Mathematics Section A

Section Id :	864351990
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 :	8643511217
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435121310 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $f : \mathbf{N} \to \mathbf{N}$ be a function such that $f(m+n) = f(m) + f(n)$ for every $m, n \in \mathbf{N}$. If $f(6) = 18$, then $f(2) \cdot f(3)$ is equal to :

Options :

86435170511. 6

86435170512. 18

86435170513. 36

86435170514. 54

Question Number : 62 Question Id : 86435121311 Question Type : MCQ Option Shuffling : Yes Qu

Correct Marks : 4 Wrong Marks : 1

If z is a complex number such that $\frac{z-i}{z-1}$ is purely imaginary, then the minimum value of $|z-(3+3i)|$ is :

Options :

86435170515. $2\sqrt{2}-1$

86435170516. $2\sqrt{2}$

86435170517. $3\sqrt{2}$

86435170518. $6\sqrt{2}$

Question Number : 63 Question Id : 86435121312 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The sum of the roots of the equation,
$x+1-2\log_2(3+2^x)+2\log_4(10-2^{-x})=0$, is :

Options :

86435170519. $\log_2 11$

86435170520. $\log_2 12$

86435170521. $\log_2 13$

86435170522. $\log_2 14$

Question Number : 64 Question Id : 86435121313 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\alpha+\beta+\gamma=2\pi$, then the system of equations

$x+(\cos\gamma)y+(\cos\beta)z=0$

$(\cos\gamma)x+y+(\cos\alpha)z=0$

$(\cos\beta)x+(\cos\alpha)y+z=0$

has :

Options :

86435170523. infinitely many solutions

86435170524. no solution

86435170525. a unique solution

86435170526. exactly two solutions

Question Number : 65 Question Id : 86435121314 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $a_1, a_2, a_3, \ldots$ be an A.P. If $\frac{a_1+a_2+\ldots+a_{10}}{a_1+a_2+\ldots+a_p}=\frac{100}{p^2}$, $p \neq 10$,

Options :

86435170527. $\frac{121}{100}$

86435170528. $\frac{21}{19}$

86435170529. $\frac{19}{21}$

86435170530. $\frac{100}{121}$

Question Number : 66 Question Id : 86435121315 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

An angle of intersection of the curves, $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $x^2 + y^2 = ab$, $a > b$, is :

Options :

86435170531. $\tan^{-1}\left(\frac{a-b}{\sqrt{ab}}\right)$

86435170532. $\tan^{-1}\left(\frac{a+b}{\sqrt{ab}}\right)$

86435170533. $\tan^{-1}\left(\frac{a-b}{2\sqrt{ab}}\right)$

86435170534. $\tan^{-1}\left(2\sqrt{ab}\right)$

Question Number : 67 Question Id : 86435121316 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\alpha = \lim\limits_{x\to\pi/4} \frac{\tan^3 x - \tan x}{\cos\left(x+\frac{\pi}{4}\right)}$ and $\beta = \lim\limits_{x\to 0} (\cos x)^{\cot x}$ are the roots of the equation, $ax^2+bx-4=0$, then the ordered pair (a, b) is :

Options :

86435170535. $(-1, 3)$

86435170536. $(1, -3)$

86435170537. $(1, 3)$

86435170538. $(-1, -3)$

Question Number : 68 Question Id : 86435121317 Question Type : MCQ Option Shuffling : Yes Is Qu

Correct Marks : 4 Wrong Marks : 1

Let f be any continuous function on $[0, 2]$ and twice differentiable on $(0, 2)$. If $f(0) = 0$, $f(1) = 1$ and $f(2) = 2$, then :

Options :

86435170539. $f'(x) = 0$ for some $x \in [0, 2]$

86435170540. $f''(x) > 0$ for all $x \in (0, 2)$

86435170541. $f''(x) = 0$ for some $x \in (0, 2)$

86435170542. $f''(x) = 0$ for all $x \in (0, 2)$

Question Number : 69 Question Id : 86435121318 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If $[x]$ is the greatest integer $\leq x$, then $\pi^2 \int_0^2 \left(\sin\frac{\pi x}{2}\right)(x - [x])^{[x]}\,dx$ is equal to :

Options :

86435170543. $2(\pi + 1)$

86435170544. $2(\pi - 1)$

86435170545. $4(\pi + 1)$

86435170546. $4(\pi - 1)$

Question Number : 70 Question Id : 86435121319 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\frac{dy}{dx} = \frac{2^x y + 2^y \cdot 2^x}{2^x + 2^{x+y} \log_e 2}$, $y(0) = 0$, then for $y = 1$, the value of x lies in the interval :

Options :

86435170547. $\left(0, \frac{1}{2}\right]$

86435170548. $\left(\frac{1}{2}, 1\right]$

86435170549. $(1, 2)$

86435170550. $(2, 3)$

Question Number : 71 Question Id : 86435121320 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $y\frac{dy}{dx} = x\left[\frac{y^2}{x^2} + \frac{\phi\left(\frac{y^2}{x^2}\right)}{\phi'\left(\frac{y^2}{x^2}\right)}\right]$, $x > 0$, $\phi > 0$, and $y(1) = -1$, then $\phi\left(\frac{y^2}{4}\right)$ is equal to :

Options :

86435170551. $\phi(1)$

86435170552. $2\phi(1)$

86435170553. $4\phi(1)$

86435170554. $4\phi(2)$

Question Number : 72 Question Id : 86435121321 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let A be the set of all points (α, β) such that the area of triangle formed by the points (5, 6), (3, 2) and (α, β) is 12 square units. Then the least possible length of a line segment joining the origin to a point in A, is :

Options :

86435170555. $\frac{8}{\sqrt{5}}$

86435170556. $\frac{4}{\sqrt{5}}$

86435170557. $\frac{16}{\sqrt{5}}$

86435170558. $\frac{12}{\sqrt{5}}$

Question Number : 73 Question Id : 86435121322 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The locus of mid-points of the line segments joining $(-3, -5)$ and the points on the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$ is :

Options :

86435170559. $36x^2 + 16y^2 + 90x + 56y + 145 = 0$

86435170560. $9x^2 + 4y^2 + 18x + 8y + 145 = 0$

86435170561. $36x^2 + 16y^2 + 72x + 32y + 145 = 0$

86435170562. $36x^2 + 16y^2 + 108x + 80y + 145 = 0$

Question Number : 74 Question Id : 86435121323 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

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

Options :

86435170563. $\frac{1}{\sqrt{2}}$

86435170564. $\frac{5}{2}$

86435170565. $\frac{\sqrt{34}}{2}$

86435170566. $\frac{\sqrt{42}}{2}$

Question Number : 75 Question Id : 86435121324 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors mutually perpendicular to each other and have same magnitude.

If a vector $\vec{r}$ satisfies

$\vec{a} \times \{(\vec{r} - \vec{b}) \times \vec{a}\} + \vec{b} \times \{(\vec{r} - \vec{c}) \times \vec{b}\} + \vec{c} \times \{(\vec{r} - \vec{a}) \times \vec{c}\} = \vec{0}$, then $\vec{r}$ is equal to :

Options :

86435170567. $\frac{1}{2}(\vec{a} + \vec{b} + 2\vec{c})$

86435170568. $\frac{1}{2}(\vec{a} + \vec{b} + \vec{c})$

86435170569. $\frac{1}{3}(\vec{a} + \vec{b} + \vec{c})$

86435170570. $\frac{1}{3}(2\vec{a} + \vec{b} - \vec{c})$

Question Number : 76 Question Id : 86435121325 Question Type : MCQ Option Shuffling : Yes Is Qu

Correct Marks : 4 Wrong Marks : 1

Let S = {1, 2, 3, 4, 5, 6}. Then the probability that a randomly cho n S to S satisfies g(3) = 2g(1) is :

Options :

86435170571. $\frac{1}{30}$

86435170572. $\frac{1}{15}$

86435170573. $\frac{1}{10}$

86435170574. $\frac{1}{5}$

Question Number : 77 Question Id : 86435121326 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The mean and variance of 7 observations are 8 and 16 respetively. If two observations are 6 and 8, then the variance of the remaining 5 observations is :

Options :

86435170575. $\frac{92}{5}$

86435170576. $\frac{536}{25}$

86435170577. $\frac{112}{5}$

86435170578. $\frac{134}{5}$

Question Number : 78 Question Id : 86435121327 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The number of solutions of the equation $32^{\tan^2 x} + 32^{\sec^2 x} = 81,\ 0 \le x \le \frac{\pi}{4}$ is :

Options :

86435170579. 0

86435170580. 1

86435170581. 2

86435170582. 3

Question Number : 79 Question Id : 86435121328 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The domain of the function

$$f(x) = \sin^{-1}\left(\frac{3x^2 + x - 1}{(x-1)^2}\right) + \cos^{-1}\left(\frac{x-1}{x+1}\right) \text{ is :}$$

Options :

86435170583. $\left[0, \frac{1}{4}\right]$

86435170584. $\left[0, \frac{1}{2}\right]$

86435170585. $\left[\frac{1}{4}, \frac{1}{2}\right] \cup \{0\}$

86435170586. $[-2, 0] \cup \left[\frac{1}{4}, \frac{1}{2}\right]$

Question Number : 80 Question Id : 86435121329 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Negation of the statement $(p \vee r) \Rightarrow (q \vee r)$ is :

Options :

86435170587. $p \wedge q \wedge r$

86435170588. $\sim p \wedge q \wedge r$

86435170589. $p \wedge \sim q \wedge \sim r$

86435170590. $\sim p \wedge q \wedge \sim r$

Mathematics Section B

Section Id :	864351991
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 :	8643511218
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 86435121330 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The number of elements in the set

$$\left\{A = \begin{pmatrix} a & b \\ 0 & d \end{pmatrix} : a, b, d \in \{-1, 0, 1\} \text{ and } (I - A)^3 = I - A^3\right\}, \text{ where I i}$$ 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 : 86435121331 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The number of 4-digit numbers which are neither multiple of 7 nor multiple of 3 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 : 86435121332 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the coefficient of a^7b^8 in the expansion of $(a+2b+4ab)^{10}$ is $K\cdot 2^{16}$, 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 : 84 Question Id : 86435121333 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If $S=\frac{7}{5}+\frac{9}{5^2}+\frac{13}{5^3}+\frac{19}{5^4}+\ldots$, then 160 S 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 : 86435121334 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $f(x)$ be a cubic polynomial with $f(1)=-10$, $f(-1)=6$, and has a local minima at $x=1$, and $f'(x)$ has a local minima at $x=-1$. Then $f(3)$ 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 : 86435121335 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $\int\frac{\sin x}{\sin^3 x+\cos^3 x}\,dx=\alpha\log_e\left|1+\tan x\right|+\beta\log_e\left|1-\tan x+\tan^2 x\right|+$,
when C is constant of integration, then the value of $18(\alpha+\beta+\gamma^2$

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 : 86435121336 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the line $y=mx$ bisects the area enclosed by the lines $x=0$, $y=0$, $x=\frac{3}{2}$ and the curve $y=1+4x-x^2$, then 12 m 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 : 86435121337 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let B be the centre of the circle $x^2+y^2-2x+4y+1=0$. Let the tangents at two points P and Q on the circle intersect at the point A(3, 1). Then $8\cdot\left(\frac{\text{area }\Delta APQ}{\text{area }\Delta BPQ}\right)$ is

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 : 86435121338 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A tangent line L is drawn at the point $(2, -4)$ on the parabola $y^2 = 8x$. If the line L is also tangent to the circle $x^2 + y^2 = a$, then 'a' 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 : 86435121339 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Suppose the line $\frac{x-2}{\alpha} = \frac{y-2}{-5} = \frac{z+2}{2}$ lies on the plane $x + 3y - 2z + \beta = 0$. 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