

Provide the following for each application problem below:

- Define your variables
- Write a system of linear equations
- From your system of linear equations, write a matrix equation
- Use your calculator to solve your matrix equation
- Answer the question asked in each problem using a complete sentence

1. Greg is a star player on the basketball team. In one game, his field-goal total was 20 points, made up of 2-point and 3-point baskets. If Greg made a total of 9 baskets, how many of each type did he make?

$$\begin{aligned} a &= \# \text{ 2 pointers} & a+b &= 9 \\ b &= \# \text{ 3 pointers} & 2a+3b &= 20 \end{aligned} \quad \begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 9 \\ 20 \end{bmatrix} \quad \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 7 \\ 2 \end{bmatrix}$$

Greg made 7 2-pointers and 2 3-pointers

2. A mail-order company charges for postage and handling according to the weight of the package. A package that weighs less than 3 pounds costs \$2.00 for shipping and handling, and a package that weighs 3 pounds or more costs \$3.00. An order of 12 packages had a total shipping and handling cost of \$29.00. Find the number of packages that weighed less than 3 pounds and the number of packages that weighed 3 pounds or more.

$$\begin{aligned} a &= \# \text{ packages} < 3 \text{ lbs} & a+b &= 12 \\ b &= \# \text{ packages} \geq 3 \text{ lbs} & 2a+3b &= 29 \end{aligned} \quad \begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 12 \\ 29 \end{bmatrix} \quad \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 7 \\ 5 \end{bmatrix}$$

The # packages < 3 lbs was 7. There were 5 pkgs \geq 3 lbs.

3. When Dale baby-sat for 8 hours and worked at a restaurant for 3 hours, he made a total of \$58. When he baby-sat for 2 hours and worked at a restaurant for 5 hours, he made a total of \$40. How much does Dale get paid for each type of work?

$$\begin{aligned} b &= \# \text{ hrs baby sitting} & 8b+3r &= 58 \\ r &= \# \text{ hrs at restaurant} & 2b+5r &= 40 \end{aligned} \quad \begin{bmatrix} 8 & 3 \\ 2 & 5 \end{bmatrix} \begin{bmatrix} b \\ r \end{bmatrix} = \begin{bmatrix} 58 \\ 40 \end{bmatrix} \quad \begin{bmatrix} b \\ r \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$$

Dale earned \$5 babysitting and \$6 at the restaurant.

4. Armando is comparing parking prices at a local concert. One option is a \$7 entry fee plus \$2 per hour. A second option is a \$5 entry fee plus \$3 per hour. What is the break-even point (intersection) for the two options? Which option do you think is better? Explain your answer.

$$\begin{aligned} C &= \text{Cost} & C &= 7+2h \Rightarrow 2h-C = -7 \\ h &= \# \text{ of hours} & C &= 5+3h \Rightarrow 3h-C = -5 \end{aligned} \quad \begin{bmatrix} 2 & -1 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} h \\ C \end{bmatrix} = \begin{bmatrix} -7 \\ -5 \end{bmatrix} \quad \begin{bmatrix} h \\ C \end{bmatrix} = \begin{bmatrix} 2 \\ 11 \end{bmatrix}$$

Break even point is (2, 11). Option 1 is better for 2 hrs or more.
Option 2 is better for less than 2 hours.

5. To conduct a scientific experiment, students need to mix 90 milliliters of a 3% acid solution. They have a 1% and a 10% solution available. How many milliliters of the 1% solution and of the 10% solution should be combined to produce 90 milliliters of the 3% solution?

$$\begin{aligned} X &= \text{amount of 1\%} & X+Y &= 90 \Rightarrow X+Y=90 \\ Y &= \text{amount of 10\%} & .01X+.1Y &= .03(90) \Rightarrow .01X+.1Y=2.7 \end{aligned}$$

$$\begin{bmatrix} 1 & 1 \\ .01 & .1 \end{bmatrix} \begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} 90 \\ 2.7 \end{bmatrix} \quad \begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} 70 \\ 20 \end{bmatrix} \quad \text{There should be 70 milliliters of the 1\% solution + 20 milliliters of the 10\% solution.}$$

6. Mr. George bought 7 drums of two different cleaning fluids for his dry cleaning business. One of the fluids cost \$30 a drum and the other was \$20 a drum. The total price of the supplies was \$160. How much of each fluid did Mr. George buy?

$a = \# \text{ \$30 drums}$ $a + b = 7$
 $b = \# \text{ \$20 drums}$ $30a + 20b = 160$

$$\begin{bmatrix} 1 & 1 \\ 30 & 20 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 7 \\ 160 \end{bmatrix} \quad \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$$

Mr. George bought 2 \$30 drums and 5 \$20 drums.

7. The perimeter of a rectangular picture is 86 inches. Twice the width exceeds the length by 2 inches. What are the dimensions of the picture?

$L = \text{length}$ $2l + 2w = 86 \Rightarrow 2l + 2w = 86$
 $w = \text{width}$ $2w = l + 2 \Rightarrow -l + 2w = 2$

$$\begin{bmatrix} 2 & 2 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} l \\ w \end{bmatrix} = \begin{bmatrix} 86 \\ 2 \end{bmatrix} \quad \begin{bmatrix} l \\ w \end{bmatrix} = \begin{bmatrix} 28 \\ 15 \end{bmatrix}$$

The length of the rectangle is 28 inches and the width is 15 inches.

8. A limited edition of a book published by a historical society was offered for sale to its members. The cost was one book for \$12 or two books for \$20. The society sold 880 books and the total amount of money taken in was \$9840. How many members ordered two books?

$a = \# \text{ of members ordering 1}$ $a + 2b = 880$
 $b = \# \text{ of members ordering 2}$ $12a + 20b = 9840$

$$\begin{bmatrix} 1 & 2 \\ 12 & 20 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 880 \\ 9840 \end{bmatrix} \quad \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 520 \\ 180 \end{bmatrix}$$

180 members ordered 2 books.

9. HomeMade Toys manufactures solid pine trucks and cars and usually sells four times as many trucks as cars. The net profit from each truck is \$6 and the profit from each car is \$5. If the company wants a total profit of \$29,000, how many trucks and cars should they sell?

$C = \# \text{ of cars}$ $T = 4C \Rightarrow 4C - T = 0$
 $T = \# \text{ of trucks}$ $5C + 6T = 29,000$

$$\begin{bmatrix} 4 & -1 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} C \\ T \end{bmatrix} = \begin{bmatrix} 0 \\ 29000 \end{bmatrix}$$

They should sell 1000 cars + 4000 trucks.

$$\begin{bmatrix} C \\ T \end{bmatrix} = \begin{bmatrix} 1000 \\ 4000 \end{bmatrix}$$

10. Mr. Griffin wants to plant soybeans and corn on 100 acres of land. Soybeans require 6 hours of labor per acre, and corn requires 8 hours of labor per acre. If Mr. Griffin has 660 hours available, how many acres of each crop should he plant?

$S = \# \text{ of acres of soybeans}$ $S + C = 100$
 $C = \# \text{ of acres of corn}$ $6S + 8C = 660$

$$\begin{bmatrix} 1 & 1 \\ 6 & 8 \end{bmatrix} \begin{bmatrix} S \\ C \end{bmatrix} = \begin{bmatrix} 100 \\ 660 \end{bmatrix}$$

Mr. Griffin should have 70 acres of soybeans + 30 acres of corn.

$$\begin{bmatrix} S \\ C \end{bmatrix} = \begin{bmatrix} 70 \\ 30 \end{bmatrix}$$

ANSWERS

- 2 three point, 7 two point baskets
- 5 pkgs are greater than or equal to 3 lbs, 7 pkgs are less than 3 lbs
- \$6 @ restaurant, \$5 @ babysitting
- Break even point is (2, 11). Opt 1 is better for more than 2 hr., opt 2 is better for less than 2 hr.
- 20 ml of 10%, 70 ml of 1%
- 5 drums costing \$20; 2 drums costing \$30
- width 15 in; length 28 in.
- 180 members bought 2 books
- 1000 cars; 4000 trucks
- 30 acres of corn, 70 acres of soybeans