Full Name	Math III Unit 3 Lesson 1
Time Frame	
Unit Name	Matrices and Linear programming
Learning Task/Topics/ Themes	**Central High School Booster Club Learning Task:** **Walk Like a Mathematician Learning Task:**
Standards **and** Elements	**MM3A4. Students will perform basic operations with matrices.** a. Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology. c.Examine the properties of matrices, contrasting them with properties of real numbers.
Lesson Essential Questions	How to perform basic operations with matrices?
Activator	**Central High School Booster Club Learning Task:**
Work Session	Lesson 1 powerpoint (in file folder) Graphic organizer for multiplying matrices
Summarizing/Closing/Formative Assessment	Complete booster club learning task Additional practice problems: textbook, notetaking guide book, kuta software, etc

Math III – Unit 1
Matrices

INTRODUCTION:

In previous mathematics courses students have used continuous functions to deal with a wide variety of data. In this unit the approach to data is discrete. Matrices allow students to store and retrieve data easily. Data arranged in matrices can be manipulated as a single entity while still being maintained as individual values. Students usually find matrix algebra operations to be very appealing since most operations can be done with a variety of calculators and/or computer programs. The tasks in this unit are designed to introduce matrix algebra and to provide practical applications for matrix transposes, determinants, inverses, and powers.

ENDURING UNDERSTANDINGS:

- Matrices are used to store and operate with data.
- Properties of matrices are used when operating with data.
- Matrices are used to represent and solve problems.

KEY STANDARDS ADDRESSED:

MM3A4. Students will perform basic operations with matrices.

a. Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology.
b. Find the inverses of two-by-two matrices using pencil and paper, and find inverses of larger matrices using technology.
c. Examine the properties of matrices, contrasting them with properties of real numbers.

MM3A5. Students will use matrices to formulate and solve problems.

a. Represent a system of linear equations as a matrix equation.
b. Solve matrix equations using inverse matrices.
c. Represent and solve realistic problems using systems of linear equations.

MM3A6. Students will solve linear programming problems in two variables.

a. Solve systems of inequalities in two variables, showing the solutions graphically.
b. Represent and solve realistic problems using linear programming.

MM3A7. Students will understand and apply matrix representations of vertex-edge graphs.

a. Use graphs to represent realistic situations.
b. Use matrices to represent graphs, and solve problems that can be represented by graphs.

RELATED STANDARDS ADDRESSED:

MM3P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.
b. Solve problems that arise in mathematics and in other contexts.
c. Apply and adapt a variety of appropriate strategies to solve problems.
d. Monitor and reflect on the process of mathematical problem solving.

MM3P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.
b. Make and investigate mathematical conjectures.
c. Develop and evaluate mathematical arguments and proofs. d. Select and use various types of reasoning and methods of proof.

MM3P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.
b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
c. Analyze and evaluate the mathematical thinking and strategies of others.
d. Use the language of mathematics to express mathematical ideas precisely.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.
b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
c. Recognize and apply mathematics in contexts outside of mathematics.

MM3P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.
b. Select, apply, and translate among mathematical representations to solve problems.
c. Use representations to model and interpret physical, social, and mathematical phenomena.

Multiplying Matrices

Use only the rows from

$$\begin{bmatrix} 2 & -3 & 5 \\ -1 & -4 & 12 \end{bmatrix}$$

$$\begin{bmatrix} -5 & 7 \\ 3 & 0 \\ -8 & 10 \end{bmatrix}$$

Use only the columns from

Begin with

Multiply

This answer goes

Next take

Multiply

Place this answer

$$\begin{bmatrix} 2 & -3 & 5 \\ -1 & -4 & 12 \end{bmatrix} \begin{bmatrix} -5 & 7 \\ 3 & 0 \\ -8 & 10 \end{bmatrix} = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$$

Graphic Organizer by Dale Graham and Linda Meyer
Thomas County Central High School; Thomasville GA

Multiplying Matrices

Use only the rows from the first matrix

$$\begin{bmatrix} 2 & -3 & 5 \\ -1 & -4 & 12 \end{bmatrix} \square \begin{bmatrix} -5 & 7 \\ 3 & 0 \\ -8 & 10 \end{bmatrix}$$

Use only the columns from the second matrix.

Begin with the first row times the first column. Multiply corresponding positions and add the results. This answer goes in the first row, first column of the answer matrix.

Now continue with the first row times the second column. Multiply corresponding positions and add the results. Place this answer in the first row, second column of the answer matrix.

Follow this same procedure with the second row of the first matrix, multiplying times the first row of the second matrix, adding the results and placing it in the second row, first column position of the answer matrix.

Finish by multiplying the second row of the first matrix by the second column of the second, following the procedure above and placing the answer in the proper place of the answer matrix.

$$\begin{bmatrix} 2 & -3 & 5 \\ -1 & -4 & 12 \end{bmatrix} \square \begin{bmatrix} -5 & 7 \\ 3 & 0 \\ -8 & 10 \end{bmatrix} = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$$

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Math 3 **Name _____**
Multiplying Matrices 1

State whether the product is defined. If so, give the dimensions of AB.

1. A: 3x3, B: 3x1
2. A: 2x3, B: 2x3
3. A: 3x1, B: 1x3
4. A: 3x3, B: 1x3
5. A: 2x2, B: 2x2

Find the product. If not defined, state the reason.

6. $\begin{bmatrix} 1 & 4 \\ -2 & 7 \end{bmatrix}\begin{bmatrix} -1 & 0 & 3 \\ -2 & 4 & 1 \end{bmatrix}$

7. $\begin{bmatrix} 4 & 5 & -4 \end{bmatrix}\begin{bmatrix} 5 \\ 6 \\ 11 \end{bmatrix}$

8. $\begin{bmatrix} -1 & 7 \\ 9 & 0 \end{bmatrix}\begin{bmatrix} 2 & 1 & 8 \\ 7 & -3 & 7 \\ 4 & 1 & 0 \end{bmatrix}$

9. $\begin{bmatrix} 6 & -8 \\ 3 & 5 \\ 0 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 4 \\ -5 & 11 & 2 \end{bmatrix}$

10. $\begin{bmatrix} 1 \\ 4 \end{bmatrix}\begin{bmatrix} 6 & 3 & 4 \end{bmatrix}$

11. $\begin{bmatrix} 3 & 10 \\ 8 & -5 \end{bmatrix}\begin{bmatrix} -2 & 9 \\ 5 & -3 \end{bmatrix}$

12. $\begin{bmatrix} 3 & -7 & 6 \\ 11 & -4 & 0 \end{bmatrix}\begin{bmatrix} 2 & -8 & 1 \\ 8 & -2 & -5 \end{bmatrix}$

13. $\begin{bmatrix} \frac{1}{2} & -1 \\ 2 & \frac{1}{4} \end{bmatrix}\begin{bmatrix} 0 & \frac{3}{4} \\ 3 & \frac{-1}{4} \end{bmatrix}$

14. $\begin{bmatrix} .2 & 1.4 \\ .4 & 1.5 \end{bmatrix}\begin{bmatrix} -.3 & 2.1 \\ .5 & 2.2 \end{bmatrix}$

15. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} \frac{1}{3} & -2 \\ 5 & \frac{2}{6} \end{bmatrix}$

Math 3 Name _____
Operations on Matrices

Tell whether the matrices are equal or not equal.

1. $\begin{bmatrix} 5 & -1 & 7 \end{bmatrix}, \begin{bmatrix} 5 \\ -1 \\ 7 \end{bmatrix}$

2. $\begin{bmatrix} 1 & 0 & -8 \\ 8 & 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 & -8 \\ 8 & 0 & 1 \end{bmatrix}$

Perform the indicated operation, if possible. If not possible, state the reason.

3. $\begin{bmatrix} 4 & -2 \\ 0 & -6 \end{bmatrix} + \begin{bmatrix} 4 \\ -1 \end{bmatrix}$

4. $\begin{bmatrix} 7 & -1 & 4 \\ 11 & -9 & 2 \end{bmatrix} + \begin{bmatrix} -3 & 0 & 6 \\ 3 & -2 & 4 \end{bmatrix}$

5. $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ 3 & \frac{8}{2} \end{bmatrix} - \begin{bmatrix} 2 & \frac{3}{4} \\ \frac{1}{2} & 5 \end{bmatrix}$

6. $\begin{bmatrix} 1 & 5 \\ 5 & -1 \\ 2 & 8 \end{bmatrix} - \begin{bmatrix} 7 & 3 & 6 \\ -9 & -2 & 7 \\ 10 & 1 & -4 \end{bmatrix}$

7. $2\begin{bmatrix} 7 & -8 \\ -1 & 2 \end{bmatrix} + 4\begin{bmatrix} 2 & -3 \\ -4 & 5 \end{bmatrix}$

8. $\begin{bmatrix} -6 & -10 & 2 \\ 3 & -7 & -4 \end{bmatrix} - 2\begin{bmatrix} 4 & -1 & -3 \\ -7 & 5 & 5 \end{bmatrix}$

Solve the matrix equation for x and y.

9. $2x\begin{bmatrix} -3 & 4 \\ -11 & 5 \end{bmatrix} = \begin{bmatrix} 12 & -16 \\ y & -20 \end{bmatrix}$

10. $\begin{bmatrix} 3x & -2 \\ -1 & 8 \end{bmatrix} + \begin{bmatrix} -4 & 0 \\ -7 & -8 \end{bmatrix} = \begin{bmatrix} -16 & -2 \\ y & 0 \end{bmatrix}$

11. $\begin{bmatrix} -2x & -8 \\ -10 & -9 \end{bmatrix} = \begin{bmatrix} 6 & y \\ -10 & -9 \end{bmatrix}$

12. $\begin{bmatrix} -3 & -7 & 2 \\ 4 & 8 & 1 \end{bmatrix} + \begin{bmatrix} x & 7 & -9 \\ -5 & -7 & 4 \end{bmatrix} = \begin{bmatrix} -8 & 0 & -7 \\ -1 & y & 5 \end{bmatrix}$