

**Warm up:**

1a)  $7 + 4 =$

1b)  $4 + 7 =$

These are examples of the Commutative property.

**Essential Questions:**

- How do geometric relationships help us to solve problems and make sense of our world?
- How do we use math models to describe relationships?

**Learning Targets:**

- 7.4.1 I can determine the dimensions of a matrix.  
 7.5.1 I can add and subtract 2 matrices. I understand how the dimensions of the matrices may make the operation impossible. I understand how the commutative property may apply to the operation.  
 7.5.2 I can perform scalar multiplication on a matrix.

**Vocabulary:**

Matrix: Collection of #'s arranged into a fixed # of rows and columns.

Element/Entry: A number in a matrix

Dimensions: listed row x column.

**Adding/Subtracting Matrices:**

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

$$B = \begin{bmatrix} -1 & -5 \\ -3 & 5 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

	By Hand	Calculator Steps
1. $A + B =$	$\begin{bmatrix} 2 & 3 \\ -2 & 1 \end{bmatrix} + \begin{bmatrix} -1 & -5 \\ -3 & 5 \end{bmatrix}$ $= \begin{bmatrix} 1 & -2 \\ -5 & 6 \end{bmatrix}$	2nd, X <sup>-1</sup> , edit Change dimen.

Using your calculator find:

2.  $A - B = \begin{bmatrix} 3 & 8 \\ 1 & -4 \end{bmatrix}$

4.  $B + A = \begin{bmatrix} 1 & -2 \\ -5 & 6 \end{bmatrix}$

6. What observations can you make for questions 1 through 5?

1, 3, 4 are commutative  
 2, 5 are not.

3.  $A + C = \text{ONE}$

5.  $B - A = \begin{bmatrix} -3 & -8 \\ -1 & 4 \end{bmatrix}$

**Scalar Multiplication & Naming:**

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

$$B = \begin{bmatrix} 1 & 5 & 9 \\ 0 & -4 & -2 \end{bmatrix}$$

1.  $2A = \begin{bmatrix} -4 & 10 & 0 \\ 6 & -10 & 2 \end{bmatrix}$

2. Verify the answer above on your calculator. Is it the same? *yep, duh!*

3. Then try  $-3B$  on your calculator.  $\begin{bmatrix} -3 & -15 & -27 \\ 0 & 12 & 6 \end{bmatrix}$

4. Also try  $4A - 5B$  on your calculator.  $\begin{bmatrix} -13 & -5 & -45 \\ 12 & 0 & 14 \end{bmatrix}$

5. What element is in  $A_{2,2}$ ?  $-5$

6. What element is in  $B_{3,2}$ ? *DNE*

7. A company offers three types of health care plans with two levels of coverage to its employees. The current annual costs for these plans are represented in the table. If the annual costs are expected to increase by 4% next year, what will be the annual increase for each plan and what are the annual costs for each plan next year?

	Plan <span style="float: right;">A</span>		
Coverage Level	Premium	HMO	HMO Plus
Single	694	451	489
Family	1725	1187	1248

$$.04 \cdot A = \begin{bmatrix} 27.76 & 18.04 & 19.56 \\ 69 & 47.48 & 49.92 \end{bmatrix}$$

$$.04 \cdot A + A = \begin{bmatrix} 721.76 & 469.04 & 508.56 \\ 1794 & 1234.48 & 1297.92 \end{bmatrix}$$

**Warm ups:**

1a)  $3 \times 4 =$

1b)  $4 \times 3 =$

These are examples of the Commutative.

**Essential Questions:**

1. How do geometric relationships help us to solve problems and make sense of our world?
2. How do we use math models to describe relationships?

**Learning Targets:**

- 7.5.3 I can multiply matrices. I understand how the dimensions of the matrices may make the operation impossible. I understand how the commutative property may apply to the operation.
- 7.5.4 I can multiply matrices in a real world situation. I understand how the dimensions of the matrices may make the operation impossible. I understand how the commutative property may apply to the operation.

**Multiplying Matrices:**

$$A = \begin{bmatrix} 1 & 4 & 2 \\ 0 & -1 & -2 \end{bmatrix}$$

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

$$C = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$$

**Dimensions:**

$2 \times 3$

$3 \times 3$

$3 \times 1$

1. Find AC by hand, then verify on your calculator:

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

$\begin{bmatrix} 9 & 0 & -7 \\ -8 & -3 & 4 \end{bmatrix}$

2. Find CA with your calculator:

Not commutative!

3. Observations:

You Try:  $D = \begin{bmatrix} 1 & 2 & 0 \\ -1 & 4 & 5 \\ 0 & 3 & -2 \end{bmatrix}$   
 $3 \times 3$

$E = \begin{bmatrix} 4 & -1 & 1 \\ 0 & 2 & -3 \\ -4 & 2 & 3 \end{bmatrix}$   
 $3 \times 3$

$F = [1 \ -2 \ 9]$   
 $1 \times 3$

Evaluate with your calculator:

4. DF *NOPE!*

5. DE

$\begin{bmatrix} 4 & 3 & -5 \\ -24 & 19 & 2 \\ 8 & 2 & -15 \end{bmatrix}$

6. ED  $\begin{bmatrix} 5 & 7 & -7 \\ -2 & -1 & 16 \\ -6 & 9 & 4 \end{bmatrix}$

Fruit Farms				
Location	Peaches	Apricots	Plums	Apples
Farm 1	165	217	430	290
Farm 2	243	190	235	175
Farm 3	74	150	198	0

	Peaches	Apricots	Plums	Apples
Income	\$ 26	\$ 18	\$ 32	\$ 19

a) Write matrix A so that it represents the location/production table.

$\begin{bmatrix} 165 & 217 & 430 & 290 \\ 243 & 190 & 235 & 175 \\ 74 & 150 & 198 & 0 \end{bmatrix}$   $3 \times 4$

b) Write matrix B so that it represents the income by fruit table and so that it can be multiplied by matrix A.

$[26 \ 18 \ 32 \ 19]$   $4 \times 1$   $\begin{bmatrix} 26 \\ 18 \\ 32 \\ 19 \end{bmatrix}$

c) Calculate the total income for each farm.

$\begin{matrix} 27466 \\ 20583 \\ 10960 \end{matrix}$   $\begin{matrix} \text{cum sum} \\ = 59009 \end{matrix}$

d) Find the total income of all three farms.

Homework: LTs 7.5.3 & 7.5.4 Practice Worksheet (next page)