Write

Rewrite the definition for the following terms in your own words.

1. multiplicative identity matrix
2. multiplicative inverse of a square matrix
3. matrix equation
4. variable matrix
5. constant matrix
6. coefficient matrix

Remember

When a matrix is multiplied by its inverse matrix, their product is the identity matrix. Non-square matrices do not have inverses. Matrices can be used to solve a system of equations by writing the system as a matrix equation. Technology can be used to determine the inverse of a matrix and to solve matrix equations.

Practice

1. Consider the system of three linear equations in three variables

$$\begin{cases} 2x \quad\;\; + 2z = 2 \\ 5x + 3y \quad\;\; = 4 \\ \quad\; 3y - 4z = 4 \end{cases}$$

   a. Write a matrix equation for the system in the form $A \cdot X = B$.

   b. Use technology to determine A^{-1}.

   c. Solve the matrix equation.

2. Maria is helping with a school fundraiser by selling fruit baskets. Basket A contains 3 apples, 2 pears, and 4 oranges and sells for $9.65. Basket B contains 4 apples, 3 pears, and 3 oranges and sells for $10.70. Basket C contains 2 apples, 2 pears, and 2 oranges and sells for $6.30. What is the cost of each apple, pear and orange?

   a. Write a system of equations to represent the scenario. Define your variables.

   b. Write the system of equations as a matrix equation.

   c. Calculate the solution to the system of linear equations by using technology with matrices.

3. A middle school theater department sells tickets for their upcoming production. A child's ticket costs $3.50, a student ticket costs $5, and an adult ticket costs $8.50. They sell the same number of student tickets as adult tickets. They sold a total of 82 tickets and total income from ticket sales is $495.

   a. Write a system of three linear equations in three variables to represent this scenario. Define your variables.

   b. Write the system of equations as a matrix equation.

   c. How many of each ticket type did the theater department sell? Calculate the solution to the system of linear equations using technology with matrices. Round decimals to four decimal places.
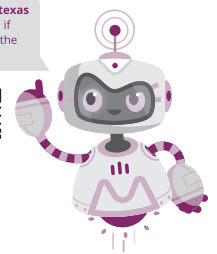
Stretch

The matrix $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ reflects any *2d* vector across the *y*-axis. Explain why.

Review

Determine each product.

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

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

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