

Linear Systems and Calories MATH NSPIRED Create Activity

Name	
Class	

Activity Overview

In this activity, you will create a new document to solve a linear system of three equations in three unknowns. You will learn three different strategies to solve the same linear system, one utilizing the Algebra menu of the Calculator application and each of the other two utilizing a Matrix. Any of the three methods can be used to solve a system of equations.

Steps

- Step 1: Select from > New Document. Add a Calculator application.
- Step 2: Method 1: linSolve(command from Algebra menu
- Press Menu > Algebra > Solve Systems of Equations > Solve Systems of Linear Equations.

Choose to solve a system of three linear equations. Press
 tab to enter the variables that you will be using. Use *p*, *c*, and *f* to represent protein, carbohydrates, and fat. Press
 [enter].

4	1	Actions	_	PAD 📄 🗙
1 2.5	2	Number	1	Solve
X=	3	Algebra	2	Factor
Sd	4	Calculus	3	Expand
0	5	Probability	4	Zeros
$\overline{\mathbf{X}}$	6	Statistics	5	Complete the Square
			-	himmed and Calus
	7	Matrix & \	6	Numerical Solve
[::] \$€	7	Matrix & \ Finance	6 7	Solve System of Equations •
[::] \$€	7 8 9	Matrix & \ Finance Functions	6 7 8	Solve System of Equations Polynomial Tools
(::) \$€ 81 10	7 8 9	Matrix & \ Finance Functions	6 7 8 9	Solve System of Equations Polynomial Tools Fraction Tools
[::] \$€ 81 10	7 8 9	Matrix & \ Finance Functions	6 7 8 9 A	Solve System of Equations Polynomial Tools Fraction Tools Convert Expression

.1 1.2 1.3 > *Linea	ries RAD (
Solve a System of	Linear Equations
Number of equations:	3
Variables:	p,c,f
Enter variable names s	separated by commas
	OK Cancel

It would be a good idea to save your document. Press ctrl 📓 and name your document. Press tab [save]. As you progress through this activity, remember that ctrl esc will undo your previous entry.

Enter the information from question 1 of the activity. The screen capture on the right shows the three entries. Press
 tab to move to the next equation.

1.2 1.3	3 2.1	▶ *Linear_S…rev	RAD 📘	X
linSolve	91• p 108• p 94• p	+271·c+65·f=2(p+288·c+48·f=2 +345·c+83·f=2	033 2016 ,{ <i>p,c,f</i> }	
				v

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4. Press enter to solve the system. Note, p = 4, c = 4, and f = 9.

Step 2: Method 2: Reduced row-echelon method

 The same solution can be found by using the reduced rowechelon form of the matrix. Press docr > Insert > Problem then Add Calculator Page..

2. Press Menu > Matrix & Vector > Create > Matrix.

 The augmented matrix for a system of equations with three equations with three unknowns will have 3 rows and 4 columns. Press tab to move around the page to make your selections. Highlight OK, and press enter.

2









linSolve $\begin{cases} 91 \cdot p + 271 \cdot c + 65 \cdot f = 2033 \\ 108 \cdot p + 288 \cdot c + 48 \cdot f = 2016 , \{p, c, f\} \} \\ 94 \cdot p + 345 \cdot c + 83 \cdot f = 2503 \end{cases}$

RAD 🔲 🗡

{4,4,9}

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4. After you input the information into the matrix, your screen should look like the one shown on the right. After you input all of the information, press [enter].

The matrix shown is for the system of equations:

91p + 271c + 65f = 2033108p + 288c + 48f = 201694p + 345c + 83f = 2503

5. Press Menu > Matrix & Vector > Reduced Row-Echelon Form.

6. The screen will display **rref(.** Press **etri**) (---) to insert the answer from the previous line.

7. Press enter to see the resulting solution matrix.

Again, p = 4, c = 4, and f = 9.



¹ / ₂ × 1: Actions ¹ / ₂ × 5 2: Numbe	r 1: Create 2: Transpose 3: Determinant 4: Row-Echelon Form 5: Reduced Row-Echelon 6: Simultaneous	Form R
A: Hints	o: Simultaneous 7: Norms 8: Dimensions 9: Row Operations A: Element Operations B: Advanced C:Vector	4 4 4 4 4 4

1.2	1.3	2.1	▶ *Line;	ar_S… r	ev		RAD 📘	×
91 108 94	271 288 345	65 48 83	2033 2016 2503	91 108 94	271 288 345	65 48 83	2033 2016 2503	4
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1.2	1.3	2.1	 ▶ *L	inear_S	rev		RAI	D 📋	×
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94	345	0 83	250	91 91 108 94	271 288 345	65 48 83	20: 20: 25:	33 16 03	I
rref	91 108 94	271 288 345	65 48 83	2033 2016 2503		1 0 0 1 0 0	0 0 1	4 4 9	

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Step 2: Method 3: Matrix inverse

 The solution can also be found by using an inverse matrix. To add a Calculator page for a new problem, press docv > Insert > Problem > Add Calculator.

Press Menu > Matrix & Vector > Create > Matrix.

2. Create a coefficient matrix(3X3) and a constant matrix(3X1) as shown.

Once again, the matrix shown is for the system of equations:

91p + 271c + 65f = 2033108p + 288c + 48f = 201694p + 345c + 83f = 2503

 Copy the coefficient matrix and raise it to -1 power to indicate the inverse matrix. Multiply this by a copy of the constant matrix. When you press enter, you will see the solution to the system.

In matrix notation, this is $[A]^{-1} \cdot [B]$.

Again, p = 4, c = 4, and f = 9.

4	1 Actions	RAD 🔲 🗙
1	Matrix	te 🕨
2	Zero Matrix	spose
3	Identity	minant
4	Diagonal	-Echelon Form
5	Random Matrix	ced Row-Echelon Form
6	Fill	ltaneous
7	Submatrix	is 🕨
8	Augment	nsions 🕨
9	Column Augment	Operations •
А	Construct Matrix	ent Operations 🔹 🕨
		•

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1.3	2.1	3.1	▶ *Linear_S…rev	/	R	AD 📋	Х
91 108 94	271 288 345	65 48 83		91 108 94	271 288 345	65 48 83]	4
2033 2016 2503					20 20 21	033 016 503]	

1.3 2.1	3.1 ▶ *Linear_S	rev	RAD 📘	×
94 345	83	94	345 83	^
2033 2016 2503			2033 2016 2503	
91 271 108 288 94 345	$\begin{pmatrix} 65 \\ 48 \\ 83 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 2033 \\ 2016 \\ 2503 \end{bmatrix}$		$\begin{bmatrix} 4\\ 4\\ 9\end{bmatrix}$	
1				