

https://gateoverflow.in/40206

Choose the most appropriate words from the options given below to complete the following sentence.

Because she had a reputation for _____ we were surprised and pleased when she greeted us so _____.

A. insolence …… irately
B. insouciance …… curtly
C. graciousness …… amiably
D. querulousness …… affably

gate2011-gg most-appropriate-word verbal-ability

9.7.12 Most Appropriate Word: GATE2011 MN: GA-57

https://gateoverflow.in/31522

Choose the most appropriate word(s) from the options given below to complete the following sentence.

We lost confidence in him because he never _____ the grandiose promises he had made.

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A. delivered B. delivered on C. forgot D. reneged on

gate2011-mn verbal-ability most-appropriate-word

9.7.13 Most Appropriate Word: GATE2011 MN: GA-58 https://gateoverflow.in/31529

Choose the word or phrase that best completes the sentence below.
_____ in the frozen wastes of Arctic takes special equipment.

A. To survive B. Surviving C. Survival D. That survival

verbal-ability gate2011-mn most-appropriate-word

9.7.14 Most Appropriate Word: GATE2011 MN: GA-60 https://gateoverflow.in/31533

Choose the most appropriate word from the options given below to complete the following sentence.

The _____ of evidence was on the side of the plaintiff since all but one witness testified that his story was correct.

A. paucity B. propensity C. preponderance D. accuracy

verbal-ability gate2011-mn most-appropriate-word

9.7.15 Most Appropriate Word: GATE2011-58 https://gateoverflow.in/2167

Choose the most appropriate word(s) from the options given below to complete the following sentence.

I contemplated _____ Singapore for my vacation but decided against it.

A. to visit B. having to visit C. visiting D. for a visit

gate2011 verbal-ability most-appropriate-word easy

9.7.16 Most Appropriate Word: GATE2011-59 https://gateoverflow.in/2169

Choose the most appropriate word from the options given below to complete the following sentence.

If you are trying to make a strong impression on your audience, you cannot do so by being understated, tentative or _____.

A. hyperbolic B. restrained C. argumentative D. indifferent

gate2011 verbal-ability most-appropriate-word normal

9.7.17 Most Appropriate Word: GATE2012 AE: GA-3 https://gateoverflow.in/40214

Choose the most appropriate alternative from the options given below to complete the following sentence:

The administrators went on to implement yet another unreasonable measure, arguing that the measures were already ___ and one more would hardly make a difference.

A. reflective B. utopian C. luxuriant D. unpopular

gate2012-ae most-appropriate-word verbal-ability

9.7.18 Most Appropriate Word: GATE2012 AE: GA-4 https://gateoverflow.in/40215

Choose the most appropriate alternative from the options given below to complete the following sentence:

To those of us who had always thought him timid, his ___ came as a surprise.

A. intrepidity B. inevitability C. inability D. inertness

gate2012-ae verbal-ability most-appropriate-word

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9.7.19 Most Appropriate Word: GATE2012 AR: GA-2

https://gateoverflow.in/40223

Choose the most appropriate pair of words from the options given below to complete the following sentence:

The high level of ___ of the questions in the test was ___ by an increase in the period of time allotted for answering them.

A. difficulty, compensated
B. exactitude, magnified
C. aptitude, decreased
D. attitude, mitigated

gate2012-ar most-appropriate-word verbal-ability normal

9.7.20 Most Appropriate Word: GATE2012 CY Q 57

https://gateoverflow.in/32298

Choose the most appropriate alternative from the options given below to complete the following sentence:

If the tired soldier wanted to lie down, he ___ the mattress out on the balcony.

A. should take
B. shall take
C. should have taken
D. will have taken

gate-cy-2012 verbal-ability most-appropriate-word

9.7.21 Most Appropriate Word: GATE2012-60

https://gateoverflow.in/2200

Choose the most appropriate alternative from the options given below to complete the following sentence:

Suresh's dog is the one _____ was hurt in the stampede.

A. that
B. which
C. who
D. whom

gate2012 verbal-ability most-appropriate-word normal

9.7.22 Most Appropriate Word: GATE2013 CE: GA-4

https://gateoverflow.in/40271

Friendship, no matter how _____ it is, has its limitations.

A. cordial
B. intimate
C. secret
D. pleasant

gate2013-ce most-appropriate-word verbal-ability

9.7.23 Most Appropriate Word: GATE2013 EE: GA-3

https://gateoverflow.in/40290

Complete the sentence:

Dare _____ mistakes.

A. commit
B. to commit
C. committed
D. committing

gate2013-ee most-appropriate-word easy verbal-ability

9.7.24 Most Appropriate Word: GATE2014 AE: GA-2

https://gateoverflow.in/40301

Choose the most appropriate word from the options given below to complete the following sentence.
One of his biggest _____ was his ability to forgive.

A. vice
B. virtues
C. choices
D. strength

gate2014-ae most-appropriate-word

9.7.25 Most Appropriate Word: GATE2014 AG: GA-1

https://gateoverflow.in/41660

Choose the most appropriate word from the options given below to complete the following sentence. A person suffering from Alzheimer's disease _____ short-term memory loss.

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A. Experienced
B. Has experienced
C. Is experiencing
D. Experiences

gate2014-ag verbal-ability most-appropriate-word normal

9.7.26 Most Appropriate Word: GATE2014 AG: GA-2

https://gateoverflow.in/41665

Choose the most appropriate word from the options given below to complete the following sentence. _____ is the key to their happiness; they are satisfied with what they have.

A. Contentment
B. Ambition
C. Perseverance
D. Hunger

gate2014-ag verbal-ability most-appropriate-word easy

9.7.27 Most Appropriate Word: GATE2014 EC-1: GA-3

https://gateoverflow.in/41492

Choose the most appropriate word from the options given below to complete the following sentence.

Many ancient cultures attributed disease to supernatural causes. However, modern science has largely helped _____ such notions.

A. Impel
B. Dispel
C. Propel
D. Repel

gate2014-ec-1 most-appropriate-word verbal-ability

9.7.28 Most Appropriate Word: GATE2014 EC-2: GA-1

https://gateoverflow.in/41507

Choose the most appropriate word from the options given below to complete the following sentence.

Communication and interpersonal skills are _____ important in their own ways.

A. Each
B. Both
C. All
D. Either

gate2014-ec-2 verbal-ability most-appropriate-word easy

9.7.29 Most Appropriate Word: GATE2014 EC-2: GA-3

https://gateoverflow.in/41510

Choose the most appropriate pair of words from the options given below to complete the following sentence.

She could not _____ the thought of _____ the election to her bitter rival.

A. Bear, loosing
B. Bare, loosing
C. Bear, losing
D. Bare, losing

gate2014-ec-2 most-appropriate-word

9.7.30 Most Appropriate Word: GATE2014 EC-3: GA-2

https://gateoverflow.in/41141

The value of one U.S. dollar is 65 Indian Rupees today, compared to 60 last year. The Indian Rupee has _____.

A. Depressed
B. Depreciated
C. Appreciated
D. Stabilized

gate2014-ec-3 most-appropriate-word verbal-ability

9.7.31 Most Appropriate Word: GATE2014-1-GA-2

https://gateoverflow.in/771

Choose the most appropriate word from the options given below to complete the following sentence.

He could not understand the judges awarding her the first prize, because he thought that her performance was quite _____.

A. superb
B. medium
C. mediocre
D. exhilarating

gate2014-1 verbal-ability most-appropriate-word easy

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9.7.32 Most Appropriate Word: GATE2014-2-GA-1

https://gateoverflow.in/1938

Choose the most appropriate phrase from the options given below to complete the following sentence.
India is a post-colonial country because

A. it was a former British colony
B. Indian Information Technology professionals have colonized the world
C. India does not follow any colonial practices
D. India has helped other countries gain freedom

gate2014-2 verbal-ability most-appropriate-word easy

9.7.33 Most Appropriate Word: GATE2015 CE-2: GA-1

https://gateoverflow.in/40176

Choose the most appropriate word from the options given below to complete the following sentence.

The official answered _____ that the complaints of the citizen would be looked into.

A. respectably B. respectfully C. reputably D. respectively

gate2015-ce-2 verbal-ability most-appropriate-word

9.7.34 Most Appropriate Word: GATE2015 EC-1: GA-1

https://gateoverflow.in/39489

Choose the most appropriate word from the options given below to complete the following sentence.

The principal presented the chief guest with a _____, as token of appreciation.

A. momento B. memento C. momentum D. moment

gate2015-ec-1 most-appropriate-word

9.7.35 Most Appropriate Word: GATE2015 EC-1: GA-2

https://gateoverflow.in/39490

Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence:

Frogs _____.

A. croak B. roar C. hiss D. patter

gate2015-ec-1 most-appropriate-word

9.7.36 Most Appropriate Word: GATE2015 EC-2: GA- 1

https://gateoverflow.in/38935

Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence:
Dhoni, as well as the other team members of Indian team, _____present on the occasion.

A. were B. was C. has D. have

gate2015-ec-2 verbal-ability most-appropriate-word

9.7.37 Most Appropriate Word: GATE2015 EC-3: GA-3

https://gateoverflow.in/39516

Choose the correct verb to fill in the blank below:
Let us _____.

A. introvert B. alternate
C. atheist D. altruist

gate2015-ec-3 verbal-ability most-appropriate-word

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9.7.38 Most Appropriate Word: GATE2015 ME-3: GA-1

https://gateoverflow.in/40166

Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence:
Apparent lifelessness _____ dormant life.

A. harbours B. leads to C. supports D. affects

gate2015-me-3 verbal-ability most-appropriate-word

9.7.39 Most Appropriate Word: GATE2015 ME-3: GA-2

https://gateoverflow.in/40167

Fill in the blank with the correct idiom/phrase.

That boy from the town was a _____ in the sleepy village.

A. dog out of herd
B. sheep from the heap
C. fish out of water
D. bird from the flock

gate2015-me-3 verbal-ability most-appropriate-word

9.7.40 Most Appropriate Word: GATE2015-2-GA-4

https://gateoverflow.in/8032

A generic term that includes various items of clothing such as a skirt, a pair of trousers and a shirt is

A. fabric B. textile C. fiber D. apparel

gate2015-2 verbal-ability easy most-appropriate-word

9.7.41 Most Appropriate Word: GATE2015-3-GA-3

https://gateoverflow.in/8301

Extreme focus on syllabus and studying for tests has become such a dominant concern of Indian student that they close their minds to anything _____ to the requirements of the exam.

A. related B. extraneous C. outside D. useful

gate2015-3 verbal-ability normal most-appropriate-word

9.7.42 Most Appropriate Word: GATE2016 CE-2: GA-3

https://gateoverflow.in/110881

Choose the most appropriate set of words from the options given below to complete the following sentence.

_____, _____ is a will, _____ is a way.

A. Wear, there, their
B. Were, their, there
C. Where, there, there
D. Where, their, their

gate2016-ce-2 most-appropriate-word verbal-ability

9.7.43 Most Appropriate Word: GATE2016 EC-1: GA-3

https://gateoverflow.in/108069

Despite the new medicine's _____ in treating diabetes, it is not _____widely.

A. effectiveness --- prescribed
B. availability --- used
C. prescription --- available
D. acceptance --- proscribed

gate2016-ec-1 verbal-ability most-appropriate-word

9.7.44 Most Appropriate Word: GATE2016 EC-2: GA-2

https://gateoverflow.in/108478

The students _____ the teacher on teachers' day for twenty years of dedicated teaching.

A. Facilitated B. Felicitated C. Fantasized D. Facillitated

gate2016-ec-2 verbal-ability most-appropriate-word

9.7.45 Most Appropriate Word: GATE2016 ME-2: GA-1

https://gateoverflow.in/108240

The volume of a sphere of diameter 1 unit is _____ than the volume of a cube of side 1 unit.

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A. Least B. Less C. Lesser D. Low

gate2016-me-2 verbal-ability most-appropriate-word

9.7.46 Most Appropriate Word: GATE2016 ME-2: GA-2

https://gateoverflow.in/108249

The unruly crowd demanded that the accused be _____ without trial.

A. Hanged B. Hanging C. Hankering D. Hung

gate2016-me-2 most-appropriate-word verbal-ability

9.7.47 Most Appropriate Word: GATE2017 CE-1: GA-2

https://gateoverflow.in/313488

_____ with someone else's email account is now a very serious offence.

A. Involving B. Assisting C. Tampering D. Incubating

gate2017-ce-1 general-aptitude verbal-ability most-appropriate-word

9.7.48 Most Appropriate Word: GATE2018 CE-1: GA-1

https://gateoverflow.in/313276

"The driver applied the ____ as soon as she approached the hotel where she wanted to take a ____"

A. brake, break B. break, brake C. brake, brake D. break, break

gate2018-ce-1 general-aptitude verbal-ability most-appropriate-word

9.7.49 Most Appropriate Word: GATE2018 CE-1: GA-2

https://gateoverflow.in/313278

"It is no surprise that every society has had codes of behavior; however, the nature of these codes is often _____."

The word that best fills the blank in the above sentence is

A. unpredictable B. simple C. expected D. strict

gate2018-ce-1 general-aptitude verbal-ability most-appropriate-word

9.7.50 Most Appropriate Word: GATE2018 CE-2: GA-1

https://gateoverflow.in/313395

"His face ____ with joy when the solution of the puzzle was ___ to him."

The words that best fill the blanks in the above sentence are

A. shone, shown B. shone, shone C. shown, shone D. shown, shown

gate2018-ce-2 verbal-ability most-appropriate-word

9.7.51 Most Appropriate Word: GATE2018 CE-2: GA-2

https://gateoverflow.in/313396

"Although it does contain some pioneering ideas, one would hardly characterize the work as _____."

A. innovative B. simple C. dull D. boring

gate2018-ce-2 general-aptitude verbal-ability most-appropriate-word

9.7.52 Most Appropriate Word: GATE2018 CH: GA-1

https://gateoverflow.in/205087

"When she fell down the _____ , she received many _____ but little help."

The words that best fill the blanks in the above sentence are

A. stairs, stares B. stairs, stairs
C. stares, stairs D. stares, stares

gate2018-ch general-aptitude verbal-ability normal most-appropriate-word

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9.7.53 Most Appropriate Word: GATE2018 CH: GA-2

https://gateoverflow.in/205088

"In spite of being warned repeatedly, he failed to correct his _____ behaviour ."

The word that best fills the blank in the above sentence is

A. rational B. reasonable C. errant D. good

gate2018-ch general-aptitude verbal-ability normal most-appropriate-word

9.7.54 Most Appropriate Word: GATE2018 EC: GA-1

https://gateoverflow.in/205205

“By giving him the last _____ of the cake, you will ensure lasting _____ in our house today.”
The words that best fill the blanks in the above sentence are

A. peas, piece B. piece, peace C. peace, piece D. peace, peas

gate2018-ec general-aptitude verbal-ability normal most-appropriate-word

9.7.55 Most Appropriate Word: GATE2018 EC: GA-2

https://gateoverflow.in/205206

“Even though there is a vast scope for its _____, tourism has remained a/an _____ area.”
The words that best fill the blanks in the above sentence are

A. improvement, neglected
B. rejection, approved
C. fame, glum
D. interest, disinterested

gate2018-ec general-aptitude verbal-ability normal most-appropriate-word

9.7.56 Most Appropriate Word: GATE2018 EE: GA-1

https://gateoverflow.in/205097

“Since you have gone off the _____, the _____ sand is likely to damage the car.”
The words that best fill the blanks in the above sentence are

A. course, coarse
B. course, course
C. coarse, course
D. coarse, coarse

gate2018-ee verbal-ability normal most-appropriate-word

9.7.57 Most Appropriate Word: GATE2018 EE: GA-2

https://gateoverflow.in/205098

“A common misconception among writers is that sentence structure mirrors thought; the more _____ the structure, the more complicated the ideas.”
The word that best fills the blank in the above sentence is

A. detailed B. simple C. clear D. convoluted

gate2018-ee general-aptitude verbal-ability normal most-appropriate-word

9.7.58 Most Appropriate Word: GATE2018 ME-1: GA-2

https://gateoverflow.in/313656

"Her _____ should not be confused with miserliness; she is ever willing to assist those in need."

The word that best fills the blank in the above sentence is

A. cleanliness B. punctuality C. frugality D. greatness

gate2018-me-1 general-aptitude verbal-ability most-appropriate-word

9.7.59 Most Appropriate Word: GATE2018 ME-2: GA-1

https://gateoverflow.in/313634

"The dress _____ her so well that they all immediately _____ her on her appearance."

The words that best fill the blanks in the above sentence are

A. complemented, complemented
B. complimented, complemented
C. complimented, complimented
D. complemented, complimented

gate2018-me-2 general-aptitude verbal-ability most-appropriate-word

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9.7.60 Most Appropriate Word: GATE2018 ME-2: GA-2

https://gateoverflow.in/313641

" The judge's standing in the legal community, though shaken by false allegations of wrongdoing, remained _____ ."

The word that best fills the blank in the above sentence is

A. undiminished B. damaged C. illegal D. uncertain

gate2018-me-2 general-aptitude verbal-ability most-appropriate-word

9.7.61 Most Appropriate Word: GATE2018-GA-1

https://gateoverflow.in/204062

"From where are they bringing their books? _____ bringing _____ books from _____"

The words that best fill the blanks in the above sentence are

A. Their, they're, there
B. They're, their, there
C. There, their, they're
D. They're, there,there

gate2018 verbal-ability most-appropriate-word easy

9.7.62 Most Appropriate Word: GATE2018-GA-2

https://gateoverflow.in/204063

A _____ investigation can sometimes yield new facts, but typically organized ones are more successful.

The word that best fills the blank in the above sentence is

A. meandering B. timely C. consistent D. systematic

gate2018 verbal-ability most-appropriate-word normal

9.7.63 Most Appropriate Word: GATE2019 CE-2: GA-1

https://gateoverflow.in/313377

Daytime temperature in Delhi can _____ $40^{\circ}C$.

A. get B. stand C. reach D. peak

gate2019-ce-2 general-aptitude verbal-ability most-appropriate-word

9.7.64 Most Appropriate Word: GATE2019 EC: GA-5

https://gateoverflow.in/313541

When he did not come home, she _____ him lying dead on the roadside somewhere.

A. concluded B. looked C. notice D. pictured

gate2019-ec general-aptitude verbal-ability most-appropriate-word

9.7.65 Most Appropriate Word: GATE2019 EE: GA-1

https://gateoverflow.in/313568

I am not sure if the bus that has been booked will be able to _____ all the students.

A. sit
B. deteriorate
C. fill
D. accommodate

gate2019-ee general-aptitude verbal-ability most-appropriate-word

9.7.66 Most Appropriate Word: GATE2019 EE: GA-5

https://gateoverflow.in/313744

Newspapers are a constant source of delight and recreation for me. The _____ trouble is that I read _____ many of them.

A. even, quite B. even, too C. only, quite D. only, too

gate2019-ee general-aptitude verbal-ability most-appropriate-word

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9.7.67 Most Appropriate Word: GATE2019 ME-1: GA-1

https://gateoverflow.in/313602

John Thomas, an _____ writer, passed away in 2018.

A. imminent B. prominent C. eminent D. dominant

gate2019-me-1 general-aptitude verbal-ability most-appropriate-word

9.7.68 Most Appropriate Word: GATE2019 ME-1: GA-5

https://gateoverflow.in/313604

The minister avoided any mention of the issue of women's reservation in the private sector. He was accused of _____ the issue.

A. collaring B. skirting C. tying D. belting

gate2019-me-1 general-aptitude verbal-ability most-appropriate-word

9.7.69 Most Appropriate Word: GATE2019 ME-2: GA-2

https://gateoverflow.in/313586

A final examination is the ____ of a series of evaluations that a student has to go through

A. culmination B. consultation C. desperation D. insinuation

gate2019-me-2 general-aptitude verbal-ability most-appropriate-word

9.7.70 Most Appropriate Word: GATE2019 ME-2: GA-5

https://gateoverflow.in/313590

Are there enough seats here? There are ____ people here than I expected

A. many B. most C. least D. more

gate2019-me-2 general-aptitude verbal-ability most-appropriate-word

9.7.71 Most Appropriate Word: GATE2019-GA-1

https://gateoverflow.in/302872

The expenditure on the project _____ as follows: equipment Rs. 20 lakhs, salaries Rs.12 lakhs, and contingency Rs.3 lakhs.

A. break down B. break C. breaks down D. breaks

gate2019 general-aptitude verbal-ability most-appropriate-word

9.7.72 Most Appropriate Word: GATE2019-GA-5

https://gateoverflow.in/302868

A court is to a judge as _____ is to a teacher

A. a student B. a punishment C. a syllabus D. a school

gate2019 general-aptitude verbal-ability most-appropriate-word

9.8 Noun Verb Adjective (2)

9.8.1 Noun Verb Adjective: GATE2014 EC-3: GA-3

https://gateoverflow.in/41142

'Advice' is _____.

A. A verb
B. A noun
C. An adjective
D. Both a verb and a noun

gate2014-ec-3 verbal-ability noun-verb-adjective

9.8.2 Noun Verb Adjective: GATE2015 EC-2: GA- 3

https://gateoverflow.in/39504

What is the adverb for the given word below?
Misogynous

A. Misogynousness
B. Misogynity

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C. Misogynously D. Misogynous

gate2015-ec-2 verbal-ability noun-verb-adjective

9.9 Opposite (5)

9.9.1 Opposite: GATE2011 AG: GA-2

https://gateoverflow.in/312113

Choose the word from the questions given below that is most nearly opposite in meaning to the given word:

Frequency

A. periodicity B. rarity C. gradualness D. persistency

general-aptitude verbal-ability gate2011-ag opposite

9.9.2 Opposite: GATE2011 GG: GA-2

https://gateoverflow.in/40203

Choose the word from the options given below that is most nearly opposite in meaning to the given word:

Polemical

A. imitative B. conciliatory C. truthful D. ideological

gate2011-gg verbal-ability opposite

9.9.3 Opposite: GATE2011 MN: GA-56

https://gateoverflow.in/31519

Choose the word from the options given below that is most nearly opposite in meaning to the given word:
Deference

A. aversion B. resignation C. suspicion D. contempt

verbal-ability gate2011-mn opposite

9.9.4 Opposite: GATE2011-60

https://gateoverflow.in/2170

Choose the word from the options given below that is most nearly opposite in the meaning to the given word

Amalgamate

A. merge B. split C. collect D. separate

gate2011 verbal-ability opposite normal

9.9.5 Opposite: GATE2014-3-GA-3

https://gateoverflow.in/2026

Choose the word that is opposite in meaning to the word “coherent”.

A. sticky B. well-connected C. rambling D. friendly

gate2014-3 verbal-ability opposite easy

9.10 Passage Reading (45)

9.10.1 Passage Reading: GATE2010 MN: GA-6

https://gateoverflow.in/312015

The ban on smoking in designated public places can save a large number of people from the well-known effects of environmental tobacco smoke. Passive smoking seriously impairs respiratory health. The ban rightly seeks to protect non-smokers from its ill effects.

Which of the following statements best sums up the meaning of the above passage:

A. Effects of environmental tobacco are well known.
B. The ban on smoking in public places protects the non-smokers.
C. Passive smoking is bad for health.
D. The ban on smoking in public places excludes passive smoking.

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passage-reading verbal-ability gate2010-mn

9.10.2 Passage Reading: GATE2010 TF: GA-6

https://gateoverflow.in/312025

It has taken fifty-six long and frustrating, years to turn bronze, into gold for India's Olympics aspirations . Beijing 2008 marks a defining moment in India's Olympic history . From Delhi to Beijing is a long journey but one that our Olympians have undertaken with courage.

Which of the following statement best sums up the meaning of the above passage :

A. India's participation in Olympics has been frustrating.
B. Beijing Olympics was a landmark in India's Olympic history.
C. Our Olympians have undertaken a long journey to Beijing.
D. India's bronze medal turned into gold at Beijing.

general-aptitude verbal-ability gate2010-tf passage-reading

9.10.3 Passage Reading: GATE2010-63

https://gateoverflow.in/2371

Modern warfare has changed from large scale clashes of armies to suppression of civilian populations. Chemical agents that do their work silently appear to be suited to such warfare; and regretfully, there exist people in military establishments who think that chemical agents are useful tools for their cause.

Which of the following statements best sums up the meaning of the above passage:

A. Modern warfare has resulted in civil strife.
B. Chemical agents are useful in modern warfare.
C. Use of chemical agents in warfare would be undesirable.
D. People in military establishments like to use chemical agents in war.

gate2010 verbal-ability passage-reading normal

9.10.4 Passage Reading: GATE2011 AG: GA-10

https://gateoverflow.in/312132

The horse has played a little known but very important role in the field of medicine. Horses were injected with toxins of diseases until their blood built up immunities. Then a serum was made from their blood. Serums to fight with diphtheria and tetanus were developed this way.

It can be inferred from the passage, that horses were

A. given immunity to diseases
B. generally quite immune to diseases
C. given medicines to fight toxins
D. given diphtheria and tetanus serums

general-aptitude verbal-ability gate2011-ag passage-reading

9.10.5 Passage Reading: GATE2011 GG: GA-10

https://gateoverflow.in/40211

In order to develop to full potential, a baby needs to be physically able to respond to the environment.

It can be inferred from the passage that

A. Full physical potential is needed in order for a baby to be able to respond to the environment.
B. It is necessary for a baby to be able to physically respond to the environment for it to develop its full potential.
C. Response to the environment of physically able babies needs to be developed to its full potential.
D. A physically able baby needs to develop its full potential in order to respond to its environment.

gate2011-gg logical-reasoning passage-reading

9.10.6 Passage Reading: GATE2011 MN: GA-65

https://gateoverflow.in/31545

Nimbus clouds are dark and ragged, stratus clouds appear dull in colour and cover the entire

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sky. Cirrus clouds are thin and delicate, whereas cumulus clouds look like cotton balls.

It can be inferred from the passage that

A. A cumulus cloud on the ground is called fog
B. It is easy to predict the weather by studying clouds
C. Clouds are generally of very different shapes, sizes and mass
D. There are four basic cloud types: stratus, nimbus, cumulus and cirrus

gate2011-mn verbal-ability passage-reading

9.10.7 Passage Reading: GATE2011-61

https://gateoverflow.in/2171

Few school curricula include a unit on how to deal with bereavement and grief, and yet all students at some point in their lives suffer from losses through death and parting.

Based on the above passage which topic would not be included in a unit on bereavement?

A. how to write a letter of condolence
B. what emotional stages are passed through in the healing process
C. what the leading causes of death are
D. how to give support to a grieving friend

gate2011 verbal-ability passage-reading normal

9.10.8 Passage Reading: GATE2012 AE: GA-10

https://gateoverflow.in/40221

In the early nineteenth century, theories of social evolution were inspired less by Biology than by the conviction of social scientists that there was a growing improvement in social institutions. Progress was taken for granted and social scientists attempted to discover its laws and phases.

Which one of the following inferences may be drawn with the greatest accuracy from the above passage? Social scientists

A. did not question that progress was a fact.
B. did not approve of Biology.
C. framed the laws of progress.
D. emphasized Biology over Social Sciences.

gate2012-ae verbal-ability passage-reading

9.10.9 Passage Reading: GATE2012 AR: GA-10

https://gateoverflow.in/40231

The documents expose the cynicism of the government officials – and yet as the media website reflects, not a single newspaper has reported on their existence.

Which one of the following inferences may be drawn with the greatest accuracy from the above passage?

A. Nobody other than the government officials knew about the existence of the documents.
B. Newspapers did report about the documents but nobody cared.
C. Media reports did not show the existence of the documents.
D. The documents reveal the attitude of the government officials.

gate2012-ar verbal-ability passage-reading

9.10.10 Passage Reading: GATE2012 CY: GA-6

https://gateoverflow.in/40237

One of the legacies of the Roman legions was discipline. In the legions, military law prevailed and discipline was brutal. Discipline on the battlefield kept units obedient, intact and fighting, even when the odds and conditions were against them.

Which one of the following statements best sums up the meaning of the above passage?

A. Thorough regimentation was the main reason for the efficiency of the Roman legions even in adverse circumstances.

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B. The legions were treated inhumanly as if the men were animals.
C. Discipline was the armies' inheritance from their seniors.
D. The harsh discipline to which the legions were subjected to led to the odds and conditions being against them.

gate2012-cy verbal-ability passage-reading

9.10.11 Passage Reading: GATE2013-63

https://gateoverflow.in/1567

After several defeats in wars, Robert Bruce went in exile and wanted to commit suicide. Just before committing suicide, he came across a spider attempting tirelessly to have its net. Time and again, the spider failed but that did not deter it to refrain from making attempts. Such attempts by the spider made Bruce curious. Thus, Bruce started observing the near-impossible goal of the spider to have the net. Ultimately, the spider succeeded in having its net despite several failures. Such act of the spider encouraged Bruce not to commit suicide. And then, Bruce went back again and won many a battle, and the rest is history.

Which one of the following assertions is best supported by the above information?

A. Failure is the pillar of success.
B. Honesty is the best policy.
C. Life begins and ends with adventures.
D. No adversity justifies giving up hope.

gate2013 verbal-ability passage-reading normal

9.10.12 Passage Reading: GATE2014 AE: GA-3

https://gateoverflow.in/40302

Rajan was not happy that Sajan decided to do the project on his own. On observing his unhappiness, Sajan explained to Rajan that he preferred to work independently.

Which one of the statements below is logically valid and can be inferred from the above sentences?

A. Rajan has decided to work only in a group.
B. Rajan and Sajan were formed into a group against their wishes.
C. Sajan had decided to give in to Rajan's request to work with him.
D. Rajan had believed that Sajan and he would be working together.

gate2014-ae passage-reading logical-reasoning

9.10.13 Passage Reading: GATE2014 AG: GA-7

https://gateoverflow.in/41671

Moving into a world of big data will require us to change our thinking about the merits of exactitude. To apply the conventional mindset of measurement to the digital, connected world of the twenty-first century is to miss a crucial point. As mentioned earlier, the obsession with exactness is an artefact of the information-deprived analog era. When data was sparse, every data point was critical, and thus great care was taken to avoid letting any point bias the analysis. From "BIG DATA" Viktor Mayer-Schonberger and Kenneth Cukier. The main point of the paragraph is:

A. The twenty-first century is a digital world
B. Big data is obsessed with exactness
C. Exactitude is not critical in dealing with big data
D. Sparse data leads to a bias in the analysis

gate2014-ag verbal-ability passage-reading normal

9.10.14 Passage Reading: GATE2014 EC-1: GA-7

https://gateoverflow.in/41496

For submitting tax returns, all resident males with annual income below Rs 10 lakh should fill up Form P and all resident females with income below Rs 8 lakh should fill up Form Q. All people with incomes above Rs 10 lakh should fill up Form R, except non residents with income above Rs 15 lakhs, who should fill up Form S. All others should fill Form T. An example of a person who should fill Form T is

A. A resident male with annual income Rs 9 lakh
B. A resident female with annual income Rs 9 lakh

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C. A non-resident male with annual income Rs 16 lakh
D. A non-resident female with annual income Rs 16 lakh

gate2014-ec-1 verbal-ability passage-reading normal

9.10.15 Passage Reading: GATE2014-1-GA-6

https://gateoverflow.in/774

The Palghat Gap (or Palakkad Gap) , a region about $30\ km$ wide in the southern part of the Western Ghats in India, is lower than the hilly terrain to its north and south. The exact reasons for the formation of this gap are not clear. It results in the neighbouring regions of Tamil Nadu getting more rainfall from the South West monsoon and the neighbouring regions of Kerala having higher summer temperatures.

What can be inferred from this passage?

Select one:

A. The Palghat gap is caused by high rainfall and high temperatures in southern Tamil Nadu and Kerala
B. The regions in Tamil Nadu and Kerala that are near the Palghat Gap are low-lying
C. The low terrain of the Palghat Gap has a significant impact on weather patterns in neighbouring parts of Tamil Nadu and Kerala
D. Higher summer temperatures result in higher rainfall near the Palghat Gap area

gate2014-1 verbal-ability passage-reading normal

9.10.16 Passage Reading: GATE2014-2-GA-6

https://gateoverflow.in/1943

The old city of Koenigsberg, which had a German majority population before World War 2, is now called Kaliningrad. After the events of the war, Kaliningrad is now a Russian territory and has a predominantly Russian population. It is bordered by the Baltic Sea on the north and the countries of Poland to the south and west and Lithuania to the east respectively. Which of the statements below can be inferred from this passage?

A. Kaliningrad was historically Russian in its ethnic make up
B. Kaliningrad is a part of Russia despite it not being contiguous with the rest of Russia
C. Koenigsberg was renamed Kaliningrad, as that was its original Russian name
D. Poland and Lithuania are on the route from Kaliningrad to the rest of Russia

gate2014-2 verbal-ability passage-reading normal

9.10.17 Passage Reading: GATE2014-2-GA-7

https://gateoverflow.in/1944

Number of people diagnosed with dengue fever (contracted from the bite of a mosquito) in North India is twice the number diagnosed last year. Municipal authorities have concluded that measures to control the mosquito population have failed in this region.

Which one of the following statements, if true, does not contradict this conclusion?

A. A high proportion of the affected population has returned from neighbouring countries where dengue is prevalent
B. More cases of dengue are now reported because of an increase in the Municipal Office's administrative efficiency
C. Many more cases of dengue are being diagnosed this year since the introduction of a new and effective diagnostic test
D. The number of people with malarial fever (also contracted from mosquito bites) has increased this year

gate2014-2 verbal-ability passage-reading normal

9.10.18 Passage Reading: GATE2014-3-GA-6

https://gateoverflow.in/2029

A dance programme is scheduled for 10.00 a.m. Some students are participating in the programme and they need to come an hour earlier than the start of the event. These students should be accompanied by a parent. Other students and parents should come in time for the programme. The instruction you think that is appropriate for this is

A. Students should come at 9.00 a.m. and parents should come at 10.00 a.m.

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B. Participating students should come at 9.00 a.m. accompanied by a parent, and other parents and students should come by 10.00 a.m.
C. Students who are not participating should come by 10.00 a.m. and they should not bring their parents. Participating students should come at 9.00 a.m.
D. Participating students should come before 9.00 a.m. Parents who accompany them should come at 9.00 a.m. All others should come at 10.00 a.m.

gate2014-3 verbal-ability passage-reading easy

9.10.19 Passage Reading: GATE2014-3-GA-7

https://gateoverflow.in/2031

By the beginning of the 20th century, several hypotheses were being proposed, suggesting a paradigm shift in our understanding of the universe. However, the clinching evidence was provided by experimental measurements of the position of a star which was directly behind our sun.

Which of the following inference(s) may be drawn from the above passage?

i. Our understanding of the universe changes based on the positions of stars
ii. Paradigm shifts usually occur at the beginning of centuries
iii. Stars are important objects in the universe
iv. Experimental evidence was important in confirming this paradigm shift

A. i, ii and iv B. iii only C. i and iv D. iv only

gate2014-3 verbal-ability passage-reading easy

9.10.20 Passage Reading: GATE2015 EC-1: GA-7

https://gateoverflow.in/39495

Read the following paragraph and choose the correct statement.

Climate change has reduced human security and threatened human well being. An ignored reality of human progress is that human security largely depends upon environmental security. But on the contrary, human progress seems contradictory to environmental security. To keep up both at the required level is a challenge to be addressed by one and all. One of the ways to curb the climate change may be suitable scientific innovations, while the other may be the Gandhian perspective on small scale progress with focus on sustainability.

A. Human progress and security are positively associated with environmental security.
B. Human progress is contradictory to environmental security.
C. Human security is contradictory to environmental security.
D. Human progress depends upon environmental security

gate2015-ec-1 general-aptitude verbal-ability passage-reading

9.10.21 Passage Reading: GATE2015 EC-3: GA-10

https://gateoverflow.in/39523

Ms. X will be in Bagdogra from $01/05/2014$ to $20/05/2014$ and from $22/05/2014$ to $31/05/2014$. On the morning of $21/05/2014$, she will reach Kochi via Mumbai.

Which one of the statements below is logically valid and can be inferred from the above sentences?

A. Ms. X will be in Kochi for one day, only in May.
B. Ms. X will be in Kochi for only one day in May.
C. Ms. X will be only in Kochi for one day in May.
D. Only Ms. X will be in Kochi for one day in May.

gate2015-ec-3 verbal-ability passage-reading

9.10.22 Passage Reading: GATE2015-3-GA-9

https://gateoverflow.in/8388

Most experts feel that in spite of possessing all the technical skills required to be a batsman of the highest order, he is unlikely to be so due to lack of requisite temperament. He was guilty of throwing away his wicket several time after working hard to lay a strong foundation. His critics pointed out that until he addressed his problem, success at the highest level will continue to elude him.

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Which of the statement(s) below is/are logically valid and can be inferred from the above passage?

i. He was already a successful batsman at the highest level.
ii. He was to improve his temperament in order to become a great batsman.
iii. He failed to make many of his good starts count.
iv. Improving his technical skills will guarantee success.

A. iii and iv B. ii and iii C. i, ii and iii D. ii only

gate2015-3 verbal-ability normal passage-reading

9.10.23 Passage Reading: GATE2016 CE-2: GA-7

https://gateoverflow.in/110913

Today, we consider Ashoka as a great ruler because of the copious evidence he left behind in the form of stone carved edicts. Historians tend to correlate greatness of a king at his time with the availability of evidence today. Which of the following can be logically inferred from the above sentences?

A. Emperors who do not leave significant sculpted evidence are completely forgotten.
B. Ashoka produced stone carved edicts to ensure that later historians will respect him.
C. Statues of kings are a reminder of their greatness.
D. A king's greatness, as we know him today, is interpreted by historians.

gate2016-ce-2 passage-reading verbal-ability

9.10.24 Passage Reading: GATE2016 EC-2: GA-7

https://gateoverflow.in/108717

Social science disciplines were in existence in an amorphous form until the colonial period when they were institutionalized. In varying degrees, they were intended to further the colonial interest. In the time of globalization and the economic rise of postcolonial countries like India, conventional ways of Knowledge production have become obsolete.

Which of the following can be logically inferred from the above statements?

(i) Social science disciplines have become obsolete.

(ii) Social science disciplines had a pre-colonial origin.

(iii) Social science disciplines always promote colonialism.

(iv) Social science must maintain disciplinary boundaries.

A. (ii) only
B. (i) and (iii) only.
C. (ii) and (iv) only.
D. (iii) and (iv) only.

gate2016-ec-2 logical-reasoning passage-reading

9.10.25 Passage Reading: GATE2016 EC-3: GA-7

https://gateoverflow.in/110844

The overwhelming number of people infected with rabies in India has been flagged by the World Health Organization as a source of concern. It is estimated that inoculating 70% of pets and stray dogs against rabies can lead to a significant reduction in the number of people infected with rabies.

Which of the following can be logically inferred from the above sentences?

A. The number of people in India infected with rabies is high.
B. The number of people in other parts of the world who are infected with rabies is low.
C. Rabies can be eradicated in India by vaccinating 70% of stray dogs.
D. Stray dogs are the main source of rabies worldwide.

gate2016-ec-3 verbal-ability passage-reading

9.10.26 Passage Reading: GATE2016-2-GA-07

https://gateoverflow.in/39533

Computers were invented for performing only high-end useful computations. However, it is no understatement that they have taken over our world today. The internet, for example, is ubiquitous. Many believe that the internet itself is an unintended consequence of the original invention. With the advent of mobile

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computing on our phones, a whole new dimension is now enabled. One is left wondering if all these developments are good or, more importantly, required.

Which of the statement(s) below is/are logically valid and can be inferred from the above paragraph?

(i) The author believes that computers are not good for us.

(ii) Mobile computers and the internet are both intended inventions.

A. (i) only B. (ii) only C. Both (i) and (ii) D. Neither (i) nor (ii)

gate2016-2 verbal-ability passage-reading normal

9.10.27 Passage Reading: GATE2017 CE-1: GA-6

https://gateoverflow.in/313486

The old concert hall was demolished because of fears that the foundation would be affected by the construction of the new metro line in the area. Modern technology for underground metro construction tried to mitigate the impact of pressurized air pockets created by the excavation of large amounts of soil. But even with these safeguards, it was feared the soil below the concert hall would not be stable.

From this, one can infer that

A. the foundations of old buildings create pressurized air pockets underground, which are difficult to handle during metro construction.
B. metro construction has to be done carefully considering its impact on the foundations of existing buildings.
C. old buildings in an area from an impossible hurdle to metro construction in that area.
D. pressurized air can be used to excavate large amount of soil from underground areas.

gate2017-ce-1 general-aptitude verbal-ability passage-reading

9.10.28 Passage Reading: GATE2017 CE-2: GA-6

https://gateoverflow.in/313422

Bhaichung was observing the pattern of people entering and leaving a car service centre. There was a single window where customers were being served. He saw that people inevitably came out of the centre in the order that they went in. However, the time they spent inside seemed to vary a lot: some people came out in a matter of minutes while for others it took much longer.

From this, what can conclude?

A. The centre operators on a first-come-first-served basis, but with variable service times, depending on specific customer needs.
B. Customers were served in an arbitrary order, since they took varying amounts of time for service completion in the centre.
C. Since some people came out within a few minutes of entering the centre, the system is likely to operate on a last-come-first-served basis.
D. Entering the centre early ensured that one would have shorter service times and most people attempted to do this.

gate2017-ce-2 verbal-ability passage-reading

9.10.29 Passage Reading: GATE2017 CE-2: GA-7

https://gateoverflow.in/313423

A map shows the elevations of Darjeeling, Gangtok, Kalimpong, Pelling, and Siliguri. Kalimpong is at a lower elevation than Gangtok, Pelling is at a lower elevation than Gantok. Pelling is at a higher elevation than Siliguri. Darjeeling is at a higher elevation than Gangtok.

Which of the following statement can be inferred from the paragraph above?

i. Pelling is at a higher elevation than Kalimpong
ii. Kalimpong is at a lower elevation than Darjeeling
iii. Kalimpong is at a higher elevation than Siliguri
iv. Siliguri is at a lower elevation than Gangtok

A. Only ii B. Only ii and iii C. Only ii and iv D. Only iii and iv

gate2017-ce-2 verbal-ability passage-reading logical-reasoning

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9.10.30 Passage Reading: GATE2017 EC-2: GA-6

https://gateoverflow.in/313516

"If you are looking for a history of India, or for an account of the rise and fall of the British Raj, or for all reason of the cleaving of the subcontinent into two mutually antagonistic parts and the effects this mutilation will have in the respective sections, and ultimately on Asia, you will not find it in these pages; for though I have spent a lifetime in the country, I lived too near the seat of events, and was too intimately associated with the actors, to get the perspective needed for impartial recording of these matters".

Which of the following statements best reflects the author's opinion?

A. An intimate association does not allow for the necessary perspective.
B. Matters are recorded with an impartial perspective.
C. An intimate association offers an impartial perspective.
D. Actors are typically associated with the impartial recording of matters.

gate2017-ec-2 general-aptitude verbal-ability passage-reading

9.10.31 Passage Reading: GATE2017 ME-1: GA-6

https://gateoverflow.in/313667

"Here, throughout the early 1820s, Stuart continued to fight his losing battle to allow his sepoys to wear their caste-marks and their own choice of facial hair on parade, being again reprimanded by the commander-in-chief. His retort that 'A stronger instance than this of European prejudice with relation to this country has never come under my observations' had no effect on his superiors."

According to this paragraph, which of the statements below is most accurate?

A. Stuart's commander-in-chief was moved by this demonstration of his prejudice.
B. The Europeans were accommodating of the sepoy's desire to wear their caste-marks.
C. Stuart's 'losing-battle' refers to his inability to succeed in enabling sepoys to wear caste-marks.
D. The commander-in-chief was exempt from the Europeans prejudice that dictated how the sepoys were to dress.

gate2017-me-1 general-aptitude verbal-ability passage-reading easy

9.10.32 Passage Reading: GATE2017 ME-2: GA-6

https://gateoverflow.in/313678

"If you are looking for a history of India, or for an account of the rise and fall of the British Raj, or for the reason of the cleaving of the subcontinent into two mutually antagonistic parts and the effects this mutilation will have in the respective sections, and ultimately on Asia, you will not find it in these pages; for though I have spent lifetime in the country, I lived too near the seat of events, and was too intimately associated with the actors, to get the perspective needed for the impartial recording of these matters."

Which of the following is closest in meaning to 'cleaving' ?

A. deteriorating B. arguing C. departing D. splitting

gate2017-me-2 general-aptitude verbal-ability passage-reading

9.10.33 Passage Reading: GATE2017-1-GA-6

https://gateoverflow.in/118409

"The hold of the nationalist imagination on our colonial past is such that anything inadequately or improperly nationalist is just not history."

Which of the following statements best reflects the author's opinion?

A. Nationalists are highly imaginative.
B. History is viewed through the filter of nationalism.
C. Our colonial past never happened.
D. Nationalism has to be both adequately and properly imagined.

gate2017-1 general-aptitude verbal-ability passage-reading

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9.10.34 Passage Reading: GATE2018 EC: GA-10

https://gateoverflow.in/205214

A coastal region with unparalleled beauty is home to many species of animals. It is dotted with coral reefs and unspoilt white sandy beaches. It has remained inaccessible to tourists due to poor connectivity and lack of accommodation. A company has spotted the opportunity and is planning to develop a luxury resort with helicopter service to the nearest major city airport. Environmentalists are upset that this would lead to the region becoming crowded and polluted like any other major beach resorts.

Which one of the following statements can be logically inferred from the information given in the above paragraph?

A. The culture and tradition of the local people will be influenced by the tourists.
B. The region will become crowded and polluted due to tourism.
C. The coral reefs are on the decline and could soon vanish.
D. Helicopter connectivity would lead to an increase in tourists coming to the region.

gate2018-ec general-aptitude verbal-ability normal passage-reading

9.10.35 Passage Reading: GATE2018 EC: GA-8

https://gateoverflow.in/205212

The Cricket Board has long recognized John's potential as a leader of the team. However, his on-field temper has always been a matter of concern for them since his junior days. While this aggression has filled stadia with die-hard fans, it has taken a toll on his own batting. Until recently, it appeared that he found it difficult to convert his aggression into big scores. Over the past three seasons though, that picture of John has been replaced by a cerebral, calculative and successful batsman-captain. After many years, it appears that the team has finally found a complete captain.

Which of the following statements can be logically inferred from the above paragraph?

i. Even as a junior cricketer, John was considered a good captain.
ii. Finding a complete captain is a challenge.
iii. Fans and the Cricket Board have differing views on what they want in a captain.
iv. Over the past three seasons, John has accumulated big scores.

A. (i), (ii) and (iii) only
B. (iii) and (iv) only
C. (ii) and (iv) only
D. (i), (ii), (iii) and (iv)

gate2018-ec general-aptitude verbal-ability normal passage-reading

9.10.36 Passage Reading: GATE2019 CE-1: GA-6

https://gateoverflow.in/313445

The new cotton technology, Bollgard_II, with herbicide-tolerant traits has developed into a thriving business in India. However, the commercial use of this technology is not legal in India. Notwithstanding that, reports indicate that the herbicide tolerant Bt cotton had been purchased by farmers at an average of Rs 200 more than the control price of ordinary cotton, and planted in 15% of the cotton growing area in the 2017 Kharif season.

Which one of the following statements can be inferred from the given passage?

A. Farmers want to access the new technology if India benefits from it
B. Farmers want to access the new technology even if it is not legal
C. Farmers want to access the new technology for experimental purposes
D. Farmers want to access the new technology by paying high price

gate2019-ce-1 general-aptitude verbal-ability passage-reading

9.10.37 Passage Reading: GATE2019 CE-2: GA-10

https://gateoverflow.in/313375

"Popular Hindi fiction, despite - or perhaps because of - its wide reach, often does not appear in our cinema. As ideals that viewers are meant to look up to rather identify with, Hindi film protagonists usually read books of aspirational value: textbook, English books, or high-value literature."

Which one of the following CANNOT be inferred from the paragraph above?

A. Though popular Hindi fiction has wide reach, it often does not appear in the movies
B. Protagonists in Hindi movies, being ideals for viewers, read only books of aspirational value

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C. Textbooks, English books or high literature have aspirational value, but not popular Hindi fiction
D. People do not look up to writers of textbook, English books or high-value literature

gate2019-ce-2 general-aptitude verbal-ability passage-reading

9.10.38 Passage Reading: GATE2019 CE-2: GA-8

https://gateoverflow.in/313381

The Newspaper reports that over 500 hectares of tribal land spread across 28 tribal settlements in Mohinitampuram forest division have already been "alienated". A top forest official said, "First the tribals are duped out of their land holdings. Second, the families thus rendered landless are often forced to encroach further into the forests".

On the basis of the information available in the paragraph,_____ is /are responsible for duping the tribals.

A. forest officials
B. landless families
C. *The Newspaper*
D. it can not be inferred who

gate2019-ce-2 general-aptitude verbal-ability passage-reading

9.10.39 Passage Reading: GATE2019 EC: GA-8

https://gateoverflow.in/313540

"Indian history was written by British historians-extremely well documented and researched, but not always impartial. History had to serve its purpose: Everything was made subservient to the glory of the Union Jack. Latter-day Indian scholars presented a contrary picture."

From the text above, we can infer that:
India history written by British historians_____

A. was well documented and not researched but was always biased
B. was not well documented and researched and was always biased
C. was well documented and researched but was sometimes biased
D. was not well documented and researched and was sometimes biased

gate2019-ec general-aptitude verbal-ability easy passage-reading

9.10.40 Passage Reading: GATE2019 EE: GA-8

https://gateoverflow.in/313747

An award-winning study by a group of researchers suggests that men are as prone to buying on impulse as women but women feel more guilty about shopping.

Which one of the following statements can be inferred from the given text?

A. Some men and women indulge in buying on impulse
B. All men and women indulge in buying on impulse
C. Few men and women indulge in buying on impulse
D. Many men and women indulge in buying on impulse

gate2019-ee general-aptitude verbal-ability passage-reading

9.10.41 Passage Reading: GATE2019 IN: GA-10

https://gateoverflow.in/313555

"I read somewhere that in ancient times the prestige of a kingdom depended upon the number of taxes that it was able to levy on its people. It was very much like the prestige of a head-hunter in his own community."

Based on the paragraph above, the prestige of a head-hunter depended upon _____

A. the prestige of the kingdom
B. the prestige of the heads
C. the number of taxes he could levy
D. the number of heads he could gather

gate2019-in general-aptitude verbal-ability passage-reading

9.10.42 Passage Reading: GATE2019 IN: GA-8

https://gateoverflow.in/313554

The nomenclature of Hindustani music has changed over the countries. Since the medieval period, *dhrupad* styles were identified as *baanis*. Terms like *gayaki* and *baaj* were used to refer to vocal and instrumental styles, respectively. With the institutionalization of music education, the term *gharana* became acceptable. *Gharana*

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originally referred to hereditary musicians from a particular lineage, including disciples and grand disciples.

Which one of the following pairings is NOT correct?

A. *dhrupad, baani*
B. *gayaki, vocal*
C. *baaj, institution*
D. *gharana, lineage*

gate2019-in general-aptitude verbal-ability passage-reading

9.10.43 Passage Reading: GATE2019 ME-1: GA-8

https://gateoverflow.in/313606

Congo was named by Europeans, Congo's dictator Mobuto later changed the name of the county and the river to Zaire with the objective of Africanising names of persons and spaces. However, the name Zaire was a Portuguese alteration of *Nzadi o Nzere*, a local African term meaning 'River that swallows Rivers'. Zaire was the Portuguese name for the Congo river in the 16th and 17th centuries.

Which one of the following statements can be inferred from the paragraph above?

A. Mobuto was not entirely successful in Africanising the name of his country
B. The term *Nzadi o Nzere* was of Portuguese origin
C. Mobuto's desire to Africanise names was prevented by the Portuguese
D. As a dictator Mobuto ordered the Portuguese to alter the name of the river to Zaire

gate2019-me-1 general-aptitude verbal-ability passage-reading

9.10.44 Passage Reading: GATE2019 ME-2: GA-10

https://gateoverflow.in/313594

X is an online media provider. By offering unlimited and exclusive online content at attractive prices for a loyalty membership, X is almost forcing its customers towards its loyalty membership. If its royalty membership continues to grow at its current rate, within the next eight years more households will be watching X than cable television.

Which one of the following statements can be inferred from the above paragraph?

A. Most households that subscribe to $X's$ loyalty membership discontinue watching cable television
B. Non-members prefer to watch cable television
C. Cable television operators don't subscribe to $X's$ loyalty members
D. The X is cancelling accounts of non-members

gate2019-me-2 general-aptitude verbal-ability passage-reading

9.10.45 Passage Reading: GATE2019 ME-2: GA-8

https://gateoverflow.in/313592

While teaching a creative writing class in India, I was surprised at receiving stories from the students that were all set in distant places: in the American West with cowboys and in Manhattan penthouses with clinking ice cubes. This was, till an eminent Caribbean writer gave the writers in the once-colonised countries the confidence to see the shabby lives around them as worthy being "told".

The writer of this passage is surprised by the creative writing assignments of his students, because _____

A. Some of the students had written stories set in foreign places
B. None of the students had written stories set in India
C. None of the students had written about ice cubes and cowboys
D. Some of the students had written about ice cubes and cowboys

gate2019-me-2 general-aptitude verbal-ability passage-reading

9.11 Phrasal Verbs (2)

9.11.1 Phrasal Verbs: GATE2016 CE-2: GA-2

https://gateoverflow.in/110873

He <u>turned a deaf ear to</u> my request.

What does the underlined phrasal verb mean?

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A. Ignored B. Appreciated C. Twisted D. Returned

gate2016-ce-2 general-aptitude english-grammar phrasal-verbs

9.11.2 Phrasal Verbs: GATE2016 EC-2: GA-3

https://gateoverflow.in/108481

After India's cricket world cup victory in 1985, Shrotria who was playing both tennis and cricket till then, decided to concentrate only on cricket. And the rest is history.

What does the underlined phrase mean in this context?

A. History will rest in peace
B. Rest is recorded in history books
C. Rest is well known
D. Rest is archaic

gate2016-ec-2 verbal-ability phrasal-verbs

9.12 Prepositions (4)

9.12.1 Prepositions: GATE2019 CE-2: GA-2

https://gateoverflow.in/313378

The growth rate of ABC Motors in 2017 was the same _____ XYZ Motors in 2016.

A. as off
B. as those of
C. as that off
D. as that of

gate2019-ce-2 general-aptitude verbal-ability prepositions most-appropriate-word

9.12.2 Prepositions: GATE2019 CE-2: GA-5

https://gateoverflow.in/313379

Hema Das was_____ only Indian athlete to win _____ gold for India.

A. the , many B. the, a C. an, a D. an , the

gate2019-ce-2 general-aptitude verbal-ability english-grammar prepositions

9.12.3 Prepositions: GATE2019 EC: GA-2

https://gateoverflow.in/313542

The boat arrived _____ dawn.

A. in B. at C. on D. under

gate2019-ec general-aptitude verbal-ability prepositions

9.12.4 Prepositions: GATE2019 EE: GA-2

https://gateoverflow.in/313571

The passengers were angry _____ the airline staff about the delay.

A. on B. about C. with D. towards

gate2019-ee general-aptitude verbal-ability prepositions

9.13 Sentence Ordering (1)

9.13.1 Sentence Ordering: GATE2015 EC-3: GA-7

https://gateoverflow.in/39520

In the following question, the first and the last sentence of the passage are in order and numbered 1 and 6. The rest of the passage is split into 4 parts and numbered as 2, 3, 4, and 5. These 4 parts are not arranged in proper order. Read the sentences and arrange them in a logical sequence to make a passage and choose the correct sequence from the given options.

1. On Diwali, the family rises early in the morning.
2. The whole family, including the young and the old enjoy doing this.
3. Children let off fireworks later in the night with their friends.
4. At sunset, the lamps are lit and the family performs various rituals.
5. Father, mother, and children visit relatives and exchange gifts and sweets.
6. Houses look so pretty with lighted lamps all around.

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A. $2, 5, 3, 4$ B. $5, 2, 4, 3$ C. $3, 5, 4, 2$ D. $4, 5, 2, 3$

gate2015-ec-3 verbal-ability sentence-ordering

9.14 Statement Sufficiency (2)

9.14.1 Statement Sufficiency: GATE2015-1-GA-4

https://gateoverflow.in/8006

Based on the given statements, select the most appropriate option to solve the given question.

If two floors in a certain building are 9 feet apart, how many steps are there in a set of stairs that extends from the first floor to the second floor of the building?

Statements:

I. Each step is $3/4$ foot high.
II. Each step is 1 foot wide.

A. Statements I alone is sufficient, but statement II alone is not sufficient.
B. Statements II alone is sufficient, but statement I alone is not sufficient.
C. Both statements together are sufficient, but neither statement alone is sufficient.
D. Statements I and II together are not sufficient.

gate2015-1 verbal-ability easy statement-sufficiency

9.14.2 Statement Sufficiency: GATE2015-2-GA-5

https://gateoverflow.in/8033

Based on the given statements, select the most appropriate option to solve the given question.

What will be the total weight of 10 poles each of same weight?

Statements:

I. One fourth of the weight of the pole is $5\ Kg$.
II. The total weight of these poles is $160\ Kg$ more than the total weight of two poles.

A. Statement I alone is not sufficient.
B. Statement II alone is not sufficient.
C. Either I or II alone is sufficient.
D. Both statements I and II together are not sufficient.

gate2015-2 normal logical-reasoning statement-sufficiency

9.15 Statements Follow (11)

9.15.1 Statements Follow: GATE2013 AE: GA-9

https://gateoverflow.in/40250

All professors are researchers Some scientists are professors Which of the given conclusions is logically valid and is inferred from the above arguments:

A. All scientists are researchers
B. All professors are scientists
C. Some researchers are scientists
D. No conclusion follows

gate2013-ae verbal-ability logical-reasoning statements-follow

9.15.2 Statements Follow: GATE2014 EC-1: GA-2

https://gateoverflow.in/41491

Read the statements:

All women are entrepreneurs.

Some women are doctors.

Which of the following conclusions can be logically inferred from the above statements?

A. All women are doctors
B. All doctors are entrepreneurs
C. All entrepreneurs are women
D. Some entrepreneurs are doctors

gate2014-ec-1 verbal-ability mathematical-logic statements-follow easy

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9.15.3 Statements Follow: GATE2015 ME-3: GA-7

https://gateoverflow.in/40172

Given below are two statements followed by two conclusions. Assuming these statements to be true, decide which one logically follows.

Statements:

I. No manager is a leader.
II. All leaders are executives.

Conclusions:

I. No manager is an executive.
II. No executive is a manager.

A. Only conclusion I follows.
B. Only conclusion II follows.
C. Neither conclusion I nor II follows.
D. Both conclusions I and II follow.

gate2015-me-3 mathematical-logic logical-reasoning first-order-logic verbal-ability statements-follow

9.15.4 Statements Follow: GATE2015-1-GA-8

https://gateoverflow.in/8012

The given statement is followed by some courses of action. Assuming the statement to be true, decide the correct option.

Statement:

There has been a significant drop in the water level in the lakes supplying water to the city.

Course of action:

I. The water supply authority should impose a partial cut in supply to tackle the situation.
II. The government should appeal to all the residents through mass media for minimal use of water.
III. The government should ban the water supply in lower areas.

A. Statements I and II follow.
B. Statements I and III follow.
C. Statements II and III follow.
D. All the statements follow.

gate2015-1 verbal-ability normal statements-follow

9.15.5 Statements Follow: GATE2016 ME-2: GA-4

https://gateoverflow.in/108275

Fact: If it rains, then the field is wet.

Read the following statements:

i. It rains
ii. The field is not wet
iii. The field is wet
iv. It did not rain

Which one of the options given below is **NOT** logically possible, based on the given fact?

A. If (iii), then (iv).
B. If (i), then (iii).
C. If (i), then (ii).
D. If (ii), then (iv).

gate2016-me-2 logical-reasoning statements-follow

9.15.6 Statements Follow: GATE2016-2-GA-08

https://gateoverflow.in/39534

All hill-stations have a lake. Ooty has two lakes.

Which of the statement(s) below is/are logically valid and can be inferred from the above sentences?

i. Ooty is not a hill-station.
ii. No hill-station can have more than one lake.

A. (i) only.
B. (ii) only.
C. Both (i) and (ii)
D. Neither (i) nor (ii)

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gate2016-2 verbal-ability logical-reasoning easy statements-follow

9.15.7 Statements Follow: GATE2017 CE-1: GA-3

https://gateoverflow.in/313487

Consider the following sentences:

All benches are beds. No bed is bulb. Some bulbs are lamps.

Which of the following can be inferred?

i. Some beds are lamps.
ii. Some lamps are beds.

A. Only i B. Only ii C. Both i and ii D. Neither i nor ii

gate2017-ce-1 general-aptitude verbal-ability verbal-reasoning statements-follow

9.15.8 Statements Follow: GATE2017 EC-1: GA-5

https://gateoverflow.in/313523

Some tables are shelves. Some shelves are chairs. All chairs are benches. Which of the following conclusion can be deduced from the preceding sentences?

i. At least one bench is a table
ii. At least one shelf is a bench
iii. At least one chair is a table
iv. All benches are chairs

A. Only i B. Only ii C. Only ii and iii D. Only iv

gate2017-ec-1 general-aptitude verbal-ability statements-follow

9.15.9 Statements Follow: GATE2017 ME-2: GA-9

https://gateoverflow.in/313681

All people in a certain island are either 'Knights' or 'Knaves' and each person knows every other person's identity. Knights never lie, and Knaves ALWAYS lie.

P says "Both of us are Knights". Q says "None of us are Knaves".

Which one of the following can be logically inferred from the above?

A. Both P and Q are knights.
B. P is a knight; Q is a Knave.
C. Both P and Q are Knaves.
D. The identities of P, Q cannot be determined.

gate2017-me-2 verbal-ability logical-reasoning statements-follow

9.15.10 Statements Follow: GATE2018 ME-1: GA-10

https://gateoverflow.in/313657

Consider the following three statements:

i. Some roses are red.
ii. All red flowers fade quickly.
iii. Some roses fade quickly.

Which of the following statements can be logically inferred from the above statements?

A. If (i) is true and (ii) is false, then (iii) is false.
B. If (i) is true and (ii) is false, then (iii) is true.
C. If (i) and (ii) are true, then (iii) is true.
D. If (i) and (ii) are false, then (iii) is false.

gate2018-me-1 general-aptitude verbal-ability statements-follow verbal-reasoning

9.15.11 Statements Follow: GATE2019 IN: GA-2

https://gateoverflow.in/313551

Some students were not involved in the strike.

If the above statement is true, which of the following conclusions is/are logically necessary?

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1. Some who were involved in the strike were students.
2. No student was involved in the strike.
3. At least one student was involved in the strike.
4. Some who were not involved in the strike were students.

A. 1 and 2 B. 3 C. 4 D. 2 and 3

gate2019-in general-aptitude verbal-ability statements-follow

9.16 Tenses (15)

9.16.1 Tenses: GATE2012 AE: GA-1

https://gateoverflow.in/40212

Choose the most appropriate alternative from the options given below to complete the following sentence:
I ___ to have bought a diamond ring.

A. have a liking B. should have liked C. would like D. may like

gate2012-ae tenses verbal-ability

9.16.2 Tenses: GATE2013 AE: GA-2

https://gateoverflow.in/40243

The Headmaster _____ to speak to you. Which of the following options is incorrect to complete the above sentence?

A. is wanting
B. wants
C. want
D. was wanting

gate2013-ae verbal-ability english-grammar tenses

9.16.3 Tenses: GATE2013-59

https://gateoverflow.in/1563

Were you a bird, you _____ in the sky.

A. would fly B. shall fly C. should fly D. shall have flown

gate2013 verbal-ability tenses normal

9.16.4 Tenses: GATE2014 EC-1: GA-1

https://gateoverflow.in/41490

Choose the most appropriate phrase from the options given below to complete the following sentence.
The aircraft _____ take off as soon as its flight plan was filed.

A. Is allowed to
B. Will be allowed to
C. Was allowed to
D. Has been allowed to

gate2014-ec-1 verbal-ability tenses easy

9.16.5 Tenses: GATE2014-2-GA-2

https://gateoverflow.in/1939

Who _____ was coming to see us this evening?

A. you said B. did you say C. did you say that D. had you said

gate2014-2 verbal-ability tenses normal

9.16.6 Tenses: GATE2014-3-GA-2

https://gateoverflow.in/2025

If she _____ how to calibrate the instrument, she _____ done the experiment.

A. knows, will have
B. knew, had
C. had known, could have
D. should have known, would have

gate2014-3 verbal-ability easy english-grammar tenses

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9.16.7 Tenses: GATE2015 EC-2: GA- 6

https://gateoverflow.in/39507

In the following sentence certain parts are underlined and marked P, Q, and R. One of the parts may contain certain error or may not be acceptable in standard written communication. Select the part containing an error. Choose D as your answer if there is no error.

The student corrected $\underbrace{\text{all the errors}}_{P}$ that $\underbrace{\text{the instructor marked}}_{Q}$ on $\underbrace{\text{the answer book}}_{R}$.

A. P B. Q C. R D. No error

gate2015-ec-2 verbal-ability english-grammar tenses

9.16.8 Tenses: GATE2015 EC-3: GA-1

https://gateoverflow.in/39514

Choose the most appropriate word from the options given below to complete the following sentence.
If the athlete had wanted to come first in the race, he _____ several hours every day.

A. should practise
B. should have practised
C. practised
D. should be practising

gate2015-ec-3 general-aptitude verbal-ability tenses

9.16.9 Tenses: GATE2017 CE-1: GA-1

https://gateoverflow.in/313489

The bacteria in milk are destroyed when it _____ heated to 80 degree Celsius.

A. would be B. will be C. is D. was

gate2017-ce-1 verbal-ability tenses

9.16.10 Tenses: GATE2017 CE-2: GA-1

https://gateoverflow.in/313420

The event would have been successful if you_____able to come.

A. are B. had been C. have been D. would have been

gate2017-ce-2 verbal-ability tenses

9.16.11 Tenses: GATE2017 EC-1: GA-2

https://gateoverflow.in/313525

I _____ made arrangements had I _____informed earlier.

A. could have, been
B. would have, being
C. had, have
D. had been, been

gate2017-ec-1 verbal-ability tenses

9.16.12 Tenses: GATE2017-1-GA-1

https://gateoverflow.in/118403

After Rajendra Chola returned from his voyage to Indonesia, he _____ to visit the temple in Thanjavur.

A. was wishing B. is wishing C. wished D. had wished

gate2017-1 general-aptitude verbal-ability tenses english-grammar normal

9.16.13 Tenses: GATE2019 IN: GA-5

https://gateoverflow.in/313552

Until Iran came along, India had never been _____ in Kabaddi.

A. defeated B. defeating C. defeat D. defeatist

gate2019-in general-aptitude verbal-ability english-grammar tenses

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9.16.14 Tenses: GATE2019 ME-1: GA-2

https://gateoverflow.in/313603

____I permitted him to leave, I wouldn't have had any problem with him being absent, ____ I?

A. Had, wouldn't
B. Have, would
C. Had, would
D. Have, wouldn't

gate2019-me-1 general-aptitude verbal-ability tenses

9.16.15 Tenses: GATE2019 ME-2: GA-1

https://gateoverflow.in/313583

Once the team of analysis identify the problem, we ____ in a better position to comment on the issue.

Which of the following choices CANNOT fill the given blank?

A. will be
B. were to be
C. are going to be
D. might be

gate2019-me-2 general-aptitude verbal-ability tenses

9.17 Verbal Reasoning (25)

9.17.1 Verbal Reasoning: GATE2012-61

https://gateoverflow.in/2209

Wanted Temporary, Part-time persons for the post of Field Interviewer to conduct personal interviews to collect and collate economic data. Requirements: High School-pass, must be available for Day, Evening and Saturday work. Transportation paid, expenses reimbursed.

Which one of the following is the best inference from the above advertisement?

A. Gender-discriminatory
B. Xenophobic
C. Not designed to make the post attractive
D. Not gender-discriminatory

gate2012 verbal-ability verbal-reasoning normal

9.17.2 Verbal Reasoning: GATE2013 AE: GA-3

https://gateoverflow.in/40244

Mahatama Gandhi was known for his humility as

A. he played an important role in humiliating exit of British from India.
B. he worked for humanitarian causes.
C. he displayed modesty in his interactions.
D. he was a fine human being

gate2013-ae verbal-ability verbal-reasoning

9.17.3 Verbal Reasoning: GATE2013 EE: GA-5

https://gateoverflow.in/40292

Statement: You can always give me a ring whenever you need.

Which one of the following is the best inference from the above statement?

A. Because I have a nice caller tune.
B. Because I have a better telephone facility.
C. Because a friend in need is a friend indeed.
D. Because you need not pay towards the telephone bills when you give me a ring.

gate2013-ee verbal-reasoning verbal-ability

9.17.4 Verbal Reasoning: GATE2013 EE: GA-7

https://gateoverflow.in/40294

Statement: There were different streams of freedom movements in colonial India carried out by the moderates, liberals, radicals, socialists, and so on.

Which one of the following is the best inference from the above statement?

A. The emergence of nationalism in colonial India led to our Independence.
B. Nationalism in India emerged in the context of colonialism.
C. Nationalism in India is homogeneous.

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D. Nationalism in India is heterogeneous

gate2013-ee passage-reading verbal-ability verbal-reasoning

9.17.5 Verbal Reasoning: GATE2014 AG: GA-3

https://gateoverflow.in/41667

Which of the following options is the closest in meaning to the sentence below?

"As a woman, I have no country."

A. Women have no country.
B. Women are not citizens of any country.
C. Women's solidarity knows no national boundaries.
D. Women of all countries have equal legal rights.

gate2014-ag general-aptitude verbal-ability verbal-reasoning normal

9.17.6 Verbal Reasoning: GATE2014 EC-3: GA-1

https://gateoverflow.in/41140

"India is a country of rich heritage and cultural diversity." Which one of the following facts best supports the claim made in the above sentence?

A. India is a union of 28 states and 7 union territories.
B. India has a population of over 1.1 billion.
C. India is home to 22 official languages and thousands of dialects.
D. The Indian cricket team draws players from over ten states.

gate2014-ec-3 verbal-reasoning verbal-ability

9.17.7 Verbal Reasoning: GATE2014 EC-4: GA-7

https://gateoverflow.in/41469

If '$KCLFTSB$' stands for 'best of luck' and '$SHSWDG$' stands for 'good wishes', which of the following indicates 'ace the exam'?

A. $MCHTX$ B. $MXHTC$ C. $XMHCT$ D. $XMHTC$

gate2014-ec-4 verbal-ability verbal-reasoning normal

9.17.8 Verbal Reasoning: GATE2014-1-GA-7

https://gateoverflow.in/775

Geneticists say that they are very close to confirming the genetic roots of psychiatric illnesses such as depression and schizophrenia, and consequently, that doctors will be able to eradicate these diseases through early identification and gene therapy.

On which of the following assumptions does the statement above rely?

Select one:

A. Strategies are now available for eliminating psychiatric illnesses
B. Certain psychiatric illnesses have a genetic basis
C. All human diseases can be traced back to genes and how they are expressed
D. In the future, genetics will become the only relevant field for identifying psychiatric illnesses

gate2014-1 verbal-ability verbal-reasoning normal

9.17.9 Verbal Reasoning: GATE2015 EC-1: GA-10

https://gateoverflow.in/39497

Humpty Dumpty sits on a wall every day while having lunch. The wall sometimes breaks. A person sitting on the wall falls if the wall breaks.

Which one of the statements below is logically valid and can be inferred from the above sentences?

A. Humpty Dumpty always falls while having lunch

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B. Humpty Dumpty does not fall sometimes while having lunch
C. Humpty Dumpty never falls during dinner
D. When Humpty Dumpty does not sit on the wall, the wall does not break

gate2015-ec-1 general-aptitude verbal-reasoning

9.17.10 Verbal Reasoning: GATE2015 EC-2: GA-10

https://gateoverflow.in/39511

Lamenting the gradual sidelining of the arts in school curricula, a group of prominent artists wrote to the Chief Minister last year, asking him to allocate more funds to support arts education in schools. However, no such increase has been announced in this year's Budget. The artists expressed their deep anguish at their request not being approved, but many of them remain optimistic about funding in the future.

Which of the statement(s) below is/are logically valid and can be inferred from the above statements?

i. The artists expected funding for the arts to increase this year.
ii. The Chief Minister was receptive to the idea of increasing funding for the arts.
iii. The Chief Minister is a prominent artist.
iv. Schools are giving less importance to arts education nowadays.

A. (iii) and (iv) B. (i) and (iv) C. (i), (ii) and (iv) D. (i) and (iii)

gate2015-ec-2 passage-reading verbal-reasoning verbal-ability

9.17.11 Verbal Reasoning: GATE2015 ME-3: GA-4

https://gateoverflow.in/40169

1. Tanya is older than Eric.
2. Cliff is older than Tanya.
3. Eric is older than Cliff.

If the first two statements are true, then the third statement is:

A. True
B. False
C. Uncertain
D. Data insufficient

gate2015-me-3 logical-reasoning verbal-ability verbal-reasoning

9.17.12 Verbal Reasoning: GATE2015-3-GA-6

https://gateoverflow.in/8306

Alexander turned his attention towards India, since he had conquered Persia.

Which one of the statements below is logically valid and can be inferred from the above sentence?

A. Alexander would not have turned his attention towards India had he not conquered Persia.
B. Alexander was not ready to rest on his laurels, and wanted to march to India.
C. Alexander was not completely in control of his army and could command it to move towards India.
D. Since Alexander's kingdom extended to Indian borders after the conquest of Persia, he was keen to move further.

gate2015-3 verbal-ability normal verbal-reasoning

9.17.13 Verbal Reasoning: GATE2016 EC-1: GA-7

https://gateoverflow.in/108087

In a world filled with uncertainty, he was glad to have many good friends. He had always assisted them in times of need and was confident that they would reciprocate. However, the events of the last week proved him wrong.

Which of the following inference(s) is/are logically valid and can be inferred from the above passage?

i. His friends were always asking him to help them.
ii. He felt that when in need of help, his friends would let him down.
iii. He was sure that his friends would help him when in need.
iv. His friends did not help him last week.

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A. (i) and (ii) B. (iii) and (iv) C. (iii) only D. (iv) only

gate2016-ec-1 passage-reading verbal-reasoning

9.17.14 Verbal Reasoning: GATE2016 EC-1: GA-8

https://gateoverflow.in/108089

Leela is older than her cousin Pavithra. Pavithra's brother Shiva is older than Leela. When Pavithra and Shiva are visiting Leela, all three like to play chess. Pavithra wins more often than Leela does.

Which one of the following statements must be TRUE based on the above?

A. When Shiva plays chess with Leela and Pavithra, he often loses.
B. Leela is the oldest of the three.
C. Shiva is a better chess player than Pavithra.
D. Pavithra is the youngest of the three.

gate2016-ec-1 verbal-ability passage-reading verbal-reasoning

9.17.15 Verbal Reasoning: GATE2016 ME-2: GA-7

https://gateoverflow.in/108299

A smart city integrates all modes of transport, uses clean energy and promotes sustainable use of resources. It also uses technology to ensure safety and security of the city, something which critics argue, will lead to a surveillance state. Which of the following can be logically inferred from the above paragraph?

i. All smart cities encourage the formation of surveillance states.
ii. Surveillance is an integral part of a smart city.
iii. Sustainability and surveillance go hand in hand in a smart city.
iv. There is a perception that smart cities promote surveillance.

A. (i) and (iv) only B. (ii) and (iii) only C. (iv) only D. (i) only

gate2016-me-2 passage-reading verbal-reasoning

9.17.16 Verbal Reasoning: GATE2016-1-GA07

https://gateoverflow.in/39613

Indian currency notes show the denomination indicated in at least seventeen languages. If this is not an indication of the nation's diversity, nothing else is.

Which of the following can be logically inferred from the above sentences?

A. India is a country of exactly seventeen languages.
B. Linguistic pluralism is the only indicator of a nation's diversity.
C. Indian currency notes have sufficient space for all the Indian languages.
D. Linguistic pluralism is strong evidence of India's diversity.

gate2016-1 verbal-ability verbal-reasoning normal

9.17.17 Verbal Reasoning: GATE2016-1-GA08

https://gateoverflow.in/39617

Consider the following statements relating to the level of poker play of four players $P, Q, R\ and\ S$.

I. P always beats Q
II. R always beats S
III. S loses to P only sometimes.
IV. R always loses to Q

Which of the following can be logically inferred from the above statements?

i. P is likely to beat all the three other players
ii. S is the absolute worst player in the set

A. (i). only B. (ii) only
C. (i) and (ii) only' D. neither (i) nor (ii)

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gate2016-1 verbal-reasoning normal

9.17.18 Verbal Reasoning: GATE2017 ME-1: GA-9

https://gateoverflow.in/313668

Two very famous sportsmen Mark and Steve happened to be brothers and played for country K. Mark teased James, an opponent from country E, "There is no way you are good enough to play for your country." James replied, "Maybe not, but at least I am the best player in my own family."

Which one of the following can be inferred from this conversation?

A. Mark was known to play better than James.
B. Steve was known to play better than Mark.
C. James and Steve were good friends.
D. James played better than Steve.

gate2017-me-1 general-aptitude verbal-ability verbal-reasoning

9.17.19 Verbal Reasoning: GATE2017-2-GA-6

https://gateoverflow.in/118420

"We lived in a culture that denied any merit to literary works, considering them important only when they were handmaidens to something seemingly more urgent – namely ideology. This was a country where all gestures, even the most private, were interpreted in political terms."

The author's belief that ideology is not as important as literature is revealed by the word:

A. 'culture'
B. 'seemingly'
C. 'urgent'
D. 'political'

gate2017-2 passage-reading verbal-reasoning

9.17.20 Verbal Reasoning: GATE2018 EE: GA-7

https://gateoverflow.in/205187

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. $XSVR$

gate2018-ee general-aptitude numerical-ability easy verbal-reasoning

9.17.21 Verbal Reasoning: GATE2018 ME-2: GA-3

https://gateoverflow.in/313639

Find the missing group of letters in the following series:

BC, FCH, LMNO, _____

A. UVWXY
B. TUVWX
C. STUVW
D. RSTUV

gate2018-me-2 general-aptitude verbal-ability verbal-reasoning

9.17.22 Verbal Reasoning: GATE2019 IN: GA-6

https://gateoverflow.in/313553

Since the last one year after a 125 basis point reduction in repo rate by the Reserve Bank of India, banking institutions have been making a demand to reduce interest rates on small saving schemes. Finally, the government announced yesterday a reduction in interest rates on small saving schemes to bring them on par with fixed deposit interest rates.

Which one of the following statements can be inferred from the given passage?

A. Whenever the Reserve Bank of India reduces the repo rate, the interest rates on small saving schemes are also reduced
B. Interest rates on small saving schemes are always maintained on par with fixed deposit interest rates
C. The government sometimes takes into consideration the demands of banking institutions before reducing the interest rates on small saving scheme
D. A reduction in interest rates on small savings scheme follow only after a reduction in repo rate by the Reserve Bank Of India

gate2019-in general-aptitude verbal-ability passage-reading verbal-reasoning

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9.17.23 Verbal Reasoning: GATE2019 ME-1: GA-6

https://gateoverflow.in/313605

Under a certain legal system, prisoners are allowed to make one statement. If their statements turns out to be true then they are hanged. If the statements turns to be false then they are shot. One prisoner made a statement and the judge had no option but to set him free. Which one of the following could be that statement?

A. I did not commit the crime
B. I committed the crime
C. I will be shot
D. You committed the crime

gate2019-me-1 general-aptitude verbal-ability verbal-reasoning

9.17.24 Verbal Reasoning: GATE2019-GA-6

https://gateoverflow.in/302867

The police arrested four criminals – P, Q, R and S. The criminals knew each other. They made the following statements:

- P says "Q committed the crime."
- Q says "S committed the crime."
- R says " I did not do it."
- S says "What Q said about me is false".

Assume only one of the arrested four committed the crime and only one of the statements made above is true. Who committed the crime?

A. P
B. R
C. S
D. Q

gate2019 verbal-ability verbal-reasoning

9.17.25 Verbal Reasoning: GATE2019-GA-8

https://gateoverflow.in/302865

"A recent High Court judgement has sought to dispel the idea of begging as a disease – which leads to its stigmatization and criminalization – and to regard it as a symptom. The underlying disease is the failure of the state to protect citizens who fall through the social security net."

Which one of the following statements can be inferred from the given passage?

A. Beggars are lazy people who beg because they are unwilling to work
B. Beggars are created because of the lack of social welfare schemes
C. Begging is an offence that has to be dealt with firmly
D. Begging has to be banned because it adversely affects the welfare of the state

gate2019 general-aptitude verbal-ability verbal-reasoning

9.18 Word Meaning (3)

9.18.1 Word Meaning: GATE2017 EC-1: GA-1

https://gateoverflow.in/313524

She has a sharp tongue and it can occasionally turn_____

A. Hurtful
B. Left
C. Methodical
D. Vital

gate2017-ec-1 general-aptitude verbal-ability word-meaning

9.18.2 Word Meaning: GATE2017 ME-1: GA-2

https://gateoverflow.in/313664

As the two speakers become increasingly agitated, the debate became _____.

A. lukewarm
B. poetic
C. forgiving
D. heated

gate2017-me-1 general-aptitude verbal-ability word-meaning

9.18.3 Word Meaning: GATE2017 ME-2: GA-2

https://gateoverflow.in/313676

If you choose plan P, you will have to _____ plan Q, as these two are mutually _____.

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A. forgo, exclusive
B. forget, inclusive
C. accept, exhaustive
D. adopt, intrusive

gate2017-me-2 general-aptitude verbal-ability word-meaning

9.19 Word Pairs (9)

9.19.1 Word Pairs: GATE2010 MN: GA-2

https://gateoverflow.in/312010

The question below consists of a pair of related words followed by four pairs of words . Select the pair that best expresses the relation in the original pair.

Preamble : Constitution

A. amendment : law
B. prologue : play
C. episode : serial
D. plot : story

general-aptitude verbal-ability gate2010-mn word-pairs

9.19.2 Word Pairs: GATE2010 TF: GA-2

https://gateoverflow.in/312021

The question below consists of a pair of related words followed by four pairs of words. Select the pair the best expresses the relation in the original pair.

Erudition : Scholar

A. steadfast : mercurial
B. competence : strict
C. skill : craftsman
D. nurse : doctor

general-aptitude verbal-ability gate2010-tf word-pairs

9.19.3 Word Pairs: GATE2010-60

https://gateoverflow.in/2368

The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair.

Unemployed : Worker

A. fallow : land
B. unaware : sleeper
C. wit : jester
D. renovated : house

gate2010 verbal-ability word-pairs normal

9.19.4 Word Pairs: GATE2011 AG: GA-5

https://gateoverflow.in/312124

The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair:

Gladiator : Arena

A. dancer : stage
B. commuter : train
C. teacher : classroom
D. lawyer : courtroom

general-aptitude verbal-ability gate2011-ag word-pairs

9.19.5 Word Pairs: GATE2013 AE: GA-5

https://gateoverflow.in/40246

Select the pair that best expresses a relationship similar to that expressed in the pair:

water: pipe::

A. cart: road
B. electricity: wire
C. sea: beach
D. music: instrument

gate2013-ae verbal-ability word-pairs

9.19.6 Word Pairs: GATE2013 CE: GA-5

https://gateoverflow.in/40272

Select the pair that best expresses a relationship similar to that expressed in the pair:

Medicine: Health

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A. Science: Experiment
B. Wealth: Peace
C. Education: Knowledge
D. Money: Happiness

gate2013-ce word-pairs verbal-ability

9.19.7 Word Pairs: GATE2013-57

https://gateoverflow.in/1560

Complete the sentence:

Universalism is to particularism as diffuseness is to _____.

A. specificity
B. neutrality
C. generality
D. adaptation

gate2013 verbal-ability normal word-pairs

9.19.8 Word Pairs: GATE2015-1-GA-5

https://gateoverflow.in/8008

Which one of the following combinations is incorrect?

A. Acquiescence - Submission
B. Wheedle - Roundabout
C. Flippancy - Lightness
D. Profligate - Extravagant

gate2015-1 verbal-ability difficult word-pairs

9.19.9 Word Pairs: GATE2015-3-GA-4

https://gateoverflow.in/8302

Select the pair of best expresses a relationship similar to that expressed in the pair:

Children : Pediatrician

A. Adult : Orthopaedist
B. Females : Gynaecologist
C. Kidney : Nephrologist
D. Skin : Dermatologist

gate2015-3 verbal-ability easy word-pairs

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