

38. Let $x_i \in [-1, 1]$ for $i = 1, 2, 3, \dots, 24$, such that

$$\sin^{-1}x_1 + \sin^{-1}x_2 + \dots + \sin^{-1}x_{24} = 12\pi$$

then the value of $x_1 + 2x_2 + 3x_3 + \dots + 24x_{24}$ is

(1) 276

(2) 300

(3) 325

(4) 351

We know that $-\frac{\pi}{2} \leq \sin x_i \leq \frac{\pi}{2} \quad \forall i = 1, 2, \dots, 24$.

$$\text{So, } -\frac{\pi}{2} \times 24 \leq \sum_{i=1}^{24} \sin x_i \leq \frac{\pi}{2} \times 24$$

$$\Rightarrow -2\pi \leq \sum_{i=1}^{24} \sin x_i \leq 2\pi$$

We are given that $\sum \sin x_i = 2\pi$, this is possible only if each $\sin x_i$ attains maximum value, i.e., $\frac{\pi}{2}$ which implies $x_i = 1 \quad \forall i = 1, 2, \dots, n$.

$$\therefore x_1 + 2x_2 + \dots + 24x_{24} = 1 \cdot [1 + 2 + 3 + \dots + 24] = \boxed{300}$$