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1.2 Matrix Multiplication



Figure 1:Photo provided by MarkyB, 1995

|  |  |  |
| --- | --- | --- |
|   |  **Wildcats**  |  **Mud Cats**  |
|  Goals  |  6  |  10  |
|  Balls  |  30  |  24  |
|  Jerseys  |  14  |  20  |

Table 1.3: Soccer Teams’ Equipment Needs

A goal costs $300; a ball costs $10; a jersey costs $30. How can we find the total cost for the equipment needed for each team? We will discover a method in which the data in the soccer equipment table can be displayed and used for calculating other information. Then, we will be able to calculate the cost of the equipment.

Learning Objectives:

In this section, you will learn matrix multiplication and proper usage. Upon completion you will be able to:

 • State whether or not the product of two matrices is defined.

 • Demonstrate matrix multiplication.

 • Apply multiplication of matrices to real-world applications.

### 0.1 Multiplying Matrices

In addition to multiplying a matrix by a scalar, we can multiply two matrices. Finding the product of two matrices, , is only possible when the *inner dimensions are the same*, meaning that the number of columns of the first matrix, , is equal to the number of rows of the second matrix, . If  is an  matrix and  is an  matrix, then the product matrix  is defined and is an  matrix.

