

Section Id :	8643511008
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	8643511235
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435121580 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The range of the function

$$f(x) = \log_{\sqrt{5}} \left(3 + \cos\left(\frac{3\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) - \cos\left(\frac{3\pi}{4} - x\right) \right) \text{ is :}$$

Options :

86435171321. $(0, \sqrt{5})$

86435171322. $\left[\frac{1}{\sqrt{5}}, \sqrt{5} \right]$

86435171323. $[0, 2]$

86435171324. $[-2, 2]$

Question Number : 62 Question Id : 86435121581 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The number of pairs (a, b) of real numbers, such that whenever α is a root of the equation $x^2 + ax + b = 0$, $\alpha^2 - 2$ is also a root of this equation, is :

Options :

86435171325. 2

86435171326. 4

86435171327. 6

86435171328. 8

Question Number : 63 Question Id : 86435121582 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Consider the system of linear equations

$$-x + y + 2z = 0$$

$$3x - ay + 5z = 1$$

$$2x - 2y - az = 7$$

Let S_1 be the set of all $a \in \mathbb{R}$ for which the system is inconsistent and S_2 be the set of all $a \in \mathbb{R}$ for which the system has infinitely many solutions. If $n(S_1)$ and $n(S_2)$ denote the number of elements in S_1 and S_2 respectively, then

Options :

86435171329. $n(S_1) = 1, n(S_2) = 0$

86435171330. $n(S_1) = 0, n(S_2) = 2$

86435171331. $n(S_1) = 2, n(S_2) = 2$

86435171332. $n(S_1) = 2, n(S_2) = 0$

**Question Number : 64 Question Id : 86435121583 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

Let $J_{n,m} = \int_0^{\frac{1}{2}} \frac{x^n}{x^m - 1} dx, \forall n > m$ and $n, m \in \mathbb{N}$. Consider a matrix $A = [a_{ij}]_{3 \times 3}$ where

$$a_{ij} = \begin{cases} J_{6+i,3} - J_{i+3,3}, & i \leq j \\ 0, & i > j \end{cases}. \text{ Then } |\text{adj } A^{-1}| \text{ is :}$$

Options :

86435171333. $(105)^2 \times 2^{38}$

86435171334. $(105)^2 \times 2^{36}$

86435171335. $(15)^2 \times 2^{34}$

86435171336. $(15)^2 \times 2^{42}$

**Question Number : 65 Question Id : 86435121584 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

Let P_1, P_2, \dots, P_{15} be 15 points on a circle. The number of distinct triangles formed by points P_i, P_j, P_k such that $i+j+k \neq 15$, is :

Options :

86435171337. 12

86435171338. 443

86435171339. 455

86435171340. 419

Question Number : 66 Question Id : 86435121585 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $S_n = 1 \cdot (n-1) + 2 \cdot (n-2) + 3 \cdot (n-3) + \dots + (n-1) \cdot 1, n \geq 4$.

The sum $\sum_{n=4}^{\infty} \left(\frac{2S_n}{n!} - \frac{1}{(n-2)!} \right)$ is equal to :

Options :

86435171341. $\frac{e}{3}$

86435171342. $\frac{e}{6}$

86435171343. $\frac{e-1}{3}$

86435171344.

$$\frac{e-2}{6}$$

Question Number : 67 Question Id : 86435121586 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The function $f(x) = x^3 - 6x^2 + ax + b$ is such that $f(2) = f(4) = 0$. Consider two statements.

(S1) there exists $x_1, x_2 \in (2, 4)$, $x_1 < x_2$, such that $f'(x_1) = -1$ and $f'(x_2) = 0$.

(S2) there exists $x_3, x_4 \in (2, 4)$, $x_3 < x_4$, such that f is decreasing in $(2, x_4)$, increasing in $(x_4, 4)$ and $2f'(x_3) = \sqrt{3}f(x_4)$.

Then

Options :

86435171345. (S1) is true and (S2) is false

86435171346. (S1) is false and (S2) is true

86435171347. both (S1) and (S2) are false

86435171348. both (S1) and (S2) are true

Question Number : 68 Question Id : 86435121587 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $f: \mathbf{R} \rightarrow \mathbf{R}$ be a continuous function. Then $\lim_{x \rightarrow \pi/4} \frac{\frac{\pi}{4} \int_2^{\sec^2 x} f(x) dx}{x^2 - \frac{\pi^2}{16}}$ is equal to :

Options :

86435171349. $f(2)$

86435171350. $2f(2)$

86435171351. $4f(2)$

86435171352. $2f(\sqrt{2})$

Question Number : 69 Question Id : 86435121588 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The function $f(x)$, that satisfies the condition $f(x) = x + \int_0^{\pi/2} \sin x \cdot \cos y f(y) dy$, is :

Options :

86435171353. $x + \frac{\pi}{2} \sin x$

86435171354. $x + (\pi + 2) \sin x$

86435171355. $x + (\pi - 2) \sin x$

86435171356. $x + \frac{2}{3}(\pi - 2) \sin x$

Question Number : 70 Question Id : 86435121589 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The area, enclosed by the curves $y = \sin x + \cos x$ and $y = |\cos x - \sin x|$ and the lines $x = 0, x = \frac{\pi}{2}$,
is :

Options :

86435171357. $4(\sqrt{2} - 1)$

86435171358. $2\sqrt{2}(\sqrt{2} - 1)$

86435171359. $2(\sqrt{2} + 1)$

86435171360. $2\sqrt{2}(\sqrt{2} + 1)$

Question Number : 71 Question Id : 86435121590 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $y = y(x)$ is the solution curve of the differential equation

$x^2 dy + \left(y - \frac{1}{x}\right) dx = 0; x > 0$, and $y(1) = 1$, then $y\left(\frac{1}{2}\right)$ is equal to :

Options :

86435171361. $3 + e$

86435171362. $3 - e$

86435171363. $\frac{3}{2} - \frac{1}{\sqrt{e}}$

86435171364. $3 + \frac{1}{\sqrt{e}}$

Question Number : 72 Question Id : 86435121591 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Consider the parabola with vertex $\left(\frac{1}{2}, \frac{3}{4}\right)$ and the directrix $y = \frac{1}{2}$. Let P be the point

where the parabola meets the line $x = -\frac{1}{2}$. If the normal to the parabola at P intersects the parabola again at the point Q, then $(PQ)^2$ is equal to :

Options :

86435171365. $\frac{125}{16}$

86435171366. $\frac{25}{2}$

86435171367. $\frac{75}{8}$

86435171368. $\frac{15}{2}$

Question Number : 73 Question Id : 86435121592 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following is equivalent to the Boolean expression $p \wedge \sim q$?

Options :

86435171369. $\sim p \rightarrow \sim q$

86435171370. $\sim(p \rightarrow \sim q)$

86435171371. $\sim(q \rightarrow p)$

86435171372. $\sim(p \rightarrow q)$

Question Number : 74 Question Id : 86435121593 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let the acute angle bisector of the two planes $x - 2y - 2z + 1 = 0$ and $2x - 3y - 6z + 1 = 0$ be the plane P. Then which of the following points lies on P ?

Options :

86435171373. $(4, 0, -2)$

86435171374. $(0, 2, -4)$

86435171375. $(3, 1, -\frac{1}{2})$

86435171376. $(-2, 0, -\frac{1}{2})$

Question Number : 75 Question Id : 86435121594 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The distance of line $3y - 2z - 1 = 0 = 3x - z + 4$ from the point $(2, -1, 6)$ is :

Options :

86435171377. $4\sqrt{2}$

86435171378. $2\sqrt{6}$

86435171379. $\sqrt{26}$

86435171380. $2\sqrt{5}$

Question Number : 76 Question Id : 86435121595 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let a_1, a_2, \dots, a_{21} be an AP such that $\sum_{n=1}^{20} \frac{1}{a_n a_{n+1}} = \frac{4}{9}$. If the sum of this AP is 189, then

$a_6 a_{16}$ is equal to :

Options :

86435171381. 57

86435171382. 72

86435171383. 48

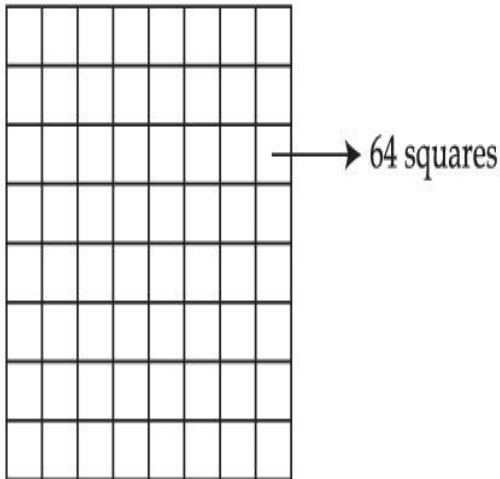
86435171384. 36

Question Number : 77 Question Id : 86435121596 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two squares are chosen at random on a chessboard (see figure). The probability that they have a side in common is :



Options :

86435171385. $\frac{1}{18}$

86435171386. $\frac{2}{7}$

86435171387. $\frac{1}{7}$

86435171388.

$\frac{1}{9}$

Question Number : 78 Question Id : 86435121597 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let θ be the acute angle between the tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{1} = 1$ and the circle $x^2 + y^2 = 3$ at their point of intersection in the first quadrant. Then $\tan\theta$ is equal to :

Options :

86435171389. 2

86435171390. $\frac{5}{2\sqrt{3}}$

86435171391. $\frac{2}{\sqrt{3}}$

86435171392. $\frac{4}{\sqrt{3}}$

Question Number : 79 Question Id : 86435121598 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If n is the number of solutions of the equation $2 \cos x \left(4 \sin \left(\frac{\pi}{4} + x \right) \sin \left(\frac{\pi}{4} - x \right) - 1 \right) = 1$

$x \in [0, \pi]$ and S is the sum of all these solutions, then the ordered pair (n, S) is :

Options :

86435171393. $(2, 2\pi/3)$

86435171394. $(3, 13\pi/9)$

86435171395. $(3, 5\pi/3)$

86435171396. $(2, 8\pi/9)$

Question Number : 80 Question Id : 86435121599 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

$\cos^{-1}(\cos(-5)) + \sin^{-1}(\sin(6)) - \tan^{-1}(\tan(12))$ is equal to :

(The inverse trigonometric functions take the principal values)

Options :

86435171397. $4\pi - 9$

86435171398. $3\pi + 1$

86435171399. $3\pi - 11$

86435171400. $4\pi - 11$

Mathematics Section B

Section Id :

8643511009

Section Number :

6

Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	8643511236
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 86435121600 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If for the complex numbers z satisfying $|z-2-2i| \leq 1$, the maximum value of $|3iz+6|$ is attained at $a+ib$, then $a+b$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 82 Question Id : 86435121601 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $f(x) = x^6 + 2x^4 + x^3 + 2x + 3$, $x \in \mathbf{R}$. Then the natural number n for which

$\lim_{x \rightarrow 1} \frac{x^n f(1) - f(x)}{x-1} = 44$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 83 Question Id : 86435121602 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let the points of intersections of the lines $x - y + 1 = 0$, $x - 2y + 3 = 0$ and $2x - 5y + 11 = 0$ are the mid points of the sides of a triangle ABC. Then the area of the triangle ABC is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 84 Question Id : 86435121603 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $f(x)$ be a polynomial of degree 3 such that $f(k) = -\frac{2}{k}$ for $k = 2, 3, 4, 5$. Then the value of $52 - 10 f(10)$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 85 Question Id : 86435121604 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A man starts walking from the point $P(-3, 4)$, touches the x -axis at R , and then turns to reach at the point $Q(0, 2)$. The man is walking at a constant speed. If the man reaches the point Q in the minimum time, then $50((PR)^2 + (RQ)^2)$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 86 Question Id : 86435121605 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the sum of the coefficients in the expansion of $(x + y)^n$ is 4096, then the greatest coefficient in the expansion is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 87 Question Id : 86435121606 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $[t]$ denote the greatest integer $\leq t$. The number of points where the function

$$f(x) = [x] |x^2 - 1| + \sin\left(\frac{\pi}{[x] + 3}\right) - [x + 1], x \in (-2, 2) \text{ is not continuous is } \underline{\hspace{2cm}}.$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 88 **Question Id :** 86435121607 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

Let X be a random variable with distribution.

x	-2	-1	3	4	6
$P(X=x)$	$\frac{1}{5}$	a	$\frac{1}{3}$	$\frac{1}{5}$	b

If the mean of X is 2.3 and variance of X is σ^2 , then $100 \sigma^2$ is equal to :

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 89 **Question Id :** 86435121608 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

Let $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$. Let a vector \vec{v} be in the plane containing

\vec{a} and \vec{b} . If \vec{v} is perpendicular to the vector $3\hat{i} + 2\hat{j} - \hat{k}$ and its projection on \vec{a} is 19

units, then $|\vec{v}|^2$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 90 **Question Id :** 86435121609 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

All the arrangements, with or without meaning, of the word FARMER are written excluding any word that has two R appearing together. The arrangements are listed serially in the alphabetic order as in the English dictionary. Then the serial number of the word FARMER in this list is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1