

Task:

Find the ratios of $x : y : z$ from the equations ($x, y, z \neq 0$)

$$7x = 4y + 8z, 3z = 12x + 11y$$

(a) 4: -3 :5 (b) 2 : 3 : 5 (c) 3 : 1: 2 (d) 1: 4: 5

Solution:

$$\begin{cases} 7x = 4y + 8z \\ 3z = 12x + 11y \end{cases}$$

$$\begin{cases} 7x = 4y + 8 \cdot \left(\frac{12x + 11y}{3}\right) \\ z = \frac{12x + 11y}{3} \end{cases} \begin{cases} 7x = 4y + \frac{96x + 88y}{3} \\ z = \frac{12x + 11y}{3} \end{cases} \begin{cases} 3 \cdot 7x = 3 \cdot 4y + 96x + 88y \\ z = \frac{12x + 11y}{3} \end{cases}$$

$$\begin{cases} 21x = 12y + 96x + 88y \\ z = \frac{12x + 11y}{3} \end{cases} \begin{cases} 21x - 96x = 100y \\ z = \frac{12x + 11y}{3} \end{cases} \begin{cases} -75x = 100y \\ z = \frac{4 \cdot 3x + 11y}{3} \end{cases} \begin{cases} 3x = -4y \\ z = \frac{4 \cdot 3x + 11y}{3} \end{cases}$$

$$\begin{cases} 3x = -4y \\ z = \frac{4 \cdot (-4y) + 11y}{3} \end{cases} \begin{cases} 3x = -4y \\ z = \frac{-16y + 11y}{3} \end{cases} \begin{cases} y = -\frac{3x}{4} \\ z = \frac{-5y}{3} \end{cases} \begin{cases} 3x = -4y \\ z = \frac{-5(-\frac{3x}{4})}{3} \end{cases} \begin{cases} 3x = -4y \\ z = -5(-\frac{x}{4}) \end{cases}$$

$$\begin{cases} y = -\frac{3x}{4} \\ z = \frac{5x}{4} \end{cases}$$

So we get:

$$x : y : z = x : -\frac{3x}{4} : \frac{5x}{4} = 1 : -\frac{3}{4} : \frac{5}{4} = 4 : -3 : 5$$

Answer: (a) 4: -3 :5