Mathematics Section A

Section Id :	864351948
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 :	8643511175
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435120680 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $\mathbb{Z}$ be the set of all integers,

$A = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : (x - 2)^2 + y^2 \leq 4\}$,

$B = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x^2 + y^2 \leq 4\}$ and

$C = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : (x - 2)^2 + (y - 2)^2 \leq 4\}$

If the total number of relations from $A \cap B$ to $A \cap C$ is 2^p, then the value of p is :

Options :

86435168621. 9

86435168622. 16

86435168623. 25

86435168624. 49

Question Number : 62 Question Id : 86435120681 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The set of all values of $k > -1$, for which the equation

$(3x^2+4x+3)^2-(k+1)(3x^2+4x+3)(3x^2+4x+2)+k(3x^2+4x+2)^2=0$ has real roots, is :

Options :

86435168625. $\left(1, \frac{5}{2}\right]$

86435168626. $[2, 3)$

86435168627. $\left[-\frac{1}{2}, 1\right)$

86435168628. $\left(\frac{1}{2}, \frac{3}{2}\right] - \{1\}$

Question Number : 63 Question Id : 86435120682 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $[\lambda]$ be the greatest integer less than or equal to λ. The set of all values of λ for which the system of linear equations $x+y+z=4,\ 3x+2y+5z=3,\ 9x+4y+(28+[\lambda])z=[\lambda]$ has a solution is :

Options :

86435168629. $[-9, -8)$

86435168630. $(-\infty, -9) \cup [-8, \infty)$

86435168631. $\mathbf{R}$

86435168632. $(-\infty, -9) \cup (-9, \infty)$

Question Number : 64 Question Id : 86435120683 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $A = \begin{pmatrix} [x+1] & [x+2] & [x+3] \\ [x] & [x+3] & [x+3] \\ [x] & [x+2] & [x+4] \end{pmatrix}$, where [t] denotes the greatest integer less than or equal to t. If $\det(A) = 192$, then the set of values of x is the interval :

Options :

86435168633. $[68, 69)$

86435168634. $[65, 66)$

86435168635. $[62, 63)$

86435168636. $[60, 61)$

Question Number : 65 Question Id : 86435120684 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If $0 < x < 1$ and $y = \frac{1}{2}x^2 + \frac{2}{3}x^3 + \frac{3}{4}x^4 + \ldots$, then the value of e^{1+y} at $x = \frac{1}{2}$ is :

Options :

86435168637. $2e$

86435168638. $2e^2$

86435168639. $\frac{1}{2}\sqrt{e}$

86435168640. $\frac{1}{2}e^2$

Question Number : 66 Question Id : 86435120685 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\lim\limits_{x\to\infty}\left(\sqrt{x^2 - x + 1} - ax\right) = b$, then the ordered pair (a, b) is :

Options :

86435168641. $\left(-1, -\frac{1}{2}\right)$

86435168642. $\left(1, -\frac{1}{2}\right)$

86435168643. $\left(1, \frac{1}{2}\right)$

86435168644. $\left(-1, \frac{1}{2}\right)$

Question Number : 67 Question Id : 86435120686 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $y(x) = \cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right), x \in \left(\frac{\pi}{2}, \pi\right)$, then $\frac{dy}{dx}$ at $x = \frac{5\pi}{6}$ is :

Options :

86435168645. $\frac{1}{2}$

86435168646. $-\frac{1}{2}$

86435168647. 0

86435168648. -1

Question Number : 68 Question Id : 86435120687 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let M and m respectively be the maximum and minimum values of the function $f(x)=\tan^{-1}(\sin x+\cos x)$ in $\left[0, \frac{\pi}{2}\right]$. Then the value of tan(M−m) is equ

Options :

86435168649. $2 + \sqrt{3}$

86435168650. $2 - \sqrt{3}$

86435168651. $3 - 2\sqrt{2}$

86435168652. $3 + 2\sqrt{2}$

Question Number : 69 Question Id : 86435120688 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A box open from top is made from a rectangular sheet of dimension $a \times b$ by cutting squares each of side x from each of the four corners and folding up the flaps. If the volume of the box is maximum, then x is equal to :

Options :

86435168653. $\frac{a + b - \sqrt{a^2 + b^2 - ab}}{6}$

86435168654. $\frac{a + b - \sqrt{a^2 + b^2 - ab}}{12}$

86435168655. $\frac{a+b-\sqrt{a^2+b^2+ab}}{6}$

86435168656. $\frac{a+b+\sqrt{a^2+b^2-ab}}{6}$

Question Number : 70 Question Id : 86435120689 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The value of the integral $\int_0^1 \frac{\sqrt{x}\,dx}{(1+x)(1+3x)(3+x)}$ is :

Options :

86435168657. $\frac{\pi}{8}\left(1-\frac{\sqrt{3}}{2}\right)$

86435168658. $\frac{\pi}{8}\left(1-\frac{\sqrt{3}}{6}\right)$

86435168659. $\frac{\pi}{4}\left(1-\frac{\sqrt{3}}{6}\right)$

86435168660. $\frac{\pi}{4}\left(1-\frac{\sqrt{3}}{2}\right)$

Question Number : 71 Question Id : 86435120690 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The area of the region bounded by the parabola $(y-2)^2=(x-1)$, the tangent to it at the point whose ordinate is 3 and the x-axis is :

Options :

86435168661. 6

86435168662. 9

86435168663. 10

86435168664. 4

Question Number : 72 Question Id : 86435120691 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A differential equation representing the family of parabolas with axis parallel to y-axis and whose length of latus rectum is the distance of the point $(2, -3)$ form the line $3x+4y=5$, is given by :

Options :

86435168665. $11\,\frac{d^2x}{dy^2} = 10$

86435168666. $10\,\frac{d^2y}{dx^2} = 11$

86435168667. $11\,\frac{d^2y}{dx^2} = 10$

86435168668. $10\,\frac{d^2x}{dy^2} = 11$

Question Number : 73 Question Id : 86435120692 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If the solution curve of the differential equation $(2x-10y^3)dy+ydx=0$, passes through the points (0, 1) and (2, β), then β is a root of the equation :

Options :

86435168669. $2y^5-2y-1=0$

86435168670. $2y^5-y^2-2=0$

86435168671. $y^5 - y^2 - 1 = 0$

86435168672. $y^5 - 2y - 2 = 0$

Question Number : 74 Question Id : 86435120693 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let A(a, 0), B(b, 2b + 1) and C(0, b), $b \neq 0$, $|b| \neq 1$, be points such that the area of triangle ABC is 1 sq. unit, then the sum of all possible values of a is :

Options :

86435168673. $\frac{2b}{b+1}$

86435168674. $\frac{-2b}{b+1}$

86435168675. $\frac{2b^2}{b+1}$

86435168676. $\frac{-2b^2}{b+1}$

Question Number : 75 Question Id : 86435120694 Question Type : MCQ Option Shuffling : Yes Is Question Ma

Correct Marks : 4 Wrong Marks : 1

If two tangents drawn from a point P to the parabola $y^2=16(x-3)$ are at right angles, then the locus of point P is :

Options :

86435168677. $x+1=0$

86435168678. $x+2=0$

86435168679. $x+3=0$

86435168680. $x+4=0$

Question Number : 76 Question Id : 86435120695 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The angle between the straight lines, whose direction cosines are given by the equations $2l+2m-n=0$ and $mn+nl+lm=0$, is :

Options :

86435168681. $\frac{\pi}{3}$

86435168682. $\cos^{-1}\left(\frac{8}{9}\right)$

86435168683. $\frac{\pi}{2}$

86435168684. $\pi - \cos^{-1}\left(\frac{4}{9}\right)$

Question Number : 77 Question Id : 86435120696 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The equation of the plane passing through the line of intersection of the planes $\vec{r} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 1$ and $\vec{r} \cdot \left(2\hat{i} + 3\hat{j} - \hat{k}\right) + 4 = 0$ and parallel to the x-axis is :

Options :

86435168685. $\vec{r} \cdot \left(\hat{i} - 3\hat{k}\right) + 6 = 0$

86435168686. $\vec{r} \cdot \left(\hat{i} + 3\hat{k}\right) + 6 = 0$

86435168687. $\vec{r} \cdot \left(\hat{j} - 3\hat{k}\right) - 6 = 0$

86435168688. $\vec{r} \cdot \left(\hat{j} - 3\hat{k}\right) + 6 = 0$

Question Number : 78 Question Id : 86435120697 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Each of the persons A and B independently tosses three fair coins. The probability that both of them get the same number of heads is :

Options :

86435168689. $\frac{5}{8}$

86435168690. $\frac{1}{8}$

86435168691. $\frac{5}{16}$

86435168692. 1

Question Number : 79 Question Id : 86435120698 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The Boolean expression $(p \wedge q) \Rightarrow ((r \wedge q) \wedge p)$ is equivalent to :

Options :

86435168693. $(q \wedge r) \Rightarrow (p \wedge q)$

86435168694. $(p \wedge q) \Rightarrow (r \wedge q)$

86435168695. $(p \wedge q) \Rightarrow (r \vee q)$

86435168696. $(p \wedge r) \Rightarrow (p \wedge q)$

Question Number : 80 Question Id : 86435120699 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Two poles, AB of length a metres and CD of length $a+b$ ($b \neq a$) metres are erected at the same horizontal level with bases at B and D. If $BD = x$ and $\tan\angle ACB = \frac{1}{2}$, then :

Options :

86435168697. $x^2 + 2(a+2b)x - b(a+b) = 0$

86435168698. $x^2 - 2ax + a(a+b) = 0$

86435168699. $x^2 - 2ax + b(a+b) = 0$

86435168700. $x^2 + 2(a+2b)x + a(a+b) = 0$

Mathematics Section B

Section Id :	864351949
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 : 8643511176
Question Shuffling Allowed : Yes

Question Number : 81 Question Id : 86435120700 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let z_1 and z_2 be two complex numbers such that $\arg(z_1 - z_2) = \frac{\pi}{4}$ and z_1, z_2 satisfy the equation $|z-3| = \text{Re}(z)$. Then the imaginary part of $z_1 + z_2$ 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 : 82 Question Id : 86435120701 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $S = \{1, 2, 3, 4, 5, 6, 9\}$. Then the number of elements in the set $T = \{A \subseteq S : A \neq \phi$ and the sum of all the elements of A is not a 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 : 86435120702 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

$3 \times 7^{22} + 2 \times 10^{22} - 44$ when divided by 18 leaves the remainder _____.

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 : 86435120703 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $\int \frac{2e^{x} + 3e^{-x}}{4e^{x} + 7e^{-x}} dx = \frac{1}{14}(ux + v \log_e(4e^{x} + 7e^{-x})) + C$, where C is a constant of integration, then $u + v$ 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 : 86435120704 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Two circles each of radius 5 units touch each other at the point (1, 2). If the equation of their common tangent is $4x+3y=10$, and $C_1(\alpha, \beta)$ and $C_2(\gamma, \delta)$, $C_1 \neq C_2$ are their centres, then $|(\alpha+\beta)(\gamma+\delta)|$ 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 : 86435120705 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let A $(\sec\theta, 2\tan\theta)$ and B $(\sec\phi, 2\tan\phi)$, where $\theta+\phi=\pi/2$, be two points on the hyperbola $2x^2-y^2=2$. If (α, β) is the point of the intersection of the normals to the hyperbola at A and B, then $(2\beta)^2$ 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 : 87 Question Id : 86435120706 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let S be the mirror image of the point Q(1, 3, 4) with respect to the plane $2x-y+z+3=0$ and let R $(3, 5, \gamma)$ be a point of this plane. Then the square of the length t SR 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 : 86435120707 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The probability distribution of random variable X is given by :

X	1	2	3	4	5
P(X)	K	2K	2K	3K	K

Let $p = P(1 < X < 4 \mid X < 3)$. If $5p = \lambda K$, then λ 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 : 86435120708 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let S be the sum of all solutions (in radians) of the equation $\sin^4\theta + \cos^4\theta - \sin\theta\cos\theta = 0$ in $[0, 4\pi]$. Then $\frac{8S}{\pi}$ 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 : 86435120709 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

An online exam is attempted by 50 candidates out of which 20 are boys. The average marks obtained by boys is 12 with a variance 2. The variance of marks obtained by 30 girls is also 2. The average marks of all 50 candidates is 15. If μ is the average marks of girls and σ^2 is the variance of marks of 50 candidates, then $\mu+\sigma^2$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1