

Lesson 5
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Solving systems systems with three variables using MATLAB

This lesson gives an introduction to solve systems of linear equations with three unknowns. Students will learn the MATLAB commands - solve and ezplot to solve linear equations and plot the two lines. $S = \text{solve}(\text{expr})$ solves the equation $\text{expr} = 0$ for its default variable and assigns the result to S. $\text{ezplot}(\text{fun})$ plots the expression $\text{fun}(x)$ over the default domain $-2\pi < x < 2\pi$, where $\text{fun}(x)$ is not an implicit function of only one variable. Students were able to solve two equations with two unknowns by using the solve command. Graphing the equations using ezplots can also be used to solve the systems of equations. The points where both the graphs intersect represent the solutions.

Science Lesson Plan

Teacher: Megha Sunny

Period: Lesson Plan 5

Date(s): November 19 2012

SETTING THE STAGE	
<u>Essential Question</u>	How to solve problems in MATLAB? In this lesson we will introduce solving systems of equations with three unknowns in MATLAB
<u>Content Objective(s)</u> (Student-friendly)	To understand the MATLAB command “solve ” and “ezplot” to solve linear equations with three unknowns and plot the equations.
<u>Connection to previous or future lessons</u>	This is the fifth lesson in MATLAB. An introduction to basic MATLAB programming was provided in the first lesson.
<u>Critical Thinking Questions</u>	What is the purpose of learning MATLAB? How to solve problems in MATLAB?
<u>Key Vocabulary</u>	Solve, ezplot
<u>Materials Needed/Safety</u>	Laptops, MATLAB, Pencil, Paper
ACTIVE INSTRUCTION	
<ul style="list-style-type: none"> • Launch (Engage) 	Students will turn on the laptops and open MATLAB in it. Working with laptops will grab the student’s attention.
<ul style="list-style-type: none"> • Investigation (Explore) 	
TIME FOR REFLECTION	
<ul style="list-style-type: none"> • Summarization (Explain & Extend) 	Students will learn about solving linear equations with three unknowns using the MATLAB command ‘solve’. They were able to plot the equations using ‘ezplot’ to see whether the solutions obtained using solve command was correct.
<ul style="list-style-type: none"> • Assessment (Evaluate) 	Observation Listening

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	Questions
<ul style="list-style-type: none">• Homework	None

Systems With Three Variables

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Solving three variable systems

- Solve the following system of equations using MATLAB

$$x - y + z = -1$$

$$x + y + 3z = -3$$

$$2x - y + 2z = 0$$

Solving three variable systems

- When solving a system of equations, we can write the equations as
 - $\text{eq1}='2*x-y+2*z=0'$
 - $\text{eq2}='x-y+z=-1'$
 - $\text{eq3}='x+y+3*z=-3'$
- $S = \text{solve}(\text{expr})$ solves the equation expr for its default variable
 - $s=\text{solve}(\text{eq1},\text{eq2},\text{eq3});$
- To display the solutions, access the elements of the structure array S :
 - $s=[s.x \ s.y \ s.z]$

Solving three variable systems

- When solving a system of equations, we can also use output argument to return the solutions in the form of a structure array:
 - `s=solve('2*x-y+2*z=0','x-y+z=-1','x+y+3*z=-3')`
- To display the solutions, access the elements of the structure array S:
 - `s=[s.x s.y s.z]`

Problem 1

- Lowell High prevailed in Saturdays Track meet with the help of 20 individual-event placers earning a combined 68 points. A first place finish earns 5 points, a second place earns 3 points, and a third place earns 1 point. Lowell had a strong second place showing, with as many second-place finishes as first and third place finishers combined.

Solution

- x :First place
- y :Second place
- z :Third place

Solution

- X:First place
- Y:Second place
- Z=Third place
- $X+Y+Z=20$
- $5X+3Y+Z=68$
- $Y=X+Z$

Problem 2

- Marina had \$24,500 to invest. She divided the money into three different accounts. At the end of the year, she had made \$1,300 in interest. The annual yield on each of the three accounts was 4%, 5.5%, and 6%. If the amount of money in the 4% account was four times the amount of money in the 5.5% account, how much had she placed in each account?

Solution

- X: Account with 4% annual interest
- Y: Account with 5.5% annual interest
- Z: Account with 6% annual interest

Solution

- X: Account with 4% annual interest
- Y: Account with 5.5% annual interest
- Z: Account with 6% annual interest
- $X+Y+Z=24500$
- $0.04X+0.055Y+0.06Z=1300$
- $X=4Y$

Problem 3

- Billy's Restaurant ordered 200 flowers for Mother's Day. They ordered carnations at \$1.50 each, roses at \$5.75 each, and daisies at \$2.60 each. They ordered mostly carnations, and 20 fewer roses than daisies. The total order came to \$589.50. How many of each type of flower was ordered?

Solution

- X: Number of carnations
- Y: Number of roses
- Z: Number of daisies

Solution

- X: Number of carnations
- Y: Number of roses
- Z: Number of daisies
- $X+Y+Z=200$
- $1.5X+5.75Y+2.60Z=589.50$
- $Y=Z-20$

