# Solucions Sistemes d'Equacions

Substitució

**1.** $\left.\begin{array}{l}\mathbf{5x}-\mathbf{y}=\mathbf{2}\\ \mathbf{6x}+\mathbf{2y}=\mathbf{12}\end{array}\right\}$

-y = 2 – 5x
y = -2 + 5x
6x + 2·(-2 + 5x) = 12
6x – 4 + 10x = 12
6x + 10x = 12 + 4
16x = 16
$\boxed{x=1}$
y = -2 + 5·1
$\boxed{y=3}$

**2.** $\left.\begin{array}{l}\mathbf{3x}+\mathbf{2y}=\mathbf{0}\\ \mathbf{4x}+\mathbf{y}=-\mathbf{5}\end{array}\right\}$

y = -5 – 4x
3x + 2·(-5 – 4x) = 0
3x – 10 – 8x = 0
-5x = 10
$\boxed{x=-2}$
y = -5 – 4·(-2)
$\boxed{y=3}$

**3.** $\left.\begin{array}{l}\mathbf{3x}-\mathbf{2}\cdot(\mathbf{y}+\mathbf{2})=\mathbf{5}\\ \mathbf{3}-(\mathbf{x}-\mathbf{4y})=\mathbf{5}+\mathbf{x}\end{array}\right\}$

$\left.\begin{array}{l}3x-2y-4=5\\ 3-x+4y=5+x\end{array}\right\}\rightarrow\left.\begin{array}{l}3x-2y=9\\ -2x+4y=2\end{array}\right\}$

$3x = 9 + 2y \rightarrow x=\frac{9+2y}{3}$

$-2\cdot\frac{9+2y}{3}+4y=2\rightarrow\frac{-18-4y}{3}+4y=2$

$3\cdot\frac{-18-4y}{3}+3\cdot4y=3\cdot2$

1·(-18 – 4y) +12y = 6
-18 – 4y + 12y = 6
8y =24
y =3

$x=\frac{9+2\cdot3}{3}\rightarrow x=\frac{15}{3}\rightarrow\boxed{x=5}$

**4.** $\left.\begin{array}{l}\mathbf{y}+\mathbf{2}\cdot(\mathbf{3}-\mathbf{x})=\mathbf{5}-\mathbf{3y}\\ \mathbf{x}-(\mathbf{1}+\mathbf{2y})=\mathbf{3}-\mathbf{2}\cdot(\mathbf{1}+\mathbf{2x})\end{array}\right\}$

$\left.\begin{array}{l}y+6-2x=5-3y\\ x-1-2y=3-2-4x\end{array}\right\}\rightarrow\left.\begin{array}{l}-2x+4y=-1\\ 5x-2y=2\end{array}\right\}$

$4y = -1 + 2x \rightarrow y=\frac{-1+2x}{4}$

$5x-2\cdot\frac{-1+2x}{4}=2\rightarrow5x-\frac{-2+4x}{4}=2$

$4\cdot 5x - 4\cdot\frac{-2+4x}{4} = 4\cdot 2$

$20x - 1\cdot(-2 + 4x) = 8$

$20x + 2 - 4x = 8$

$16x = 6 \rightarrow x = \frac{6}{16} \rightarrow \boxed{x = \frac{3}{8}}$

$y = \frac{-1+2\cdot\frac{3}{8}}{4} \rightarrow \boxed{y = \frac{-1}{16}}$

**5.** $\left.\begin{array}{l} \mathbf{2 - \frac{x+3}{5} = \frac{y-3}{2} - x} \\ \mathbf{\frac{3}{4} - \frac{y-2x}{6} = \frac{x+1}{3}} \end{array}\right\}$

$\left.\begin{array}{l} 10\cdot 2 - 10\cdot\frac{x+3}{5} = 10\cdot\frac{y-3}{2} - 10\cdot x \\ 12\cdot\frac{3}{4} - 12\cdot\frac{y-2x}{6} = 12\cdot\frac{x+1}{3} \end{array}\right\}$

$\left.\begin{array}{l} 20 - 2\cdot(x+3) = 5\cdot(y-3) - 10x \\ 3\cdot 3 - 2\cdot(y-2x) = 4\cdot(x+1) \end{array}\right\}$

$\left.\begin{array}{l} 20 - 2x - 6 = 5y - 15 - 10x \\ 9 - 2y + 4x = 4x + 4 \end{array}\right\}$

$\left.\begin{array}{l} 8x - 5y = -29 \\ -2y = -5 \end{array}\right\} \rightarrow \boxed{y = \frac{5}{2}}$

$8x - 5\cdot\frac{5}{2} = -29 \rightarrow 8x - \frac{25}{2} = -29$

$8x = \frac{-33}{2} \rightarrow \boxed{x = \frac{-33}{16}}$

Igualació

**1.** $\left.\begin{array}{l} \mathbf{3x - 4y = 1} \\ \mathbf{-4x + 5y = -2} \end{array}\right\}$

$\left.\begin{array}{l} 3x = 1 + 4y \\ -4x = -2 - 5y \end{array}\right\}$

$\left.\begin{array}{l} x = \frac{1+4y}{3} \\ x = \frac{-2-5y}{-4} \end{array}\right\}$

$\frac{1+4y}{3} = \frac{-2-5y}{-4}$

$-4\cdot(1 + 4y) = 3\cdot(-2 - 5y)$

$-4 - 16y = -6 - 15y$

$-16y + 15y = -6 + 4$

$-y = -2$

$\boxed{y = 2}$

$x = \frac{1+4\cdot 2}{3}$

$\boxed{x = 3}$

**2.** $\left.\begin{array}{l} -\mathbf{x}+\mathbf{4y}=\mathbf{7} \\ \mathbf{3x}-\mathbf{2y}=-\mathbf{6} \end{array}\right\}$

$\left.\begin{array}{l} -x=7-4y \\ 3x=-6+2y \end{array}\right\}$

$\left.\begin{array}{l} x=\dfrac{7-4y}{-1} \\ x=\dfrac{-6+2y}{3} \end{array}\right\}$

$\dfrac{7-4y}{-1}=\dfrac{-6+2y}{3}$

$3\cdot(7-4y) = -1\cdot(-6+2y)$

$21-12y = 6-2y$

$-12y+2y = 6-21$

$-10y = -15$

$y=\dfrac{-15}{-10}$

$\boxed{y=\dfrac{3}{2}}$

$x=\dfrac{7-4\cdot\frac{3}{2}}{-1}$

$\boxed{x=-1}$

**3.** $\left.\begin{array}{l} \mathbf{2}-\mathbf{3}\cdot(\mathbf{x}-\mathbf{4})=\mathbf{5}+\mathbf{7y} \\ \mathbf{4y}-\mathbf{6}=\mathbf{2}-(\mathbf{3}-\mathbf{x}) \end{array}\right\}$

$\left.\begin{array}{l} 2-3x+12=5+7y \\ 4y-6=2-3+x \end{array}\right\}$

$\left.\begin{array}{l} -3x-7y=-9 \\ -x+4y=5 \end{array}\right\}$

$\left.\begin{array}{l} -3x=-9+7y \\ -x=5-4y \end{array}\right\}$

$\left.\begin{array}{l} x=\dfrac{-9+7y}{-3} \\ x=\dfrac{5-4y}{-1} \end{array}\right\}$

$\dfrac{-9+7y}{-3}=\dfrac{5-4y}{-1}$

$-1\cdot(-9+7y) = -3\cdot(5-4y)$

$9-7y = -15+12y$

$-7y-12y = -15-9$

$-19y = -24$

$y=\dfrac{-24}{-19}$

$\boxed{y=\dfrac{24}{19}}$

$x=\dfrac{-9+7\cdot\frac{24}{19}}{-3}$

$\boxed{x=\dfrac{1}{19}}$

**4.** $\left.\begin{array}{l} \mathbf{x+3\cdot(y-7)=1-(x+2)} \\ \mathbf{-(y+10)+4=x+5} \end{array}\right\}$

$\left.\begin{array}{l} x+3y-21=1-x-2 \\ -y-10+4=x+5 \end{array}\right\}$

$\left.\begin{array}{l} 2x+3y=20 \\ -x-y=11 \end{array}\right\}$

$\left.\begin{array}{l} 2x=20-3y \\ -x=11+y \end{array}\right\}$

$\left.\begin{array}{l} x=\dfrac{20-3y}{2} \\ x=\dfrac{11+y}{-1} \end{array}\right\}$

$\dfrac{20-3y}{2}=\dfrac{11+y}{-1}$

$-1\cdot(20-3y)=2\cdot(11+y)$

$-20+3y=22+2y$

$\boxed{y=42}$

$x=\dfrac{11+42}{-1}$

$\boxed{x=-53}$

**5.** $\left.\begin{array}{l} \mathbf{x-\dfrac{2+y}{3}=1+\dfrac{x-3}{2}} \\ \mathbf{4+\dfrac{2x-y}{10}=\dfrac{3}{5}-\dfrac{y+1}{2}} \end{array}\right\}$

$\left.\begin{array}{l} 6\cdot x-6\cdot\dfrac{2+y}{3}=6\cdot1+6\cdot\dfrac{x-3}{2} \\ 10\cdot4+10\cdot\dfrac{2x-y}{10}=10\cdot\dfrac{3}{5}-10\cdot\dfrac{y+1}{2} \end{array}\right\}$

$\left.\begin{array}{l} 6x-2\cdot(2+y)=6+3\cdot(x-3) \\ 40+1\cdot(2x-y)=2\cdot3-5\cdot(y+1) \end{array}\right\}$

$\left.\begin{array}{l} 6x-4-2y=6+3x-9 \\ 40+2x-y=6-5y-5 \end{array}\right\}$

$\left.\begin{array}{l} 6x-3x-2y=6-9+4 \\ 2x-y+5y=6-5-40 \end{array}\right\}$

$\left.\begin{array}{l} 3x-2y=1 \\ 2x+4y=-39 \end{array}\right\}$

$\left.\begin{array}{l} 3x=1+2y \\ 2x=-39-4y \end{array}\right\}$

$\left.\begin{array}{l} x=\dfrac{1+2y}{3} \\ x=\dfrac{-39-4y}{2} \end{array}\right\}$

$\dfrac{1+2y}{3}=\dfrac{-39-4y}{2}$

$2\cdot(1+2y)=3\cdot(-39-4y)$

$2+4y=-117-12y$

$16y=-119$

$$\boxed{y=\frac{-119}{16}}$$

$$x=\frac{1+2\cdot\left(\frac{-119}{16}\right)}{3}$$

$$\boxed{x=\frac{-37}{8}}$$

Reducció

**1.** $\left.\begin{matrix}\mathbf{3x-2y=0}\\ \mathbf{2x+3y=13}\end{matrix}\right\}$

m.c.m(3, 2) = 6

$\left.\begin{matrix}2\cdot(3x-2y=0)\\ 3\cdot(2x+3y=13)\end{matrix}\right\}$

$\left.\begin{matrix}6x-4y=0\\ 6x+9y=39\end{matrix}\right\}$

$$\begin{array}{r} 6x-4y=0 \\ +\ \underline{-6x-9y=-39} \\ -13y=-39 \end{array}$$

$y=\frac{-39}{-13}\rightarrow \boxed{y=3}$

$3x-2y=0\xrightarrow{y=3}3x-2\cdot 3=0$

$3x=6$

$x=\frac{6}{3}\rightarrow \boxed{x=2}$

**2.** $\left.\begin{matrix}\mathbf{-x+3y=5}\\ \mathbf{2x-y=-6}\end{matrix}\right\}$

m.c.m(1, 2) = 2

$\left.\begin{matrix}2\cdot(-x+3y=5)\\ 1\cdot(2x-y=-6)\end{matrix}\right\}$

$\left.\begin{matrix}-2x+6y=10\\ 2x-y=-6\end{matrix}\right\}$

$$\begin{array}{r} -2x+6y=10 \\ +\ \underline{2x-y=-6} \\ 5y=4 \end{array}$$

$\boxed{y=\frac{4}{5}}$

$2x-y=-6\xrightarrow{y=\frac{4}{5}}2x-\frac{4}{5}=-6$

$2x=-6+\frac{4}{5}\rightarrow x=\frac{-6+\frac{4}{5}}{2}\rightarrow \boxed{x=-\frac{13}{5}}$

**3.** $\left.\begin{array}{l} \mathbf{-(2y-x)+3=7-2x} \\ \mathbf{5-2\cdot(x+1)=x-(y+2)} \end{array}\right\}$

$\left.\begin{array}{l} -2y+x+3=7-2x \\ 5-2x-2=x-y-2 \end{array}\right\}$

$\left.\begin{array}{l} 3x-2y=4 \\ -3x+y=-5 \end{array}\right\}$

$$\begin{array}{r} 3x-2y=4 \\ +\ \underline{-3x+y=-5} \\ -y=-1 \end{array}$$

$\boxed{y=1}$

$3x-2y=4 \xrightarrow{y=1} 3x-2\cdot 1=4$

$3x=6 \rightarrow x=\frac{6}{3} \rightarrow \boxed{x=2}$

**4.** $\left.\begin{array}{l} \mathbf{-2x+y-4=1-(x+2y)} \\ \mathbf{-3\cdot(x-2y)+1=0} \end{array}\right\}$

$\left.\begin{array}{l} -2x+y-4=1-x-2y \\ -3x+6y+1=0 \end{array}\right\}$

$\left.\begin{array}{l} -x+3y=5 \\ -3x+6y=-1 \end{array}\right\}$

m.c.m(1, 3) = 3

$\left.\begin{array}{l} 3\cdot(-x+3y=5) \\ 1\cdot(-3x+6y=-1) \end{array}\right\}$

$\left.\begin{array}{l} -3x+9y=15 \\ -3x+6y=-1 \end{array}\right\}$

$$\begin{array}{r} -3x+9y=15 \\ +\ \underline{3x-6y=1} \\ 3y=16 \end{array}$$

$\boxed{y=\frac{16}{3}}$

$-x+3y=5 \xrightarrow{y=\frac{16}{3}} -x+3\cdot\frac{16}{3}=5$

-x + 16 = 5 $\rightarrow$ -x = -11 $\rightarrow$ $\boxed{x=11}$

**5.** $\left.\begin{array}{l} \dfrac{\mathbf{x-2}}{\mathbf{3}}-\mathbf{7}=\mathbf{1}-\dfrac{\mathbf{2x+y}}{\mathbf{6}} \\ \mathbf{2y}-\dfrac{\mathbf{1-3x}}{\mathbf{4}}=\mathbf{7}-\dfrac{\mathbf{2x+y}}{\mathbf{10}} \end{array}\right\}$

$$\left.\begin{array}{l} 6\cdot\dfrac{x-2}{3}-6\cdot 7=6\cdot 1-6\cdot\dfrac{2x+y}{6} \\ 20\cdot 2y-20\cdot\dfrac{1-3x}{4}=20\cdot 7-20\cdot\dfrac{2x+y}{10} \end{array}\right\}$$

$$\left.\begin{array}{l} 2\cdot(x-2)-42=6-1\cdot(2x+y) \\ 40y-5\cdot(1-3x)=140-2\cdot(2x+y) \end{array}\right\}$$

$$\left.\begin{array}{l} 2x-4-42=6-2x-y \\ 40y-5+15x=140-4x-2y \end{array}\right\}$$

$$\left.\begin{array}{l} 4x+y=52 \\ 19x+42y=145 \end{array}\right\}$$

m.c.m(4, 19) = 76

$$\left.\begin{array}{l} 19\cdot(4x+y=52) \\ 4\cdot(19x+42y=145) \end{array}\right\}$$

$$\left.\begin{array}{l} 76x+19y=988 \\ 76x+168y=580 \end{array}\right\}$$

$$\begin{array}{r} 76x+19y=988 \\ +\quad -76x-168y=-580 \\ \hline -149y=408 \end{array}$$

$$\boxed{y=-\frac{408}{149}}$$

$$4x+y=52 \xrightarrow{y=-\frac{408}{149}} 4x-\frac{408}{149}=52$$

$$4x=52+\frac{408}{149}\rightarrow x=\frac{52+\frac{408}{149}}{4}\rightarrow \boxed{x=\frac{2039}{149}}$$