

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 :	8643511133
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435120050 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Out of all the patients in a hospital 89% are found to be suffering from heart ailment and 98% are suffering from lungs infection. If K% of them are suffering from both ailments, then K can **not** belong to the set :

Options :

86435166731. {84, 86, 88, 90}

86435166732. {80, 83, 86, 89}

86435166733. {79, 81, 83, 85}

86435166734. {84, 87, 90, 93}

Question Number : 62 Question Id : 86435120051 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The equation $\arg \left(\frac{z - 1}{z + 1} \right) = \frac{\pi}{4}$ represents a circle with :

Options :

86435166735. centre at (0, 0) and radius $\sqrt{2}$

86435166736. centre at (0, 1) and radius 2

86435166737. centre at (0, 1) and radius $\sqrt{2}$

86435166738. centre at (0, -1) and radius $\sqrt{2}$

Question Number : 63 Question Id : 86435120052 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $A = \begin{pmatrix} \frac{1}{\sqrt{5}} & \frac{2}{\sqrt{5}} \\ -2 & 1 \\ \frac{1}{\sqrt{5}} & \frac{1}{\sqrt{5}} \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 \\ i & 1 \end{pmatrix}$, $i = \sqrt{-1}$, and $Q = A^T B A$, then the inverse of the matrix

$A Q^{2021} A^T$ is equal to :

Options :

86435166739. $\begin{pmatrix} 1 & 0 \\ -2021 i & 1 \end{pmatrix}$

86435166740. $\begin{pmatrix} \frac{1}{\sqrt{5}} & -2021 \\ 2021 & \frac{1}{\sqrt{5}} \end{pmatrix}$



86435166741. $\begin{pmatrix} 1 & -2021 i \\ 0 & 1 \end{pmatrix}$

86435166742. $\begin{pmatrix} 1 & 0 \\ 2021 i & 1 \end{pmatrix}$

Question Number : 64 Question Id : 86435120053 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $\theta \in \left(0, \frac{\pi}{2}\right)$. If the system of linear equations.

$$(1 + \cos^2\theta) x + \sin^2\theta y + 4 \sin 3\theta z = 0$$

$$\cos^2\theta x + (1 + \sin^2\theta) y + 4 \sin 3\theta z = 0$$

$$\cos^2\theta x + \sin^2\theta y + (1 + 4 \sin 3\theta)z = 0$$

has a non-trivial solution, then the value of θ is :

Options :

86435166743. $\frac{\pi}{18}$

86435166744. $\frac{7\pi}{18}$



86435166745. $\frac{5\pi}{18}$

86435166746. $\frac{4\pi}{9}$

Question Number : 65 Question Id : 86435120054 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The sum of the series $\frac{1}{x+1} + \frac{2}{x^2+1} + \frac{2^2}{x^4+1} + \dots + \frac{2^{100}}{x^{2^{100}}+1}$ when $x=2$ is :

Options :

86435166747. $1 - \frac{2^{101}}{4^{101} - 1}$

86435166748. $1 - \frac{2^{100}}{4^{100} - 1}$

86435166749. $1 + \frac{2^{101}}{4^{101} - 1}$



86435166750. $1 + \frac{2^{100}}{4^{101} - 1}$

Question Number : 66 Question Id : 86435120055 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If ${}^{20}C_r$ is the co-efficient of x^r in the expansion of $(1+x)^{20}$, then the value of $\sum_{r=0}^{20} r^2 {}^{20}C_r$ is equal to :

Options :

86435166751. 420×2^{19}

86435166752. 380×2^{19}

86435166753. 380×2^{18}

86435166754. 420×2^{18}

Question Number : 67 Question Id : 86435120056 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If the sum of an infinite GP a, ar, ar^2, ar^3, \dots is 15 and the sum of the squares of its each term is 150, then the sum of ar^2, ar^4, ar^6, \dots is :

Options :

86435166755. $\frac{5}{2}$

86435166756. $\frac{1}{2}$

86435166757. $\frac{9}{2}$

86435166758. $\frac{25}{2}$

Question Number : 68 Question Id : 86435120057 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $f(x) = \cos\left(2 \tan^{-1} \sin\left(\cot^{-1} \sqrt{\frac{1-x}{x}}\right)\right)$, $0 < x < 1$. Then :

Options :

86435166759. $(1-x)^2 f'(x) - 2(f(x))^2 = 0$

86435166760. $(1+x)^2 f'(x) + 2(f(x))^2 = 0$

86435166761. $(1-x)^2 f'(x) + 2(f(x))^2 = 0$



86435166762. $(1+x)^2 f'(x) - 2(f(x))^2 = 0$

Question Number : 69 Question Id : 86435120058 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The value of $\int_{-1/\sqrt{2}}^{1/\sqrt{2}} \left(\left(\frac{x+1}{x-1} \right)^2 + \left(\frac{x-1}{x+1} \right)^2 - 2 \right)^{1/2} dx$ is :

Options :

86435166763. $4 \log_e (3 + 2\sqrt{2})$

86435166764. $\log_e 4$

86435166765. $\log_e 16$

86435166766. $2 \log_e 16$

Question Number : 70 Question Id : 86435120059 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The value of $\lim_{n \rightarrow \infty} \frac{1}{n} \sum_{r=0}^{2n-1} \frac{n^2}{n^2 + 4r^2}$ is :

Options :

86435166767. $\frac{1}{4} \tan^{-1}(4)$

86435166768. $\frac{1}{2} \tan^{-1}(4)$

86435166769. $\tan^{-1}(4)$

86435166770. $\frac{1}{2} \tan^{-1}(2)$

Question Number : 71 Question Id : 86435120060 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The sum of solutions of the equation $\frac{\cos x}{1 + \sin x} = |\tan 2x|$, $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) - \left\{\frac{\pi}{4}, -\frac{\pi}{4}\right\}$ is :

Options :

86435166771. $\frac{\pi}{10}$

86435166772. $-\frac{11\pi}{30}$



86435166773. $-\frac{7\pi}{30}$

86435166774. $-\frac{\pi}{15}$

Question Number : 72 Question Id : 86435120061 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let ABC be a triangle with A $(-3, 1)$ and $\angle ACB = \theta, 0 < \theta < \frac{\pi}{2}$. If the equation of the median through B is $2x + y - 3 = 0$ and the equation of angle bisector of C is $7x - 4y - 1 = 0$, then $\tan\theta$ is equal to :

Options :

86435166775. $\frac{1}{2}$

86435166776. $\frac{3}{4}$

86435166777. $\frac{4}{3}$

86435166778. 2



Question Number : 73 Question Id : 86435120062 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If a line along a chord of the circle $4x^2 + 4y^2 + 120x + 675 = 0$, passes through the point $(-30, 0)$ and is tangent to the parabola $y^2 = 30x$, then the length of this chord is :

Options :

86435166779. 7

86435166780. $3\sqrt{5}$

86435166781. 5

86435166782. $5\sqrt{3}$

Question Number : 74 Question Id : 86435120063 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

On the ellipse $\frac{x^2}{8} + \frac{y^2}{4} = 1$ let P be a point in the second quadrant such that the tangent at P to the ellipse is perpendicular to the line $x + 2y = 0$. Let S and S' be the foci of the ellipse and e be its eccentricity. If A is the area of the triangle SPS' then, the value of $(5 - e^2) \cdot A$ is :

Options :

86435166783. 24

86435166784. 14



86435166785. 12

86435166786. 6

Question Number : 75 Question Id : 86435120064 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A plane P contains the line $x + 2y + 3z + 1 = 0 = x - y - z - 6$, and is perpendicular to the plane $-2x + y + z + 8 = 0$. Then which of the following points lies on P ?

Options :

86435166787. (2, -1, 1)

86435166788. (0, 1, 1)

86435166789. (1, 0, 1)

86435166790. (-1, 1, 2)

Question Number : 76 Question Id : 86435120065 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $y = y(x)$ be a solution curve of the differential equation $(y + 1) \tan^2 x \, dx + \tan x \, dy + y \, dx = 0$, $x \in \left(0, \frac{\pi}{2}\right)$. If $\lim_{x \rightarrow 0^+} xy(x) = 1$, then the value of $y\left(\frac{\pi}{4}\right)$ is :

Options :

86435166791. $\frac{\pi}{4} - 1$

86435166792. $\frac{\pi}{4} + 1$

86435166793. $-\frac{\pi}{4}$

86435166794. $\frac{\pi}{4}$

Question Number : 77 Question Id : 86435120066 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{j} - \hat{k}$. If \vec{c} is a vector such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a} \cdot \vec{c} = 3$,

then $\vec{a} \cdot (\vec{b} \times \vec{c})$ is equal to :

Options :

86435166795. -2

86435166796. 2

86435166797. -6



86435166798. 6

Question Number : 78 Question Id : 86435120067 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If the truth value of the Boolean expression $((p \vee q) \wedge (q \rightarrow r) \wedge (\sim r)) \rightarrow (p \wedge q)$ is false, then the truth values of the statements p, q, r respectively can be :

Options :

86435166799. T F T

86435166800. F F T

86435166801. F T F

86435166802. T F F

Question Number : 79 Question Id : 86435120068 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let A and B be independent events such that $P(A) = p, P(B) = 2p$. The largest value of p , for which $P(\text{exactly one of } A, B \text{ occurs}) = \frac{5}{9}$, is :

Options :

86435166803. $\frac{1}{3}$

86435166804. $\frac{4}{9}$

86435166805. $\frac{5}{12}$

86435166806. $\frac{2}{9}$

Question Number : 80 Question Id : 86435120069 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The mean and standard deviation of 20 observations were calculated as 10 and 2.5 respectively. It was found that by mistake one data value was taken as 25 instead of 35. If α and $\sqrt{\beta}$ are the mean and standard deviation respectively for correct data, then (α, β) is :

Options :

86435166807. (11, 25)

86435166808. (11, 26)

86435166809. (10.5, 26)

86435166810. (10.5, 25)

Mathematics Section B

Section Id :	864351907
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 :	8643511134
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 86435120070 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The number of three-digit even numbers, formed by the digits 0, 1, 3, 4, 6, 7 if the repetition of digits is not allowed, 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 : 86435120071 Question Type : SA

Correct Marks : 4 Wrong Marks : 0



Let $a, b \in \mathbf{R}, b \neq 0$. Define a function

$$f(x) = \begin{cases} a \sin \frac{\pi}{2}(x - 1), & \text{for } x \leq 0 \\ \frac{\tan 2x - \sin 2x}{b x^3}, & \text{for } x > 0. \end{cases}$$

If f is continuous at $x=0$, then $10 - ab$ 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 :** 86435120072 **Question Type :** SA

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

The sum of all integral values of k ($k \neq 0$) for which the equation

$$\frac{2}{x-1} - \frac{1}{x-2} = \frac{2}{k} \text{ in } x \text{ has no real roots, is } \underline{\hspace{2cm}}.$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 84 Question Id : 86435120073 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A wire of length 36 m is cut into two pieces, one of the pieces is bent to form a square and the other is bent to form a circle. If the sum of the areas of the two figures is minimum, and the circumference of the circle is k (meter), then $\left(\frac{4}{\pi} + 1\right)k$ 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 : 85 Question Id : 86435120074 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The area of the region $S = \{(x, y) : 3x^2 \leq 4y \leq 6x + 24\}$ 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 : 86435120075 Question Type : SA

Correct Marks : 4 Wrong Marks : 0



If $y = y(x)$ is an implicit function of x such that $\log_e (x + y) = 4xy$, then $\frac{d^2y}{dx^2}$ at $x = 0$ 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 :** 86435120076 **Question Type :** SA

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

If ${}^1P_1 + 2 \cdot {}^2P_2 + 3 \cdot {}^3P_3 + \dots + 15 \cdot {}^{15}P_{15} = {}^qP_r - s$, $0 \leq s \leq 1$, then ${}^{q+s}C_{r-s}$ 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 : 88 **Question Id :** 86435120077 **Question Type :** SA

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



Let the line L be the projection of the line

$$\frac{x - 1}{2} = \frac{y - 3}{1} = \frac{z - 4}{2}$$

in the plane $x - 2y - z = 3$. If d is the distance of the point (0, 0, 6) from L, then d^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 :** 86435120078 **Question Type :** SA

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

Let $z = \frac{1 - i\sqrt{3}}{2}$, $i = \sqrt{-1}$. Then the value of

$$21 + \left(z + \frac{1}{z}\right)^3 + \left(z^2 + \frac{1}{z^2}\right)^3 + \left(z^3 + \frac{1}{z^3}\right)^3 + \dots + \left(z^{21} + \frac{1}{z^{21}}\right)^3$$

is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 90 Question Id : 86435120079 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The locus of a point, which moves such that the sum of squares of its distances from the points $(0, 0)$, $(1, 0)$, $(0, 1)$, $(1, 1)$ is 18 units, is a circle of diameter d . Then d^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