

3.5: Matrix Operations

“I WILL ...

Perform Operations with Matrices.”

I. Definitions

A. Matrix is a rectangular arrangement of numbers into rows and columns

1. Dimensions read *row x column*

2. Address is read through location

B. _____ are numbers which are across

C. _____ are numbers which are up and down

D. _____ is a real number that multiplies each entry

II. Adding and Subtracting Matrices

A. Add them like integers and correspond to the same entry

B. Must have same number of rows and columns

III. Scalar

A. Just like the Distribution Property

IV. Model Problems

<p>Ex 1: Identify the matrix of the following:</p> $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$	<p>Your Turn: Identify the matrix of the following: $[16.781 \ 16.29 \ 17.318]$</p>
<p>Ex 2: Solve $\begin{bmatrix} 3 & -1 \\ -4 & 8 \end{bmatrix} + \begin{bmatrix} 4 & 9 \\ -2 & -9 \end{bmatrix}$</p>	<p>Ex 3: Solve $\left(\begin{bmatrix} 2 \\ 3 \end{bmatrix} - \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right) + \begin{bmatrix} 5 \\ 4 \end{bmatrix}$</p>

<p>Your Turn: Solve</p> $\left(\begin{bmatrix} 4 & 0 \\ -1 & 5 \end{bmatrix} - \begin{bmatrix} 6 & -2 \\ 3 & 4 \end{bmatrix} \right) + \begin{bmatrix} 3 & 5 \\ -1 & 8 \end{bmatrix}$	<p>Ex 4: Solve $\begin{bmatrix} 1 & 2 \\ 5 & 10 \end{bmatrix}$</p>
<p>Ex 5: Given the following below, solve for $B - A$</p> $A = \begin{bmatrix} 4 & 7 & 2 \\ 5 & 1 & -1 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 0 & 4 \end{bmatrix}$ $C = \begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$	<p>Your Turn: Given the following below, solve for $A - B$</p> $A = \begin{bmatrix} 4 & 7 & 2 \\ 5 & 1 & -1 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 0 & 4 \end{bmatrix}$ $C = \begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$
<p>Ex 6: Solve</p> $-2 \begin{bmatrix} 4 & 6 \\ -1 & 0 \end{bmatrix}$	<p>Your Turn: Given the following below, solve for $2A - 3C$</p> $A = \begin{bmatrix} 4 & -2 \\ -3 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 4 & -1 & -5 \\ 3 & 2 & 8 \end{bmatrix}$ $C = \begin{bmatrix} 3 & 2 \\ 0 & -9 \end{bmatrix} \quad D = \begin{bmatrix} 6 & -3 & 8 \end{bmatrix}$
<p>Ex 7: Solve $\begin{bmatrix} -1 & 3x \\ -4 & 5 \end{bmatrix} = \begin{bmatrix} -1 & -18 \\ 2y & 5 \end{bmatrix}$</p>	<p>Ex 8: Solve</p> $2 \begin{bmatrix} 8 & -x \\ 5 & 6 \end{bmatrix} - \begin{bmatrix} 3 & -9 \\ 10 & 4y \end{bmatrix} = \begin{bmatrix} 13 & 4 \\ 0 & 16 \end{bmatrix}$
<p>Your Turn: $\begin{bmatrix} 2x & 0 \\ 0.5 & -0.75 \end{bmatrix} = \begin{bmatrix} 6.4 & 0 \\ 0.5 & 3y \end{bmatrix}$</p>	

ADDING AND SUBTRACTING MATRICES Perform the indicated operation, if possible. If not possible, state the reason.

4. $\begin{bmatrix} 5 & 2 \\ -1 & 8 \end{bmatrix} + \begin{bmatrix} -8 & 10 \\ -6 & 3 \end{bmatrix}$ 5. $\begin{bmatrix} 10 & -8 \\ 5 & -3 \end{bmatrix} - \begin{bmatrix} 12 & -3 \\ 3 & -4 \end{bmatrix}$ 6. $\begin{bmatrix} 4 & -5 \\ 8 & 1 \end{bmatrix} - \begin{bmatrix} 2 \\ -1 \end{bmatrix}$

7. $\begin{bmatrix} 1.2 & 5.3 \\ 0.1 & 4.4 \\ 6.2 & 0.7 \end{bmatrix} + \begin{bmatrix} 2.4 & -0.6 \\ 6.1 & 3.1 \\ 8.1 & -1.9 \end{bmatrix}$ 8. $\begin{bmatrix} 8 & 3 \\ 9 & -1 \\ 4 & 5 \end{bmatrix} + \begin{bmatrix} 5 & -1 & 0 \\ 6 & 2 & -3 \\ 8 & -1 & 2 \end{bmatrix}$ 9. $\begin{bmatrix} 7 & -3 \\ 12 & 5 \\ -4 & 11 \end{bmatrix} - \begin{bmatrix} 9 & 2 \\ -2 & 6 \\ 6 & 5 \end{bmatrix}$

MULTIPLYING BY A SCALAR Perform the indicated operation.

10. $2 \begin{bmatrix} -1 & 4 \\ 3 & -6 \end{bmatrix}$ 11. $-3 \begin{bmatrix} 2 & 0 & -5 \\ 4 & 7 & -3 \end{bmatrix}$ 12. $-4 \begin{bmatrix} 2 & -3 & -2 \\ -5 & 11 & 7 \\ 8 & 2 & 4 \end{bmatrix}$

13. $1.5 \begin{bmatrix} -2 & 3.4 & 1.6 \\ 5.4 & 0 & -3 \end{bmatrix}$ 14. $\frac{1}{2} \begin{bmatrix} -2 & 8 & 12 \\ 20 & -1 & 0 \\ -8 & 10 & 2 \end{bmatrix}$ 15. $-2.2 \begin{bmatrix} 6 & 3.1 & 4.5 \\ -1 & 0 & 2.5 \\ 5.5 & -1.8 & 6.4 \end{bmatrix}$

MATRIX OPERATIONS Use matrices A , B , C , and D to evaluate the matrix expression.

$$A = \begin{bmatrix} 5 & -4 \\ 3 & -1 \end{bmatrix} \quad B = \begin{bmatrix} 18 & -12 \\ -6 & 0 \end{bmatrix} \quad C = \begin{bmatrix} 1.8 & -1.5 & 10.6 \\ -8.8 & 3.4 & 0 \end{bmatrix} \quad D = \begin{bmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{bmatrix}$$

16. $A + B$ 17. $B - A$ 18. $4A - B$ 19. $\frac{2}{3}B$

20. $C + D$ 21. $C + 3D$ 22. $D - 2C$ 23. $0.5C - D$

SOLVING MATRIX EQUATIONS Solve the matrix equation for x and y .

24. $\begin{bmatrix} -1 & 3x \\ -4 & 5 \end{bmatrix} = \begin{bmatrix} -1 & -18 \\ 2y & 5 \end{bmatrix}$ 25. $\begin{bmatrix} -2x & 6 \\ 1 & -8 \end{bmatrix} + 2 \begin{bmatrix} 5 & -1 \\ -7 & 6 \end{bmatrix} = \begin{bmatrix} -9 & 4 \\ -13 & y \end{bmatrix}$

26. $2 \begin{bmatrix} 8 & -x \\ 5 & 6 \end{bmatrix} - \begin{bmatrix} 3 & -9 \\ 10 & -4y \end{bmatrix} = \begin{bmatrix} 13 & 4 \\ 0 & 16 \end{bmatrix}$ 27. $4x \begin{bmatrix} -1 & 2 \\ 3 & 6 \end{bmatrix} = \begin{bmatrix} 8 & -16 \\ -24 & 3y \end{bmatrix}$

28. **TAKS REASONING** Based on the equation below, what is the value of the expression $3x - 2y$?

$$\begin{bmatrix} 2x & 0 \\ 0.5 & -0.75 \end{bmatrix} = \begin{bmatrix} 6.4 & 0 \\ 0.5 & 3y \end{bmatrix}$$

- (A) 7.15 (B) 9.1 (C) 10.1 (D) 20.7

29. **TAKS REASONING** Find two matrices A and B such that $2A - 3B = \begin{bmatrix} 5 & 0 \\ -1 & 2 \end{bmatrix}$.

30. **CHALLENGE** Find the matrix X that makes the equation true.

a. $X + \begin{bmatrix} -5 & 0 \\ 4 & -3 \end{bmatrix} = \begin{bmatrix} 7 & -8 \\ -3 & 5 \end{bmatrix}$ b. $X - \begin{bmatrix} 2 & 3 \\ 5 & 0 \end{bmatrix} = \begin{bmatrix} 8 & 6 \\ -1 & 3 \end{bmatrix}$