

PGDBA 2022

Question Paper

Question: 1

[Single Correct Option, +3, -1]

Read the passage and answer the following questions

Doomsayers of the past two centuries have blamed, among other things, novels, the radio, jazz, rock 'n roll, television, horror films, Dungeons & Dragons, video games, the internet, smartphones and social media for the sad decline of the young. John Protzko, a psychologist... wondered whether things might not be quite so gloomy as they seemed. To try to bring some rigour to the question, he went hunting for examples of a cognitive experiment called the marshmallow test. This test, first performed at Stanford University in the 1960s, measures how good young children are at self-control – specifically, whether or not they can defer a small but immediate reward, such as a marshmallow, in favour of a bigger one later. It was one of the first examples of a standardised psychological test, so it gave him plenty of historical data to work with.

The set-up is simple. A child is taken into a room and presented with a choice of sugary snacks. A researcher explains that the child can choose his favourite treat and eat it whenever he likes – but, if he waits 15 minutes, he can have two instead. The researcher then leaves the room. Age is the strongest predictor of successfully resisting the temptation [to take the treat immediately].

Among children of the same age, however, doing well on the test is associated with plenty of good things later in life, from healthy weight to longer school attendance and better exam results.

Dr Protzko...polled 260 experts in child cognitive development, inviting them to predict what he might find. Just over half thought that children would have become worse at delaying gratification – perhaps thinking about a plethora of recent studies into the supposedly deleterious effects of modern technology. Another third predicted no change.

Only 16% of the experts made the correct prediction. This is, that children have become steadily and significantly better at the test over the past half century. In 1967, the average waiting time before succumbing to temptation was around three minutes. By 2017, that had risen to eight minutes – an increase of about a minute a decade. And that increase seems to be happening at all levels of ability. The most impulsive children are improving at the same rate as the most prudent.

The rate of increase caught Dr Protzko's eye as well. That rate, a fifth of a standard deviation every decade, is about the same improvement as has been seen in IQ tests over the past 80 years.... The cause of this increase in IQ, which is dubbed the Flynn effect after the psychologist who brought it to the world's attention, remains mysterious – as does whether Dr Protzko's results are related to it. *IQ* is associated with the ability to delay gratification, but the correlation is far from perfect.

Qs. In the context of the passage, what do doomsayers intend to convey when they talk of 'the sad decline of the young'?

- | | | | |
|-------------------------|--|-------------------------|--|
| <input type="radio"/> A | The young waste a lot of time on social media. | <input type="radio"/> B | The young don't live up to their full potential. |
| <input type="radio"/> C | The young are lazy and that affects their studies. | <input type="radio"/> D | The young are failing the 'Marshmallow Test'. |

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Qs. From the passage it can be inferred that those doing well in the 'Marshmallow Test' are more likely to do well later in adult life because,

- A they work harder than other children, and therefore, succeed in life.
- B they can sacrifice short-term gains for higher long-term returns.
- C they are unaffected by social media, and therefore, are more successful in life.
- D they focus more on their studies than on watching television.

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[Single Correct Option, +3, -1]

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effect after the psychologist who brought it to the world's attention, remains mysterious – as does whether Dr Protzko's results are related to it. *IQ* is associated with the ability to delay gratification, but the correlation is far from perfect.

Qs. In the context of the passage, what could the 'plethora of recent studies into the supposedly deleterious effects of modern technology' have concluded?

- A Children are doing less well in exams when compared to the past.
- B Children are being affected by the 'Flynn Effect'.
- C There has been a decrease in IQ among children.
- D Children are keen on instant gratification.

Question: 4

[Single Correct Option, +3, -1]

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Qs. From the passage what can one infer about the impact of the 'Flynn Effect' on children's performance in the Marshmallow Test?

- A More children would fail the test than earlier.
- B Children's performance would remain the same.
- C The 'Flynn Effect' would have no impact on children's performance.
- D Children would do better than earlier.

Question: 5

[Single Correct Option, +3, -1]

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Qs. Which of the following best reflects the main argument of the passage?

- A Children have become more patient since the 1960 s despite a plethora of distractions.
- B Children have become less patient since the 1960 s despite a plethora of distractions.
- C Children have become less patient since the 1960s because of a plethora of distractions.
- D Children have become more patient since the 1960 s because of a plethora of distractions.

Question: 6

[Single Correct Option, +3, -1]

Read the passage and answer the following questions

One of the problems we face in working out where we stand on surveillance is that none of us know exactly how we are being surveilled, and what the coming years might bring. Surveillance technology is developing at breakneck speed, and what seemed science-fiction 10 years ago is today old news. As a thought experiment, consider a hypothetical government that demands that every citizen wears a biometric bracelet that monitors body temperature and heart-rate 24 hours a day. The resulting data is hoarded and analysed by government algorithms. The algorithms will know that you are sick even before you know it, and they will also know where you have been, and who you have met. The chains of infection could be drastically shortened, and even cut altogether. Such a system could arguably stop the epidemic in its tracks within days. Sounds wonderful, right?

The downside is, of course, that this would give legitimacy to a terrifying new surveillance system. If you know, for example, that I clicked on a Fox News link rather than a CNN link, that can teach you something about my political views and perhaps even my personality. But if you can monitor what happens to my body temperature, blood pressure and heart-rate as I watch the video clip, you can learn what makes me laugh, what makes me cry, and what makes me really, really angry.

It is crucial to remember that anger, joy, boredom and love are biological phenomena just like fever and a cough. The same technology that identifies coughs could also identify laughs. If corporations and governments start harvesting our biometric data en masse, they can get to know us far better than we know ourselves, and they can then not just predict our feelings but also manipulate our feelings and sell us anything they want – be it a product or a politician. Biometric monitoring would make Cambridge Analytica's data hacking tactics look like something from the Stone Age. Imagine North Korea in 2030, when every citizen has to wear a biometric bracelet 24 hours a day. If you listen to a speech by the Great Leader and the bracelet picks up the tell-tale signs of anger, you are done for.

You could, of course, make the case for biometric surveillance as a temporary measure taken during a state of emergency. It would go away once the emergency is over. But temporary measures have a nasty habit of outlasting emergencies, especially as there is always a new emergency lurking on the horizon. My home country of Israel, for example, declared a state of emergency during its

1948 War of Independence, which justified a range of temporary measures from press censorship and land confiscation to special regulations for making pudding (I kid you not). The War of Independence has long been won, but Israel never declared the emergency over, and has failed to abolish many of the "temporary" measures of 1948 (the emergency pudding decree was mercifully abolished in 2011).

Qs. What does the author want to convey through the anecdote of the Emergency Pudding Decree?

- A Powerful individuals may take advantage of an emergency to pass laws that are harmful.
- B Governments often abuse their power by not abolishing temporary laws sanctioned during a state of emergency.
- C Governments in power use measures taken during emergency as an excuse to justify surveillance.
- D Surveillance is bad for democracy.

Question: 7

[Single Correct Option, +3, -1]

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Qs. Many individuals wear smart watches that monitor heart rate, oxygen level and other physical activity. In the context of the passage, does this imply that governments are already practicing biometric surveillance?

- A No
- B Yes
- C Insufficient information
- D Maybe

Question: 8

[Single Correct Option, +3, -1]

Read the passage and answer the following questions

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Qs. How might authoritarian governments use biometric surveillance to remain in power

- A Monitoring negative emotions like anger or hatred to identify dissenters.
- B Using biometric data to crack down on opposition leaders and activists.
- C Using biometric data to push products/services that glorify the government
- D Ensuring that no pandemic or health crisis happens.

Question: 9

[Single Correct Option, +3, -1]

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Qs. How does the author define data surveillance?

A Data surveillance is something that uses data to manipulate our emotions and modify our behaviour.

B Data surveillance is something that can assist governments and corporations to predict our feelings.

C Data surveillance is 'Stone Age' technology, and hence, is being considered outdated and useless.

D

Data surveillance is not as scary as biometric surveillance, and hence, can be conveniently used by governments and corporations.

Question: 10

[Single Correct Option, +3, -1]

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Qs. In the context of the passage, which of the following statements about biometric surveillance are TRUE?

- 1. Biometric surveillance could arguably stop an epidemic very fast.**
- 2. Biometric surveillance turns emotions into data.**
- 3. Biometric surveillance can predict our actions.**
- 4. Biometric surveillance can manipulate our feelings.**

A 1, 3, 4

B 1, 2, 3, 4

C 1, 2, 4

D 2, 3, 4

Question: 11

[Single Correct Option, +3, -1]

Para Jumbles

1. He pioneered a new method for making such shapes understandable: instead of drawing them as solids, he made them see-through skeletons, as if constructed of wooden beams.
2. Most of Leonardo's drawings for Pacioli's book, which was finished in 1498, are variations of five shapes known as Platonic solids.
3. He also illustrated more complex shapes such as rhombicuboctahedron, which has twenty-six facets, eight of them equilateral triangles that are bordered by squares.
4. These are polyhedrons that have the same number of faces meeting at each vertex: pyramids, cubes, octahedrons (eight faces), dodecahedrons (twelve) and icosahedrons (twenty).

A 2134

B 2413

C 2341

D 2431

Question: 12

[Single Correct Option, +3, -1]

Para Jumbles

1. Mr. Hernandez is not the first Latin American head of state to be accused of drugtrafficking.
2. On 15th February, 2022, Mr. Juan Orlando Hernandez, the outgoing President of Honduras, was arrested and taken away in handcuffs.
3. But the rot goes particularly deep in Honduras.
4. The arrest was in response to an extradition request from the US relating to a drug trafficking case.

A 2134

B 2431

C 2341

D 2413

Question: 13

[Single Correct Option, +3, -1]

Para Jumbles

1. Both at the same level of credibility, both at the same level of fakery.
2. And so, at Disneyland, along with Mickey Mouse and the kindly Bears, there must also be, in tactile evidence, Metaphysical Evil (The Haunted Mansion) and Historical Evil (The Pirates), and in the waxwork museums, alongside the Venuses de Milo, we must find grave robbers, Dracula, Jack the Ripper and the Phantom of the Opera.
3. The ideology of this America wants to establish reassurance through imitation.
4. But profit defeats ideology, because the consumers want to be thrilled not only by the guarantee of the Good but also by the shudder of the Bad.

A 4321

B 3421

C 2341

D 3241

Question: 14

[Single Correct Option, +3, -1]

Fill in the blanks

The adjective for metal is metallic. But not for iron, which is _____

A strange

B ironic

C ferrous

D unlikely

Question: 15

[Single Correct Option, +3, -1]

Choose the combination of words that appropriately completes this sentence:

'You tried to _____ money from me, and now that I've refused, you _____ and _____ me.'

A Hedge, spank, scold

B Cadge, upbraid, reproach

C Cadge, braid, approach

D Cadge, argue, pester

Question: 16

[Single Correct Option, +3, -1]

Cases filed in different courts may be pending (not yet processed to completion) or closed. The total number of cases pending from previous years, the total number of new cases filed this year and the total number of cases closed this year in different courts across four states are given below.

State	Pending cases from Previous Years	New cases filed this Year	Cases closed this Year
S1	52753	17004	25252
S2	1217	7005	3414
S3	117328	32766	23722
S4	12876	2251	3731

Qs. Assuming that the total number of cases filed and getting closed remain approximately the same over the years, which states are likely to see a decrease in the total number of pending cases next year?

A S1,S3

B S2, S4

C S1, S4

D S2, S3

Question: 17

[Single Correct Option, +3, -1]

A city is divided into three regions P, Q and R. A survey was conducted in each of the regions to get an idea of the proportion of males and proportion of females who feel safe or unsafe. Accordingly, 250 males and 250 females were interviewed and the following were observed:

Regions	Number of Males who		Number of Females who	
	Feel Safe	Feel Unsafe	Feel Safe	Feel Unsafe
P	90	10	20	10
Q	30	20	40	60
R	80	20	60	60

Qs. The three regions can be ordered based on the differences in the proportion of males and proportion of females feeling safe as:

A $P > Q > R$

B $R > P > Q$

C $Q > P > R$

D $R > Q > P$

Question: 18

[Single Correct Option, +3, -1]

A product can have at most 3 defects D1, D2 and D3. Suppose 1000 samples of the product are inspected and the number of samples with different combinations of defects are tabulated as follows:

Sl. No.	Defects			Number of Samples
	D1	D2	D3	
1	Yes	Yes	Yes	20
2	Yes	Yes	No	50
3	Yes	No	Yes	130
4	Yes	No	No	200
5	No	Yes	Yes	100
6	No	Yes	No	50
7	No	No	Yes	50
8	No	No	No	400

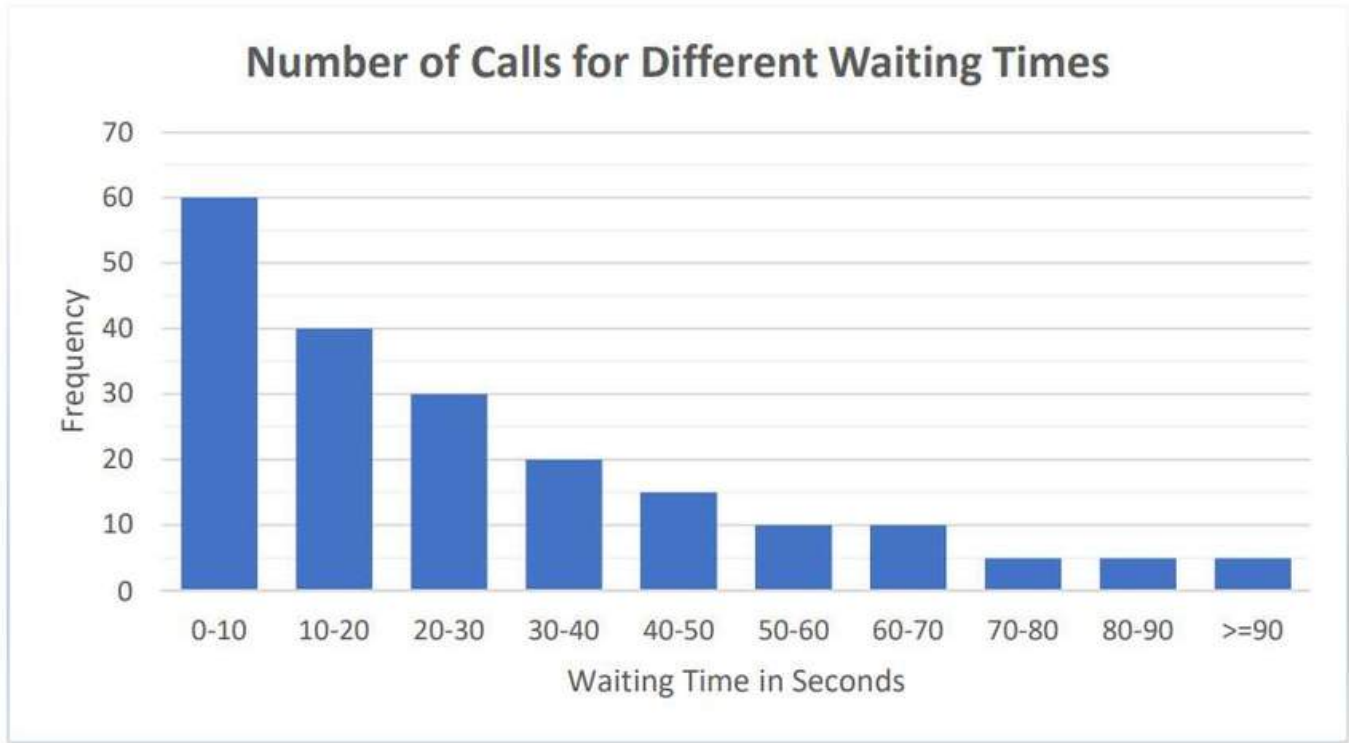
Qs. Which of the following statements is TRUE?

- A The number of samples with at least one defect is less than the number of samples with no defects
- B The number of samples with exactly one defect is less than the number of samples with exactly two defects
- C The number of samples with exactly one defect is more than the number of samples with more than one defect
- D More than 2% of the samples have at least two defects

Question: 19

[Single Correct Option, +3, -1]

Customers calling up a call center often need to wait before being attended to. In order to study the waiting time of customers, data were collected on waiting times of 200 calls. The following is a graphical representation of the observed waiting times. Note that the bar marked $a - b$ includes all waiting times t such that $a \leq t < b$. A call is said to have waiting time 0 in case it is answered as soon as it is connected to the call center.



Qs. The lowest possible value of the average of the observed waiting times is closest to

- A 21
- B 22.75
- C 20
- D 20.5

Question: 20

[Single Correct Option, +3, -1]

It is believed that job satisfaction is related to pay. A study was conducted where 400 respondents were asked about their monthly salary and level of job satisfaction. The data collected are given below.

Salary (Rs. / Month)	No. of Respondents with Level of Job Satisfaction			Total
	Low	Medium	High	
≤ 25000	20	30	70	120
> 25000 but ≤ 50000	20	40	90	150
> 50000	10	30	90	130
Total	50	100	250	400

Qs. A pair of respondents (R_1, R_2) with salary of R_1 greater than salary of R_2 and with job satisfaction of R_1 greater than job satisfaction of R_2 is called a concordant pair. Then the observed number of concordant pairs is

- A 16000
- B 16400

Question: 21**[Single Correct Option, +3, -1]**

There are four different teams in a tournament, each having exactly two players. These eight players {A, B, C, D, E, F, G and H} are sitting around a circular table, wearing dresses that are Red or Blue or Green in colour. No two players wearing dresses of same colour sit either adjacent or opposite to each other. Further, no two teammates wear dresses of same colour, and no two teammates sit either adjacent or opposite to each other.

It is also known that:

- 1) A, D, E and F belong to four different teams.
- 2) H and F belong to the same team.
- 3) A is wearing a Green dress and sitting opposite to C.
- 4) E is wearing a Blue dress and sitting opposite to G.
- 5) D is not wearing a Red dress and is not a teammate of G.
- 6) Wearing a Green dress, B is sitting to the immediate left of C and to the immediate right of teammate of C.

Qs. Who is definitely sitting adjacent to F?

A A

B G

C B

D E

Question: 22**[Single Correct Option, +3, -1]**

There are four different teams in a tournament, each having exactly two players. These eight players {A, B, C, D, E, F, G and H} are sitting around a circular table, wearing dresses that are Red or Blue or Green in colour. No two players wearing dresses of same colour sit either adjacent or opposite to each other. Further, no two teammates wear dresses of same colour, and no two teammates sit either adjacent or opposite to each other.

It is also known that:

- 1) A, D, E and F belong to four different teams.
- 2) H and F belong to the same team.
- 3) A is wearing a Green dress and sitting opposite to C.
- 4) E is wearing a Blue dress and sitting opposite to G.
- 5) D is not wearing a Red dress and is not a teammate of G.
- 6) Wearing a Green dress, B is sitting to the immediate left of C and to the immediate right of teammate of C.

Qs. What is the colour of the dress of teammate of D?

A Red

B Blue

C Green

D Cannot be determined

Question: 23**[Single Correct Option, +3, -1]**

There are four different teams in a tournament, each having exactly two players. These eight players {A, B, C, D, E, F, G and H} are sitting around a circular table, wearing dresses that are Red or Blue or Green in colour. No two players wearing dresses of same colour sit either adjacent or opposite to each other. Further, no two teammates wear dresses of same colour, and no two teammates sit either adjacent or opposite to each other.

It is also known that:

- 1) A, D, E and F belong to four different teams.
- 2) H and F belong to the same team.
- 3) A is wearing a Green dress and sitting opposite to C.
- 4) E is wearing a Blue dress and sitting opposite to G.
- 5) D is not wearing a Red dress and is not a teammate of G.
- 6) Wearing a Green dress, B is sitting to the immediate left of C and to the immediate right of teammate of C.

Qs. Who is sitting in-between two players wearing Blue dresses?

A A

B B

C F

D G

Question: 24

[Single Correct Option, +3, -1]

There are four different teams in a tournament, each having exactly two players. These eight players {A, B, C, D, E, F, G and H} are sitting around a circular table, wearing dresses that are Red or Blue or Green in colour. No two players wearing dresses of same colour sit either adjacent or opposite to each other. Further, no two teammates wear dresses of same colour, and no two teammates sit either adjacent or opposite to each other.

It is also known that:

- 1) A, D, E and F belong to four different teams.
- 2) H and F belong to the same team.
- 3) A is wearing a Green dress and sitting opposite to C.
- 4) E is wearing a Blue dress and sitting opposite to G.
- 5) D is not wearing a Red dress and is not a teammate of G.
- 6) Wearing a Green dress, B is sitting to the immediate left of C and to the immediate right of teammate of C.

Qs. Whose teammate is wearing a Red dress?

A C

B D

C E

D G

Question: 25

[Single Correct Option, +3, -1]

There are four different teams in a tournament, each having exactly two players. These eight players {A, B, C, D, E, F, G and H} are sitting around a circular table, wearing dresses that are Red or Blue or Green in colour. No two players wearing dresses of same colour sit either adjacent or opposite to each other. Further, no two teammates wear dresses of same colour, and no two teammates sit either adjacent or opposite to each other.

It is also known that:

- 1) A, D, E and F belong to four different teams.
- 2) H and F belong to the same team.
- 3) A is wearing a Green dress and sitting opposite to C.
- 4) E is wearing a Blue dress and sitting opposite to G.
- 5) D is not wearing a Red dress and is not a teammate of G.
- 6) Wearing a Green dress, B is sitting to the immediate left of C and to the immediate right of teammate of C.

Qs. Who is sitting opposite to B?

A D

B E

C Either F or H

D Either D or E

Question: 26

[Single Correct Option, +3, -1]

Which of the following equations will have positive integer solutions?

A $x^2 + y^2 = 2025$

B $x^2 + y^2 = 2023$

C $x^2 - y^2 = 2022$

D $xy(x - y) = 2021$

Question: 27

[Single Correct Option, +3, -1]

An airplane is observed to be approaching a point that is at a distance of 20 km from the point of observation such that the angle of elevation is 60° . Then the height of the airplane above the ground is

A $40\sqrt{3}$ km

B $\sqrt{30}$ km

C $10\sqrt{3}$ km

D 20 km

Question: 28

[Single Correct Option, +3, -1]

For what value of m will the equation $\frac{x^2 - bx}{ax - c} = \frac{m - 1}{m + 1}$ have roots equal in magnitude but opposite in sign?

A $\frac{a+b}{a-b}$

B $\frac{a-b}{a+b}$

C $\frac{a-c}{a+c}$

D $\frac{b-c}{b+c}$

Question: 29

[Single Correct Option, +3, -1]

If P and Q are two matrices such that $PQ = Q$ and $QP = P$, then $P^3 + Q^3$ is equal to

A $3PQ$

B $3QP$

C $P + Q$

D P^3Q^3

Question: 30

[Single Correct Option, +3, -1]

Suppose $2 \sin \theta - 5 \cos \theta = \sqrt{13}$. Then the expression $(2 \cos \theta + 5 \sin \theta)$ equals

A ± 5

B 0

C ± 13

D ± 4

Question: 31

[Single Correct Option, +3, -1]

Let a_1, a_2, a_3, a_4, a_5 be the distinct fifth roots of 1. Then the value of $a_1^{2022} + a_2^{2022} + a_3^{2022} + a_4^{2022} + a_5^{2022}$ is

A 0

B 5

C 7

D 10

Question: 32

[Single Correct Option, +3, -1]

Consider the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \max \{x, x^2\} - \min \{x, x^2\}$. Then f is differentiable

A everywhere except $x = 0$

B everywhere except $x = 0$ and $x = -1$

C everywhere except $x = 0$ and $x = 1$

D everywhere except $x = 0, x = 1$ and $x = -1$

Question: 33

[Single Correct Option, +3, -1]

The highest power of 7 that divides $2022!$ is

A 337

B 334

C 323

D 345

Question: 34

[Single Correct Option, +3, -1]

The area of the region bounded by the curves $y^2 = 4x$ and $y = 2x$ is

A $\frac{1}{10}$

B $\frac{1}{5}$

C $\frac{1}{3}$

D $\frac{1}{8}$

Question: 35

[Single Correct Option, +3, -1]

If α and β are the two roots of the quadratic equation $x^2 + x + 1 = 0$, then the equation whose roots are α^{2022} and β^{2022} is

A $x^2 + x - 1 = 0$

B $x^2 - 2x + 1 = 0$

C $x^2 + 2x - 1 = 0$

D $x^2 + x + 1 = 0$

Question: 36

[Single Correct Option, +3, -1]

For which values of $\lambda \in \mathbb{R}$ will the system of linear equations

$$x + y + z = 2$$

$$x + 2y + z = -2$$

$$x + y + (\lambda - 5)z = \lambda$$

have a unique solution?

A $\lambda = 6$

B $\lambda \neq 6$

C $\lambda = 2$

D $\lambda \neq 3$

Question: 37

[Single Correct Option, +3, -1]

The domain of the function $f(x) = \sqrt{\frac{1-|x|}{2-|x|}}$ is

A $\mathbb{R} \setminus \{-2, 2\}$

B $[-1, 1] \cup (-\infty, -2) \cup (2, \infty)$

C $(-1, 1) \cup (-\infty, -2) \cup (2, \infty)$

D $(-\infty, -2) \cup (2, \infty)$

Question: 38

[Single Correct Option, +3, -1]

Let P, Q, R be any three sets. Consider the following two statements:

(I) $P - (Q - R) = (P - Q) \cup R$

(II) $P - (Q \cup R) = (P - Q) - R$

Which of the following is TRUE?

A Both (I) and (II) are always correct

B Both (I) and (II) are always incorrect

C (II) is always correct and (I) is correct if and only if $P \subset R$

D (II) is always correct and (I) is correct if and only if $R \subset P$

Question: 39

[Single Correct Option, +3, -1]

If the line $\frac{x}{a} + \frac{y}{b} = 1$ is a tangent to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 1$, then which of the following is TRUE?

A $a^2 + b^2 = 1$

B $a^2 + b^2 = 2$

C $a^2 + b^2 = \frac{2}{3}$

D $\frac{1}{a^2} + \frac{1}{b^2} = 1$

Question: 40

[Single Correct Option, +3, -1]

The limit

$$\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right)^{\frac{1}{x}}$$

A is 1

B is 0

C is e

D does not exist

Question: 41

[Single Correct Option, +3, -1]

Let P be a 19×19 matrix whose entries in both the diagonals are all equal to 1 and all other entries are equal to 0. Then, $\text{rank}(P)$ is equal to

A 9

B 10

C 11

D 19

Question: 42**[Single Correct Option, +3, -1]**

Suppose E_1 and E_2 are two independent events, each having probability p . If $P(E_1 \cup E_2) = \frac{5}{9}$, what is the value of p ?

A $\frac{1}{9}$

B $\frac{2}{9}$

C $\frac{1}{3}$

D $\frac{5}{18}$

Question: 43**[Single Correct Option, +3, -1]**

Consider a function $f(x) = x^2 + px + q$ such that the roots of $f(x) = 0$ are positive and distinct. Let the arithmetic mean, the geometric mean and the harmonic mean of the two roots be a, b and c , respectively. Then, which of the following statements is TRUE?

A $f(a) > f(b) > f(c)$

B $f(a) > f(c) > f(b)$

C $f(a) < f(b) < f(c)$

D $f(a) < f(c) < f(b)$

Question: 44**[Single Correct Option, +3, -1]**

Let $a_1, a_2 \in \mathbb{R}$ be such that $|a_1 - a_2| = 10$. Consider

$$f(x) = \begin{vmatrix} 1 & a_2 & a_1 \\ 1 & a_2 & 2a_1 - x \\ 1 & 2a_2 - x & a_1 \end{vmatrix}$$

Then, the largest value of $f(x)$ is

A 15

B 20

C 25

D 30

Question: 45**[Single Correct Option, +3, -1]**

If $f(x) = \sin(\log_{10} x)$ and $h(x) = \cos(\log_{10} x)$, then $\frac{1}{2} \left(h\left(\frac{x}{y}\right) + h(xy) \right) - f(x)f(y)$ equals

A $\cos(\log_{10}(xy))$

B $\sin(\log_{10}(xy))$

C $\cos\left(\log_{10}\left(\frac{x}{y}\right)\right)$

D $\sin\left(\log_{10}\left(\frac{x}{y}\right)\right)$

Question: 46**[Single Correct Option, +3, -1]**

A straight line segment AB of length p moves with its ends on the axes. Let C be a point on AB such that $AC : BC = 1 : 3$. Then the equation of the locus of C is

A $16(x^2 + y^2) = 9p^2$

B $16(9x^2 + y^2) = 9p^2$

C $16(x^2 + 9y^2) = 9p^2$

D $16(9x^2 + y^2) = p^2$

Question: 47**[Single Correct Option, +3, -1]**

The number of terms in the expansion of $(1 - x)^{51} (1 + x + x^2 + x^3 + x^4)^{50}$ is

A 112

B 102

C 100

D 101

Question: 48**[Single Correct Option, +3, -1]**

For any real number x , let $[x]$ denote the greatest integer m such that $m \leq x$. Then the value of $\int_0^\pi [2 \sin x] dx$ is

A $\frac{\pi}{3}$

B $\frac{\pi}{6}$

C $\frac{2\pi}{3}$

D $\frac{\pi}{2}$

Question: 49**[Single Correct Option, +3, -1]**

If a circle passes through the points of intersection of the coordinate axes with the lines $x - \lambda y + 1 = 0$ and $x - 2y + 3 = 0$, then λ equals

A $\frac{3}{2}$ or $\frac{1}{2}$

B $\frac{2}{3}$ or $\frac{1}{2}$

C $\frac{4}{3}$ or $\frac{1}{3}$

D $\frac{3}{4}$ or $\frac{1}{3}$

Question: 50

[Single Correct Option, +3, -1]

In how many ways can the 26 letters of the English alphabet be arranged such that no two vowels are next to each other in the arrangement?

A $26! - 5 \times 21!$

B $26! - 5 \times 25!$

C ${}^{21}P_5 \times 21!$

D ${}^{22}C_5 \times 21! \times 5!$