Algebra 2 3.6

Multiply matrices

Use the properties of matrix multiplication

row

column

element

dimensions (of a matrix) $r \times c$ 2×3

whiteboards

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

Clementine

- The table shows the scoring summary for Lisa Leslie, the WNBA's all-time scoring leader, during her highest scoring seasons. Her total baskets can be summarized

Lisa Leslie Regular Season Scoring				
Type	2005	2006	2008	2009
Field Goal	197	249	184	143
3-Point Field Goal	7	8	4	1
Free Throw	102	158	117	65

Source: WNBA

2
3
1

3 × 1

3 × 4

NP

How would you calculate her point total for each season?

2005

2006

$394 + 21 + 102$

2pt
3pt
1pt

Lisa Leslie Regular Season Scoring				
Type	2005	2006	2008	2009
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Source: WNBA

2005 2006 2008 2009

Point Values

$$P = \begin{bmatrix} 2 & 3 & 1 \end{bmatrix}$$

Baskets

$$B = \begin{bmatrix} 197 & 249 & 184 & 143 \\ 7 & 8 & 4 & 1 \\ 102 & 158 & 117 & 65 \end{bmatrix}$$

$= [517 \quad 680 \quad 497 \quad 358]$

1×3

dimensions have to work out…

dimensions must work out...

Example 1 Dimensions of Matrix Products

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

a. $A_{3\times 4}$ and $B_{4\times 2}$ yes 3×2

b. $A_{5\times 3}$ and $B_{5\times 4}$

whiteboards

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

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

yes

2×3

2. $C_{5\times 4} \cdot D_{6\times 4}$

no

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

yes

8×10

GuidedPractice

1A. $A_{4 \times 6}$ and $B_{6 \times 2}$

1B. $A_{3 \times 2}$ and $B_{3 \times 2}$

Example 2 Multiply Square Matrices

Find XY if $X = \begin{bmatrix} 6 & -3 \\ -10 & -2 \end{bmatrix}$ and $Y = \begin{bmatrix} -5 & -4 \\ 3 & 3 \end{bmatrix}$.

$2 \times 2 \quad 2 \times 2$

$$\begin{bmatrix} 6 & -3 \\ -10 & -2 \end{bmatrix} \cdot \begin{bmatrix} -5 & -4 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} -21 & -33 \\ 44 & 34 \end{bmatrix}$$

$-30+9 \quad -24+-9$

$50+-6 \quad 40+-6$

Matrix Multiplication

(My Darling Clementine)

Row by column, row by column,
Multiply them line by line.
Add them up to form a matrix,
Now you're doing it just fine!

3.4
4.3

2. Find UV if $U = \begin{bmatrix} 5 & 9 \\ -3 & -2 \end{bmatrix}$ and $V = \begin{bmatrix} 2 & -1 \\ 6 & -5 \end{bmatrix}$.

2×2 $\quad$ 2×2

$$UV = \begin{bmatrix} 5 & 9 \\ -3 & -2 \end{bmatrix} \cdot \begin{bmatrix} 2 & -1 \\ 6 & -5 \end{bmatrix} = \begin{bmatrix} 64 & -50 \\ -18 & 13 \end{bmatrix}$$

$$VU = \begin{bmatrix} 2 & -1 \\ 6 & -5 \end{bmatrix} \cdot \begin{bmatrix} 5 & 9 \\ -3 & -2 \end{bmatrix} = \begin{bmatrix} 13 & 20 \\ 45 & 64 \end{bmatrix}$$

$10 + 54$

whiteboards

Find each product, if possible.

4. $\begin{bmatrix} 2 & 1 \\ 7 & -5 \end{bmatrix} \cdot \begin{bmatrix} -6 & 3 \\ -2 & -4 \end{bmatrix} = \begin{bmatrix} -14 & 2 \\ -32 & 41 \end{bmatrix}$

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

6. $[9 \quad -2] \cdot \begin{bmatrix} -2 & 4 \\ 6 & -7 \end{bmatrix} =$ [-30 50]

1×2 2×2

$-18 + -12$

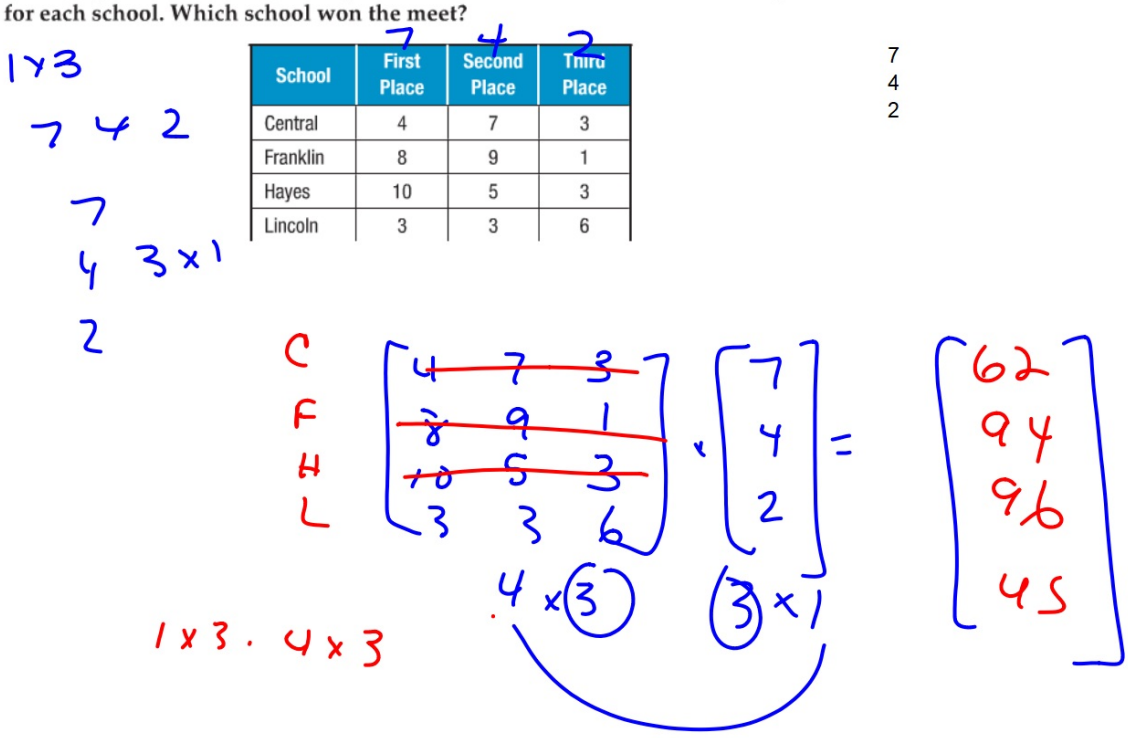
$36 + 14$

Real-World Example 3 Multiply Matrices

SWIM MEET At a particular swim meet, 7 points were awarded for each first-place finish, 4 points for second, and 2 points for third. Find the total number of points for each school. Which school won the meet?

School	First Place	Second Place	Third Place
Central	4	7	3
Franklin	8	9	1
Hayes	10	5	3
Lincoln	3	3	6

7
4
2



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

$2 \times 3 \quad 2 \times 2$

$A \cdot B \neq B \cdot A$

Is 3x4=4x3?

$A(B+C)$ $\quad$ $(B+C)A$

$AB + AC$ $\quad$ $BA + CA$

Is AxB = BxA ?