Mathematical Reasoning - Class XI

Past Year JEE Questions

Questions

Quetion: 01

Consider the following two statements :

Statement p :

The value of sin 120^{O} can be derived by taking $\theta = 240^{O}$ in the equation
$2\sin\frac{\theta}{2} = \sqrt{1+\sin\theta} - \sqrt{1-\sin\theta}$

Statement q :
The angles A, B, C and D of any quadrilateral ABCD satisfy the equation
$\cos\left(\frac{1}{2}(A+C)\right) + \cos\left(\frac{1}{2}(B+D)\right) = 0$

Then the truth values of p and q are respectively :
A. F, T
B. T, F
C. T, T
D. F, F

Solutions

Solution: 01

Explanation

Statement p :

sin 120^{O} = cos 30^{O} = $\frac{\sqrt{3}}{2} \Rightarrow$ 2 sin 120^{O} = $\sqrt{3}$

So, $\sqrt{1+\sin 240^{O}} - \sqrt{1-\sin 240^{O}}$

$= \sqrt{\frac{1-\sqrt{3}}{2}} - \sqrt{\frac{1+\sqrt{3}}{2}} \neq \sqrt{3}$

Statement q :
So, A + B + C + D = 2π

$\Rightarrow \frac{A+C}{2} + \frac{B+D}{2} = \pi$

$\Rightarrow \cos\left(\frac{A+C}{2}\right) + \cos\left(\frac{B+D}{2}\right)$

$= \cos\left(\frac{A+C}{2}\right) - \cos\left(\frac{A+C}{2}\right) = 0$

Therefore, statement p is false and statement q is true.