Section 4-7:

Solving a system of equations using matrices

Entering Matrices on the Ti-84:

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

What are the dimensions of this matrix?

2x2

Enter this matrix as [A] on the calc.

Enter the following matrix as [B]

$$\begin{bmatrix} 9 \\ 2 \end{bmatrix}$$

Multiply the two matrices:

Find each:

1. [A][B] $\begin{bmatrix} 42 \\ 40 \end{bmatrix}$

2. [B][A] NOT POSSIBLE

To multiply matrices: [A]•[B]

$$\begin{bmatrix} 4 & 3 \\ 4 & 2 \end{bmatrix} \bullet \begin{bmatrix} 9 \\ 2 \end{bmatrix} = \begin{bmatrix} 42 \\ 40 \end{bmatrix}$$

2 x 2   2 x 1   2 x 1

# of columns of the first matrix must match the number of rows in the second matrix.

The answer matrix will have the # of rows in the first and the # of columns in the second.

Trying to multiply matrices: [B]•[A]

$$\begin{bmatrix} 9 \\ 2 \end{bmatrix} \bullet \begin{bmatrix} 4 & 3 \\ 4 & 2 \end{bmatrix} =$$

2 x 1   2 x 2

These don't match so you can't find this product.

Find the product of this pair of matrices:

$$\begin{bmatrix} 8 & 5 \\ 3 & 0 \\ 7 & 11 \\ -2 & 1 \end{bmatrix} \cdot \begin{bmatrix} 9 \\ 4 \end{bmatrix} = \begin{bmatrix} 92 \\ 27 \\ 107 \\ -14 \end{bmatrix}$$

4x2   2x1   4x1

Which pair of matrices can be multiplied?

$A\begin{bmatrix} -2 \\ 3 \end{bmatrix}$ 2x1 $B\begin{bmatrix} 6 \\ 1 \\ -5 \end{bmatrix}$ 3x1 $C\begin{bmatrix} 0 & -4 & 7 \\ 10 & -3 & 5 \end{bmatrix}$ 2x3

C · B

2x3 · 3x1

Solve the following equation without using division:

$\frac{1}{8} \cdot 8x = 106 \cdot \frac{1}{8}$

Write the following expression without negative exponents:

w^{-1}

$w^{-1} = \frac{1}{w}$

Property **Negative Exponent**

For every nonzero number a and integer n, $a^{-n} = \frac{1}{a^n}$.

Solve the following equation without using division:

$8^{-1} \cdot 8x = 106 \cdot 8^{-1}$

Instead of multiplying by the reciprocal of 8 → $\frac{1}{8}$

you could multiply by the inverse of 8. → 8^{-1}

Now solve this equation without using division or without using fractions.

$9.5^{-1} \cdot (9.5m) = (22.8) \cdot 9.5^{-1}$

A matrix equation that models a system of linear equations:

Both equations must be in Standard Form

$4m + 3n = 9$
$4m + 2n = 2$ → $[A]\begin{bmatrix} x \\ y \end{bmatrix} = [B]$

	Matrix:	Dimensions:
[A] Coefficient Matrix →	$\begin{bmatrix} 4 & 3 \\ 4 & 2 \end{bmatrix}$	2x2
[B] Constant Matrix →	$\begin{bmatrix} 9 \\ 2 \end{bmatrix}$	2x1

Solving the matrix equation:

$$[A]\begin{bmatrix} x \\ y \end{bmatrix} = [B] \longrightarrow \begin{bmatrix} x \\ y \end{bmatrix} = [A]^{-1} \cdot [B]$$

2x2 · 2x1

You can't divide matrices so how do you move [A] to the other side of the equation?

$$\begin{bmatrix} x \\ y \end{bmatrix} = [B] \cdot [A]^{-1}$$

2x1 2x2

dimensions don't match.

Multiply both sides by the inverse of [A] but because of the dimensions of the two matrices you must do it this way $[A]^{-1}[B]$

Solve each system of linear equations using matrices. Give your answer as an ordered pair. Round any decimals to the nearest hundredth.

1. R=5 P=2.4

7R + 8P = 54.2

12R + 17P = 100.8

$$A \begin{bmatrix} 7 & 8 \\ 12 & 17 \end{bmatrix}$$

$[A]^{-1}[B]$ (2.4, 5)

$$B \begin{bmatrix} 54.2 \\ 100.8 \end{bmatrix}$$

2.

M + 3N = 9.3

5M - 7N = -10.7

$$A \begin{bmatrix} 1 & 3 \\ 5 & -7 \end{bmatrix}$$

$[A]^{-1}[B]$ (1.5, 2.6)

$$B \begin{bmatrix} 9.3 \\ -10.7 \end{bmatrix}$$