Classifying Systems of Equations:

If a system of linear equations has one or more solutions, the system is said to be a **consistent system.** If a linear equation has no solution, it is said to be an **inconsistent system.**

Inconsistent -> No Solution

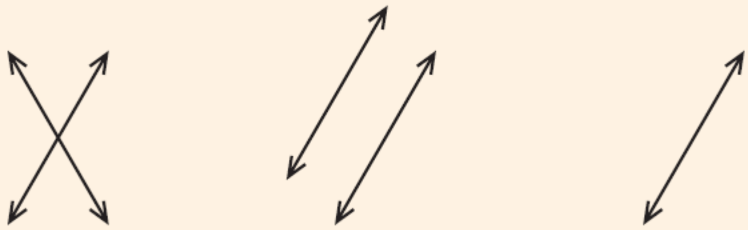
$$\left.\begin{aligned} 2y &= 2x+14 \\ y &= x+7 \end{aligned}\right\} \text{dependent}$$

If two equations represent the same line, then all points along the line are solutions to the system of equations. In such a case, the system is characterized as a **dependent system.** An **independent system** is one in which the two equations represent different lines.

Three possibilities when solving systems of equations in two variables...

Solutions to Systems of Linear Equations in Two Variables

One unique solution	No solution	Infinitely many solutions



One point of intersection	Parallel lines	Coinciding lines
System is consistent.	System is inconsistent.	System is consistent.
System is independent.	System is independent.	System is dependent.

True or False??

F A consistent system is a system that always has a unique solution.

F A dependent system is a system that has no solution.

T If two lines coincide, the system is dependent.

F If two lines are parallel, the system is independent.

Inconsistent System

- sometimes there may be no solutions when the lines are parallel.
- indicator is getting 0 = # in your solution.

Example: Solve... $y = 3x - 5$ & $y = 3x + 2$

Substitution:

$3x - 5 = 3x + 2$

Incorrect Statement → $0 = 7$??

∴ No Solution

Dependent System

- sometimes there may be infinitely many solutions when the lines are the same.
- indicator is getting 0 = 0 in your solution.
- must develop a parametric solution.

Example: Solve... $3x - y = 5$ & $-15 + 9x = 3y$

$\underline{\times 3}$

$3x - y = 5$

$9x - 3y = 15$

$\underline{9x - 3y = 15}$

$0 = 0 \leftarrow$ Dependent

How do I develop a parametric solution??

or even better....What is a parametric solution?.... What is it for??

Example: Solve... $3x - y = 5$ & $-15 + 9x = 3y$

$$\times 3 \quad 3x - y = 5$$
$$9x - 3y = 15$$
$$9x - 3y = 15$$
$$0 = 0 \leftarrow \text{dependent}$$

Parametric Solution

→ Introduce a parameter: Let $y = t$

Substitute & Solve for "x" in terms of "t"

$$3x - y = 5$$
$$3x - t = 5$$
$$3x = 5 + t$$
$$x = \frac{5+t}{3}$$

$$\boxed{\left(\frac{5+t}{3}, t\right)} \leftarrow \text{Parametric Solution}$$

Possible solutions...

$t = 1$ $t = -7$ $t = 1000$

$(2, 1)$ $\left(-\frac{2}{3}, -7\right)$ $\left(\frac{1005}{3}, 1000\right)$

Solve the following system of equations.

$$\times 5 \quad 2x+5y=-1$$

$$-10x-25y=5$$

$$10x+25y=-5 \quad \text{Add}$$

$$0=0$$

Let $x=t$

$2t+5y=-1$

$5y=-1-2t$

$y=\frac{-1-2t}{5}$

$\left(t, \frac{-1-2t}{5}\right)$

OR

Let $y=t$

$2x+5t=-1$

$2x=-1-5t$

$x=\frac{-1-5t}{2}$

$\left(\frac{-1-5t}{2}, t\right)$

3 Possible Solutions:

$t=0$

$\left(0, \frac{-1}{5}\right)$

$t=0$

$\left(\frac{-1}{2}, 0\right)$

Dependent Systems:

How many solutions?....

$$3x + 5y = 9$$
$$6x = 18 - 10y$$

$$2x + 3y - 4 = 0$$
$$6y - 8 = -4x$$

Introduction to Matrices

What is a matrix? A matrix is a rectangular arrangement of values inside brackets. The "rectangular arrangement" is made up of rows and columns. We use the number of *rows by number of columns to name a matrix*. **For example, a 3x4 matrix has 3 rows and 4 columns.**

Each individual value inside a matrix is called an **element** of the matrix. If we have a matrix named **A**, **A[2,3]** means the individual value located at the *cross-section of row 2 and column 3*.

Very Important
When we name a matrix the **number of rows ALWAYS comes before the number of columns.** Just think RC.

$\begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$

Examples of matrices...

$$\begin{pmatrix} 1 & 4 & 3 \\ 2 & 5 & 4 \\ 1 & -3 & -2 \end{pmatrix}, \quad \begin{pmatrix} 1 & 4 & x & 17 \\ 2 & x+y & 7 & -19 \end{pmatrix}, \quad \begin{pmatrix} 1 \\ 3 \\ 5 \\ 7 \end{pmatrix}, \quad \begin{pmatrix} x & y & z & w \end{pmatrix}$$

3x3   2x4   4x1   1x4

$$A = \begin{pmatrix} -1 & 7 & 4 \\ 0 & -2 & 5 \\ 8 & -1 & 3 \end{pmatrix}$$

$a_{1,2} = \underline{7}$

Row 1
column 2

$a_{3,2} = -1$ $a_{2,1} = 0$

MATRIX OPERATIONS

Adding & Subtracting Matrices

Must have the same dimension!

$$\begin{pmatrix} -3 & 5 \\ 2 & -4 \end{pmatrix} - \begin{pmatrix} 7 & 0 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} -10 & 5 \\ -1 & -8 \end{pmatrix}$$

$$2x + \begin{pmatrix} -3 & 4 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 2 & -8 \\ 3 & -2 \end{pmatrix}$$

$$2X = \begin{pmatrix} 2 & -8 \\ 3 & -2 \end{pmatrix} - \begin{pmatrix} -3 & 4 \\ 5 & 7 \end{pmatrix}$$

$$\left(\frac{1}{2}\right)2X = \frac{1}{2}\begin{pmatrix} 5 & -12 \\ -2 & -9 \end{pmatrix}$$

$$X = \frac{1}{2}\begin{pmatrix} 5 & -12 \\ -2 & -9 \end{pmatrix}$$

$$X = \begin{pmatrix} 2.5 & -6 \\ -1 & -4.5 \end{pmatrix}$$

Scalar Multiplication

Multiply through the matrix!

Scalar

$$3\begin{pmatrix} 5 & -2 \\ 4 & 1 \\ -7 & 0 \end{pmatrix} = \begin{pmatrix} 15 & -6 \\ 12 & 3 \\ -21 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -1 \\ 0 & -3 \end{pmatrix} + 5W = \begin{pmatrix} -1 & 1 \\ 4 & 7 \end{pmatrix}$$

$$5W = \begin{pmatrix} -1 & 1 \\ 4 & 7 \end{pmatrix} - \begin{pmatrix} 2 & -1 \\ 0 & -3 \end{pmatrix}$$

$$5W = \begin{pmatrix} -3 & 2 \\ 4 & 10 \end{pmatrix}$$

$$W = \frac{1}{5}\begin{pmatrix} -3 & 2 \\ 4 & 10 \end{pmatrix}$$

$$W = \begin{pmatrix} -\frac{3}{5} & \frac{2}{5} \\ \frac{4}{5} & 2 \end{pmatrix}$$

Matrix Multiplication

In order to multiply matrices, the number of columns in the 1st matrix must equal the number of rows in the 2nd matrix.

Product Dimensions: (# rows 1st) x (# columns 2nd)

Always multiply a row through a column, adding the products as you go.

Ex. (2x4) x (2x2)

$$\begin{pmatrix} 2 & 7 \\ 3 & 5 \end{pmatrix} \times \begin{pmatrix} 6 & -2 & 0 & -1 \\ 7 & 1 & 5 & 4 \end{pmatrix} =$$

(2 x 2) (2 x 4)

=

Solution...

Your turn! Given...

```
[A]
        [[5 1 -1]
         [6 2 4 ]]
```

```
[B]
        [[4  -1]
         [2  -5]
         [-3 0 ]]
```

Find...

```
[A][B]
```

Solution? →

Check with TI-83

Attachments

Worksheet - Primary Trig Ratios.doc