Slide 1

Matrix: Rows and Columns of data

$$\begin{bmatrix} 9 & 2 \\ 4 & 7 \\ -8 & 0 \end{bmatrix}$$

Dimensions of a Matrix:

the matrix at the left has the following dimensions:

3 x 2   "three by two"

Rows   Col

Each number in a matrix is called an element

Matrices are named using a capital letter

Slide 2

Entering matrices on a calculator:

$$\begin{bmatrix} 9 & 2 \\ 4 & 7 \\ -8 & 0 \end{bmatrix}$$

1. press 2ND then X⁻¹
2. Arrow key to EDIT and press ENTER
3. Enter the dimensions you want (Rows x Columns)
4. Enter the elements row by row

Slide 3

$$A \begin{bmatrix} 9 & 2 \\ 4 & 7 \\ -8 & 0 \end{bmatrix} \quad B \begin{bmatrix} -5 & 3 \\ 6 & 1 \\ 10 & -4 \end{bmatrix} \quad C \begin{bmatrix} 2 & -1 & 7 \\ -3 & 20 & 8 \end{bmatrix}$$

Enter Matrices B and C too.

Slide 4

Matrix Operations

$$A \begin{bmatrix} 9 & 2 \\ 4 & 7 \\ -8 & 0 \end{bmatrix} \quad B \begin{bmatrix} -5 & 3 \\ 6 & 1 \\ 10 & -4 \end{bmatrix} \quad C \begin{bmatrix} 2 & -1 & 7 \\ -3 & 20 & 8 \end{bmatrix}$$

Which two matrices can be:

1. Added   A + B
            B + A

2. Subtracted   A - B
                B - A

3. Multiplied
   A·C, C·A, B·C, C·B

4. Divided   NONE

To Add and Subtract two matrices they must
have the exact same dimensions.

To multiply two matrices
the second matrix must have the same number of rows as the number
of columns in the first matrix Their middle numbers must match:

A*C = 3 x 2 * 2 x 3   or   C*B = 2 x 3 * 3 x 2

These "middle" numbers must match

the dimensions of the answer are the first and last numbers of the
two matrices being multiplied.

   A*C = 3 x 2 * 2 x 3 = 3 x 3 matrix

Find this qoutient.

Instead of dividing by a fraction you can multiply by the reciprocal.

$$\dfrac{\dfrac{8}{15}}{\dfrac{56}{55}}$$

$$\dfrac{8}{15} \cdot \dfrac{55}{56} = \dfrac{11}{21}$$

You CAN'T do matrix division.   However.....

   Solve this equation without dividing.

          2x   =   10

   multiply both sides by the reciprocal of the coefficient

          $\frac{1}{2} \cdot$ 2x   =   10 $\cdot \frac{1}{2}$ x = 5

or   multiply both sides by the inverse of the coefficient

          $2^{-1} \cdot$ 2x   =   10 $\cdot 2^{-1}$

               x = 5

Solving a system of linear equations using matrices.

3.
$$9C + 12D = 21$$
$$10C + 4D = -14$$

Coefficient Matrix: A

$$\begin{bmatrix} 9 & 12 \\ 10 & 4 \end{bmatrix}$$

2 x 2

Constant Matrix: B
(Answer Matrix)

$$\begin{bmatrix} 21 \\ -14 \end{bmatrix}$$

2 x 1

Matrix Equation

$$A \begin{bmatrix} X \\ Y \end{bmatrix} = B$$

To solve for $\begin{bmatrix} X \\ Y \end{bmatrix}$

you would normally

divide by matrix A.

But instead, we multiply by the inverse of matrix A.

$$\begin{bmatrix} X \\ Y \end{bmatrix} = A^{-1} \cdot B$$

$$A^{-1} \cdot B \quad \text{(2 x 2)(2 x 1)}$$

This is the one that can be calculated because the middle numbers match. the answer will be a 2x1 matrix where x is the first number and y is the second.

Or

$$\begin{bmatrix} X \\ Y \end{bmatrix} = B \cdot A^{-1}$$

$$B \cdot A^{-1} \quad \text{(2 x 1)(2 x 2)}$$

This can't be done because the middle numbers don't match up!