

3.5 Perform Basic Matrix Operations

A **matrix** is a rectangular arrangement of numbers in rows and columns.

- ❖ The **dimensions** of a matrix with m rows and n columns are $m \times n$.
- ❖ The numbers in a matrix are called **elements**.

A matrix can be named with a capital letter and its dimensions. For instance, $A_{3 \times 2}$.

Two matrices are said to be **equal** when they have the same dimensions and the elements in the corresponding positions are the same.

Find each of the missing variables.

<p>1. $\begin{bmatrix} 2 & 3 \\ m & a \end{bmatrix} = \begin{bmatrix} t & h \\ -4 & 34 \end{bmatrix}$</p>	<p>2. $\begin{bmatrix} 5x \\ 5x + 4y \end{bmatrix} = \begin{bmatrix} y \\ 10 \end{bmatrix}$</p>	<p>3. $\begin{bmatrix} x^2 & 7 & 9 \\ 5 & 12 & 6 \end{bmatrix} = \begin{bmatrix} 25 & 7 & y \\ 5 & 2z & 6 \end{bmatrix}$</p>
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KEY CONCEPT
For Your Notebook

Adding and Subtracting Matrices

To add or subtract two matrices, simply add or subtract elements in corresponding positions. You can add or subtract matrices only if they have the same dimensions.

Adding Matrices $\begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} a+e & b+f \\ c+g & d+h \end{bmatrix}$

Subtracting Matrices $\begin{bmatrix} a & b \\ c & d \end{bmatrix} - \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} a-e & b-f \\ c-g & d-h \end{bmatrix}$

Perform the indicated operations.

<p>4. $\begin{bmatrix} 2 & -1 \\ 3 & 7 \\ 14 & 9 \end{bmatrix} + \begin{bmatrix} -6 & 9 \\ 7 & -11 \\ -8 & 17 \end{bmatrix}$</p>	<p>5. $\begin{bmatrix} -7 & x & -7 \\ 24 & 9 & 5 \\ 2 & 4 & 0 \end{bmatrix} - \begin{bmatrix} 3 & x^2 & 4 \\ -76 & 3 & x \\ 18 & 9 & -7 \end{bmatrix}$</p>	<p>6. $[3 \ -5] + \begin{bmatrix} 6 \\ -8 \end{bmatrix}$</p>
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Scalar multiplication: a matrix can be multiplied by a constant (called a scalar). Every element is multiplied by the scalar and a new matrix is formed.

7. $A = -3 \begin{bmatrix} 2 & -16 & 1 \\ -9 & 5 & 0 \\ 4 & 22 & -7 \end{bmatrix}$	8. $B = \frac{2}{3} \begin{bmatrix} 2 & -9 \\ 5 & -1 \\ 8 & -4 \end{bmatrix}$
* What is element $A_{3,2}$?	* What is element $B_{1,2}$?

Find each of the missing variables.

9. $4 \begin{bmatrix} x & y-1 \\ 3 & z \end{bmatrix} = \begin{bmatrix} 20 & 8 \\ 6z & x+y \end{bmatrix}$	10. $\begin{bmatrix} x \\ 7z \\ 2y \end{bmatrix} - \begin{bmatrix} 4z \\ -3y \\ 3x \end{bmatrix} + \begin{bmatrix} -2y \\ 2x \\ -5z \end{bmatrix} = \begin{bmatrix} -4 \\ 11 \\ 18 \end{bmatrix}$
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