Algebra 2 、 3.6
Multiply matrices
Use the properties of matrix multiplication
commutative property
distributive property
dimensions (of a matrix) $r \times c$
whiteboards

whiteboards

Determine whether each matrix product is defined. If so, state the dimensions of the product.

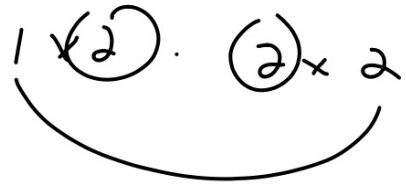
1. $A_{2\times 4} \cdot B_{4\times 3}$ 2x3

2. $C_{5\times 4} \cdot D_{5\times 4}$ NP

3. $E_{8\times 6} \cdot F_{6\times 10}$ 8 x 10

whiteboards

6. $\begin{bmatrix} 9 & -2 \end{bmatrix} \cdot \begin{bmatrix} -2 & 4 \\ 6 & -7 \end{bmatrix} = \begin{bmatrix} & \end{bmatrix}$



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

$2 \times 3 \cdot 3 \times 2$

NP

$A \cdot B = B \cdot A$

Example 4 Test of the Commutative Property

Find each product if $G = \begin{bmatrix} 1 & 3 & -5 \\ 4 & -2 & 0 \end{bmatrix}$ and $H = \begin{bmatrix} 2 & 3 \\ -2 & -8 \\ 1 & 7 \end{bmatrix}$.

a. GH

$2 \times 3 \cdot 3 \times 2$ $\quad \begin{bmatrix} \quad \end{bmatrix}$ 2×2

b. HG $\quad 3 \times 2 \cdot 2 \times 3$ $\quad \begin{bmatrix} \quad \end{bmatrix}$ 3×3

Are they the same
(for these examples)?

GuidedPractice

4. Determine if $AB = BA$ is true for $A = \begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 6 \\ -4 & 5 \end{bmatrix}$.

2×2 2×2

Generally no....
But for THIS pair of matrices...
(Maybe)

A · B

$$\begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix} \cdot \begin{bmatrix} -3 & 6 \\ -4 & 5 \end{bmatrix} = \begin{bmatrix} -12+4 & 24+-5 \\ -15+8 & 30-10 \end{bmatrix} = \begin{bmatrix} 16 & 19 \\ -7 & 20 \end{bmatrix}$$

B · A

$$\begin{bmatrix} -3 & 6 \\ -4 & 5 \end{bmatrix} \cdot \begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix} = \begin{bmatrix} -12+30 & \\ & \end{bmatrix} = \begin{bmatrix} 18 & \\ & \end{bmatrix}$$

for this set of matrices:

Guided Practice

5. Use the matrices $R = \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$, $S = \begin{bmatrix} 4 & 6 \\ -2 & 5 \end{bmatrix}$, and $T = \begin{bmatrix} -3 & 7 \\ -4 & 8 \end{bmatrix}$ to determine if $(S + T)R = SR + TR$.

$$\begin{bmatrix} 1 & 13 \\ -6 & 13 \end{bmatrix} \cdot \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 15 & 38 \\ 1 & 45 \end{bmatrix}$$

$A(B + C) = BA + CA$

is A*B always equal to B*A?

no

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KeyConcept Properties of Matrix Multiplication

For any matrices A, B, and C for which the matrix product is defined and any scalar k, the following properties are true.

Associative Property of Matrix Multiplication	$(AB)C = A(BC)$
Associative Property of Scalar Multiplication	$k(AB) = (kA)B = A(kB)$
Left Distributive Property	$C(A + B) = CA + CB$
Right Distributive Property	$(A + B)C = AC + BC$

What about commutative property?...only if coincidence!

WB 3.6