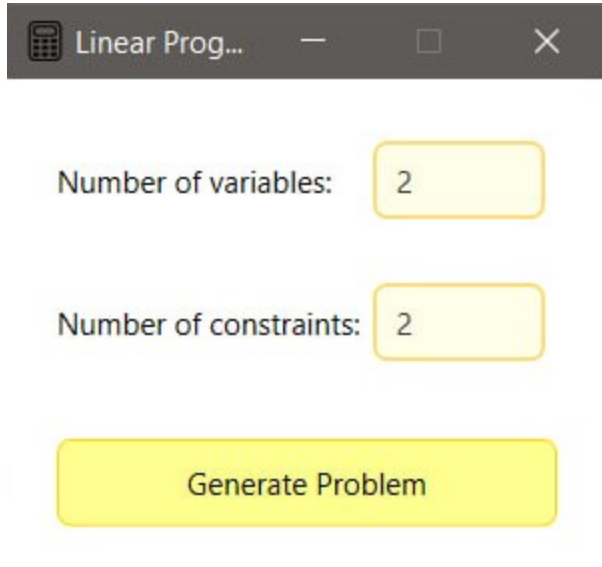# Linear Programming Calculator

Linear Programming Calculator is a product that helps you solve LPPs using the simplex method for constraints that are greater than or equal to, the Big M method for constraints that are less than or equal to or equal to, and finding integer solutions using Gomory cuts.

Quick Start 🏃:

When you start the project, it displays a **Startup window** where you can set the number of variables and constraints.

Then, when you press *Generate Problem*, another window will appear where you can set up all the necessary parameters. You can also **return to the startup window**, press *New Problem*, to edit the number of variables or constraints.

Linear Programming Solver

Objective function:

$$2\ x1\ +\ -3\ x2\ \rightarrow\ \text{max}$$

[New problem]   [Solve]

Constraints

$$5\ x1\ +\ 2\ x2\ \geq\ 10$$

$$1\ x1\ +\ 3\ x2\ \leq\ 12$$

☐ x1, x2 are integers

Finally, when you press *Solve* button, the application navigates to the **Result window**, where you can view all steps of the problem?solving process. Additionally, you can edit the current problem by pressing *Edit problem*, or start a new one by pressing *New problem*.

New problem   Edit problem

Mathematical model

$F(x_1, x_2) = 2x_1 + (-3)x_2 \to \max$
$5x_1 + 2x_2 \geq 10$
$1x_1 + 3x_2 \leq 12$

$x_1 \geq 0, x_2 \geq 0$

Introduce slack variables

$F(x_1, x_2, x_3, x_4) = 2x_1 + (-3)x_2 + 0x_3 + 0x_4 \to \max$
$5x_1 + 2x_2 + (-1)x_3 + 0x_4 = 10$
$1x_1 + 3x_2 + 0x_3 + 1x_4 = 12$

$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0, x_4 \geq 0$

Introduce artificial variables

$F(x_1, x_2, x_3, x_4, x_5) = 2x_1 + (-3)x_2 + 0x_3 + 0x_4 + (-M)x_5 \to \max$
$5x_1 + 2x_2 + (-1)x_3 + 0x_4 + 1x_5 = 10$
$1x_1 + 3x_2 + 0x_3 + 1x_4 + 0x_5 = 12$

$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0, x_4 \geq 0, x_5 \geq 0$

Initial feasible basic solution of the problem
$x_4 = 12, x_5 = 10$

Constructing the simplex table

Pivot column: A1
Pivot row: x5
Pivot element: x51

	C	-	2	-3	0	0	-M
	B	A0	A1	A2	A3	A4	A5
0	x4	12	1	3	0	1	0
-M	x5	10	5	2	-1	0	1
	Δ	-10M	-5M - 2	-2M + 3	1M	0	0

Namespace Linear_Programming_Calculator_Desktop

Namespaces

Linear_Programming_Calculator_Desktop.Attributes

Linear_Programming_Calculator_Desktop.Converters

Linear_Programming_Calculator_Desktop.DTOs

Linear_Programming_Calculator_Desktop.Models

Linear_Programming_Calculator_Desktop.Services

Linear_Programming_Calculator_Desktop.Stores

Linear_Programming_Calculator_Desktop.ViewModels

Namespace Methods

Namespaces

[Methods.Enums](#)

[Methods.Interfaces](#)

[Methods.MathObjects](#)

[Methods.Models](#)

[Methods.Solvers](#)