Mathematics Section A

Section Id :	864351227
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 :	864351227
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 8643513391 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

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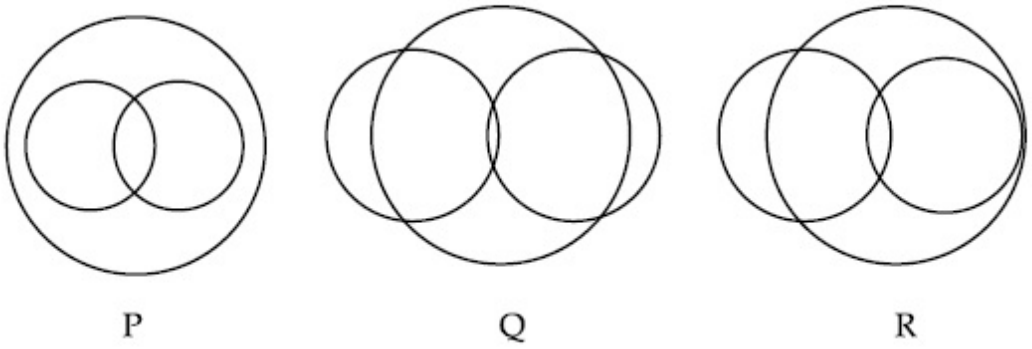
In a school, there are three types of games to be played. Some of the students play two types of games, but none play all the three games. Which Venn diagrams can justify the above statement ?



P Q R

Options :

86435110171. P and Q

86435110172. P and R

86435110173. Q and R

86435110174. None of these

Question Number : 62 Question Id : 8643513392 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The area of the triangle with vertices A(z), B(iz) and C($z+iz$) is :

Options :

86435110175. $\frac{1}{2}|z+iz|^2$

86435110176. $\frac{1}{2}|z|^2$

86435110177. $\frac{1}{2}$

86435110178. 1

Question Number : 63 Question Id : 8643513393 Question Type : MCQ Option Shuf

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Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $A = \begin{pmatrix} 0 & \sin\alpha \\ \sin\alpha & 0 \end{pmatrix}$ and $\det\left(A^2 - \frac{1}{2}I\right) = 0$, then a possible value of α is :

Options :

86435110179. $\frac{\pi}{4}$

86435110180. $\frac{\pi}{3}$

86435110181. $\frac{\pi}{6}$

86435110182. $\frac{\pi}{2}$

Question Number : 64 Question Id : 8643513394 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The system of equations $kx+y+z=1$, $x+ky+z=k$ and $x+y+zk=k^2$ has no solution if k is equal to :

Options :

86435110183. 0

86435110184. 1

86435110185. -1

86435110186. -2

Question Number : 65 Question Id : 8643513395 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Team 'A' consists of 7 boys and n girls and Team 'B' has 4 boys and 6 girls. If a total of 52 single matches can be arranged between these two teams when a boy pla[illegible] and a girl plays against a girl, then n is equal to :

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Options :

86435110187. 2

86435110188. 4

86435110189. 5

86435110190. 6

Question Number : 66 Question Id : 8643513396 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the fourth term in the expansion of $(x + x^{\log_2 x})^7$ is 4480, then the value of x where $x \in \mathbf{N}$ is equal to :

Options :

86435110191. 1

86435110192. 2

86435110193. 3

86435110194. 4

Question Number : 67 Question Id : 8643513397 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The value of $4 + \cfrac{1}{5 + \cfrac{1}{4 + \cfrac{1}{5 + \cfrac{1}{4 + \ldots\ldots \infty}}}}$ is :

Options :

86435110195. $2 + \frac{2}{5}\sqrt{30}$

86435110196. $2 + \frac{4}{\sqrt{5}}\sqrt{30}$

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86435110197. $5+\frac{2}{5}\sqrt{30}$

86435110198. $4+\frac{4}{\sqrt{5}}\sqrt{30}$

Question Number : 68 Question Id : 8643513398 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $\cot^{-1}(\alpha)=\cot^{-1}2+\cot^{-1}8+\cot^{-1}18+\cot^{-1}32+\ldots..$ upto 100 terms, then α is :

Options :

86435110199. 1.00

86435110200. 1.01

86435110201. 1.02

86435110202. 1.03

Question Number : 69 Question Id : 8643513399 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The inverse of $y=5^{\log x}$ is :

Options :

86435110203. $x=5^{\frac{1}{\log y}}$

86435110204. $x=y^{\frac{1}{\log 5}}$

86435110205. $x=5^{\log y}$

86435110206. $x=y^{\log 5}$

Question Number : 70 Question Id : 8643513400 Question Type : MCQ Option Shuf

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Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The value of $\lim\limits_{x\to 0^+}\frac{\cos^{-1}\left(x-[x]^2\right)\cdot\sin^{-1}\left(x-[x]^2\right)}{x-x^3}$, where $[x]$ denotes the greatest integer $\leq x$ is :

Options :

86435110207. $\frac{\pi}{4}$

86435110208. 0

86435110209. $\frac{\pi}{2}$

86435110210. π

Question Number : 71 Question Id : 8643513401 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following statements is incorrect for the function $g(\alpha)$ for $\alpha \in \mathbf{R}$ such that

$$g(\alpha)=\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\frac{\sin^{\alpha}x}{\cos^{\alpha}x+\sin^{\alpha}x}\,dx$$

Options :

86435110211. $g(\alpha)$ is a strictly increasing function

86435110212. $g(\alpha)$ is a strictly decreasing function

86435110213. $g(\alpha)$ has an inflection point at $\alpha=-\frac{1}{2}$

86435110214. $g(\alpha)$ is an even function

Question Number : 72 Question Id : 8643513402 Question Type : MCQ Option Shuf Question Mandatory : No

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Correct Marks : 4 Wrong Marks : 1

Which of the following is true for $y(x)$ that satisfies the differential equation

$\frac{dy}{dx} = xy - 1 + x - y\,;\, y(0) = 0$:

Options :

86435110215. $y(1) = e^{-\frac{1}{2}} - 1$

86435110216. $y(1) = e^{\frac{1}{2}} - 1$

86435110217. $y(1) = e^{\frac{1}{2}} - e^{-\frac{1}{2}}$

86435110218. $y(1) = 1$

Question Number : 73 Question Id : 8643513403 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In a triangle PQR, the co-ordinates of the points P and Q are $(-2, 4)$ and $(4, -2)$ respectively. If the equation of the perpendicular bisector of PR is $2x - y + 2 = 0$, then the centre of the circumcircle of the ΔPQR is :

Options :

86435110219. $(1, 4)$

86435110220. $(0, 2)$

86435110221. $(-1, 0)$

86435110222. $(-2, -2)$

Question Number : 74 Question Id : 8643513404 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The line $2x - y + 1 = 0$ is a tangent to the circle at the point $(2, 5)$ and the centre of the circle lies on $x - 2y = 4$. Then, the radius of the circle is :

Options :

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86435110223. $5\sqrt{3}$

86435110224. $5\sqrt{4}$

86435110225. $4\sqrt{5}$

86435110226. $3\sqrt{5}$

Question Number : 75 Question Id : 8643513405 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Choose the incorrect statement about the two circles whose equations are given below :

$x^2+y^2-10x-10y+41=0$ and

$x^2+y^2-16x-10y+80=0$

Options :

86435110227. Circles have two intersection points.

86435110228. Both circles pass through the centre of each other.

86435110229. Both circles' centres lie inside region of one another.

86435110230. Distance between two centres is the average of radii of both the circles.

Question Number : 76 Question Id : 8643513406 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The equation of the plane which contains the y-axis and passes through the point (1, 2, 3) is :

Options :

86435110231. $3x+z=6$

86435110232. $x+3z=10$

86435110233. $x+3z=0$

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86435110234. $3x - z = 0$

Question Number : 77 Question Id : 8643513407 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the Boolean expression $(p \Rightarrow q) \Leftrightarrow (q * (\sim p))$ is a tautology, then the Boolean expression $p * (\sim q)$ is equivalent to :

Options :

86435110235. $p \Rightarrow q$

86435110236. $p \Rightarrow \sim q$

86435110237. $q \Rightarrow p$

86435110238. $\sim q \Rightarrow p$

Question Number : 78 Question Id : 8643513408 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and $\vec{b} = 7\hat{i} + \hat{j} - 6\hat{k}$.

If $\vec{r} \times \vec{a} = \vec{r} \times \vec{b}$, $\vec{r} \cdot (\hat{i} + 2\hat{j} + \hat{k}) = -3$, then $\vec{r} \cdot (2\hat{i} - 3\hat{j} + \hat{k})$ is equal to :

Options :

86435110239. 8

86435110240. 10

86435110241. 12

86435110242. 13

Question Number : 79 Question Id : 8643513409 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

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Two dices are rolled. If both dices have six faces numbered 1, 2, 3, 5, 7 and 11, then the probability that the sum of the numbers on the top faces is less than or equal to 8 is :

Options :

86435110243. $\frac{5}{12}$

86435110244. $\frac{4}{9}$

86435110245. $\frac{17}{36}$

86435110246. $\frac{1}{2}$

Question Number : 80 Question Id : 8643513410 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The sum of possible values of x for $\tan^{-1}(x+1) + \cot^{-1}\left(\frac{1}{x-1}\right) = \tan^{-1}\left(\frac{8}{31}\right)$ is :

Options :

86435110247. $-\frac{33}{4}$

86435110248. $-\frac{32}{4}$

86435110249. $-\frac{31}{4}$

86435110250. $-\frac{30}{4}$

Mathematics Section B

Section Id :	864351228
Section Number :	6
Section type :	Online

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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 :	864351228
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 8643513411 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The maximum value of z in the following equation $z = 6xy + y^2$, where $3x + 4y \leq 100$ and $4x + 3y \leq 75$ for $x \geq 0$ and $y \geq 0$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 82 Question Id : 8643513412 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $A = \begin{bmatrix} 2 & 3 \\ 0 & -1 \end{bmatrix}$, then the value of $\det(A^4) + \det\left(A^{10} - (\text{Adj}(2A))^{10}\right)$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 83 Question Id : 8643513413 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $(2021)^{3762}$ is divided by 17, then the remainder is _____.

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

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Possible Answers :

100

Question Number : 84 Question Id : 8643513414 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the function $f(x) = \frac{\cos(\sin x) - \cos x}{x^4}$ is continuous at each point in its domain and $f(0) = \frac{1}{k}$, then k is _____.

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

100

Question Number : 85 Question Id : 8643513415 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $[\cdot]$ represents the greatest integer function, then the value of $\left|\int_0^{\sqrt{\frac{\pi}{2}}} \left[[x^2] - \cos x\right] dx\right|$ is _____.

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

100

Question Number : 86 Question Id : 8643513416 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The minimum distance between any two points P_1 and P_2 while considering point P_1 on one circle and point P_2 on the other circle for the given circles' equations

$x^2 + y^2 - 10x - 10y + 41 = 0$

$x^2 + y^2 - 24x - 10y + 160 = 0$ is _____.

Response Type : Numeric

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Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 87 Question Id : 8643513417 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the equation of the plane passing through the line of intersection of the planes $2x-7y+4z-3=0$, $3x-5y+4z+11=0$ and the point $(-2, 1, 3)$ is $ax+by+cz-7=0$, then the value of $2a+b+c-7$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 88 Question Id : 8643513418 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let there be three independent events E_1, E_2 and E_3. The probability that only E_1 occurs is α, only E_2 occurs is β and only E_3 occurs is γ. Let 'p' denote the probability of none of events occurs that satisfies the equations $(\alpha-2\beta)p=\alpha\beta$ and $(\beta-3\gamma)p=2\beta\gamma$. All the given probabilities are assumed to lie in the interval (0, 1).

Then, $\frac{\text{Probability of occurrence of } E_1}{\text{Probability of occurrence of } E_3}$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 89 Question Id : 8643513419 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

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If $f(x)=\sin\left(\cos^{-1}\left(\frac{1-2^{2x}}{1+2^{2x}}\right)\right)$ and its first derivative with respect to x is $-\frac{b}{a}\log_e 2$ when $x=1$, where a and b are integers, then the minimum value of $|a^2-b^2|$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 90 Question Id : 8643513420 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $\vec{a}=\alpha\hat{i}+\beta\hat{j}+3\hat{k}$,

$\vec{b}=-\beta\hat{i}-\alpha\hat{j}-\hat{k}$ and

$\vec{c}=\hat{i}-2\hat{j}-\hat{k}$

such that $\vec{a}\cdot\vec{b}=1$ and $\vec{b}\cdot\vec{c}=-3$, then $\frac{1}{3}\left(\left(\vec{a}\times\vec{b}\right)\cdot\vec{c}\right)$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

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