7.2 Matrix Algebra
Target 8E: Represent a system of linear equations in matrix equation form

Review of Prior Concepts

Organize this information into a chart:
Team A scored 4 3-point baskets, 22 2-point baskets, and 7 1-point baskets in a game against team B.
Team B scored 8 3-point baskets, 18 2-point baskets, and 12 1-point baskets in the game.

Sample answer:

	3pt	2pt	1pt
Team A	4	22	7
Team B	8	18	12

More Practice

Introduction to Matrices
http://mathinsight.org/matrix_introduction
http://www.basic-mathematics.com/introduction-to-matrices.html
https://www.youtube.com/watch?v=F4bmfKqvT_4
https://www.youtube.com/watch?v=0oGJTQCy4cQ

Vocabulary

Matrix – a rectangular array of m rows and n columns

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$$m \times n \text{ matrix} \rightarrow \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a & \cdots & a \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a & \cdots & a \end{bmatrix}$$

An **element** of the matrix is a_{mn} where m is the row and n is the column

Order (size) of the matrix: $m \times n$ "by"

Example:
Given the matrix $\begin{bmatrix} 1 & -2 & 3 \\ 2 & 0 & 4 \end{bmatrix}$, identify the order, a_{21}, and a_{12}.

order: 2×3 $a_{21} = 2$ $a_{12} = -2$

2 rows   3 columns

(With your group members, do TI-Nspire Activity: Operating on Matrices Part I)

Adding/Subtracting Matrices

- The matrices need to have the __Same__ order

- Add/Subtract the corresponding elements

Example: 2×3   2×2   2×3
Given $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 0 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 5 & 0 \end{bmatrix}$, and $C = \begin{bmatrix} 3 & 0 & 5 \\ 1 & -2 & 7 \end{bmatrix}$, find $A + B$, $A - C$, and $4B$.

$A + B \rightarrow$ cannot be done
b/c
$2 \times 3 \neq 2 \times 2$

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

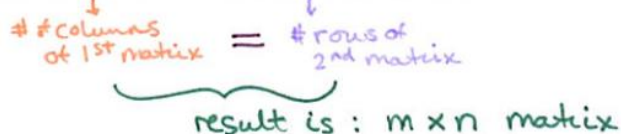$A - C = \begin{bmatrix} -2 & -2 & -2 \\ 1 & 2 & -3 \end{bmatrix}$

$4B = 4\begin{bmatrix} 1 & 2 \\ 5 & 0 \end{bmatrix}$

$4B = \begin{bmatrix} 4 & 8 \\ 20 & 0 \end{bmatrix}$

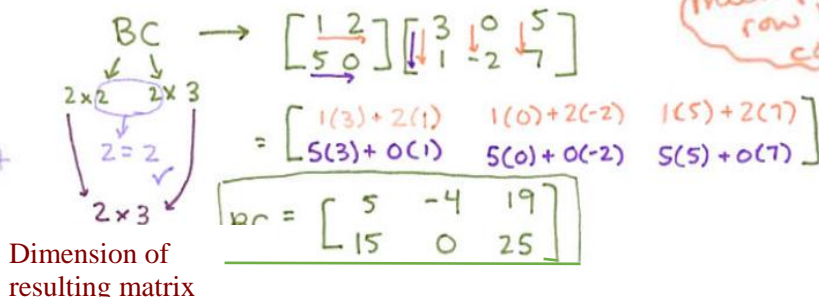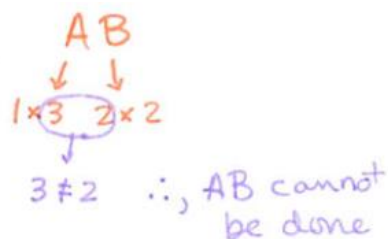*(With your group members, do TI-Nspire Activity: Operating on Matrices Part II)*

Multiplying Matrices

- Can only multiply an $m \times r$ matrix with an $r \times n$ matrix

#columns of 1st matrix = # rows of 2nd matrix

result is : $m \times n$ matrix

Example:

(1×3) $(2 \times 2) \cdots \cdots (2 \times 3)$

Given $A = [1 \quad -2 \quad 3]$, $B = \begin{bmatrix} 1 & 2 \\ 5 & 0 \end{bmatrix}$, and $C = \begin{bmatrix} 3 & 0 & 5 \\ 1 & -2 & 7 \end{bmatrix}$, find AB and BC.

AB

1×3 2×2

$3 \neq 2$ ∴ AB cannot be done

BC → $\begin{bmatrix} 1 & 2 \\ 5 & 0 \end{bmatrix}\begin{bmatrix} 3 & 0 & 5 \\ 1 & -2 & 7 \end{bmatrix}$

2×2 2×3

$2 = 2$ ✓

2×3

multiply row by column

$= \begin{bmatrix} 1(3)+2(1) & 1(0)+2(-2) & 1(5)+2(7) \\ 5(3)+0(1) & 5(0)+0(-2) & 5(5)+0(7) \end{bmatrix}$

$BC = \begin{bmatrix} 5 & -4 & 19 \\ 15 & 0 & 25 \end{bmatrix}$

Dimension of resulting matrix

More Practice

Operations with Matrices
http://www.mathsisfun.com/algebra/matrix-introduction.html
https://www.khanacademy.org/math/precalculus/precalc-matrices#adding-and-subtracting-matrices
http://www.algebralab.org/lessons/lesson.aspx?file=algebra_matrix_operations.xml
https://www.youtube.com/watch?v=xr6qsiEznKU
https://www.youtube.com/watch?v=SPFWVUkxk8E
https://www.youtube.com/watch?v=kuixY2bCc_0
https://www.youtube.com/watch?v=sYlOjyPyX3g

Homework Assignment
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