The "relative permittivity" is typically denoted as ε_r (or κ) and it is defined as
↳ "dielectric constant"

$$\varepsilon_r = \frac{\varepsilon}{\varepsilon_0}$$

where ε is the absolute permittivity of the material and ε_0 is the vacuum permittivity.

ε is a measure of the electrical polarizability of a dielectric.

$$\kappa = \varepsilon_r = \frac{\varepsilon}{\varepsilon_0}$$

So $\varepsilon_r = \kappa$ is a dimentionless quantity, also called dielectric constant.

The relative permittivity ε_r is directly related to the electric susceptibility χ_e by:

$$\chi_e = \kappa - 1 = \varepsilon_r - 1 \qquad \left(\text{for the vacuum } \varepsilon_r = 1 \text{ ; } \chi_e = 0\right)$$

also written as

$$\varepsilon = \varepsilon_r \varepsilon_0 = (1 + \chi_e)\,\varepsilon_0$$

For a capacitor: $\Delta V = \frac{\Delta V_0}{\kappa} = \frac{\Delta V_0}{\varepsilon_r} \Rightarrow C = \varepsilon_r \varepsilon_0 \frac{A}{d}$

↳ across a capacitor