1 **JEE Main 2021 (Online) 17th March Evening Shift**

Numerical

Consider a set of 3n numbers having variance 4. In this set, the mean of first 2n numbers is 6 and the mean of the remaining n numbers is 3. A new set is constructed by adding 1 into each of first 2n numbers, and subtracting 1 from each of the remaining n numbers. If the variance of the new set is k, then 9k is equal to _____.

Answer

Correct Answer is **68**

Explanation

Let first 2n observations are $x_1, x_2 \ldots\ldots\ldots\ldots, x_{2n}$

and last n observations are $y_1, y_2 \ldots\ldots\ldots\ldots, y_n$

Now, $\frac{\sum x_i}{2n} = 6, \frac{\sum y_i}{n} = 3$

$\Rightarrow \sum x_i = 12n, \sum y_i = 3n$

$\therefore \frac{\sum x_i + \sum y_i}{3n} = \frac{15n}{3n} = 5$

Now, $\frac{\sum x_i^2 + \sum y_i^2}{3n} - 5^2 = 4$

$\Rightarrow \sum x_i^2 + \sum y_i^2 = 29 \times 3n = 87n$

Now, mean is $\frac{\sum (x_i+1) + \sum (y_i-1)}{3n} = \frac{15n+2n-n}{3n} = \frac{16}{3}$

Now, variance is $\frac{\sum (x_i+1)^2 + \sum (y_i-1)^2}{3n} - \left(\frac{16}{3}\right)^2$

$= \frac{\sum x_i^2+\sum y_i^2+2(\sum x_i-\sum y_i)+3n}{3n} - \left(\frac{16}{3}\right)^2$

$= \frac{87n+2(9n)+3n}{3n} - \left(\frac{16}{3}\right)^2$

$= 29 + 6 + 1 - \left(\frac{16}{3}\right)^2$

$= \frac{324-256}{9} = \frac{68}{9} = k$

$\Rightarrow$ 9k = 68

Therefore, the correct answer is 68.