Warm-up

On Handout

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

$$AB = \begin{bmatrix} 10 & 4 \\ -3 & 6 \end{bmatrix}$$

1. Record the dimensions of matrices A and B.

The order of A is: 2x3 The order of B is: 3x2

2. Using red, circle the first *row* of A and first *column* of B. What do you notice about the number of elements in this row and in this column?

3

3. Multiply each element in the first *row* of A by the corresponding element (first, second, or third) in the first *column* of B, and add the products. Write your result below.

$4(1) + (-2)(-3) + 3(0) =$ 10

4. The result from #3 is the element in the first row and first column of the product AB. Using red, write this element in its place in the space provided for AB.

5. Using blue, circle the first *row* of A and the second *column* of B. Multiply corresponding elements and add the products. Write the result in the first row, second column of AB.

6. Using green, circle the second *row* of A and the first *column* of B. Multiply corresponding elements and add the products. Write the result in the second row, first column of AB.

7. Using orange, circle the second *row* of A and the second *column* of B. Multiply corresponding elements and add the products. Write the result in the second row, second column of AB.

8. What are the dimensions of AB? 2 x 2

Conclusions:

9. What is the same about the dimensions of A and B? What is different about the dimensions? What is the relationship between the dimensions of A and B and the dimensions of AB?

2 x 3 · 3 x 2

10. Find AB if $A = \begin{bmatrix} 2 & -1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 5 & -2 \\ 0 & 1 \end{bmatrix}$

2 x 3 3 x 2

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

11. Using red, circle the first row of C and the first column of D. Do they have the same number of elements? Do you think the product CD is defined? Explain.

$C = \begin{bmatrix} 8 & -5 \\ -1 & 2 \end{bmatrix}$, $D = \begin{bmatrix} 4 & -3 \\ 0 & 1 \\ 2 & -6 \end{bmatrix}$

2 x 2 3 x 2

# of columns in C ≠ # of rows in D.

12. Complete the statement: The product of two matrices A and B is defined provided that the number of columns in A is equal to the number of rows in B.

13. Complete the statement: If A is an m x n matrix and B is an n x p matrix, then the product AB is an m x p matrix.

Try it:

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

14. C: 5 x 2, D: 2 x 4

5 x 4

15. C: 3 x 4, D: 2 x 3

No!

16. In #14, would the product of DC be defined? Why or why not?

2 x 4 · 5 x 2

no, # of columns in D ≠ # of rows in C.

17. In #15, would the product of DC be defined? Why or why not?

2 x 3 · 3 x 4

# of columns in D = # of rows in C.