

4D Expressions Relating to Roots of Polynomials

1.

a) Expand $(\alpha + \beta + \gamma)^2$

b) A cubic equation has roots α , β and γ such that $\alpha\beta + \beta\gamma + \gamma\alpha = 7$ and $\alpha + \beta + \gamma = -3$.
Find the value of $\alpha^2 + \beta^2 + \gamma^2$.

$$\boxed{\text{The sum of the squared singles}} = \boxed{\text{The square of the sum of the singles}} - 2 \times \boxed{\text{The sum of the doubles}}$$

$$\boxed{\text{The sum of the cubed singles}} = \boxed{\text{The cube of the sum of the singles}} - 3 \times \boxed{\text{The sum of the doubles}} + 3 \times \boxed{\text{The sum of the triples}}$$

2. The three roots of a cubic equation are α , β and γ .

Given that $\alpha\beta\gamma = 4$, $\alpha\beta + \beta\gamma + \gamma\alpha = -5$ and $\alpha + \beta + \gamma = 3$,

find the value of $(\alpha + 3)(\beta + 3)(\gamma + 3)$.