HW Answers

p38/ 6. $c = \$0.10/min$
$m = \$0.18/min$
$e = \$0.39/min$

p42/ 15. $c = 13¢/min$
$m = 20¢/min$
$e = 65¢/min$

p43/ 19 a) $2m + 3c + 4y = 19.31$
$3m + 4c + 2y = 24.31$
$4m + 2c + 3y = 20.01$

c) $m = \$2.59$
$c = \$3.79$
$y = \$0.69$

Introduction to Matrices

$$\begin{matrix} & \text{col 1} & \text{col 2} & \text{col 3} \\ \text{row 1} & 2 & -1 & 0 \\ \text{row 2} & 3 & 6 & 4 \end{matrix}$$

This is called a 2×3 matrix (2 rows, 3 columns)

Each entry in a matrix is called an element

$$A = \begin{pmatrix} 1 & 5 \\ 2 & 7 \\ 3 & 2 \end{pmatrix}$$

This is a $\underset{\text{(rows)}}{3} \times \underset{\text{(columns)}}{2}$ matrix

$a_{21} = 2$ (a_{21}: row 2, column 1) $\quad a_{32} = 2$ $\quad a_{12} = 5$

Example

Sales for September

$$A = \begin{matrix} & \text{Store A} & \text{Store B} & \text{Store C} \\ \text{TVs} & 15 & 16 & 12 \\ \text{Stereos} & 14 & 21 & 13 \\ \text{Cameras} & 12 & 20 & 35 \end{matrix}$$

Sales for October

$$B = \begin{matrix} & \text{Store A} & \text{Store B} & \text{Store C} \\ \text{TVs} & 10 & 10 & 30 \\ \text{Stereos} & 8 & 15 & 21 \\ \text{Cameras} & 16 & 25 & 40 \end{matrix}$$

Sales for Sept + Oct

$$A + B = \begin{matrix} & \text{Store A} & \text{Store B} & \text{Store C} \\ \text{TVs} & 25 & 26 & 42 \\ \text{Stereos} & 22 & 36 & 34 \\ \text{Cameras} & 28 & 45 & 75 \end{matrix}$$

$15 + 10$

*NOTE => You can only add or subtract matrices if they are the same order (same size) and it is meaningful to add them.

Suppose we want to double the September sales

$$2 \cdot A = 2 \begin{pmatrix} 15 & 16 & 12 \\ 14 & 21 & 13 \\ 12 & 20 & 35 \end{pmatrix} = \begin{pmatrix} 30 & 32 & 24 \\ 28 & 42 & 26 \\ 24 & 40 & 70 \end{pmatrix}$$

$2 \cdot 15 = 30$

Suppose we want to know the total sales ($)

	TVs	Stereos	Cameras
Store A	15	14	12
Store B	16	21	20
Store C	12	13	35

	Selling Price
TV	$400
Stereos	$150
Cameras	$500

$3 \times 3 \quad 3 \times 1 = 3 \times 1$

must match

final answer.

total sales

$$\begin{matrix} \text{Store A} \\ \text{Store B} \\ \text{Store C} \end{matrix} \begin{pmatrix} (15)(400)+(14)(150)+(12)(500) \\ (16)(400)+(21)(150)+(20)(500) \\ 12(400)+(13)(150)+(35)(500) \end{pmatrix} = \begin{matrix} A \\ B \\ C \end{matrix} \begin{pmatrix} 14\,100 \\ 19\,550 \\ 24250 \end{pmatrix}$$

3×1

To multiply 2 matrices, the number of columns in the first matrix MUST equal the number of columns in the second matrix and they must have the same meaning

Example

must match

$$\begin{matrix} C \\ D \\ E \end{matrix} \begin{pmatrix} -1 & 3 \\ 4 & -2 \\ 5 & 0 \end{pmatrix} \cdot \begin{matrix} A \\ B \end{matrix} \begin{pmatrix} -3 & 2 \\ -4 & 1 \end{pmatrix} = \begin{matrix} C \\ D \\ E \end{matrix} \begin{pmatrix} -9 & 1 \\ -4 & 6 \\ -15 & 10 \end{pmatrix}$$

F G

$(-1)(-3)+(3)(-4)$ $\quad (-1)(2)+(3)(1)$

$2 \times 2 \quad 2 \times 2$ same

3×2

Example

A Sports team decides to purchase t-shirts and sweat pants as a fund raiser. They order:

20 medium, 30 large, 5 extra large shirts

5 small, 15 medium, 20 large & 10 extra large pants.

If the t-shirts are sold for $15 each and the sweatpants for $20 each, how much money will the team make if they sell all their inventory?

$$\begin{array}{c} \\ S \\ M \\ L \\ XL \end{array}\begin{array}{c} \begin{array}{cc} t & s \end{array} \\ \begin{pmatrix} 0 & 5 \\ 20 & 15 \\ 30 & 20 \\ 5 & 10 \end{pmatrix} \end{array} \cdot \begin{array}{c} \\ t \\ s \end{array}\begin{array}{c} \$ \\ \begin{pmatrix} 15 \\ 20 \end{pmatrix} \end{array} = \begin{array}{c} \\ S \\ M \\ L \\ XL \end{array}\begin{array}{c} \$ \\ \begin{pmatrix} (0)(15)+(5)(20) \\ (20)(15)+(15)(20 \\ (30)(15)+(20)(20 \\ (5)(15)+(10)(20 \end{pmatrix} \end{array}$$

$$= \begin{array}{c} \\ S \\ M \\ L \\ XL \end{array}\begin{array}{c} \$ \\ \begin{pmatrix} 0+100 \\ 300+300 \\ 450+400 \\ 75+200 \end{pmatrix} \end{array}$$

4 × 2 and 2 × 1 — same

final answer

$$= \begin{array}{c} \\ S \\ M \\ L \\ XL \end{array}\begin{array}{c} \\ \begin{pmatrix} 100 \\ 600 \\ 850 \\ 275 \end{pmatrix} \end{array}$$

Total Sale = $100 + 600 + 850 + 275$

$= \$1825$