$$log_2 x + 6log_4 x = 8$$

$$log_2 x + 6 \cdot \frac{1}{2} log_2 x = 8$$

$$log_2 x + 3log_2 x = 8$$

$$log_2 x + log_2 x^3 = 8$$

$$log_2 x^4 = 8$$

$$x^4 = 2^8$$

$$x^4 = (2^2)^4$$

$$x^4 = 4^4$$

$$x = 4$$