Extension

Use after Lesson 2.4

Perform Matrix Addition, Subtraction, Scalar Multiplic

GOAL Perform operations on matrices.

Key Vocabulary
- **matrix**
- **dimensions of a matrix**
- **element**
- **scalar multiplication**
- **scalar**

A **matrix** is a rectangular arrangement of numbers in rows and columns. If a matrix has m rows and n columns, the **dimensions of the matrix** are written as $m \times n$. For example, matrix A below has two rows and three columns. The dimensions of matrix A are 2×3 (read "2 by 3"). Each number in a matrix is called an **element**, or *entry*. In matrix A, the element in the first row and second column is 4.

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

2 rows

3 columns

MATRIX ADDITION AND SUBTRACTION To add or subtract matrices (plural of *matrix*), you add or subtract corresponding elements. You can subtract matrices only if they have the same dimensions.

EXAMPLE 1 Add or subtract two matrices

Perform the indicated operation, if possible.

a. $\begin{bmatrix} 0 & 4 & -1 \\ -3 & 2 & 5 \end{bmatrix} + \begin{bmatrix} 2 & 1 & 3 \\ -2 & -6 & 4 \end{bmatrix} = \begin{bmatrix} 0+2 & 4+1 & -1 \\ -3+(-2) & 2+(-6) & 5 \end{bmatrix}$

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

b. $\begin{bmatrix} -10 & 2 \\ -4 & 7 \\ 7 & -13 \end{bmatrix} - \begin{bmatrix} 9 & -2 \\ 4 & 8 \\ -5 & -11 \end{bmatrix} = \begin{bmatrix} -10-9 & 2-(-2) \\ -4-4 & 7-8 \\ 7-(-5) & -13-(-11) \end{bmatrix}$

$$= \begin{bmatrix} -10+(-9) & 2+2 \\ -4+(-4) & 7+(-8) \\ 7+5 & -13+11 \end{bmatrix}$$

$$= \begin{bmatrix} -19 & 4 \\ -8 & -1 \\ 12 & -2 \end{bmatrix}$$

c. You can't perform the subtraction $\begin{bmatrix} 6 & -4 & -8 \end{bmatrix} - \begin{bmatrix} 1 \\ 12 \\ -6 \end{bmatrix}$ because the first matrix is a 1×3 matrix and the second matrix is a 3×1 matrix.