

RECUPERO

Risolvi le seguenti equazioni numeriche intere.

$$1) \frac{1}{2} \left(3x - \frac{1}{5} \right) = \frac{1}{4} \left[6x - \left(1 - \frac{1}{15}x \right) \right] - \frac{1}{6}(x+1) + \frac{2}{30}$$

$$\frac{3}{2}x - \frac{1}{10} = \frac{1}{4} \left[6x - 1 + \frac{1}{15}x \right] - \frac{1}{6}x - \frac{1}{6} + \frac{1}{15} \Rightarrow \frac{3}{2}x - \frac{1}{10} = \frac{6}{4}x - \frac{1}{4} + \frac{1}{60}x - \frac{1}{6}x - \frac{1}{6} + \frac{1}{15}$$

$$60 \cdot \left(\frac{3}{2}x - \frac{1}{10} \right) = \left(\frac{3}{2}x - \frac{1}{4} + \frac{1}{60}x - \frac{1}{6}x - \frac{1}{6} + \frac{1}{15} \right) \cdot 60$$

$$90x - 6 = 90x - 15 + x - 10x - 10 + 4 \Rightarrow 90x - 90x - x + 10x = -15 - 10 + 4 + 6$$

$$9x = -15 \Rightarrow x = -\frac{15}{9} \Rightarrow x = -\frac{5}{3}$$

$$2) \frac{x-8}{12} + \frac{x+4}{4} = \frac{x+1}{3}$$

$$12 \cdot \left(\frac{x-8}{12} + \frac{x+4}{4} \right) = \frac{x+1}{3} \cdot 12 \Rightarrow x-8+3x+12=4x+4 \Rightarrow 4x-4x=4+8-12$$

$$0x=0 \Rightarrow 0=0 \Rightarrow \text{indeterminata}$$

$$3) \frac{(x+1)^2}{6} + \frac{(x-3)^2}{4} = \frac{(x+2)^2}{3} - 1 + \frac{(x-1)^2}{12}$$

$$12 \cdot \frac{(x+1)^2}{6} + 12 \cdot \frac{(x-3)^2}{4} = 12 \cdot \frac{(x+2)^2}{3} - 12 \cdot 1 + 12 \cdot \frac{(x-1)^2}{12}$$

$$2 \cdot (x+1)^2 + 3 \cdot (x-3)^2 = 4 \cdot (x+2)^2 - 12 + (x-1)^2$$

$$2 \cdot (x^2 + 2x + 1) + 3 \cdot (x^2 - 6x + 9) = 4 \cdot (x^2 + 4x + 4) - 12 + x^2 - 2x + 1$$

$$2x^2 + 4x + 2 + 3x^2 - 18x + 27 = 4x^2 + 16x + 16 + x^2 - 2x - 11$$

$$2x^2 + 4x + 3x^2 - 18x - 4x^2 - 16x - x^2 + 2x = 16 - 11 - 2 - 27$$

$$-28x = -24 \Rightarrow x = \frac{-24}{-28} \Rightarrow x = \frac{6}{7}$$

$$4) 6 + \frac{2(x-5)}{5} = 5 + \frac{2}{5}x \Rightarrow 5 \cdot \left[6 + \frac{2(x-5)}{5} \right] = \left(5 + \frac{2}{5}x \right) \cdot 5$$

$$30 + 2(x-5) = 25 + 2x \Rightarrow 30 + 2x - 10 = 25 + 2x \Rightarrow 2x - 2x = 25 - 30 + 10$$

$$0x = 5 \Rightarrow 0 = 5 \Rightarrow \text{impossibile.}$$

Risolvi le seguenti equazioni mediante la legge dell'annullamento del prodotto.

$$5) x(5x+2)(12-4x)=0$$

$$I) x=0 \quad II) 5x+2=0 \Rightarrow x=-\frac{2}{5} \quad III) 12-4x=0 \Rightarrow -4x=-12 \Rightarrow x=\frac{-12}{-4} \Rightarrow x=3$$

$$\text{Sol.: } x=-\frac{2}{5} \quad x=0 \quad x=3$$

$$6) (2x-1)(x+2)(x+7)=0$$

$$I) 2x-1=0 \Rightarrow x=\frac{1}{2} \quad II) x+2=0 \Rightarrow x=-2 \quad III) x+7=0 \Rightarrow x=-7$$

$$\text{Sol.: } x=-7 \quad x=-2 \quad x=\frac{1}{2}$$

Risolvi le seguenti equazioni numeriche fratte, scrivendo C.E. e m.c.m. dei denominatori.

$$7) \frac{2x}{3x-4} - \frac{2}{x+5} = \frac{3(x-1)}{3x-4} - \frac{x+3}{3(x+5)}$$

$$\frac{6x(x+5)-6(3x-4)}{3(x+5)(3x-4)} = \frac{9(x-1)(x+5)-(x+3)(3x-4)}{3(x+5)(3x-4)}$$

$$\text{C.E.:} \\ x+5 \neq 0 \Rightarrow x \neq -5$$

$$3x-4 \neq 0 \Rightarrow x \neq \frac{4}{3}$$

$$\text{m.c.m.: } 3(x+5)(3x-4)$$

$$6x(x+5)-6(3x-4)=9(x-1)(x+5)-(x+3)(3x-4)$$

$$6x^2+30x-18x+24=9x^2+45x-9x-45-(3x^2-4x+9x-12)$$

$$6x^2+12x+24=9x^2+36x-45-3x^2+4x-9x+12 \Rightarrow 6x^2+12x+24=6x^2+31x-33$$

$$6x^2+12x-6x^2-31x=-33-24 \Rightarrow -19x=-57 \Rightarrow x=\frac{-57}{-19} \Rightarrow x=3$$

$$8) \frac{11+4x}{2x+5} + \frac{1}{(2x+5)(3x+2)} = \frac{1}{3x+2} + 2$$

$$\frac{(11+4x)(3x+2)+1}{(2x+5)(3x+2)} = \frac{2x+5+2(2x+5)(3x+2)}{(2x+5)(3x+2)}$$

$$(11+4x)(3x+2)+1 = 2x+5+2(2x+5)(3x+2)$$

$$33x+22+12x^2+8x+1 = 2x+5+2(6x^2+4x+15x+10)$$

$$41x+23+12x^2 = 2x+5+12x^2+8x+30x+20 \Rightarrow 41x+12x^2-2x-12x^2-8x-30x = 5+20-23$$

$$x = 2$$

C.E.:

$$2x+5 \neq 0 \Rightarrow x \neq -\frac{5}{2}$$

$$3x+2 \neq 0 \Rightarrow x \neq -\frac{2}{3}$$

$$\text{m.c.m.: } (2x+5)(3x+2)$$

Risolvi e discuti, quando è necessario, l'equazione letterale intera nell'incognita x .

$$9) 3(1-4a)(x-2) + a(x-3) = 2a-3a(x-3)$$

$$3(x-2-4ax+8a) + ax-3a = 2a-3ax+9a \Rightarrow 3x-6-12ax+24a+ax-3a = 11a-3ax$$

$$3x-12ax+ax+3ax = 11a+6-24a+3a \Rightarrow 3x-8ax = 6-10a$$

$$(3-8a)x = 2(3-5a) \Rightarrow x = \frac{2(3-5a)}{3-8a} \Rightarrow \text{C.E.: } 3-8a \neq 0 \Rightarrow a \neq \frac{3}{8}$$

Discussione

$$\text{Se } a \neq \frac{3}{8} \Rightarrow x = \frac{2(3-5a)}{3-8a}.$$

$$\text{Se } a = \frac{3}{8} \Rightarrow x = \frac{2\left(3-5 \cdot \frac{3}{8}\right)}{3-8 \cdot \frac{3}{8}} = \frac{2 \cdot \frac{24-15}{8}}{3-3} = \frac{\frac{9}{4}}{0} = \frac{9}{0} \Rightarrow \text{impossibile}$$

Discuti e risolvi l'equazione letterale fratta nell'incognita x .

$$10) \frac{b}{3x-1} + \frac{b-1}{3x+1} = \frac{3b-2}{6x-2} - \frac{2b}{6x+2}$$

$$\frac{b}{3x-1} + \frac{b-1}{3x+1} = \frac{3b-2}{2(3x-1)} - \frac{2b}{2(3x+1)}$$

$$\text{C.E.: } 3x-1 \neq 0 \Rightarrow x \neq \frac{1}{3}; 3x+1 \neq 0 \Rightarrow x \neq -\frac{1}{3}.$$

$$2b(3x+1) + 2(b-1)(3x-1) = (3b-2)(3x+1) - 2b(3x-1)$$

$$6bx+2b+2(3bx-b-3x+1) = 9bx+3b-6x-2-6bx+2b$$

$$6bx + 2b + 6bx - 2b - 6x + 2 = 9bx + 3b - 6x - 2 - 6bx + 2b$$

$$12bx - 6x + 2 = 3bx + 5b - 6x - 2 \Rightarrow 12bx - 6x - 3bx + 6x = 5b - 2 - 2$$

$$9bx = 5b - 4 \Rightarrow x = \frac{5b - 4}{9b} \quad \text{C.E.: } 9b \neq 0 \Rightarrow b \neq 0;$$

Dalle C.E. iniziali:

$$x \neq \frac{1}{3} \Rightarrow \frac{5b - 4}{9b} \neq \frac{1}{3} \Rightarrow 5b - 4 \neq 3b \Rightarrow 5b - 3b \neq 4 \Rightarrow 2b \neq 4 \Rightarrow b \neq 2$$

$$x \neq -\frac{1}{3} \Rightarrow \frac{5b - 4}{9b} \neq -\frac{1}{3} \Rightarrow 5b - 4 \neq -3b \Rightarrow 5b + 3b \neq 4 \Rightarrow 8b \neq 4 \Rightarrow b \neq \frac{1}{2}$$

Discussione

$$\text{Se } b \neq 0, b \neq 2 \text{ e } b \neq \frac{1}{2} \Rightarrow x = \frac{5b - 4}{9b}$$

$$\text{Se } b = 0 \vee b = 2 \vee b = \frac{1}{2} \Rightarrow \text{Equazione impossibile.}$$

11) Risolvi il problema.

Luca versa in banca € 2100 in 30 banconote, in parte da € 10 e in parte da € 100. Quante sono le banconote da € 10 e quante da € 100?

x = numero banconote da € 10 y = numero banconote da € 100

$$10x + 100y = 2100 \quad y = 30 - x$$

$$10x + 100(30 - x) = 2100 \Rightarrow 10x + 3000 - 100x = 2100 \Rightarrow -90x = -900$$

$$x = \frac{-900}{-90} \Rightarrow x = 10 \Rightarrow y = 30 - 10 = 20$$

Le banconote da € 10 ne sono 10 e le banconote da € 100 ne sono 20.

APPROFONDIMENTO

Risolvi le seguenti equazioni numeriche intere.

$$1) \quad \frac{1}{2}\left(3x - \frac{1}{5}\right) = \frac{1}{4}\left[6x - \left(1 - \frac{1}{15}x\right)\right] - \frac{1}{6}(x+1) + \frac{2}{30}$$

$$\frac{3}{2}x - \frac{1}{10} = \frac{1}{4}\left[6x - 1 + \frac{1}{15}x\right] - \frac{1}{6}x - \frac{1}{6} + \frac{1}{15} \Rightarrow \frac{3}{2}x - \frac{1}{10} = \frac{6}{4}x - \frac{1}{4} + \frac{1}{60}x - \frac{1}{6}x - \frac{1}{6} + \frac{1}{15}$$

$$60 \cdot \left(\frac{3}{2}x - \frac{1}{10}\right) = \left(\frac{3}{2}x - \frac{1}{4} + \frac{1}{60}x - \frac{1}{6}x - \frac{1}{6} + \frac{1}{15}\right) \cdot 60 \Rightarrow 90x - 6 = 90x - 15 + x - 10x - 10 + 4$$

$$90x - 90x - x + 10x = -15 - 10 + 4 + 6 \Rightarrow 9x = -15 \Rightarrow x = -\frac{15}{9} \Rightarrow x = -\frac{5}{3}$$

$$2) \quad \frac{x-8}{12} + \frac{x+4}{4} = \frac{x+1}{3}$$

$$12 \cdot \left(\frac{x-8}{12} + \frac{x+4}{4}\right) = \frac{x+1}{3} \cdot 12 \Rightarrow x - 8 + 3x + 12 = 4x + 4 \Rightarrow 4x - 4x = 4 + 8 - 12$$

$$0x = 0 \Rightarrow 0 = 0 \Rightarrow \text{indeterminata}$$

$$3) \quad \frac{(x+1)^2}{6} + \frac{(x-3)^2}{4} = \frac{(x+2)^2}{3} - 1 + \frac{(x-1)^2}{12}$$

$$12 \cdot \frac{(x+1)^2}{6} + 12 \cdot \frac{(x-3)^2}{4} = 12 \cdot \frac{(x+2)^2}{3} - 12 \cdot 1 + 12 \cdot \frac{(x-1)^2}{12}$$

$$2 \cdot (x+1)^2 + 3 \cdot (x-3)^2 = 4 \cdot (x+2)^2 - 12 + (x-1)^2$$

$$2 \cdot (x^2 + 2x + 1) + 3 \cdot (x^2 - 6x + 9) = 4 \cdot (x^2 + 4x + 4) - 12 + x^2 - 2x + 1$$

$$2x^2 + 4x + 2 + 3x^2 - 18x + 27 = 4x^2 + 16x + 16 + x^2 - 2x - 11$$

$$2x^2 + 4x + 3x^2 - 18x - 4x^2 - 16x - x^2 + 2x = 16 - 11 - 2 - 27$$

$$-28x = -24 \Rightarrow x = \frac{-24}{-28} \Rightarrow x = \frac{6}{7}$$

$$4) \quad 6 + \frac{2(x-5)}{5} = 5 + \frac{2}{5}x \Rightarrow 5 \cdot \left[6 + \frac{2(x-5)}{5}\right] = \left(5 + \frac{2}{5}x\right) \cdot 5$$

$$30 + 2(x-5) = 25 + 2x \Rightarrow 30 + 2x - 10 = 25 + 2x \Rightarrow 2x - 2x = 25 - 30 + 10$$

$$0x = 5 \Rightarrow 0 = 5 \Rightarrow \text{impossibile.}$$

Riduci l'equazione a formula normale, fattorizza e risolvi mediante la legge dell'annullamento del prodotto.

$$5) \quad (3-x)(5+x) = 2x[(x+2)^2 + x - 4] \Rightarrow 15 + 3x - 5x - x^2 = 2x[x^2 + 4x + 4 + x - 4]$$

$$15 - 2x - x^2 = 2x[x^2 + 5x] \Rightarrow 15 - 2x - x^2 = 2x^3 + 10x^2 \Rightarrow 2x^3 + 10x^2 - 15 + 2x + x^2 = 0$$

$$2x^3 + 11x^2 + 2x - 15 = 0$$

Utilizzando Ruffini:

$$A(-1) = -2 + 11 - 2 - 15 = 11 - 19 = -8 \neq 0$$

$$A(1) = 2 + 11 + 2 - 15 = 15 - 15 = 0 \Rightarrow x - 1$$

$$2x^3 + 11x^2 + 2x - 15 = (x-1)(2x^2 + 13x + 15)$$

$$(x-1)(2x^2 + 13x + 15) = 0$$

Scomposizione del trinomio particolare $2x^2 + 13x + 15$:

trovare i due numeri la cui somma è 13 e il cui prodotto è $2 \cdot 15 = 30$.

I due numeri sono: 3 e 10.

$$\text{Pertanto: } 2x^2 + 13x + 15 = 2x^2 + 3x + 10x + 15 = x(2x+3) + 5(2x+3) = (2x+3)(x+5).$$

$$(x-1)(2x^2 + 13x + 15) = 0 \Rightarrow (x-1)(2x+3)(x+5) = 0$$

$$\text{I) } x-1=0 \Rightarrow x=1$$

$$\text{II) } 2x+3=0 \Rightarrow 2x=-3 \Rightarrow x=-\frac{3}{2} \Rightarrow$$

$$\text{III) } x+5=0 \Rightarrow x=-5 \Rightarrow$$

$$\text{Sol.: } x = -5, -\frac{3}{2}, 1.$$

Risolvi l'equazione numerica fratta, scrivendo C.E. e m.c.m. dei denominatori.

$$6) \quad \frac{11+4x}{2x+5} + \frac{1}{(2x+5)(3x+2)} = \frac{1}{3x+2} + 2$$

$$\frac{(11+4x)(3x+2)+1}{(2x+5)(3x+2)} = \frac{2x+5+2(2x+5)(3x+2)}{(2x+5)(3x+2)}$$

$$(11+4x)(3x+2)+1 = 2x+5+2(2x+5)(3x+2)$$

C.E.:

$$2x+5 \neq 0 \Rightarrow x \neq -\frac{5}{2}$$

$$3x+2 \neq 0 \Rightarrow x \neq -\frac{2}{3}$$

$$\text{m.c.m.: } (2x+5)(3x+2)$$

$$33x + 22 + 12x^2 + 8x + 1 = 2x + 5 + 2(6x^2 + 4x + 15x + 10)$$

$$41x + 23 + 12x^2 = 2x + 5 + 12x^2 + 8x + 30x + 20 \Rightarrow 41x + 12x^2 - 2x - 12x^2 - 8x - 30x = 5 + 20 - 23$$

$$x = 2$$

$$7) \quad \frac{4x-7}{2x-5} - 2 = \frac{1}{x-1} + \frac{5}{2x^2-7x+5} \Rightarrow \frac{4x-7}{2x-5} - 2 = \frac{1}{x-1} + \frac{5}{2x^2-2x-5x+5}$$

$$\frac{4x-7}{2x-5} - 2 = \frac{1}{x-1} + \frac{5}{2x(x-1)-5(x-1)} \Rightarrow \frac{4x-7}{2x-5} - 2 = \frac{1}{x-1} + \frac{5}{(x-1)(2x-5)}$$

$$\frac{4x-7}{2x-5} - 2 - \frac{1}{x-1} - \frac{5}{(x-1)(2x-5)} = 0$$

$$(4x-7)(x-1) - 2(x-1)(2x-5) - (2x-5) - 5 = 0$$

$$4x^2 - 4x - 7x + 7 - 2(2x^2 - 5x - 2x + 5) - 2x + 5 - 5 = 0$$

$$4x^2 - 11x + 7 - 4x^2 + 10x + 4x - 10 - 2x = 0 \Rightarrow 14x - 13x - 3 = 0 \Rightarrow x = 3$$

C.E.:

$$2x-5 \neq 0 \Rightarrow x \neq \frac{5}{2}$$

$$x-1 \neq 0 \Rightarrow x \neq 1$$

$$\text{m.c.m.: } (x-1)(2x-5)$$

Risolvi e discuti, quando è necessario, l'equazione letterale intera nell'incognita x .

$$8) \quad 3(1-4a)(x-2) + a(x-3) = 2a - 3a(x-3)$$

$$3(x-2-4ax+8a) + ax-3a = 2a-3ax+9a \Rightarrow 3x-6-12ax+24a+ax-3a = 2a-3ax+9a$$

$$3x-12ax+ax+3ax = 2a+9a+6-24a+3a \Rightarrow 3x-8ax = 6-10a$$

$$(3-8a)x = 6-10a \Rightarrow x = \frac{6-10a}{3-8a}$$

$$\text{C.E.: } 3-8a \neq 0 \Rightarrow -8a \neq -3 \Rightarrow a \neq \frac{3}{8}$$

Discussione

$$\text{Se } a \neq \frac{3}{8} \Rightarrow x = \frac{6-10a}{3-8a}$$

$$\text{Se } a = \frac{3}{8} \Rightarrow x = \frac{6-10 \cdot \frac{3}{8}}{3-8 \cdot \frac{3}{8}} = \frac{6-\frac{15}{2}}{3-3} = \frac{\frac{12-15}{2}}{0} = \frac{\frac{-3}{2}}{0} = \frac{-3}{0} \Rightarrow \text{impossibile}$$

Discuti e risolvi l'equazione letterale fratta nell'incognita x .

$$9) \quad \frac{1}{x(a-1)} + \frac{1}{ax+x} = \frac{1}{a-1} - \frac{2}{a+1} \quad (a \neq \pm 1)$$

$$\frac{1}{x(a-1)} + \frac{1}{x(a+1)} = \frac{1}{a-1} - \frac{2}{a+1} \Rightarrow \frac{1}{x(a-1)} + \frac{1}{x(a+1)} - \frac{1}{a-1} + \frac{2}{a+1} = 0$$

$$\frac{a+1+a-1-x(a+1)+2x(a-1)}{x(a+1)(a-1)} = 0 \quad \text{C.E.: } x \neq 0$$

$$\frac{2a+(-a-1+2a-2)x}{x(a+1)(a-1)} = 0 \Rightarrow \frac{(a-3)x+2a}{x(a+1)(a-1)} = 0 \Rightarrow (a-3)x+2a=0$$

$$x = -\frac{2a}{a-3} \quad \text{C.E.: } a-3 \neq 0 \Rightarrow a \neq 3 \quad \text{da } x \neq 0 \Rightarrow -\frac{2a}{a-3} \neq 0 \Rightarrow 2a \neq 0 \Rightarrow a \neq 0$$

Discussione

$$\text{Se } a \neq 3 \wedge a \neq 0 \Rightarrow x = -\frac{2a}{a-3} \quad (a \neq \pm 1)$$

$$\text{Se } a = 3 \Rightarrow x = \frac{6}{0} \Rightarrow \text{impossibile; Se } a = 0 \Rightarrow \text{equazione priva di significato.}$$

Discuti, senza risolverlo, il seguente sistema letterale nelle incognite x e y al variare del parametro in $\mathbb{R}$.

$$10) \quad \begin{cases} 2ax + y(a-1) = 2a \\ ax - ay = 1 \end{cases}$$

Da $ax - ay = 1 \Rightarrow a \neq 0$ altrimenti: $0 = 1$ impossibile

$$\text{Sistema determinato: } \frac{2a}{a} \neq \frac{a-1}{-a} \Rightarrow \frac{2a}{a} \neq \frac{1-a}{a} \Rightarrow 2a \neq 1-a \Rightarrow 3a \neq 1 \Rightarrow a \neq \frac{1}{3}$$

$$\text{Se } a \neq \frac{1}{3} \wedge a \neq 0, \text{ determinato; se } a = \frac{1}{3} \vee a = 0, \text{ impossibile.}$$

Risolvi il sistema nelle incognite x, y e z . Quando necessario, discuti al variare del parametro in $\mathbb{R}$.

$$11) \quad \begin{cases} 2x+3y-z=-1 \\ x-5y-3z=10 \\ 3x+4y-1=0 \end{cases} \quad \begin{cases} 2x+3y-z=-1 \\ x=10+5y+3z \\ 3x+4y-1=0 \end{cases} \quad \begin{cases} 2(10+5y+3z)+3y-z=-1 \\ x=10+5y+3z \\ 3(10+5y+3z)+4y-1=0 \end{cases}$$

$$\begin{cases} 20+10y+6z+3y-z=-1 \\ x=10+5y+3z \\ 30+15y+9z+4y-1=0 \end{cases} \quad \begin{cases} 13y+5z=-21 \\ x=10+5y+3z \\ 19y+9z=-29 \end{cases} \quad \begin{cases} z=-\frac{21+13y}{5} \\ x=10+5y-\frac{63+39y}{5} \\ 19y-\frac{189+117y}{5}=-29 \end{cases} \quad \begin{cases} z=-\frac{21+13y}{5} \\ 5x=50+25y-63-39y \\ 95y-189-117y=-145 \end{cases}$$

$$\begin{cases} z=-\frac{21+13y}{5} \\ 5x=50+25y-63-39y \\ 95y-189-117y=-145 \end{cases} \quad \begin{cases} z=-\frac{21+13y}{5} \\ 5x=-13-14y \\ -22y=44 \end{cases} \quad \begin{cases} z=-\frac{21+13y}{5} \\ 5x=-13-14y \\ y=\frac{44}{-22} \end{cases} \quad \begin{cases} z=-\frac{21+13(-2)}{5} \\ 5x=-13-14(-2) \\ y=-2 \end{cases}$$

$$\begin{cases} z=-\frac{21-26}{5} \\ 5x=-13+28 \\ y=-2 \end{cases} \quad \begin{cases} z=-\frac{-5}{5} \\ 5x=+15 \\ y=-2 \end{cases} \quad \begin{cases} z=1 \\ x=\frac{15}{5} \\ y=-2 \end{cases} \quad \begin{cases} z=1 \\ x=3 \\ y=-2 \end{cases} \Rightarrow \text{Sol.: } x=3, y=-2, z=1.$$

$$12) \quad \begin{cases} 2x-ay+z=-1 \\ x+2y-3z=a+7 \\ x-3ay+2z=-5a-2 \end{cases} \quad \begin{cases} 2(-2y+3z+a+7)-ay+z=-1 \\ x=-2y+3z+a+7 \\ -2y+3z+a+7-3ay+2z=-5a-2 \end{cases}$$

$$\begin{cases} -4y+6z+2a+14-ay+z=-1 \\ x=-2y+3z+a+7 \\ -2y+5z+a+7-3ay=-5a-2 \end{cases} \quad \begin{cases} -4y-ay+7z=-1-2a-14 \\ x=-2y+3z+a+7 \\ -2y+5z-3ay=-5a-2-a-7 \end{cases} \quad \begin{cases} -(a+4)y+7z=-2a-15 \\ x=-2y+3z+a+7 \\ -(3a+2)y+5z=-6a-9 \end{cases}$$

$$\begin{cases} (a+4)y-7z=2a+15 \\ x=-2y+3z+a+7 \\ (3a+2)y-5z=6a+9 \end{cases} \quad \begin{cases} y=\frac{2a+15+7z}{a+4} \\ x=-2y+3z+a+7 \\ y=\frac{6a+9+5z}{3a+2} \end{cases} \quad C.E.: \quad \begin{cases} a+4 \neq 0 \Rightarrow a \neq -4 \\ 3a+2 \neq 0 \Rightarrow a \neq -\frac{2}{3} \end{cases}$$

$$\begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ \frac{2a+15+7z}{a+4} = \frac{6a+9+5z}{3a+2} \end{cases} \quad \begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ (3a+2)(2a+15+7z) = (a+4)(6a+9+5z) \end{cases}$$

$$\begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ 6a^2+45a+21az+4a+30+14z = 6a^2+9a+5az+24a+36+20z \end{cases}$$

$$\begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ 21az+14z-5az-20z = 6a^2+9a+24a+36-6a^2-45a-4a-30 \end{cases}$$

$$\begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ 16az-6z = -16a+6 \end{cases} \quad \begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ 2(8a-3)z = -2(8a-3) \end{cases} \quad \begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ z = -\frac{2(8a-3)}{2(8a-3)} \end{cases} \quad \begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ z = -\frac{8a-3}{8a-3} \end{cases}$$

$$\text{C.E.: } 8a-3 \neq 0 \Rightarrow 8a \neq 3 \Rightarrow a \neq \frac{3}{8}$$

Se $a \neq \frac{3}{8}$:

$$\begin{cases} y = \frac{2a+15+7z}{a+4} \\ x = -2y+3z+a+7 \\ z = -\frac{8a-3}{8a-3} = -1 \end{cases} \quad \begin{cases} y = \frac{2 \cdot \frac{3}{8} + 15 - 7}{\frac{3}{8} + 4} \\ x = -2y - 3 + a + 7 \\ z = -1 \end{cases} \quad \begin{cases} y = \frac{\frac{3}{8} + 8}{\frac{3}{8} + 4} \\ x = -2y + 4 + a \\ z = -1 \end{cases} \quad \begin{cases} y = \frac{\frac{3+32}{4}}{\frac{3+32}{8}} = \frac{\frac{35}{4}}{\frac{35}{8}} = \frac{35}{4} \cdot \frac{8}{35} = 2 \\ x = -2y + 4 + a \\ z = -1 \end{cases}$$

$$\begin{cases} y = 2 \\ x = -4 + 4 + a = a \\ z = -1 \end{cases} \quad \begin{cases} y = 2 \\ x = a \\ z = -1 \end{cases} \Rightarrow \text{Sol.: } x = a, y = 2, z = -1.$$

Se $a = \frac{3}{8}$:

$$\left\{ \begin{array}{l} y = \frac{2 \cdot \frac{3}{8} + 15 + 7z}{\frac{3}{8} + 4} \\ x = -2y + 3z + \frac{3}{8} + 7 \\ z = -\frac{8 \cdot \frac{3}{8} - 3}{8 \cdot \frac{3}{8} - 3} \end{array} \right. \left\{ \begin{array}{l} y = \frac{\frac{3}{4} + 15 + 7z}{\frac{35}{8}} \\ x = -2y + 3z + \frac{3}{8} + 7 \\ z = -\frac{3-3}{3-3} = -\frac{0}{0} \end{array} \right. \Rightarrow \text{indeterminato}$$