

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

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**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