

Mathematics Section A

Section Id :	864351984
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 :	8643511211
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435121220 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which of the following is **not** correct for relation R on the set of real numbers ?

Options :

86435170241. $(x, y) \in R \Leftrightarrow |x - y| \leq 1$ is reflexive and symmetric.

86435170242. $(x, y) \in R \Leftrightarrow |x| - |y| \leq 1$ is reflexive but not symmetric.

86435170243. $(x, y) \in R \Leftrightarrow 0 < |x| - |y| \leq 1$ is neither transitive nor symmetric.

86435170244. $(x, y) \in R \Leftrightarrow 0 < |x - y| \leq 1$ is symmetric and transitive.

Question Number : 62 Question Id : 86435121221 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The number of real roots of the equation $e^{4x} + 2e^{3x} - e^x - 6 = 0$ is :

Options :

86435170245. 0

86435170246. 1

86435170247. 2

86435170248. 4

Question Number : 63 Question Id : 86435121222 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If $a_r = \cos \frac{2r\pi}{9} + i \sin \frac{2r\pi}{9}$, $r = 1, 2, 3, \dots$, $i = \sqrt{-1}$, then the determinant

$\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is equal to :

Options :

86435170249. a_9

86435170250. $a_1 a_9 - a_3 a_7$

86435170251. $a_2 a_6 - a_4 a_8$

86435170252. a_5

Question Number : 64 Question Id : 86435121223 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If the following system of linear equations

$$2x + y + z = 5$$

$$x - y + z = 3$$

$$x + y + az = b$$

has no solution, then :

Options :

86435170253. $a = \frac{1}{3}, b \neq \frac{7}{3}$

86435170254. $a \neq \frac{1}{3}, b = \frac{7}{3}$

86435170255. $a = -\frac{1}{3}, b \neq \frac{7}{3}$

$$a \neq -\frac{1}{3}, b = \frac{7}{3}$$

86435170256.

Question Number : 65 Question Id : 86435121224 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Three numbers are in an increasing geometric progression with common ratio r . If the middle number is doubled, then the new numbers are in an arithmetic progression with common difference d . If the fourth term of GP is $3r^2$, then $r^2 - d$ is equal to :

Options :

86435170257. $7 - 7\sqrt{3}$

86435170258. $7 + \sqrt{3}$

86435170259. $7 - \sqrt{3}$

86435170260. $7 + 3\sqrt{3}$

Question Number : 66 Question Id : 86435121225 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The sum of 10 terms of the series

$$\frac{3}{1^2 \times 2^2} + \frac{5}{2^2 \times 3^2} + \frac{7}{3^2 \times 4^2} + \dots \text{ is :}$$

Options :

86435170261. 1

86435170262. $\frac{99}{100}$

86435170263. $\frac{120}{121}$

86435170264. $\frac{143}{144}$

Question Number : 67 Question Id : 86435121226 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

$\lim_{x \rightarrow 0} \frac{\sin^2(\pi \cos^4 x)}{x^4}$ is equal to :

Options :

86435170265. $2\pi^2$

86435170266. π^2

86435170267. $4\pi^2$

86435170268. 4π

Question Number : 68 Question Id : 86435121227 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

$$\text{If the function } f(x) = \begin{cases} \frac{1}{x} \log_e \left(\frac{1 + \frac{x}{a}}{1 - \frac{x}{b}} \right) & , \quad x < 0 \\ k & , \quad x = 0 \\ \frac{\cos^2 x - \sin^2 x - 1}{\sqrt{x^2 + 1} - 1} & , \quad x > 0 \end{cases}$$

is continuous at $x=0$, then $\frac{1}{a} + \frac{1}{b} + \frac{4}{k}$ is equal to :

Options :

86435170269. - 5

86435170270. 5

86435170271. - 4

86435170272. 4

Question Number : 69 Question Id : 86435121228 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The function $f(x) = |x^2 - 2x - 3| \cdot e^{|9x^2 - 12x + 4|}$ is not differentiable at exactly

Options :

86435170273. one point

86435170274. two points

86435170275. three points

86435170276. four points

Question Number : 70 Question Id : 86435121229 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The integral $\int \frac{1}{\sqrt[4]{(x-1)^3(x+2)^5}} dx$ is equal to :

(where C is a constant of integration)

Options :

86435170277. $\frac{4}{3} \left(\frac{x-1}{x+2} \right)^{\frac{1}{4}} + C$

86435170278. $\frac{3}{4} \left(\frac{x+2}{x-1} \right)^{\frac{1}{4}} + C$

86435170279. $\frac{4}{3} \left(\frac{x-1}{x+2} \right)^{\frac{5}{4}} + C$

86435170280. $\frac{3}{4} \left(\frac{x+2}{x-1} \right)^{\frac{5}{4}} + C$

Question Number : 71 Question Id : 86435121230 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

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

Options :

86435170281. $\log_2(2 + e)$

86435170282. $\log_2(2e)$

86435170283. $\log_2(1 + e^2)$

86435170284. $\log_2(1 + e)$

Question Number : 72 Question Id : 86435121231 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let f be a non-negative function in $[0, 1]$ and twice differentiable in $(0, 1)$. If

$$\int_0^x \sqrt{1 - (f'(t))^2} dt = \int_0^x f(t) dt, \quad 0 \leq x \leq 1 \quad \text{and} \quad f(0) = 0, \quad \text{then} \quad \lim_{x \rightarrow 0} \frac{1}{x^2} \int_0^x f(t) dt :$$

Options :

86435170285. equals 0

86435170286. equals $\frac{1}{2}$

86435170287. equals 1

86435170288. does not exist

Question Number : 73 Question Id : 86435121232 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If p and q are the lengths of the perpendiculars from the origin on the lines,
 $x \operatorname{cosec} \alpha - y \sec \alpha = k \cot 2\alpha$ and $x \sin \alpha + y \cos \alpha = k \sin 2\alpha$ respectively, then k^2 is equal to :

Options :

86435170289. $p^2 + 2q^2$

86435170290. $p^2 + 4q^2$

86435170291. $2p^2 + q^2$

86435170292. $4p^2 + q^2$

Question Number : 74 Question Id : 86435121233 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The length of the latus rectum of a parabola, whose vertex and focus are on the positive x -axis at a distance R and $S (> R)$ respectively from the origin, is :

Options :

86435170293. $2(S + R)$

86435170294. $2(S - R)$

86435170295. $4(S + R)$

86435170296. $4(S - R)$

Question Number : 75 Question Id : 86435121234 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The line $12x \cos\theta + 5y \sin\theta = 60$ is tangent to which of the following curves ?

Options :

86435170297. $x^2 + y^2 = 60$

86435170298. $x^2 + y^2 = 169$

86435170299. $144x^2 + 25y^2 = 3600$

86435170300. $25x^2 + 12y^2 = 3600$

Question Number : 76 Question Id : 86435121235 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let the equation of the plane, that passes through the point $(1, 4, -3)$ and contains the line of intersection of the planes $3x - 2y + 4z - 7 = 0$ and $x + 5y - 2z + 9 = 0$, be $\alpha x + \beta y + \gamma z + 3 = 0$, then $\alpha + \beta + \gamma$ is equal to :

Options :

86435170301. 23

86435170302. 15

86435170303. -15

86435170304. -23

Question Number : 77 Question Id : 86435121236 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

$\operatorname{cosec}18^\circ$ is a root of the equation :

Options :

86435170305. $x^2 - 2x - 4 = 0$

86435170306. $x^2 - 2x + 4 = 0$

86435170307. $x^2 + 2x - 4 = 0$

86435170308. $4x^2 + 2x - 1 = 0$

Question Number : 78 Question Id : 86435121237 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let \vec{a} and \vec{b} be two vectors such that $|2\vec{a} + 3\vec{b}| = |3\vec{a} + \vec{b}|$ and the angle between \vec{a} and \vec{b} is 60° . If $\frac{1}{8}\vec{a}$ is a unit vector, then $|\vec{b}|$ is equal to :

Options :

86435170309. 4

86435170310. 5

86435170311. 6

86435170312. 8

Question Number : 79 Question Id : 86435121238 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A vertical pole fixed to the horizontal ground is divided in the ratio 3 : 7 by a mark on it with lower part shorter than the upper part. If the two parts subtend equal angles at a point on the ground 18 m away from the base of the pole, then the height of the pole (in meters) is :

Options :

86435170313. $12\sqrt{10}$

86435170314. $8\sqrt{10}$

86435170315. $6\sqrt{10}$

86435170316. $12\sqrt{15}$

Question Number : 80 Question Id : 86435121239 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $*$, $\square \in \{\wedge, \vee\}$ be such that the Boolean expression $(p * \sim q) \Rightarrow (p \square q)$ is a tautology.

Then :

Options :

86435170317. $* = \wedge, \square = \wedge$

86435170318. $* = \wedge, \square = \vee$

86435170319. $* = \vee, \square = \wedge$

86435170320. $* = \vee, \square = \vee$

Mathematics Section B

Section Id :	864351985
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 :	8643511212
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 86435121240 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If $\left(\frac{3^6}{4^4}\right)^k$ is the term, independent of x , in the binomial expansion of $\left(\frac{x}{4} - \frac{12}{x^2}\right)^{12}$, 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 : 82 Question Id : 86435121241 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A point z moves in the complex plane such that $\arg\left(\frac{z-2}{z+2}\right) = \frac{\pi}{4}$, then the minimum value

of $|z - 9\sqrt{2} - 2i|^2$ 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 : 83 **Question Id :** 86435121242 **Question Type :** SA

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

If 'R' is the least value of 'a' such that the function $f(x) = x^2 + ax + 1$ is increasing on $[1, 2]$ and 'S' is the greatest value of 'a' such that the function $f(x) = x^2 + ax + 1$ is decreasing on $[1, 2]$, then the value of $|R - S|$ 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 :** 86435121243 **Question Type :** SA

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

Let $[t]$ denote the greatest integer $\leq t$. Then the value of $8 \cdot \int_{-\frac{1}{2}}^1 ([2x] + |x|) dx$ is _____.

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 :** 86435121244 **Question Type :** SA

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

If $x \phi(x) = \int_5^x (3t^2 - 2\phi'(t)) dt$, $x > -2$, and $\phi(0) = 4$, then $\phi(2)$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 86 **Question Id :** 86435121245 **Question Type :** SA

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

If the variable line $3x + 4y = \alpha$ lies between the two circles

$(x - 1)^2 + (y - 1)^2 = 1$ and $(x - 9)^2 + (y - 1)^2 = 4$, without intercepting a chord, then the sum of all the integral values of α 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 :** 86435121246 **Question Type :** SA

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

The square of the distance of the point of intersection of the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+1}{6}$ and the plane $2x - y + z = 6$ from the point $(-1, -1, 2)$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 88 **Question Id :** 86435121247 **Question Type :** SA

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

An electric instrument consists of two units. Each unit must function independently for the instrument to operate. The probability that the first unit functions is 0.9 and that of the second unit is 0.8. The instrument is switched on and it fails to operate. If the probability that only the first unit failed and second unit is functioning is p , then

_____.

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 : 86435121248 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The number of six letter words (with or without meaning), formed using all the letters of the word 'VOWELS', so that all the consonants never come together, 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 : 86435121249 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The mean of 10 numbers
 $7 \times 8, 10 \times 10, 13 \times 12, 16 \times 14, \dots$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1