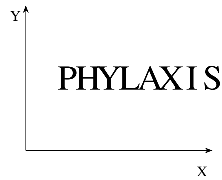
2021-AE-1-13

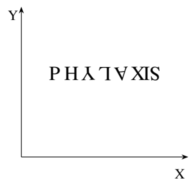
EE24BTECH11010 - BALAJI B

1) (i) Arun and Aparna are here.
   (ii) Arun and Aparna is here.
   (iii) Arun's families is here.
   (iv) Arun's family is here.
   Which of the above sentences are grammatically **CORRECT**? [2021 AE]

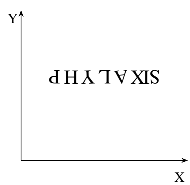
   a) (i) and (ii) b) (i) and (iv) c) (ii) and (iv) d) (iii) and (iv)

2) The mirror image of the below text about the x-axis is [2021 AE]

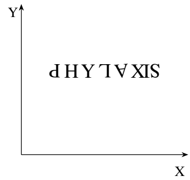




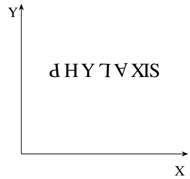
a)



b)



c)



d)

3) Two identical cube shaped dice each with faces numbered 1 to 6 are rolled simultaneously. The probability that an even number is rolled out on each dice is: [2021 AE]

a) $\frac{1}{36}$ b) $\frac{1}{12}$ c) $\frac{1}{8}$ d) $\frac{1}{4}$

4) $\oplus$ and $\odot$ are two operators on numbers p and q such that $p \odot q = p - q$, and $p \oplus q = p \times q$. Then, $(9 \odot (6 \oplus 7)) \odot (7 \oplus (6 \odot 5)) =$ [2021 AE]

a) 40
b) -26
c) -33
d) -40

5) Four persons P, Q, R and S are to be seated in a row. R should not be seated at the second position from the left end of the row. The number of distinct seating arrangements possible is: [2021 AE]

a) 6 b) 9 c) 18 d) 24

6) On a planar field, you travelled 3 units East from a point O. Next you travelled 4 units South to arrive at point P. Then you travelled from P in the North-East direction such that you arrive at a point that is 6 units East of point O. Next, you travelled in the North-West direction, so that you arrive at point Q that is 8 units North of point P. The distance of point Q to point O, in the same units, should be ____________ [2021 AE]

a) 3 b) 4 c) 5 d) 6

7) The author said, "Musicians rehearse before their concerts. Actors rehearse their roles before the opening of a new play. On the other hand, I find it strange that

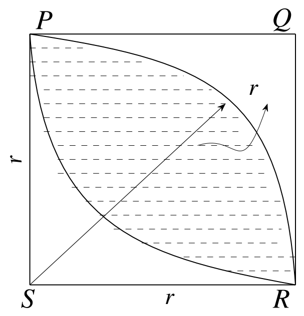
many public speakers think they can just walk on to the stage and start speaking. In my opinion, it is no less important for public speakers to rehearse their talks."

Based on the above passage, which one of the following is **TRUE**? [2021 AE]

a) The author is of the opinion that rehearsing is important for musicians, actors and public speakers.
b) The author is of the opinion that rehearsing is less important for public speakers than for musicians and actors.
c) The author is of the opinion that rehearsing is more important only for musicians than public speakers.
d) The author is of the opinion that rehearsal is more important for actors than musicians.

8) 1. Some football players play cricket.
2. All cricket players play hockey.
Among the options given below, the statement that logically follows from the two statements 1 and 2 above, is: [2021 AE]
a) No football player plays hockey.
b) Some football players play hockey.
c) All football players play hockey.
d) All hockey players play football.

9) In the figure shown above, $PQRS$ is a square. The shaded portion is formed by the intersection of sectors of circles with radius equal to the side of the square and centers at S and Q.
The probability that any point picked randomly within the square falls in the shaded area is ____________ [2021 AE]



a) $4 - \frac{\pi}{2}$
b) $\frac{1}{2}$
c) $\frac{\pi}{2} - 1$
d) $\frac{\pi}{4}$

10) In an equilateral triangle PQR, side PQ is divided into four equal parts, side QR is divided into six equal parts and side PR is divided into eight equal parts. The length of each subdivided part in cm is an integer.
The minimum area of the triangle PQR possible, in cm^2 , is [2021 XE]

a) 18 b) 24 c) $48\sqrt{3}$ d) $144\sqrt{3}$

11) Consider the differential equation $\frac{d^2y}{dx^2} + 8\frac{dy}{dx} + 16y = 0$ and the boundary conditions $y(0) = 1$ and $\frac{dy}{dx}(0) = 0$. The solution to this equation is: [2021 AE]

a) $y = (1 + 2x)\,e^{-4x}$
b) $y = (1 - 4x)\,e^{-4x}$
c) $y = (1 + 8x)\,e^{-4x}$
d) $y = (1 + 4x)\,e^{-4x}$

12) $u\,(x, y)$ is governed by the following equation $\frac{\partial^2 u}{\partial x^2} - 4\frac{\partial^2 u}{\partial x \partial y} + 6\frac{\partial^u}{\partial y^2} = x + 2y$. The nature of this equation is: [2021 AE]

a) linear
b) elliptic
c) hyperbolic
d) parabolic

13) Consider the velocity field $\mathbf{V} = (2x + 3y)\,\hat{\imath} + (3x + 2y)\,\hat{\jmath}$. The field $\mathbf{V}$ is [2021 AE]
a) divergence-free and curl-free
b) curl-free but not divergence-free
c) divergence-free but not curl-free
d) neither divergence-free nor curl-free

14) Let $\{X_n\}_{n\geq 1}$ be a sequence of independent and identically distributed random variables with $E\,(X_1) = 0$, $E\left(X_1^2\right)$ and $E\left(X_1^4\right) = 3$. Further, let

$$Y_n = \frac{X_1^2 + X_2^2 + \cdots + X_n^2}{n}$$

If

$$\lim_{n\to\infty} P\left(Y_n + \frac{\sqrt{n}(Y_n - 1)}{\sqrt{3}} \leq 2\right) = \Phi\,(c),$$

where $\Phi\,(.)$ denotes the cumulative distribution function of the standard normal distribution, then c^2 = ____________(correct up to one decimal place) [2020 ST]

15) Let the random vector $\mathbf{X} = (X_1, X_2, X_3)$ have the joint probability density function

$$f_{\mathbf{X}}\,(x_1, x_2, x_3) = \begin{cases} \frac{81}{4}x_1^2x_2^2x_3^2, & -1 \leq x_1 \leq x_2 \leq x_3 \leq 1, \\ 0, & \text{otherwise.} \end{cases}$$

Then the variable of the random variable $X_1 + X_2 + X_3$ equals ____________ (correct up to one decimal place) [2020 ST]

16) Let $X_1, \ldots, X_5$ be a random sample from a distribution with the probability density function

$$f\,(x;\theta) = \frac{1}{2}e^{-|x-\theta|}, x \in (-\infty, \infty),$$

where $\theta \in (-\infty, \infty)$. For testing $H_0 : \theta = 0$ against $H_1 : \theta < 0, let \sum_{i=1}^{5} Y_i$ be the sign test statistic, where

$$Y_i = \begin{cases} 1, & X > 0 \\ 0, & \text{otherwise} \end{cases}$$

Then the size of the test, which rejects H_0 if and only if $\sum_{i=1}^{5} Y_i \leq 2$, equals ____________ (correct up to one decimal place). [2020 ST]