Simultaneous Linear Equations (Two or Three Unknowns)

Solution of two or three simultaneous linear equations by Cramer's rule, with the determinant to show whether a unique solution exists.

Method: Cramer's rule

Input parameters

Unit system: SI

Parameter	Value	Unit
Number of unknowns	Three (x, y, z)	
Equation 1: coefficient of x	2.0000	
Equation 1: coefficient of y	1.0000	
Equation 1: coefficient of z	-1.0000	
Equation 1: coefficient of the right-hand side	8.0000	
Equation 2: coefficient of x	-3.0000	
Equation 2: coefficient of y	-1.0000	
Equation 2: coefficient of z	2.0000	
Equation 2: coefficient of the right-hand side	-11.000	
Equation 3: coefficient of x	-2.0000	
Equation 3: coefficient of y	1.0000	
Equation 3: coefficient of z	2.0000	
Equation 3: coefficient of the right-hand side	-3.0000	

Calculated results

Parameter	Value	Unit
x	2.0000	
y	3.0000	
z (0 for two unknowns)	-1.0000	
Determinant	-1.0000	

Formula and method

$$x_k = \frac{\det A_k}{\det A}$$

Variables

n	Number of unknowns	-
a_{11}	Equation 1: coefficient of x	-
a_{12}	Equation 1: coefficient of y	-
a_{13}	Equation 1: coefficient of z	-
a_{14}	Equation 1: coefficient of the right-hand side	-
a_{21}	Equation 2: coefficient of x	-
a_{22}	Equation 2: coefficient of y	-
a_{23}	Equation 2: coefficient of z	-
a_{24}	Equation 2: coefficient of the right-hand side	-
a_{31}	Equation 3: coefficient of x	-

a_{32}	Equation 3: coefficient of y	-
a_{33}	Equation 3: coefficient of z	-
a_{34}	Equation 3: coefficient of the right-hand side	-
x	x	-
y	y	-
z	z (0 for two unknowns)	-
$\det A$	Determinant	-

Method and standards

Cramer's rule.

Assumptions and limits

- Linear equations.
- The system is treated as singular when |det A| is below 10^{-12} times the product of the row lengths of A (the largest the determinant can be), so the test does not depend on the scale of the coefficients.

References

- Cramer's rule

Report details

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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/geometry/simultaneous-equations

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Reopens the calculator with the inputs of this report.