Solutions

Matrices I

Examples

1. $\begin{bmatrix} 24 & 55 \\ 65 & 78 \end{bmatrix}$

2. $\begin{bmatrix} 11 & 16 \\ 21 & 44 \end{bmatrix}$

3. $\begin{bmatrix} 28 & 81 \\ 73 & 89 \end{bmatrix}$

4. $\begin{bmatrix} 28 & 81 \\ 73 & 89 \end{bmatrix}$

5. $\begin{bmatrix} 8 & 37 \\ 21 & 17 \end{bmatrix} + \begin{bmatrix} 12 & 4 \\ 43 & 23 \end{bmatrix}$ - $\begin{bmatrix} 11 & 19 \\ 58 & 33 \end{bmatrix} = \begin{bmatrix} 9 & 22 \\ 6 & 7 \end{bmatrix}$

   We could have also used a 1×4 matrix or a 4×1 matrix.

6. (a) $\begin{bmatrix} 6 & 12 \\ 15 & 24 \end{bmatrix}$

   (b) $\begin{bmatrix} 23 & 22 \\ 46 & 67 \end{bmatrix}$

   (c) $\begin{bmatrix} 10 & 72 \\ 38 & 24 \end{bmatrix}$

   (d) $\begin{bmatrix} 70 & 140 \\ 210 & 270 \end{bmatrix}$

7.1 (a) No

(b) No

(c) Yes

(d) No

(e) No

(f) Yes

7.2 (c) 3×1

(f) 4×2

8. $\begin{bmatrix} 20 & 35 \\ 53 & 92 \end{bmatrix}$

Exercises

1. (a) $\begin{bmatrix} 110 & 50 & 92 & 56 \end{bmatrix}$

(b) $\begin{bmatrix} 4 & 8 & 16 \\ 13 & 19 & 9 \end{bmatrix}$

(c) $\begin{bmatrix} 24 & 56 \\ 84 & 36 \end{bmatrix}$

(d) $\begin{bmatrix} 70 & 102 \\ 102 & 60+8x \\ 46 & 78+14x \end{bmatrix}$

2. (a) $\begin{bmatrix} 16 & 60 \\ 43 & 125 \end{bmatrix}$

(b) $\begin{bmatrix} 43 & 47 \\ 102 & 98 \end{bmatrix}$

(c) Can't multiply!

(d) $\begin{bmatrix} 91 & 112 \\ 144 & 182 \\ 173 & 217 \end{bmatrix}$

(e) $\begin{bmatrix} 72x & 36 \\ 79x & 39\frac{1}{2} \end{bmatrix}$

3. (a) $\begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} 29 & 11 \\ 25 & 9 \end{bmatrix}$

The first column represents how much money each of the ladies spent on fruit, and the second column represents how much each woman's purchase weighed in kg.

4. (a) $\begin{bmatrix} 4 & 5 \\ 3 & 3 \end{bmatrix}$

   (b) $\begin{bmatrix} 2 & 3 & 2 & 0 \\ 2 & 0 & 4 & 2 \end{bmatrix}$

   (c) multiplying our part (a) matrix by our part (b) matrix we get:

   $$\begin{bmatrix} 4 & 5 \\ 3 & 3 \end{bmatrix} \begin{bmatrix} 2 & 3 & 2 & 0 \\ 2 & 0 & 4 & 2 \end{bmatrix} = \begin{bmatrix} 18 & 12 & 28 & 10 \\ 12 & 9 & 18 & 6 \end{bmatrix}$$

   Where the rows represent you and your friend and the columns represent the different ingredients.

   (d) We can arrange the price information in the matrix $\begin{bmatrix} 0.12 \\ 0.30 \\ 0.25 \\ 0.12 \end{bmatrix}$.

   If we multiply our matrix from part (b) by this matrix we get:

   $$\begin{bmatrix} 2 & 3 & 2 & 0 \\ 2 & 0 & 4 & 2 \end{bmatrix} \begin{bmatrix} 0.12 \\ 0.30 \\ 0.25 \\ 0.12 \end{bmatrix} = \begin{bmatrix} 1.64 \\ 1.48 \end{bmatrix}$$

   Therefore sandwich 1 costs \$1.64 to make and sandwich 2 costs \$1.48 to make.

   (e) We can either multiply our matrix from part (c) by our ingredient price matrix, or we can multiply our matrix from part (a) by our matrix from part (d).

   Both methods give the solution $\begin{bmatrix} 13.96 \\ 9.36 \end{bmatrix}$

   Therefore it will cost you \$13.96 to make one day's worth of sandwiches, and it will cost your friend \$9.36.