

MHT CET 2023 Question Paper with Answers and Solution May 13 Shift 1 (Memory-based)

**Question 1. Mean + Variance = 1.8, $n = 5$,
Find p (probability of success).**

Answer. $p = 1/5$

Question 2. If $X \sim (5, p)$ $P(X=3) = 5P(X=4)$, find variance.

Answer. $50/49$

Question 3. Find variance of first $2n$ natural numbers.

Answer. $4n^2 - 1 / 12$

Solution:

To find the variance of the first $2n$ natural numbers, we first need to find the mean of the sequence. The mean is simply the sum of the numbers divided by the total count of numbers:

$$\text{mean} = (1 + 2 + 3 + \dots + 2n) / 2n$$

Using the formula for the sum of an arithmetic series, we can simplify the expression for the mean to:

$$\text{mean} = (2n + 1) / 2$$

Next, we need to find the variance. The variance is defined as the average of the squared differences from the mean. In other words:

$$\text{variance} = [(1 - \text{mean})^2 + (2 - \text{mean})^2 + \dots + (2n - \text{mean})^2] / 2n$$

We can simplify this expression by expanding the squares and using the

formula for the sum of the first n natural numbers:

$$\text{variance} = [n(2n + 1)(4n + 1) - 6n(2n + 1) + 6n^2] / (12n)$$

Simplifying this expression, we get:

$$\text{variance} = (4n^2 - 1) / 12$$

Therefore, the variance of the first 2n natural numbers is $(4n^2 - 1) / 12$.

Question 4. $x^2 - 3xy + dy^2 + 3x - 5y + 2 = 0$; $d \geq 0$ is $\tan^{-1}(1/a)$ then the value of d is?

Question 5. The negation of inverse of the statement $(p \wedge q) \rightarrow (p \vee \sim q)$

Question 6. The value of $i^{248} + i^{246} + i^{244} + i^{242} + i^{240} / i^{249} + i^{247} + i^{245} + i^{243} + i^{241}$?

Question 7. Diff $\tan^{-1}(\sqrt{1+x^2} - 1 / x)$ wrt $\cos^{-1}(\sqrt{(1+\sqrt{1+x^2}) / 2\sqrt{1+x^2}})$

Question 8. Rolle Theorem $f(x) = \sin x + \cos x$. Find $c \in [0, 2, \pi]$

Question 9. $\int \log(x^2 + a^2) / x^2 dx$

Question 10. $y = \tan^{-1}(4 \sin 2x / \cos 2x - 6 \sin^2 x)$ dx