

## Mathematics Section A

<b>Section Id :</b>	676033107
<b>Section Number :</b>	5
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	20
<b>Number of Questions to be attempted :</b>	20
<b>Section Marks :</b>	80
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	676033107
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 61 Question Id : 6760331591 Question Type : MCQ Option Shuffling : Yes Is Question Mand:**  
**Correct Marks : 4 Wrong Marks : 1**

The number of roots of the equation  $(3 + \sqrt{5})^{|x^2-4|} + 4\left(\frac{3-\sqrt{5}}{4}\right)^{|x^2-4|} = 6$  is

**Options :**

6760334771. 2

6760334772. 4

6760334773. 6

6760334774. 8

**Question Number : 62 Question Id : 6760331592 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If  $z = x + iy$  and  $\omega = \frac{z-1}{3(z-2)}$ , then the set of points  $z$  satisfying  $|z|=1=|\omega|$

contains

**Options :**

6760334775. no point

6760334776. exactly one point

6760334777. exactly two points

6760334778. exactly three points

**Question Number : 63 Question Id : 6760331593 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Let  $A = \begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$ ,  $xyz = 60$  and  $8x + 4y + 3z = 20$ . If  $A(\text{adj } A) = k I$ , then  $k$  is equal to

**Options :**

6760334779. 36

6760334780. 64

6760334781. 68

6760334782. 88

**Question Number : 64 Question Id : 6760331594 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If the system of linear equations

$$x + y + z = 3$$

$$x + by + b^2z = 7$$

and  $ax + a^2y + a^3z = 1$

has infinitely many solutions, then the ordered pair  $(a, b)$  is

**Options :**

6760334783.  $(2, 2)$

6760334784.  $(1, 1)$

6760334785.  $\left(\frac{2}{7}, \frac{2}{7}\right)$

6760334786.  $\left(\frac{1}{7}, \frac{1}{7}\right)$

**Question Number : 65 Question Id : 6760331595 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If  $(1 + x + x^2)^4 = a_0 + a_1x + a_2x^2 + \dots + a_8x^8$ , then the value of

$a_0 + 4a_2 + 16a_4 + \dots + 2^8 a_8$  is equal to

**Options :**

6760334787. 1191

6760334788. 1214

6760334789. 1241

6760334790. 1261

**Question Number : 66 Question Id : 6760331596 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The value of  $\frac{\sum_{k=1}^{22} (-1)^{k-1} \cos k^\circ + \sum_{k=23}^{44} (-1)^k \cos k^\circ}{\sum_{k=1}^{22} (-1)^{k-1} \sin k^\circ + \sum_{k=23}^{44} (-1)^k \sin k^\circ}$ , where  $k^\circ$  denotes  $k$  degree, is

**Options :**

6760334791. 1

6760334792.  $\sqrt{2} - 1$

6760334793.  $\sqrt{2} + 2$

6760334794.  $\sqrt{2} + 1$

**Question Number : 67 Question Id : 6760331597 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1**

$$\lim_{x \rightarrow 2} (x^3 - x^2 - 8x + 13)^{\frac{1}{x^3 - 3x^2 + 4}}$$

**Options :**

6760334795. does not exist

6760334796. exists and it is equal to  $e^{3/5}$

6760334797. exists and it is equal to  $e^{5/3}$

6760334798. exists and it is equal to  $2^{1/3}$

**Question Number : 68 Question Id : 6760331598 Question Type : MCQ Option Shuffling : Yes Is Question Mand:  
Correct Marks : 4 Wrong Marks : 1**

The equation of the normal to the curve  $y = e^{-|x|}$  at a point, where the curve cuts the line  $x = -1$  is

Options :

6760334799.  $e^2x + ey - (e^2 - 1) = 0$

6760334800.  $ex + ey + e - 1 = 0$

6760334801.  $e^2x + ey + (e^2 - 1) = 0$

6760334802.  $e^2x - ey + (e^2 + 1) = 0$

Question Number : 69 Question Id : 6760331599 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

If  $I_1 = \int_0^{\pi} xe^{\operatorname{cosec}x} dx$  and  $I_2 = \int_0^{\pi} e^{\operatorname{cosec}x} dx$ , then the ratio  $I_1 : I_2$  is equal to

Options :

6760334803.  $\pi : 2$

6760334804.  $2 : \pi$

6760334805.  $\pi : 3$

6760334806.  $3 : \pi$

Question Number : 70 Question Id : 6760331600 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

The equation of the tangent to the curve  $y = \int_{x^2}^{x^3} \frac{dt}{\sqrt{1+t^2}}$  at the point whose abscissa is 1, is

Options :

6760334807.  $x + \sqrt{2}y - 1 = 0$

6760334808.  $\sqrt{3}x - y - \sqrt{3} = 0$

6760334809.  $x - y - 1 = 0$

6760334810.  $x - \sqrt{2}y - 1 = 0$

**Question Number : 71 Question Id : 6760331601 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If  $y = y(x)$  is the solution of the differential equation,  $\sqrt{1-e^{2x}} dy - \sqrt{4-y^2} \cdot e^x dx = 0$  such that  $y(0) = 1$ , then  $y(-\log_e 2)$  is equal to

Options :

6760334811.  $-\frac{\pi}{3}$

6760334812.  $-1$

6760334813.  $\frac{1}{2}$

6760334814. 1

**Question Number : 72 Question Id : 6760331602 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If  $(k, 3)$  is an interior point of the triangle formed by the lines,  $x + y = 4$ ,  $x - y = 5$  and  $x - 2y + 2 = 0$ , then the set of all values of  $k$  is the interval

**Options :**

6760334815.  $(3, 4)$

6760334816.  $(3, 8)$

6760334817.  $(4, 8)$

6760334818.  $(8, 12)$

**Question Number : 73 Question Id : 6760331603 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Consider a family of circles which pass through the point  $(1, 1)$  and touch the axis of  $y$ . If the centre of such a circle is at  $(h, k)$ , then the set of all values of  $h$  is the interval

**Options :**

6760334819.  $\left[\frac{1}{2}, \infty\right)$



6760334820.  $\left[\frac{1}{4}, \infty\right)$

6760334821.  $\left(0, \frac{1}{2}\right)$

6760334822.  $\left[\frac{1}{2}, 1\right]$

**Question Number : 74 Question Id : 6760331604 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The locus of the mid-points of the perpendiculars to the directrix of the parabola,  $y^2 = 2x$  from points on it, is

**Options :**

6760334823.  $y^2 = 4x - 1$

6760334824.  $y^2 = 4x + 1$

6760334825.  $y^2 = 8x + 2$

6760334826.  $y^2 = 2x + \frac{1}{2}$

**Question Number : 75 Question Id : 6760331605 Question Type : MCQ Option Shuffling : Yes Is Question Mand:**

**Correct Marks : 4 Wrong Marks : 1**

If the ellipse  $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$  and the circle  $x^2 + y^2 = 4b$  intersect at an angle  $\frac{\pi}{3}$ , then a value of 'b' is

**Options :**

6760334827.  $10 + 2\sqrt{21}$

6760334828.  $20 + 2\sqrt{21}$

6760334829.  $10 - 3\sqrt{21}$

6760334830.  $20 - 3\sqrt{21}$

**Question Number : 76 Question Id : 6760331606 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = 4\hat{i} - 2\hat{j} + 3\hat{k}$  and  $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$  are three vectors, then a vector of magnitude 6 units, which is parallel to the vector  $2\vec{a} - \vec{b} + 3\vec{c}$ , is

**Options :**

6760334831.  $2\hat{i} + 4\hat{j} + 4\hat{k}$

6760334832.  $4\hat{i} + 2\hat{j} - 4\hat{k}$

6760334833.  $2\hat{i} - 4\hat{j} + 4\hat{k}$

6760334834.  $4\hat{i} + 4\hat{j} - 2\hat{k}$

**Question Number : 77 Question Id : 6760331607 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Four persons work independently of each other on a task. If the probabilities that they will complete the task are :  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  and  $\frac{1}{5}$ , then the probability, that at least one of them will complete it, is

**Options :**

6760334835. 0.2

6760334836. 0.8

6760334837. 0.4

6760334838. 0.6

**Question Number : 78 Question Id : 6760331608 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Two players A and B play a game. Player A first throws a fair die and if 5 or 6 appears, he wins; otherwise player B throws a fair coin and wins if head comes. The process continues till someone wins. The probability that B wins after completion of 3 or more throws of the die, is

**Options :**

6760334839.  $\frac{1}{18}$

6760334840.  $\frac{1}{9}$

6760334841.  $\frac{4}{9}$

6760334842.  $\frac{1}{2}$

**Question Number : 79 Question Id : 6760331609 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Ten vertical poles of different height standing at equal distances on a straight line, subtend the same angle  $30^\circ$  at a point O on the line. If the height of the tallest pole is 12 units and the distance of the foot of the shortest pole from O is 1 unit, then the distance between two consecutive poles is

**Options :**

6760334843.  $\frac{12\sqrt{3}-1}{9}$

6760334844.  $\frac{4\sqrt{3}-1}{9}$

6760334845.  $\frac{12\sqrt{3}-1}{3\sqrt{3}}$

6760334846.  $\frac{12\sqrt{3}+1}{9}$

**Question Number : 80 Question Id : 6760331610 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If  $r \in \{p, q, \sim p, \sim q\}$  such that the Boolean expression  $(\sim(p \vee q)) \vee (p \wedge r)$  is equivalent to  $r$ , then  $r$  is equal to

**Options :**

6760334847.  $p$

6760334848.  $q$

6760334849.  $\sim p$

6760334850.  $\sim q$

## Mathematics Section B

<b>Section Id :</b>	676033108
<b>Section Number :</b>	6
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	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 :	676033108
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 6760331611 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let  $p$ ,  $q$  and  $r$  be the first three terms of a G.P. such that  $|p + q + r| = 15$ , and the common ratio of this G.P. is negative. If  $p < r$  and  $q = 10$ , then the product of the second and the fourth terms in it 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 : 6760331612 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let  $M = (a_{ij})_{3 \times 3}$ , where  $a_{ij} = \begin{cases} -1, & i = j, \\ i^2 - j^2, & i < j, \\ 2i - j, & i > j. \end{cases} \quad (i, j = 1, 2, 3)$

If  $X = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ , then value of  $-X^T M X$  is \_\_\_\_\_. (Here,  $X^T$  denotes transpose of  $X$ ).

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 : 6760331613 Question Type : SA**

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

Each of the numbers 1, 0, -1 is written on two different opposite faces of a six faces fair die. This die is thrown three times. The number of ways in which the sum of the numbers appearing is zero, is \_\_\_\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 84 Question Id : 6760331614 Question Type : SA**

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

If  $f(x) = |3 - x| + |2 + x| + |5 - x|$ ,  $x \in \mathbb{R}$ , then the minimum value of  $f(x)$  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 : 6760331615 Question Type : SA**

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

The local minimum value of  $\frac{(5+x)(2+x)}{(1+x)}$ ,  $(x \neq -1)$ , 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 :** 6760331616 **Question Type :** SA

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

$$\text{If } \int (\sqrt{\tan x} + \sqrt{\cot x}) dx = a \tan^{-1} \left( \frac{\tan x - 1}{\sqrt{b \tan x}} \right) + C,$$

then the value of  $a^4 + b^5$  is \_\_\_\_\_.

(Here, C is a constant of integration).

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number :** 87 **Question Id :** 6760331617 **Question Type :** SA

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

Maximum number of lines, through the origin which make equal angles with the three coordinate axes in XYZ-space, 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 : 6760331618 Question Type : SA**

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

If the distance between the point  $(a, -1, 1)$  ( $a > 0$ ) and the plane passing through the points  $(1, -2, 1)$ ,  $(3, 1, 0)$  and  $(2, 0, 1)$  is  $\frac{7}{\sqrt{6}}$ , then the value of 'a' is \_\_\_\_\_.

**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 : 6760331619 Question Type : SA**

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

The number of points in  $(0, 2\pi)$ , where the function  $f : \mathbb{R} \rightarrow \mathbb{R}$  given by  $f(x) = |\sin x| + |\cos x|$  is **NOT** differentiable, 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 : 6760331620 Question Type : SA**

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

If  $\tan A$  is equal to the integral solution of the inequality  $4x^2 - 24x + 35 < 0$  and  $\sin B$  is equal to the slope of the angle bisector of the second quadrant, then  $40 \sin(A + B) \sin(B - A)$  is \_\_\_\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100