

Since the three irreducible complex representations of $G = S_3$ can be defined over \mathbb{Q} , we know that \mathbb{Q} is a splitting field for G . The dimension equation $|G| = \sum \chi_i(1)^2$ here is $6 = 1^2 + 1^2 + 2^2$, so we have $\mathbb{Q}G \cong \mathbb{Q} \times \mathbb{Q} \times M_2(\mathbb{Q})$. The three central idempotents of $\mathbb{Q}G$ giving such a decomposition can be computed from the character table of S_3 . They are:

$$e1 = \{(1) + (123) + (132) + (12) + (23) + (13)\}/6,$$
$$e2 = \{(1) + (123) + (132) - (12) - (23) - (13)\}/6,$$
$$e3 = 1 - e1 - e2 = (1) * 2/3 - (123)/3 - (132)/3.$$