

Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	708191996
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 70819117644 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $f, g : \mathbb{N} \rightarrow \mathbb{N}$ such that $f(n+1) = f(n) + f(1) \forall n \in \mathbb{N}$ and g be any arbitrary function. Which of the following statements is NOT true ?

Options :

70819158081. If f is onto, then $f(n) = n \forall n \in \mathbb{N}$

70819158082. f is one-one

70819158083. If g is onto, then $f \circ g$ is one-one

70819158084. If $f \circ g$ is one-one, then g is one-one

Question Number : 62 Question Id : 70819117645 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let the lines $(2 - i)z = (2 + i)\bar{z}$ and $(2 + i)z + (i - 2)\bar{z} - 4i = 0$, (here $i^2 = -1$) be normal to a circle C . If the line $iz + \bar{z} + 1 + i = 0$ is tangent to this circle C , then its radius is :

Options :

70819158085. $3\sqrt{2}$

70819158086. $\frac{1}{2\sqrt{2}}$

70819158087. $\frac{3}{2\sqrt{2}}$

70819158088. $\frac{3}{\sqrt{2}}$

Question Number : 63 Question Id : 70819117646 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The integer 'k', for which the inequality $x^2 - 2(3k - 1)x + 8k^2 - 7 > 0$ is valid for every x in \mathbb{R} , is :

Options :

70819158089. 2

70819158090. 3

70819158091. 4

70819158092. 0

Question Number : 64 Question Id : 70819117647 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $0 < \theta, \phi < \frac{\pi}{2}$, $x = \sum_{n=0}^{\infty} \cos^{2n} \theta$, $y = \sum_{n=0}^{\infty} \sin^{2n} \phi$ and $z = \sum_{n=0}^{\infty} \cos^{2n} \theta \cdot \sin^{2n} \phi$ then :

Options :

70819158093. $xy - z = (x + y)z$

70819158094. $xy + z = (x + y)z$

70819158095. $xy + yz + zx = z$

70819158096. $xyz = 4$

Question Number : 65 Question Id : 70819117648 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If Rolle's theorem holds for the function $f(x) = x^3 - ax^2 + bx - 4$, $x \in [1, 2]$ with $f' \left(\frac{4}{3} \right) = 0$,

then ordered pair (a, b) is equal to :

Options :

70819158097. (5, 8)

70819158098. (5, -8)

70819158099. (-5, 8)

70819158100. (-5, -8)

Question Number : 66 Question Id : 70819117649 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1 + \frac{1}{2} + \dots + \frac{1}{n}}{n^2} \right)^n \text{ is equal to :}$$

Options :

70819158101. 0

70819158102. $\frac{1}{2}$

70819158103. $\frac{1}{e}$

70819158104. 1

Question Number : 67 Question Id : 70819117650 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The value of the integral

$$\int \frac{\sin \theta \cdot \sin 2\theta (\sin^6 \theta + \sin^4 \theta + \sin^2 \theta) \sqrt{2 \sin^4 \theta + 3 \sin^2 \theta + 6}}{1 - \cos 2\theta} d\theta \text{ is :}$$

(where c is a constant of integration)

Options :

70819158105. $\frac{1}{18} [9 - 2\sin^6 \theta - 3\sin^4 \theta - 6\sin^2 \theta]^{\frac{3}{2}} + c$

70819158106. $\frac{1}{18} [9 - 2\cos^6 \theta - 3\cos^4 \theta - 6\cos^2 \theta]^{\frac{3}{2}} + c$

70819158107. $\frac{1}{18} [11 - 18\sin^2 \theta + 9\sin^4 \theta - 2\sin^6 \theta]^{\frac{3}{2}} + c$

70819158108. $\frac{1}{18} \left[11 - 18\cos^2\theta + 9\cos^4\theta - 2\cos^6\theta \right]^{\frac{3}{2}} + c$

Question Number : 68 Question Id : 70819117651 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The value of $\int_{-1}^1 x^2 e^{\lfloor x^3 \rfloor} dx$, where $\lfloor t \rfloor$ denotes the greatest integer $\leq t$, is :

Options :

70819158109. $\frac{e + 1}{3}$

70819158110. $\frac{1}{3e}$

70819158111. $\frac{e - 1}{3e}$

70819158112. $\frac{e + 1}{3e}$

Question Number : 69 Question Id : 70819117652 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If a curve passes through the origin and the slope of the tangent to it at any point (x, y) is

$\frac{x^2 - 4x + y + 8}{x - 2}$, then this curve also passes through the point :

Options :

70819158113. $(4, 5)$

70819158114. (5, 5)

70819158115. (5, 4)

70819158116. (4, 4)

**Question Number : 70 Question Id : 70819117653 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

The image of the point (3, 5) in the line $x - y + 1 = 0$, lies on :

Options :

70819158117. $(x - 4)^2 + (y + 2)^2 = 16$

70819158118. $(x - 2)^2 + (y - 4)^2 = 4$

70819158119. $(x - 4)^2 + (y - 4)^2 = 8$

70819158120. $(x - 2)^2 + (y - 2)^2 = 12$

**Question Number : 71 Question Id : 70819117654 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

A tangent is drawn to the parabola $y^2 = 6x$ which is perpendicular to the line $2x + y = 1$.
Which of the following points does NOT lie on it ?

Options :

70819158121. (0, 3)

70819158122. (-6, 0)

70819158123. (5, 4)

70819158124. (4, 5)

Question Number : 72 Question Id : 70819117655 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the curves, $\frac{x^2}{a} + \frac{y^2}{b} = 1$ and $\frac{x^2}{c} + \frac{y^2}{d} = 1$ intersect each other at an angle of 90° , then which of the following relations is TRUE ?

Options :

70819158125. $a + b = c + d$

70819158126. $a - b = c - d$

70819158127. $ab = \frac{c + d}{a + b}$

70819158128. $a - c = b + d$

Question Number : 73 Question Id : 70819117656 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let α be the angle between the lines whose direction cosines satisfy the equations $l + m - n = 0$ and $l^2 + m^2 - n^2 = 0$. Then the value of $\sin^4 \alpha + \cos^4 \alpha$ is :

Options :

70819158129. $\frac{5}{8}$

70819158130. $\frac{3}{8}$

70819158131. $\frac{1}{2}$

70819158132. $\frac{3}{4}$

Question Number : 74 Question Id : 70819117657 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The equation of the line through the point (0, 1, 2) and perpendicular to the line

$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{-2}$ is:

Options :

70819158133. $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{-3}$

70819158134. $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$

70819158135. $\frac{x}{3} = \frac{y-1}{-4} = \frac{z-2}{3}$

70819158136. $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{3}$

Question Number : 75 Question Id : 70819117658 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

When a missile is fired from a ship, the probability that it is intercepted is $\frac{1}{3}$ and the probability that the missile hits the target, given that it is not intercepted, is $\frac{3}{4}$. If three missiles are fired independently from the ship, then the probability that all three hit the target, is :

Options :

70819158137. $\frac{1}{27}$

70819158138. $\frac{1}{8}$

70819158139. $\frac{3}{8}$

70819158140. $\frac{3}{4}$

Question Number : 76 Question Id : 70819117659 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The coefficients a, b and c of the quadratic equation, $ax^2 + bx + c = 0$ are obtained by throwing a dice three times. The probability that this equation has equal roots is :

Options :

70819158141. $\frac{1}{36}$

70819158142. $\frac{1}{54}$

70819158143. $\frac{1}{72}$

70819158144. $\frac{5}{216}$

**Question Number : 77 Question Id : 70819117660 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

All possible values of $\theta \in [0, 2\pi]$ for which $\sin 2\theta + \tan 2\theta > 0$ lie in :

Options :

70819158145. $\left(0, \frac{\pi}{2}\right) \cup \left(\pi, \frac{3\pi}{2}\right)$

70819158146. $\left(0, \frac{\pi}{4}\right) \cup \left(\frac{\pi}{2}, \frac{3\pi}{4}\right) \cup \left(\frac{3\pi}{2}, \frac{11\pi}{6}\right)$

70819158147. $\left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \frac{3\pi}{4}\right) \cup \left(\pi, \frac{7\pi}{6}\right)$

70819158148. $\left(0, \frac{\pi}{4}\right) \cup \left(\frac{\pi}{2}, \frac{3\pi}{4}\right) \cup \left(\pi, \frac{5\pi}{4}\right) \cup \left(\frac{3\pi}{2}, \frac{7\pi}{4}\right)$

**Question Number : 78 Question Id : 70819117661 Question Type : MCQ Option Shuffling : Yes
Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

The total number of positive integral solutions (x, y, z) such that $xyz = 24$ is :

Options :

70819158149. 24

70819158150. 30

70819158151. 36

70819158152. 45

Question Number : 79 Question Id : 70819117662 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A man is observing, from the top of a tower, a boat speeding towards the tower from a certain point A, with uniform speed. At that point, angle of depression of the boat with the man's eye is 30° (Ignore man's height). After sailing for 20 seconds, towards the base of the tower (which is at the level of water), the boat has reached a point B, where the angle of depression is 45° . Then the time taken (in seconds) by the boat from B to reach the base of the tower is :

Options :

70819158153. 10

70819158154. $10(\sqrt{3} + 1)$

70819158155. $10\sqrt{3}$

70819158156. $10(\sqrt{3} - 1)$

Question Number : 80 Question Id : 70819117663 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The statement $A \rightarrow (B \rightarrow A)$ is equivalent to :

Options :

70819158157. $A \rightarrow (A \rightarrow B)$

70819158158. $A \rightarrow (A \vee B)$

70819158159. $A \rightarrow (A \wedge B)$

70819158160. $A \rightarrow (A \leftrightarrow B)$

Mathematics Section B

Section Id :	708191717
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	708191997
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 70819117664 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If $A = \begin{bmatrix} 0 & -\tan\left(\frac{\theta}{2}\right) \\ \tan\left(\frac{\theta}{2}\right) & 0 \end{bmatrix}$ and $(I_2 + A)(I_2 - A)^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then $13(a^2 + b^2)$ is equal to

_____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 82 Question Id : 70819117665 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $A = \begin{bmatrix} x & y & z \\ y & z & x \\ z & x & y \end{bmatrix}$, where x, y and z are real numbers such that $x + y + z > 0$ and $xyz = 2$.

If $A^2 = I_3$, then the value of $x^3 + y^3 + z^3$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 83 Question Id : 70819117666 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the system of equations

$$kx + y + 2z = 1$$

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

$$-2x - 2y - 4z = 3$$

has infinitely many solutions, then k is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 84 Question Id : 70819117667 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The total number of numbers, lying between 100 and 1000 that can be formed with the digits 1, 2, 3, 4, 5, if the repetition of digits is not allowed and numbers are divisible by either 3 or 5, is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 85 Question Id : 70819117668 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let A_1, A_2, A_3, \dots be squares such that for each $n \geq 1$, the length of the side of A_n equals the length of diagonal of A_{n+1} . If the length of A_1 is 12 cm, then the smallest value of n for which area of A_n is less than one, is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 86 Question Id : 70819117669 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The number of points, at which the function $f(x) = |2x + 1| - 3|x + 2| + |x^2 + x - 2|$, $x \in \mathbb{R}$ is not differentiable, is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 87 **Question Id :** 70819117670 **Question Type :** SA

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

Let $f(x)$ be a polynomial of degree 6 in x , in which the coefficient of x^6 is unity and it has extrema at $x = -1$ and $x = 1$. If $\lim_{x \rightarrow 0} \frac{f(x)}{x^3} = 1$, then $5 \cdot f(2)$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 88 **Question Id :** 70819117671 **Question Type :** SA

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

The graphs of sine and cosine functions, intersect each other at a number of points and between two consecutive points of intersection, the two graphs enclose the same area A . Then A^4 is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 89 Question Id : 70819117672 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The locus of the point of intersection of the lines $(\sqrt{3})kx + ky - 4\sqrt{3} = 0$ and $\sqrt{3}x - y - 4(\sqrt{3})k = 0$ is a conic, whose eccentricity is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001

Question Number : 90 Question Id : 70819117673 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = \hat{i} - \hat{j}$ and $\vec{c} = \hat{i} - \hat{j} - \hat{k}$ be three given vectors. If \vec{r} is a vector such that $\vec{r} \times \vec{a} = \vec{c} \times \vec{a}$ and $\vec{r} \cdot \vec{b} = 0$, then $\vec{r} \cdot \vec{a}$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

5 to 5.001