

Mathematics Section A

Section Id :	864351942
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 :	8643511169
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435120590 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If $x^2 + 9y^2 - 4x + 3 = 0$, $x, y \in \mathbb{R}$, then x and y respectively lie in the intervals :

Options :

86435168351. $[1, 3]$ and $[1, 3]$



86435168352. $[1, 3]$ and $\left[-\frac{1}{3}, \frac{1}{3}\right]$

86435168353. $\left[-\frac{1}{3}, \frac{1}{3}\right]$ and $[1, 3]$

86435168354. $\left[-\frac{1}{3}, \frac{1}{3}\right]$ and $\left[-\frac{1}{3}, \frac{1}{3}\right]$

Question Number : 62 Question Id : 86435120591 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $S = \left\{z \in \mathbb{C} : \frac{z - i}{z + 2i} \in \mathbb{R}\right\}$, then :

Options :

86435168355. S contains only one element

86435168356. S contains exactly two elements

86435168357. S is a straight line in the complex plane

86435168358. S is a circle in the complex plane



Question Number : 63 Question Id : 86435120592 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If the matrix $A = \begin{pmatrix} 0 & 2 \\ K & -1 \end{pmatrix}$ satisfies $A(A^3 + 3I) = 2I$, then the value of K is :

Options :

86435168359. $-\frac{1}{2}$

86435168360. -1

86435168361. $\frac{1}{2}$

86435168362. 1

Question Number : 64 Question Id : 86435120593 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If for $x, y \in \mathbf{R}$, $x > 0$, $y = \log_{10}x + \log_{10}x^{1/3} + \log_{10}x^{1/9} + \dots$ upto ∞ terms and
 $\frac{2 + 4 + 6 + \dots + 2y}{3 + 6 + 9 + \dots + 3y} = \frac{4}{\log_{10}x}$, then the ordered pair (x, y) is equal to :

Options :

86435168363. $(10^6, 6)$

86435168364. $(10^2, 3)$



86435168365. $(10^4, 6)$

86435168366. $(10^6, 9)$

Question Number : 65 Question Id : 86435120594 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If α, β are the distinct roots of $x^2 + bx + c = 0$, then $\lim_{x \rightarrow \beta} \frac{e^{2(x^2 + bx + c)} - 1 - 2(x^2 + bx + c)}{(x - \beta)^2}$ is equal

to :

Options :

86435168367. $b^2 - 4c$

86435168368. $b^2 + 4c$

86435168369. $2(b^2 + 4c)$

86435168370. $2(b^2 - 4c)$

Question Number : 66 Question Id : 86435120595 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1



A wire of length 20 m is to be cut into two pieces. One of the pieces is to be made into a square and the other into a regular hexagon. Then the length of the side (in meters) of the hexagon, so that the combined area of the square and the hexagon is minimum, is :

Options :

86435168371. $\frac{5}{2 + \sqrt{3}}$

86435168372. $\frac{5}{3 + \sqrt{3}}$

86435168373. $\frac{10}{3 + 2\sqrt{3}}$

86435168374. $\frac{10}{2 + 3\sqrt{3}}$

Question Number : 67 Question Id : 86435120596 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let A be a fixed point (0, 6) and B be a moving point (2t, 0). Let M be the mid-point of AB and the perpendicular bisector of AB meets the y-axis at C. The locus of the mid-point P of MC is :

Options :

86435168375. $2x^2 - 3y + 9 = 0$



86435168376. $2x^2 + 3y - 9 = 0$

86435168377. $3x^2 - 2y - 6 = 0$

86435168378. $3x^2 + 2y - 6 = 0$

Question Number : 68 Question Id : 86435120597 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $U_n = \left(1 + \frac{1}{n^2}\right) \left(1 + \frac{2^2}{n^2}\right)^2 \dots \left(1 + \frac{n^2}{n^2}\right)^n$, then $\lim_{n \rightarrow \infty} (U_n)^{\frac{-4}{n^2}}$ is equal to :

Options :

86435168379. $\frac{4}{e}$

86435168380. $\frac{4}{e^2}$

86435168381. $\frac{16}{e^2}$

86435168382. $\frac{e^2}{16}$



Question Number : 69 Question Id : 86435120598 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $y=y(x)$ be the solution of the differential equation $\frac{dy}{dx} = 2(y + 2\sin x - 5) x - 2\cos x$ such that $y(0) = 7$. Then $y(\pi)$ is equal to :

Options :

86435168383. $e^{\pi^2} + 5$

86435168384. $2e^{\pi^2} + 5$

86435168385. $7e^{\pi^2} + 5$

86435168386. $3e^{\pi^2} + 5$

Question Number : 70 Question Id : 86435120599 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A tangent and a normal are drawn at the point $P(2, -4)$ on the parabola $y^2=8x$, which meet the directrix of the parabola at the points A and B respectively. If $Q(a, b)$ is a point such that AQBP is a square, then $2a + b$ is equal to :

Options :

86435168387. -12



86435168388. -16

86435168389. -18

86435168390. -20

Question Number : 71 Question Id : 86435120600 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let us consider a curve, $y=f(x)$ passing through the point $(-2, 2)$ and the slope of the tangent to the curve at any point $(x, f(x))$ is given by $f(x) + xf'(x) = x^2$. Then :

Options :

86435168391. $x^3 - 3xf(x) - 4 = 0$

86435168392. $x^2 + 2xf(x) - 12 = 0$

86435168393. $x^3 + xf(x) + 12 = 0$

86435168394. $x^2 + 2xf(x) + 4 = 0$

Question Number : 72 Question Id : 86435120601 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1



Equation of a plane at a distance $\sqrt{\frac{2}{21}}$ from the origin, which contains the line of intersection of the planes $x - y - z - 1 = 0$ and $2x + y - 3z + 4 = 0$, is :

Options :

86435168395. $3x - 4z + 3 = 0$

86435168396. $-x + 2y + 2z - 3 = 0$

86435168397. $3x - y - 5z + 2 = 0$

86435168398. $4x - y - 5z + 2 = 0$

Question Number : 73 Question Id : 86435120602 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The distance of the point $(1, -2, 3)$ from the plane $x - y + z = 5$ measured parallel to a line, whose direction ratios are $2, 3, -6$ is :

Options :

86435168399. 2

86435168400. 3

86435168401. 1

86435168402. 5



Question Number : 74 Question Id : 86435120603 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $\frac{\sin A}{\sin B} = \frac{\sin (A - C)}{\sin (C - B)}$, where A, B, C are angles of a triangle ABC. If the lengths of the sides opposite these angles are a, b, c respectively, then :

Options :

86435168403. a^2, b^2, c^2 are in A.P.

86435168404. b^2, c^2, a^2 are in A.P.

86435168405. c^2, a^2, b^2 are in A.P.

86435168406. $b^2 - a^2 = a^2 + c^2$

Question Number : 75 Question Id : 86435120604 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

When a certain biased die is rolled, a particular face occurs with probability $\frac{1}{6} - x$ and its opposite face occurs with probability $\frac{1}{6} + x$. All other faces occur with probability $\frac{1}{6}$.

Note that opposite faces sum to 7 in any die. If $0 < x < \frac{1}{6}$, and the probability of obtaining total sum = 7, when such a die is rolled twice, is $\frac{13}{96}$, then the value of x is :

Options :

86435168407. $\frac{1}{9}$

86435168408. $\frac{1}{16}$

86435168409. $\frac{1}{12}$

86435168410. $\frac{1}{8}$

Question Number : 76 Question Id : 86435120605 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1



If $(\sin^{-1}x)^2 - (\cos^{-1}x)^2 = a$; $0 < x < 1$, $a \neq 0$, then the value of $2x^2 - 1$ is :

Options :

86435168411. $\cos\left(\frac{2a}{\pi}\right)$

86435168412. $\sin\left(\frac{2a}{\pi}\right)$

86435168413. $\sin\left(\frac{4a}{\pi}\right)$

86435168414. $\cos\left(\frac{4a}{\pi}\right)$

Question Number : 77 Question Id : 86435120606 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

$$\int_6^{16} \frac{\log_e x^2}{\log_e x^2 + \log_e (x^2 - 44x + 484)} dx \text{ is equal to :}$$

Options :

86435168415. 10

86435168416. 8



86435168417. 6

86435168418. 5

Question Number : 78 Question Id : 86435120607 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $0 < x < 1$, then $\frac{3}{2}x^2 + \frac{5}{3}x^3 + \frac{7}{4}x^4 + \dots$, is equal to :

Options :

86435168419. $x \left(\frac{1+x}{1-x} \right) + \log_e(1-x)$

86435168420. $\frac{1+x}{1-x} + \log_e(1-x)$

86435168421. $x \left(\frac{1-x}{1+x} \right) + \log_e(1-x)$

86435168422. $\frac{1-x}{1+x} + \log_e(1-x)$

Question Number : 79 Question Id : 86435120608 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1



The statement $(p \wedge (p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow r$ is :

Options :

86435168423. a tautology

86435168424. a fallacy

86435168425. equivalent to $p \rightarrow \sim r$

86435168426. equivalent to $q \rightarrow \sim r$

Question Number : 80 Question Id : 86435120609 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

$\sum_{k=0}^{20} \binom{20}{k}^2$ is equal to :

Options :

86435168427. ${}^{41}C_{20}$

86435168428. ${}^{40}C_{19}$

86435168429. ${}^{40}C_{20}$

86435168430. ${}^{40}C_{21}$



Mathematics Section B

Section Id :	864351943
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 :	8643511170
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 86435120610 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If $A = \{x \in \mathbf{R} : |x - 2| > 1\}$, $B = \{x \in \mathbf{R} : \sqrt{x^2 - 3} > 1\}$, $C = \{x \in \mathbf{R} : |x - 4| \geq 2\}$ and Z is the set of all integers, then the number of subsets of the set $(A \cap B \cap C)^c \cap Z$ is _____.

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 : 86435120611 Question Type : SA

Correct Marks : 4 Wrong Marks : 0



If the system of linear equations

$$2x + y - z = 3$$

$$x - y - z = \alpha$$

$$3x + 3y + \beta z = 3$$

has infinitely many solution, then $\alpha + \beta - \alpha\beta$ 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 : 83 **Question Id :** 86435120612 **Question Type :** SA

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

A number is called a palindrome if it reads the same backward as well as forward. For example 285582 is a six digit palindrome. The number of six digit palindromes, which are divisible by 55, 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 :** 86435120613 **Question Type :** SA

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



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If $y^{1/4} + y^{-1/4} = 2x$, and $(x^2 - 1)\frac{d^2y}{dx^2} + \alpha x \frac{dy}{dx} + \beta y = 0$, then $|\alpha - \beta|$ 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 :** 86435120614 **Question Type :** SA

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

The number of distinct real roots of the equation $3x^4 + 4x^3 - 12x^2 + 4 = 0$ is _____.

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 :** 86435120615 **Question Type :** SA

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

Let the equation $x^2 + y^2 + px + (1 - p)y + 5 = 0$ represent circles of varying radius $r \in (0, 5]$. Then the number of elements in the set $S = \{q : q = p^2 \text{ and } q \text{ is an integer}\}$ 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 : 86435120616 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the minimum area of the triangle formed by a tangent to the ellipse $\frac{x^2}{b^2} + \frac{y^2}{4a^2} = 1$ and the co-ordinate axis is ka^2 , then k 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 : 88 Question Id : 86435120617 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let n be an odd natural number such that the variance of $1, 2, 3, 4, \dots, n$ is 14. Then n 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 : 86435120618 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $\vec{a} = \hat{i} + 5\hat{j} + \alpha\hat{k}$, $\vec{b} = \hat{i} + 3\hat{j} + \beta\hat{k}$ and $\vec{c} = -\hat{i} + 2\hat{j} - 3\hat{k}$ be three vectors such that,

$|\vec{b} \times \vec{c}| = 5\sqrt{3}$ and \vec{a} is perpendicular to \vec{b} . Then the greatest amongst the values of $|\vec{a}|^2$ is _____.

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 : 86435120619 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If $\int \frac{dx}{(x^2 + x + 1)^2} = a \tan^{-1}\left(\frac{2x + 1}{\sqrt{3}}\right) + b \left(\frac{2x + 1}{x^2 + x + 1}\right) + C$, $x > 0$ where C is the

constant of integration, then the value of $9(\sqrt{3}a + b)$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

