

Lesson 4–1

**Example 1 Organize Data in a Matrix**

Micheal is considering the offers being made by three ski shops in town for new ski equipment. The 3 tables show the prices for the various ski packages available. The basic package can have at most one upgrade.

a. Use a matrix to organize the information.

Ski Chalet	
Bargain Package	\$174.99
Basic Package	\$225.99
Upgrades	
• Boot upgrade	\$74.99
• Binding upgrade	\$49.99
• Deluxe skis	\$99.99

Dr. D's Skis	
Bargain Package	\$155.99
Basic Package	\$215.99
Upgrades	
• Boot upgrade	\$84.99
• Binding upgrade	\$52.99
• Deluxe skis	\$89.99

Panda Sports	
Bargain Package	\$149.99
Basic Package	\$232.99
Upgrades	
• Boot upgrade	\$78.99
• Binding upgrade	\$45.99
• Deluxe skis	\$109.99

Organize the costs into labeled columns and rows.

	Bargain	Basic	Basic Plus Boot Upgrade	Basic Plus Binding Upgrade	Basic Plus Deluxe Skis Upgrade
Ski Chalet	174.99	225.99	300.98	275.98	325.98
Dr. D's Skis	155.99	215.99	300.98	268.98	305.98
Panda Sports	149.99	232.99	311.98	278.98	342.98

b. Micheal wants to buy a bargain package for rough terrain skiing and a basic package with deluxe skis for his other ski trips. At which shop would he find the best buy for purchasing both packages?

Add the prices for the Bargain Package and the Basic with Deluxe Ski Upgrade for each store.

- Ski Chalet  $174.99 + 325.98 = 500.97$
- Dr. D's Skis  $155.99 + 305.98 = 461.97$
- Panda Sports  $149.99 + 342.98 = 492.97$

If Micheal wants to buy all his ski equipment at the same store, he should choose Dr. D's Skis for the best price.

### Example 2 Dimensions of a Matrix

State the dimensions of matrix  $A$  if  $A = \begin{bmatrix} 0 & -3 & 5 & 10 \\ -1 & -9 & 6 & -4 \end{bmatrix}$ .

$$A = \underbrace{\begin{bmatrix} 0 & -3 & 5 & 10 \\ -1 & -9 & 6 & 4 \end{bmatrix}}_{4 \text{ columns}} \left. \vphantom{\begin{bmatrix} 0 & -3 & 5 & 10 \\ -1 & -9 & 6 & 4 \end{bmatrix}} \right\} 2 \text{ rows}$$

Since matrix  $A$  has 2 rows and 4 columns, the dimensions of matrix  $A$  are  $2 \times 4$ .

### Example 3 Solve a Matrix Equation

Solve  $\begin{bmatrix} x-2y & y \\ z+6 & -8 \end{bmatrix} = \begin{bmatrix} 9 & -3 \\ 10 & -8 \end{bmatrix}$  for  $x$ ,  $y$ , and  $z$ .

Since the matrices are equal, the corresponding elements are equal. When you write the sentences to show this equality, three equations and one identity are formed.

$$x - 2y = 9$$

$$y = -3$$

$$z + 6 = 10$$

$$-8 = -8$$

The value of  $y$  is  $-3$ . Substitute  $-3$  for  $y$  into the first equation and solve for  $x$ .

$$\begin{aligned} x - 2y &= 9 && \text{First equation} \\ x - 2(-3) &= 9 && \text{Substitute } -3 \text{ for } y. \\ x + 6 &= 9 && \text{Multiply.} \\ x &= 3 && \text{Subtract 6 from each side.} \end{aligned}$$

Now solve  $z + 6 = 10$  for  $z$ .

$$\begin{aligned} z + 6 &= 10 && \text{Third equation} \\ z &= 4 && \text{Subtract 6 from each side.} \end{aligned}$$

The solution is  $x = 3$ ,  $y = -3$ , and  $z = 4$ .