

Answer on Question#53115 - Physics - Field theory

A charge Q is placed at the centre of a square if electric field intensity due to the charge at the corners of the square is 'E' and the intensity at the mid-point of the side of square is 'e' then ratio of E/e will be?

NOTE- the Electric field mentioned here are different at both the points.

Solution:

Let the side of the square be a , then the distance from the centre of the square to its corner is $d_c = \frac{a}{\sqrt{2}}$ and the distance from the centre to the mid-point of the side is $d_m = \frac{a}{2}$. Therefore, the electric field intensity due to the charge at the corner of the square is given by

$$E = \frac{Q}{4\pi\epsilon_0 d_c^2}$$

and at the mid-point of the side

$$e = \frac{Q}{4\pi\epsilon_0 d_m^2}$$

So

$$\frac{E}{e} = \frac{d_m^2}{d_c^2} = \frac{\left(\frac{a}{2}\right)^2}{\left(\frac{a}{\sqrt{2}}\right)^2} = \frac{1}{2}$$

Answer: 1/2.