Name _____ Date _____ Class _____

Practice B
Multiplying Matrices

Tell whether each product is defined. If so, give its dimensions.

1. $P_{3 \times 3}$ and $Q_{3 \times 4}$; PQ **2.** $R_{3 \times 8}$ and $S_{4 \times 3}$; SR **3.** $W_{2 \times 5}$ and $X_{2 \times 5}$; WX

_____   _____   _____

Use the following matrices for Exercises 4–7. Evaluate, if possible.

$$E = \begin{bmatrix} -4 & 1 \\ -2 & 2 \end{bmatrix} \quad F = \begin{bmatrix} 1 & 0 \\ 4 & -3 \\ -2 & 6 \\ -1 & 5 \end{bmatrix} \quad G = \begin{bmatrix} -4 & 0 & 3 & 5 \\ 1 & -2 & 0 & 0 \end{bmatrix} \quad H = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 2 & 0 & 4 & -1 \\ 3 & 5 & -2 & 2 \\ 1 & -1 & 0 & 0 \end{bmatrix}$$

4. EG **5.** HF

_____   _____

6. FG **7.** E^2

_____   _____

Solve.

8. Jamal, Ken, and Barry are playing a baseball video game. The first table shows the number of singles, doubles, triples, and home runs each scored. Find the total number of points they each scored.

Hits				
Player	**S**	**D**	**T**	**HR**
Jamal	3	2	0	1
Ken	2	4	0	0
Barry	0	1	3	1

  a. Write a matrix that represents the data in each table.

Points Scored for Hits	
Hit	**Points**
Single (S)	1
Double (D)	2
Triple (T)	3
Home run (HR)	4

_____

  b. Find the product matrix.

_____

  c. How many points did each player score?

_____

                                       Holt Algebra 2

Practice A
4-2 Multiplying Matrices

Tell whether each product is defined. If so, give its dimensions.

1. $A_{3 \times 4}$ and $B_{4 \times 6}$; AB 2. $C_{4 \times 2}$ and $D_{2 \times 1}$; CD 3. $E_{5 \times 2}$ and $F_{5 \times 3}$; EF

      3×6 4×1 No

Use the following matrices for Exercises 4–7. Evaluate, if possible.

$$A = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 5 \\ 2 & 1 \\ 0 & 3 \\ 1 & 0 \end{bmatrix} \quad C = \begin{bmatrix} 8 & 1 & 0 & 1 \\ 0 & 2 & 3 & 1 \end{bmatrix} \quad D = \begin{bmatrix} 4 & 5 & 0 & 2 \\ 0 & 1 & 3 & 0 \\ 1 & 2 & 1 & 2 \\ 5 & 0 & 1 & 4 \end{bmatrix}$$

4. $A^2 = A \times A = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix} \times \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$

$= \begin{bmatrix} 2(2) + 0(1) & 2(\underline{0}) + 0(\underline{3}) \\ 1(\underline{2}) + 3(\underline{1}) & 1(\underline{0}) + 3(\underline{3}) \end{bmatrix}$ $\begin{bmatrix} 4 & 0 \\ 5 & 9 \end{bmatrix}$

5. CB 6. BA 7. CD

$\begin{bmatrix} 3 & 41 \\ 5 & 11 \end{bmatrix}$ $\begin{bmatrix} 5 & 15 \\ 5 & 3 \\ 3 & 9 \\ 2 & 0 \end{bmatrix}$ $\begin{bmatrix} 37 & 41 & 4 & 20 \\ 8 & 8 & 10 & 10 \end{bmatrix}$

Solve.

8. Julie and Steve are playing the games at the arcade. The first table shows the number of each type of ticket they won. Find the total number of points they each won.

Tickets Won			
Player	Red	Yellow	Blue
Julie	15	6	2
Steve	17	3	4

a. Write a matrix that represents the data in each table.

$\begin{bmatrix} 15 & 6 & 2 \\ 17 & 3 & 4 \end{bmatrix}, \begin{bmatrix} 5 \\ 10 \\ 25 \end{bmatrix}$

Ticket Point Values	
Ticket	Points
Red	5
Yellow	10
Blue	25

b. Find the product matrix.

$\begin{bmatrix} 185 \\ 215 \end{bmatrix}$

c. How many points did each player win?   **Julie 185, Steve 215**

   11   Holt Algebra 2

Practice B
4-2 Multiplying Matrices

Tell whether each product is defined. If so, give its dimensions.

1. $P_{3 \times 3}$ and $Q_{3 \times 4}$; PQ 2. $R_{3 \times 8}$ and $S_{4 \times 3}$; SR 3. $W_{2 \times 5}$ and $X_{2 \times 5}$; WX

      3×4 4×8 No

Use the following matrices for Exercises 4–7. Evaluate, if possible.

$$E = \begin{bmatrix} -4 & 1 \\ -2 & 2 \end{bmatrix} \quad F = \begin{bmatrix} 1 & 0 \\ 4 & -3 \\ -2 & 6 \\ -1 & 5 \end{bmatrix} \quad G = \begin{bmatrix} -4 & 0 & 3 & 5 \\ 1 & -2 & 0 & 0 \end{bmatrix} \quad H = \begin{bmatrix} 1 & -2 & -1 & 3 \\ 2 & 0 & 4 & -1 \\ 3 & 5 & -2 & 2 \\ 1 & -1 & 0 & 0 \end{bmatrix}$$

4. EG 5. HF

$\begin{bmatrix} 17 & -2 & -12 & -20 \\ 10 & -4 & -6 & -10 \end{bmatrix}$ $\begin{bmatrix} -8 & 15 \\ -5 & 19 \\ 25 & -17 \\ -3 & 3 \end{bmatrix}$

6. FG 7. E^2

$\begin{bmatrix} -4 & 0 & 3 & 5 \\ -19 & 6 & 12 & 20 \\ 14 & -12 & -6 & -10 \\ 9 & -10 & -3 & -5 \end{bmatrix}$ $\begin{bmatrix} 14 & -2 \\ 4 & 2 \end{bmatrix}$

Solve.

8. Jamal, Ken, and Barry are playing a baseball video game. The first table shows the number of singles, doubles, triples, and home runs each scored. Find the total number of points they each scored.

Hits				
Player	S	D	T	HR
Jamal	3	2	0	1
Ken	2	4	0	0
Barry	0	1	3	1

a. Write a matrix that represents the data in each table.

$\begin{bmatrix} 3 & 2 & 0 & 1 \\ 2 & 4 & 0 & 0 \\ 0 & 1 & 3 & 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$

Points Scored for Hits	
Hit	Points
Single (S)	1
Double (D)	2
Triple (T)	3
Home run (HR)	4

b. Find the product matrix.

$\begin{bmatrix} 11 \\ 10 \\ 15 \end{bmatrix}$

c. How many points did each player score?   **Jamal 11, Ken 10, Barry 15**

   12   Holt Algebra 2

Practice C
4-2 Multiplying Matrices

Use the following matrices for Exercises 1–9. Evaluate, if possible.

$$J = \begin{bmatrix} 1 & -3 & 2 \\ 0 & -4 & 1 \\ 5 & 1 & 0 \end{bmatrix} \quad K = \begin{bmatrix} 8 & 0 & 1 \\ -2 & 1 & -1 \end{bmatrix} \quad L = \begin{bmatrix} 0 & 6 & 0 \\ -3 & 1 & 4 \\ 1 & 0 & -2 \end{bmatrix} \quad M = \begin{bmatrix} 5 & -4 \\ -3 & 3 \end{bmatrix}$$

1. JK 2. KJ 3. JL

      No $\begin{bmatrix} 13 & -23 & 16 \\ -7 & 1 & -3 \end{bmatrix}$ $\begin{bmatrix} 11 & 3 & -16 \\ 13 & -4 & -18 \\ -3 & 31 & 4 \end{bmatrix}$

4. KL 5. KM 6. M^2

$\begin{bmatrix} 1 & 48 & -2 \\ -4 & -11 & 6 \end{bmatrix}$ No $\begin{bmatrix} 37 & -32 \\ -24 & 21 \end{bmatrix}$

7. MK 8. LJ 9. L^2

$\begin{bmatrix} 48 & -4 & 9 \\ -30 & 3 & -6 \end{bmatrix}$ $\begin{bmatrix} 0 & -24 & 6 \\ 17 & 9 & -5 \\ -9 & -5 & 2 \end{bmatrix}$ $\begin{bmatrix} -18 & 6 & 24 \\ 1 & -17 & -4 \\ -2 & 6 & 4 \end{bmatrix}$

Solve.

10. The tables show the prices and amounts of milk sold in a dairy store during one week.

Milk Prices	
Size	Price
Quart	$1.65
Half-gallon	$2.10
Gallon	$3.20

Dairy Milk Sales					
Size	Mon	Tue	Wed	Thu	Fri
Quart	18	21	20	25	12
Half-gallon	12	50	10	5	10
Gallon	60	55	40	60	25

a. To compare milk sales for each day, show the data as matrices.

$\begin{bmatrix} 1.65 & 2.1 & 3.2 \end{bmatrix} \begin{bmatrix} 18 & 21 & 20 & 25 & 12 \\ 12 & 50 & 10 & 5 & 10 \\ 60 & 55 & 40 & 60 & 25 \end{bmatrix}$

b. Find the product matrix.

$\begin{bmatrix} 246.9 & 315.65 & 182 & 243.75 & 120.8 \end{bmatrix}$

c. Order the days from greatest to least in total sales.   **Tue, Mon, Thu, Wed, Fri**

   13   Holt Algebra 2

Reteach
4-2 Multiplying Matrices

Use the dimensions to decide whether matrices can be multiplied.

To multiply two matrices, the number of columns in *A* **must equal** the number of rows in *B*.

Matrices: $A \quad \times \quad B \quad = AB$ *Remember, with matrices, AB is NOT the same as BA.*

Dimensions: $m \times n \quad n \times p \quad m \times p$

Inner dimensions are equal: n = n.   *Outer dimensions give the dimensions of the product.*

To determine which products are defined, check the dimensions.

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

A: 2×3 B: 3×2 C: 2×2

AB: 2×3 and 3×2, so AB is defined and has dimensions 2×2.

Inner dimensions are equal.

AC: 2×3 and 2×2, so AC is not defined.

Inner dimensions are NOT equal.

Use the following matrices for Exercises 1–3. Tell whether each product is defined. If so, give its dimensions.

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

1. AB 2. BC 3. AC

A: 2×2 B: $\underline{2 \times 1}$ A: $\underline{2 \times 2}$

B: 2×1 C: $\underline{1 \times 2}$ C: $\underline{1 \times 2}$

Product defined?   Product defined?   Product defined?

    Yes   yes   no

    2×1 2×2

   14   Holt Algebra 2