JEE Main 2024 Mathematics Question Paper Jan 30 Shift 2

1. Bag A has 3 white and 7 red balls, Bag B has 3 white and 2 red balls. If a white ball is found, find the probability of it being from Bag A.

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2. The number of ways to distribute the 21 identical apples to three children so that each child gets at least 2 apples is:

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3. If $A = \{1, 2, 3, \ldots, 100\}$, $R = \{(x, y) \mid 2x = 3y, x, y \in A\}$ is a symmetric relation on A, and the number of elements in R is n, the smallest integer value of n is:

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4. Matrix A of order 3×3 is such that $|A| = 2$, if

$$n = \text{adj}(\text{adj}(\text{adj}(\ldots(A))\ldots)) \quad 2024 \text{ times},$$

then the remainder when n is divided by 9 is:

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5. If

$$A : \frac{x^2}{4} - \frac{x^2}{9} = 1, \quad \text{and} \quad \text{if} \quad P \text{ is a point on } \Delta PSS', \quad \text{and the area of} \quad \Delta PSS' = 2\sqrt{13},$$

then the square of the distance of P from the origin is:

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6. Two GP series (1), $a_1 = a, a_3 = b$, series (2) $b_1 = a, b_5 = b$. The 11th term from series (1) will be which term of series (2)?

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7. Given $|\mathbf{b}| = 2, |\mathbf{b} \times \mathbf{a}| = 2$, then $|\mathbf{b} \times \mathbf{a} - \mathbf{b}|^2$ is:

(1) 0
(2) 8
(3) 1
(4) 10

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8. If

$$f(x) = \ln\left(\frac{2x}{4x^2 - x - 3}\right) + \cos^{-1}\left(\frac{2x+1}{x+2}\right), \quad \text{if domain of } f(x) \text{ is } [\alpha, \beta] \text{ then } 5\alpha - 4\beta \text{ is:}$$

(1) -2
(2) 3
(3) -4
(4) 1

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9. If

$f(x) = (x-2)^2(x-3)^3$ and $x \in [1, 4]$ of M and m denotes maximum and minimum values respectively, then $M-m$ is:

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10. Find

$$f(x) = ae^{2x} + be^{x} + cx, \quad f(0) = -1, \quad f'(\log 2) = 21, \quad \int_0^{\log 4} f(x) - cx\,dx = \frac{39}{2}, \quad \text{find } |a+b+c|$$

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11. If

$$x\left(x^2+3\right)|x| + 5|x-1| + 6|x-2| = 0, \quad \text{then the number of solutions of the given equation is:}$$

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12. Given the equation

$$3\sin(A+B) = 4\sin(A-B), \quad \text{if} \quad \tan A = k\tan B, \quad \text{then the value of } k \text{ is:}$$

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13. If

$(y-2)^2 = (x-1)^2$ and $x-2y+4 = 0$, then find the area bounded by the curves between the coordinate axes in the first

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14. Find the number of common roots of the equation

$$z^{1901} + z^{100} + 1 = 0 \quad \text{and} \quad z^3 + 2z^2 + 2z + 1 = 0$$

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15. Find the number of relations which are symmetric but not reflexive on

$$A = \{1, 2, 3, 4\}.$$
