

Chapter 3 / **Investigation 16****Solving systems of linear equations**

Investigation 16 is to be done without using a calculator, but all the results of solving systems of linear equations can be checked on one.

Solve the following simultaneous equations.

**a** 
$$\begin{cases} 4x + 3y = 18 \\ 7x - 4y = 13 \end{cases}$$

**b** 
$$\begin{cases} 2x - 5y = 4 \\ -6x + 15y = 3 \end{cases}$$

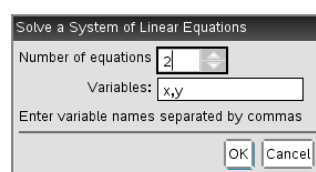
**c** 
$$\begin{cases} 10x - 4y = 3 \\ -2x + \frac{4}{5}y = -\frac{3}{5} \end{cases}$$

Open a new document and add a Calculator page.

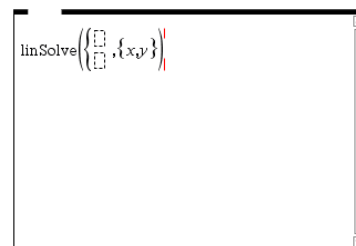
Press **menu** 3:Algebra | 2:Solve System of Linear Equations...

The default is 2 equations with  $x$  and  $y$  as variables.

Press **enter**.

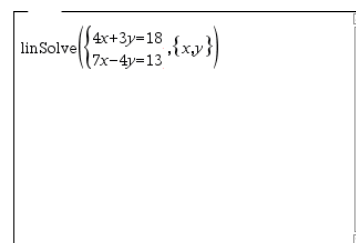


The template has places to type the two equations.

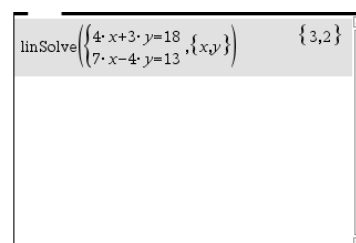


Type  $4x + 3y = 18$  and  $7x - 4y = 13$

Press **enter**.



The calculator displays the solution  $x = 3$  and  $y = 2$



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Press **menu** 3:Algebra | 2:Solve System of Linear Equations...

Type  $2x - 5y = 4$  and  $-6x + 15y = 3$

Press **enter**.

$$\text{linSolve}\left(\begin{cases} 4x + 3y = 18 \\ 7x - 4y = 13 \end{cases}, \{x, y\}\right) \quad \{3, 2\}$$

$$\text{linSolve}\left(\begin{cases} 2x - 5y = 4 \\ -6x + 15y = 3 \end{cases}, \{x, y\}\right)$$

The calculator shows that there are no solutions to the equations.

$$\text{linSolve}\left(\begin{cases} 4x + 3y = 18 \\ 7x - 4y = 13 \end{cases}, \{x, y\}\right) \quad \{3, 2\}$$

$$\text{linSolve}\left(\begin{cases} 2x - 5y = 4 \\ -6x + 15y = 3 \end{cases}, \{x, y\}\right) \quad \text{"No solution found"}$$

Press **menu** 3:Algebra | 2:Solve System of Linear Equations...

Type  $10x - 4y = 3$  and  $-2x + \frac{4}{5}y = -\frac{3}{5}$  using the fraction template, **ctrl**  $\frac{\square}{\square}$  to enter the fractions.

Press **enter**.

$$\text{linSolve}\left(\begin{cases} 4x + 3y = 18 \\ 7x - 4y = 13 \end{cases}, \{x, y\}\right) \quad \{3, 2\}$$

$$\text{linSolve}\left(\begin{cases} 2x - 5y = 4 \\ -6x + 15y = 3 \end{cases}, \{x, y\}\right) \quad \text{"No solution found"}$$

$$\text{linSolve}\left(\begin{cases} 10x - 4y = 3 \\ -2x + \frac{4}{5}y = -\frac{3}{5} \end{cases}, \{x, y\}\right)$$

The solution shown by the calculator is in terms of a parameter **c1**.

The equivalent cartesian equation is  $x = \frac{2}{5}y + \frac{3}{10}$ .

there are infinitely many solutions as the lines coincide.

$$\text{linSolve}\left(\begin{cases} 4x + 3y = 18 \\ 7x - 4y = 13 \end{cases}, \{x, y\}\right) \quad \{3, 2\}$$

$$\text{linSolve}\left(\begin{cases} 2x - 5y = 4 \\ -6x + 15y = 3 \end{cases}, \{x, y\}\right) \quad \text{"No solution found"}$$

$$\text{linSolve}\left(\begin{cases} 10x - 4y = 3 \\ -2x + \frac{4}{5}y = -\frac{3}{5} \end{cases}, \{x, y\}\right) \quad \left\{ \frac{2 \cdot c1}{5} + \frac{3}{10}, c1 \right\}$$