

The basic formula: $(c + d)^2 = c^2 + 2 \cdot c \cdot d + d^2$

$$a^2 = a \cdot a = (5 + 2\sqrt{6})^2 = 25 + 20\sqrt{6} + 4 \cdot 6 = 49 + 20\sqrt{6}$$

$$b^2 = \frac{1}{a^2} = \frac{1}{49 + 20\sqrt{6}}$$

$$a^2 + b^2 = \frac{(49 + 20\sqrt{6})^2 + 1}{49 + 20\sqrt{6}} = \frac{2401 + 1960\sqrt{6} + 400 \cdot 6 + 1}{49 + 20\sqrt{6}} = \frac{4802 + 1960\sqrt{6}}{49 + 20\sqrt{6}}$$