Chapter 7 Project *Solving Systems of Equations*

Matrices have always been a powerful mathematical tool—especially for dealing with problems that involve a lot of data. With technology available to perform the calculations, matrices have also become a practical mathematical tool. In this project, you will use matrices to represent linear systems that model real-life data.

Three iron alloys contain different percents of carbon, chromium, and iron as shown in the matrix at the right. Alloy X is a type of wrought iron, alloy Y is a type of stainless steel, and alloy Z is a type of cast iron. How much of each of the three alloys can you make with 15 tons of carbon, 39 tons of chromium, and 546 tons of iron?

	Alloy X	Alloy Y	Alloy Z
Carbon	1%	1%	4%
Chromium	0%	15%	3%
Iron	99%	84%	93%

a. Let x, y, and z represent the amounts of the three iron alloys. Write a linear system to model the situation.

b. Write the matrix equation $AX = B$ that represents this system.

c. With a graphing utility or computer, solve the equation in part (b) for X by finding $X = A^{-1}B$.

Chapter Project Investigations

1. Three different gold alloys contain the percents of gold, copper, and silver shown in the matrix. You have 20,144 grams of gold, 766 grams of copper, and 1990 grams of silver. How much of each alloy can you make?

Percent by Weight

	Alloy X	Alloy Y	Alloy Z
Gold	94%	92%	80%
Copper	4%	2%	4%
Silver	2%	6%	16%

2. The percents (by age group) of the total amount spent on three types of footwear in 2003 are shown in the matrix. The total amounts (in millions) spent by each age group on the three types of footwear were $451.53 (14–17 age group), $477.14 (18–24 age group), and $1113.74 (25–34 age group). How many dollars worth of gym shoes, jogging shoes, and walking shoes were sold in 2003? (Source: National Sporting Goods Association)

		Gym shoes	Jogging shoes	Walking shoes
Age Group	14–17	0.09	0.09	0.03
	18–24	0.06	0.10	0.05
	25–34	0.12	0.25	0.12

3. The percents (by age group) of the total number of ambulatory care visits in 2003 are shown in the matrix. The total numbers of ambulatory care visits (in millions) by each age group were 192.0 (under 15 age group), 664.1 (15–64 age group), and 258.4 (65 and older age group). How many ambulatory care visits were made to physician offices, outpatient departments, and emergency departments in 2003? (Source: National Center for Health Statistics)

		Physician offices	Outpatient dept.	Emergency dept.
Age Group	Under 15	0.1603	0.2336	0.2169
	15–64	0.5886	0.6258	0.6286
	65 and older	0.2511	0.1406	0.1545