$$8^y = 4^{2x+3} \quad (i)$$

$$\log_2 y = \log_2 x + 4. \quad (ii)$$

Solve the simultaneous equations.

(i): $\log_2 8^y = \log_2 4^{2x+3}$ (taking logs of both sides)

$y \log_2 8 = (2x+3)\log_2 4.$ (as $x \log y = \log y^x$)

$$y = \frac{(2x+3)\log_2 4}{\log_2 8.} \quad (*)$$

In (ii) we notice that the term 4 can be written with $\log_2$ ($4 = \log_2 16$).:

$\therefore \log_2 y = \log_2 x + 4$

$= \log_2 x + \log_2 16$

$\Rightarrow \log_2 y = \log_2 16x$. (as $\log a + \log b = \log ab$).

So : $y = 16x$. (removing $\log_2$)

$$\frac{(2x+3)\log_2 4}{\log_2 8} = 16x. \quad \text{(substituting from (*))}$$

$$\therefore (2x+3)\log_2 4 = 16x \log_2 8.$$

$$\therefore 3\log_2 4 = 16x\log_2 8 - 2x\log_2 4.$$

$$\therefore 3\log_2 4 = x(16\log_2 8 - 2\log_2 4).$$

$$\Rightarrow x = \frac{3\overbrace{\log_2 4}^{2}}{16\underbrace{\log_2 8}_{3} - 2\underbrace{\log_2 4}_{2}}.$$

$$= \frac{3\times 2}{16.3-2.2} = \frac{6}{48-4} = \frac{6}{44} = \frac{3}{22}$$

$$y = 16x = 16\times\frac{3}{22} = \frac{8\times 3}{11} = \frac{24}{11}$$