

12.2 Matrix Multiplication

Name: _____

RECALL:

What are the dimensions of this matrix? $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

Multiplying Matrices

1. **Check the _____.** The # of _____ in the 1st matrix = # of _____ in the 2nd matrix. (Think "*INSIDE is the same.*")

$$A \cdot B = C$$

$$\begin{pmatrix} & x & \end{pmatrix} \begin{pmatrix} & x & \end{pmatrix} = \begin{pmatrix} & x & \end{pmatrix}$$

2. **Write the dimensions of the _____.** The answer's dimensions equal the # of _____ of the 1st matrix AND the # of _____ of the 2nd matrix. (Think "*OUTSIDE is the answer.*")

3. **Calculate each element in the answer.** If you need to find element $C_{1,3}$ take _____ of Matrix A and match it up with _____ of Matrix B. Each element will have a "partner" that will multiply together. Then add these products up.

Dimension Practice:

If $AB = C$, and you are given the dimensions of matrices A and B , find the dimensions of the product matrix C .

1. $A: 3 \times 4, B: 4 \times 5 \quad C:$

2. $A: 1 \times 2, B: 2 \times 7 \quad C:$

3. $A: 4 \times 3, B: 4 \times 6 \quad C:$

4. $A: 1 \times 13, B: 13 \times 1 \quad C:$

Multiply.

$$5. \begin{bmatrix} 1 & -1 \\ 3 & 2 \\ 0 & 5 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \\ c_{3,1} & c_{3,2} \end{bmatrix}$$



12.2 Matrix Multiplication

Write your questions and thoughts here!



$$6. \begin{bmatrix} -5 & 4 \end{bmatrix} \begin{bmatrix} 2 & 5 \\ 2 & -6 \end{bmatrix} =$$



$$7. \begin{bmatrix} 2 & -1 & 0 \end{bmatrix} \begin{bmatrix} -5 \\ 6 \\ 3 \end{bmatrix} =$$

Solve.



$$8. \begin{bmatrix} 1 & -2 \\ -5 & x \end{bmatrix} \begin{bmatrix} y & 0 & 5 \\ -4 & -5 & 2 \end{bmatrix} = \begin{bmatrix} 9 & 10 & 1 \\ -21 & -20 & -17 \end{bmatrix}$$

Now summarize what you learned!



12.2 Practice – Matrix Multiplication

Name: _____

Algebra 2

For 1-6, find the product of the two matrices. Box your final answer.

$$1) \begin{bmatrix} 4 & -6 \\ 6 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & 6 \\ -6 & 1 \end{bmatrix}$$

$$2) \begin{bmatrix} -2 & -5 \\ -6 & 1 \end{bmatrix} \cdot \begin{bmatrix} -4 & -4 \\ 5 & 0 \end{bmatrix}$$

$$3) [7 \ 3 \ -1] \cdot \begin{bmatrix} 4 & -9 \\ 0 & 2 \\ 5 & -4 \end{bmatrix}$$

$$4) \begin{bmatrix} 5 & -1 \\ 0 & -2 \\ 2 & 6 \end{bmatrix} \cdot \begin{bmatrix} -2 \\ 2 \end{bmatrix}$$

$$5) \begin{bmatrix} 5 & 6 & -2 \\ 0 & 3 & 0 \end{bmatrix} \cdot \begin{bmatrix} -6 & 1 \\ 6 & -4 \\ 1 & 1 \end{bmatrix}$$

$$6) \begin{bmatrix} -2 & -5 \\ 4 & 3 \\ -3 & -4 \end{bmatrix} \cdot \begin{bmatrix} -2 & -6 \\ -6 & -5 \end{bmatrix}$$

The dimensions of Matrix A and Matrix B are listed. What are the dimensions of the product of AB? If it is not possible, then write "undefined."

7) Matrix **A**: 6 x 2
Matrix **B**: 2 x 3

8) Matrix **A**: 3 x 1
Matrix **B**: 5 x 1

9) Matrix **A**: 6 x 7
Matrix **B**: 7 x 4

10) Matrix **A**: 4 x 2
Matrix **B**: 2 x 1

Matrix **AB**: ____ x ____

Matrix **AB**: ____ x ____

Matrix **AB**: ____ x ____

Matrix **AB**: ____ x ____

Solve for x and y .

$$11). \begin{bmatrix} 4 & -3 \\ 4 & 5 \end{bmatrix} \cdot \begin{bmatrix} x & y \\ -3 & 2 \end{bmatrix} = \begin{bmatrix} 13 & 14 \\ -11 & 30 \end{bmatrix}$$

$$12). \begin{bmatrix} -3 & -5 \\ y & -2 \end{bmatrix} \cdot \begin{bmatrix} -1 & -2 \\ -5 & x \end{bmatrix} = \begin{bmatrix} 28 & 6 \\ 12 & 4 \end{bmatrix}$$

Algebra Skills

Simplify.

1. -5^2

2. $(3x^3)^3$

3. $(x - 3)^2$

4. $(5x + 1)^2 + 4$

12.2 Application and Extension

For all problems, write out your equations and show your work. No work = no credit.

1. The top three countries in the final medal standings for the 2012 Summer Olympics were the United States, China, and Russia. Each gold medal is worth 3 points, each silver medal is worth 2 points, and each bronze medal is worth 1 point. Organize the information using matrices. How many points did each country score? (Show work by multiplying matrices!)

	Gold	Silver	Bronze
USA	46	29	29
China	38	27	23
Russia	24	26	32

2. The number of calories burned by Mr. Kelly and Mr. Brust doing different activities for **20 minutes** are shown in the matrix (it would be inappropriate for me to divulge which weight class belongs to which teacher). *Show how matrix multiplication* can be used to write the total number of calories burned by a 230-pound person and a 310-pound person who each bicycled for 40 minutes, jogged for 10 minutes, and then walked for 60 minutes.

<u>CALORIES BURNED</u>		
	230 lb person	310 lb person
Bicycling	109	136
Jogging	127	159
Walking	64	79