

# Mathematics Section A

Section Id :	708191872
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 :	7081911152
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 70819119984 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If  $\vec{a}$  and  $\vec{b}$  are perpendicular, then  $\vec{a} \times \left( \vec{a} \times \left( \vec{a} \times \left( \vec{a} \times \vec{b} \right) \right) \right)$  is equal to :

Options :

70819165101.  $\vec{0}$

70819165102.  $\frac{1}{2} |\vec{a}|^4 \vec{b}$

70819165103.  $|\vec{a}|^4 \vec{b}$

70819165104.  $\vec{a} \times \vec{b}$

Question Number : 62 Question Id : 70819119985 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If  $(1, 5, 35)$ ,  $(7, 5, 5)$ ,  $(1, \lambda, 7)$  and  $(2\lambda, 1, 2)$  are coplanar, then the sum of all possible values of  $\lambda$  is :

Options :

70819165105.  $\frac{39}{5}$

70819165106.  $-\frac{39}{5}$

70819165107.  $-\frac{44}{5}$

70819165108.  $\frac{44}{5}$

Question Number : 63 Question Id : 70819119986 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The intersection of three lines  $x - y = 0$ ,  $x + 2y = 3$  and  $2x + y = 6$  is a :

Options :

70819165109. Right angled triangle

70819165110. Isosceles triangle

70819165111. Equilateral triangle

70819165112. None of the above

Question Number : 64 Question Id : 70819119987 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The value of  $\begin{vmatrix} (a+1)(a+2) & a+2 & 1 \\ (a+2)(a+3) & a+3 & 1 \\ (a+3)(a+4) & a+4 & 1 \end{vmatrix}$  is :

Options :

70819165113.  $(a+1)(a+2)(a+3)$

70819165114.  $(a+2)(a+3)(a+4)$

70819165115.  $-2$

70819165116.  $0$

Question Number : 65 Question Id : 70819119988 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The rate of growth of bacteria in a culture is proportional to the number of bacteria present and the bacteria count is 1000 at initial time  $t=0$ . The number of bacteria is increased by

20% in 2 hours. If the population of bacteria is 2000 after  $\frac{k}{\log_e\left(\frac{6}{5}\right)}$  hours, then  $\left(\frac{k}{\log_e 2}\right)^2$  is

equal to :

Options :

70819165117.  $2$

70819165118.  $4$

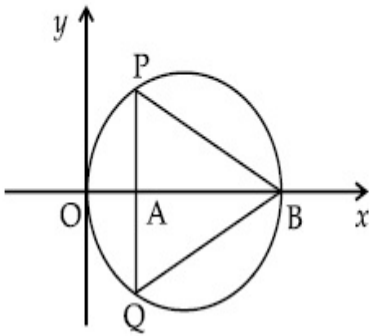
70819165119.  $8$

70819165120.  $16$

**Question Number : 66 Question Id : 70819119989 Question Type : MCQ Option Shuffling : Yes**  
**Is Question Mandatory : No**

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

In the circle given below, let  $OA = 1$  unit,  $OB = 13$  unit and  $PQ \perp OB$ . Then, the area of the triangle  $PQB$  (in square units) is :



**Options :**

70819165121.  $24\sqrt{2}$

70819165122.  $24\sqrt{3}$

70819165123.  $26\sqrt{2}$

70819165124.  $26\sqrt{3}$

**Question Number : 67 Question Id : 70819119990 Question Type : MCQ Option Shuffling : Yes**  
**Is Question Mandatory : No**

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

The value of  $\lim_{h \rightarrow 0} 2 \left\{ \frac{\sqrt{3} \sin\left(\frac{\pi}{6} + h\right) - \cos\left(\frac{\pi}{6} + h\right)}{\sqrt{3}h(\sqrt{3}\cos h - \sin h)} \right\}$  is :

**Options :**

70819165125.  $\frac{2}{3}$

70819165126.  $\frac{4}{3}$

70819165127.  $\frac{2}{\sqrt{3}}$

70819165128.  $\frac{3}{4}$

**Question Number : 68 Question Id : 70819119991 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

The maximum slope of the curve  $y = \frac{1}{2}x^4 - 5x^3 + 18x^2 - 19x$  occurs at the point :

**Options :**

70819165129.  $(0, 0)$

70819165130.  $(2, 2)$

70819165131.  $\left(3, \frac{21}{2}\right)$

70819165132.  $(2, 9)$

**Question Number : 69 Question Id : 70819119992 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

The value of  $\int_{-\pi/2}^{\pi/2} \frac{\cos^2 x}{1 + 3^x} dx$  is :

**Options :**

70819165133.  $\frac{\pi}{2}$

70819165134.  $2\pi$

70819165135.  $\frac{\pi}{4}$

70819165136.  $4\pi$

**Question Number : 70 Question Id : 70819119993 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

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

The number of seven digit integers with sum of the digits equal to 10 and formed by using the digits 1, 2 and 3 only is :

**Options :**

70819165137. 42

70819165138. 35

70819165139. 77

70819165140. 82

**Question Number : 71 Question Id : 70819119994 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

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

The maximum value of the term independent of 't' in the expansion of  $\left( tx^{\frac{1}{5}} + \frac{(1-x)^{\frac{1}{10}}}{t} \right)^{10}$

where  $x \in (0, 1)$  is :

**Options :**

70819165141.  $\frac{10!}{\sqrt{3}(5!)^2}$

70819165142.  $\frac{2 \cdot 10!}{3\sqrt{3}(5!)^2}$

70819165143.  $\frac{2 \cdot 10!}{3(5!)^2}$

70819165144.  $\frac{10!}{3(5!)^2}$

**Question Number : 72 Question Id : 70819119995 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

Let  $R = \{(P, Q) \mid P \text{ and } Q \text{ are at the same distance from the origin}\}$  be a relation, then the equivalence class of  $(1, -1)$  is the set :

**Options :**

70819165145.  $S = \{(x, y) \mid x^2 + y^2 = 4\}$

70819165146.  $S = \{(x, y) \mid x^2 + y^2 = 2\}$

70819165147.  $S = \{(x, y) \mid x^2 + y^2 = 1\}$

70819165148.  $S = \{(x, y) \mid x^2 + y^2 = \sqrt{2}\}$

**Question Number : 73 Question Id : 70819119996 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

Let  $A$  be a symmetric matrix of order 2 with integer entries. If the sum of the diagonal elements of  $A^2$  is 1, then the possible number of such matrices is :

**Options :**

70819165149. 1

70819165150. 4

70819165151. 6

70819165152. 12

**Question Number : 74 Question Id : 70819119997 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

Let  $f$  be any function defined on  $\mathbf{R}$  and let it satisfy the condition :

$$|f(x) - f(y)| \leq |x - y|^2, \forall (x, y) \in \mathbf{R}$$

If  $f(0) = 1$ , then :

**Options :**

70819165153.  $f(x) > 0, \forall x \in \mathbf{R}$

70819165154.  $f(x) < 0, \forall x \in \mathbf{R}$

70819165155.  $f(x) = 0, \forall x \in \mathbf{R}$

70819165156.  $f(x)$  can take any value in  $\mathbf{R}$

**Question Number : 75 Question Id : 70819119998 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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



A fair coin is tossed a fixed number of times. If the probability of getting 7 heads is equal to probability of getting 9 heads, then the probability of getting 2 heads is :

**Options :**

70819165157.  $\frac{15}{2^8}$

70819165158.  $\frac{15}{2^{12}}$

70819165159.  $\frac{15}{2^{13}}$

70819165160.  $\frac{15}{2^{14}}$

**Question Number : 76 Question Id : 70819119999 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

If  $\frac{\sin^{-1} x}{a} = \frac{\cos^{-1} x}{b} = \frac{\tan^{-1} y}{c}$ ;  $0 < x < 1$ , then the value of  $\cos\left(\frac{\pi c}{a + b}\right)$  is :

**Options :**

70819165161.  $1 - y^2$

70819165162.  $\frac{1 - y^2}{y\sqrt{y}}$

70819165163.  $\frac{1 - y^2}{1 + y^2}$

70819165164.  $\frac{1 - y^2}{2y}$

**Question Number : 77 Question Id : 70819120000 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

In an increasing geometric series, the sum of the second and the sixth term is  $\frac{25}{2}$  and the product of the third and fifth term is 25. Then, the sum of 4<sup>th</sup>, 6<sup>th</sup> and 8<sup>th</sup> terms is equal to :

**Options :**

70819165165.  $\frac{26}{4}$

70819165166.  $\frac{30}{4}$

70819165167.  $\frac{32}{4}$

70819165168.  $\frac{35}{4}$

**Question Number : 78 Question Id : 70819120001 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

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

The sum of the infinite series  $1 + \frac{2}{3} + \frac{7}{3^2} + \frac{12}{3^3} + \frac{17}{3^4} + \frac{22}{3^5} + \dots$  is equal to :

**Options :**

70819165169.  $\frac{9}{4}$

70819165170.  $\frac{11}{4}$

70819165171.  $\frac{13}{4}$

70819165172.  $\frac{15}{4}$

**Question Number : 79 Question Id : 70819120002 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

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

Consider the three planes

$$P_1 : 3x + 15y + 21z = 9,$$

$$P_2 : x - 3y - z = 5, \text{ and}$$

$$P_3 : 2x + 10y + 14z = 5$$

Then, which one of the following is true ?

**Options :**

70819165173.  $P_1$  and  $P_2$  are parallel.

70819165174.  $P_1$  and  $P_3$  are parallel.

70819165175.  $P_1, P_2$  and  $P_3$  all are parallel.

70819165176.  $P_2$  and  $P_3$  are parallel.

**Question Number : 80 Question Id : 70819120003 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

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

The value of  $\sum_{n=1}^{100} \int_{n-1}^n e^{x-[x]} dx$ , where  $[x]$  is the greatest integer  $\leq x$ , is :

**Options :**

70819165177.  $100(1 - e)$

70819165178.  $100(1 + e)$

70819165179.  $100e$

## Mathematics Section B

<b>Section Id :</b>	708191873
<b>Section Number :</b>	6
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	10
<b>Number of Questions to be attempted :</b>	5
<b>Section Marks :</b>	20
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	7081911153
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 81 Question Id : 70819120004 Question Type : SA**

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

The difference between degree and order of a differential equation that represents the family

of curves given by  $y^2 = a \left( x + \frac{\sqrt{a}}{2} \right)$ ,  $a > 0$  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 : 82 Question Id : 70819120005 Question Type : SA**

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

The sum of 162<sup>th</sup> power of the roots of the equation  $x^3 - 2x^2 + 2x - 1 = 0$  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 : 70819120006 Question Type : SA**

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

The area bounded by the lines  $y = ||x - 1| - 2|$  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 : 84 Question Id : 70819120007 Question Type : SA**

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

If  $y = y(x)$  is the solution of the equation  $e^{\sin y} \cos y \frac{dy}{dx} + e^{\sin y} \cos x = \cos x$ ,  $y(0) = 0$ ; then

$1 + y\left(\frac{\pi}{6}\right) + \frac{\sqrt{3}}{2}y\left(\frac{\pi}{3}\right) + \frac{1}{\sqrt{2}}y\left(\frac{\pi}{4}\right)$  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 :** 85 **Question Id :** 70819120008 **Question Type :** SA

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

The number of solutions of the equation  $\log_4(x-1) = \log_2(x-3)$  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 :** 86 **Question Id :** 70819120009 **Question Type :** SA

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

The number of integral values of 'k' for which the equation  $3\sin x + 4\cos x = k + 1$  has a solution,  $k \in \mathbb{R}$  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 :** 70819120010 **Question Type :** SA

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

Let  $(\lambda, 2, 1)$  be a point on the plane which passes through the point  $(4, -2, 2)$ . If the plane is perpendicular to the line joining the points  $(-2, -21, 29)$  and  $(-1, -16, 23)$ , then

$\left(\frac{\lambda}{11}\right)^2 - \frac{4\lambda}{11} - 4$  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 : 88 Question Id : 70819120011 Question Type : SA**

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

The value of the integral  $\int_0^{\pi} |\sin 2x| dx$  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 : 89 Question Id : 70819120012 Question Type : SA**

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

If  $\sqrt{3}(\cos^2 x) = (\sqrt{3} - 1)\cos x + 1$ , the number of solutions of the given equation when

$x \in \left[0, \frac{\pi}{2}\right]$  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 :** 70819120013 **Question Type :** SA

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

Let  $m, n \in \mathbb{N}$  and  $\gcd(2, n) = 1$ . If  $30\binom{30}{0} + 29\binom{30}{1} + \dots + 2\binom{30}{28} + 1\binom{30}{29} = n \cdot 2^m$ , then

$n + m$  is equal to \_\_\_\_\_.

(Here  $\binom{n}{k} = {}^n C_k$ )

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001