Introduction to Matrices

Linear Algebra Worksheet · Grade 10–12

Name: _____ Date: _____

Learning Objectives

- Identify the order (dimensions) of a given matrix
- Locate specific entries in a matrix using row-column subscript notation
- Recognize square matrices and identify their main diagonals

Problems

1. State the order of the matrix shown below.

$$\begin{bmatrix} 4 & 7 & 2 \\ 1 & 9 & 6 \end{bmatrix}$$

2. State the order of the matrix shown below.

$$\begin{bmatrix} 5 \\ 3 \\ 8 \\ 2 \end{bmatrix}$$

3. Find the value of the entry a(2,3) in the matrix shown below.

$$\begin{bmatrix} 3 & 0 & -1 & 4 \\ 7 & 2 & 9 & -5 \\ 6 & 1 & 8 & 3 \end{bmatrix}$$

4. Find the value of the entry a(1,1) in the matrix shown below.

Scan to watch

$$\begin{bmatrix} -4 & 6 & 2 \\ 5 & 0 & -3 \\ 1 & 8 & 7 \end{bmatrix}$$

5. Is the matrix shown below a square matrix? Explain your answer.

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

6. Identify and list the entries on the main diagonal of the matrix shown below.

$$\begin{bmatrix} 6 & 3 & -1 \\ 2 & 9 & 4 \\ 7 & 0 & 5 \end{bmatrix}$$

7. Consider the matrix shown below. Determine whether entry a(4,2) exists. If it does, state its value; if not, explain why.

$$\begin{bmatrix} 8 & -2 & 5 \\ 3 & 7 & 1 \\ 0 & 4 & -6 \end{bmatrix}$$

8. For the matrix shown below, find the values of a(1,3), a(2,1), and a(3,4).

$$\begin{bmatrix} 2 & -1 & 7 & 0 \\ 4 & 3 & -5 & 9 \\ 6 & 8 & 1 & -2 \end{bmatrix}$$

9. Identify the order of the matrix below, list its main diagonal entries, and find the sum of those diagonal entries.

Scan to watch

$$\begin{bmatrix} 5 & 2 & -3 & 1 \\ 0 & -8 & 6 & 4 \\ 7 & 3 & 9 & -1 \\ -2 & 5 & 0 & 4 \end{bmatrix}$$

10. Matrix A has order 3 × 4. Its entries are defined by the rule a(i,j) = 2i – j, where i is the row number and j is the column number. Write out the full matrix A, state whether it is a square matrix, and find a(3,4).

$$a(i,j) = 2i - j$$

Scan to watch

Introduction to Matrices — Answer Key

Linear Algebra Worksheet · Grade 10–12

Answer Key

1. Answer: 2 × 3 (2 rows, 3 columns)

- Count the number of rows: there are 2 rows.
- Count the number of columns: there are 3 columns.
- The order is written as rows × columns = 2 × 3.

2. Answer: 4 × 1 (4 rows, 1 column)

- Count the number of rows: there are 4 rows.
- Count the number of columns: there is 1 column.
- The order is 4 × 1.

3. Answer: 9

- The subscript (2,3) means row 2, column 3.
- Go to row 2: [7, 2, 9, –5].
- Move to column 3: the entry is 9.
- Therefore a(2,3) = 9.

4. Answer: –4

- The subscript (1,1) means row 1, column 1.
- Go to row 1: [–4, 6, 2].
- Move to column 1: the entry is –4.
- Therefore a(1,1) = –4.

5. Answer: Yes, it is a 3 × 3 square matrix (equal rows and columns).

- Count the rows: 3 rows.
- Count the columns: 3 columns.
- Since the number of rows equals the number of columns, this is a square matrix.
- It is a 3 × 3 square matrix.

6. Answer: 6, 9, 5

- The main diagonal consists of entries from the upper-left to the lower-right.
- Entry a(1,1) = 6 (row 1, column 1).
- Entry a(2,2) = 9 (row 2, column 2).
- Entry a(3,3) = 5 (row 3, column 3).
- The main diagonal is 6, 9, 5.

7. Answer: a(4,2) does not exist; the matrix only has 3 rows.

- The matrix has 3 rows and 3 columns, so its order is 3 × 3.
- The subscript (4,2) refers to row 4, column 2.
- Since there is no row 4 in a 3 × 3 matrix, the entry is null (does not exist).

Scan to watch

8. Answer: a(1,3) = 7, a(2,1) = 4, a(3,4) = –2

- a(1,3): row 1, column 3 → entry is 7.
- a(2,1): row 2, column 1 → entry is 4.
- a(3,4): row 3, column 4 → entry is –2.

9. Answer: Order: 4 × 4; Main diagonal: 5, –8, 9, 4; Sum = 10

- Count rows: 4, count columns: 4 → order is 4 × 4.
- It is a square matrix, so it has a main diagonal.
- Main diagonal entries: a(1,1)=5, a(2,2)=–8, a(3,3)=9, a(4,4)=4.
- Sum of main diagonal: 5 + (–8) + 9 + 4 = 10.

10. Answer: Matrix A shown below; Not a square matrix; a(3,4) = 2

$$\begin{bmatrix} 1 & 0 & -1 & -2 \\ 3 & 2 & 1 & 0 \\ 5 & 4 & 3 & 2 \end{bmatrix}$$

- Use the rule a(i,j) = 2i – j for i = 1,2,3 and j = 1,2,3,4.
- Row 1 (i=1): a(1,1)=2(1)–1=1, a(1,2)=2(1)–2=0, a(1,3)=2(1)–3=–1, a(1,4)=2(1)–4=–2.
- Row 2 (i=2): a(2,1)=2(2)–1=3, a(2,2)=2(2)–2=2, a(2,3)=2(2)–3=1, a(2,4)=2(2)–4=0.
- Row 3 (i=3): a(3,1)=2(3)–1=5, a(3,2)=2(3)–2=4, a(3,3)=2(3)–3=3, a(3,4)=2(3)–4=2.
- The order is 3 × 4; since 3 ≠ 4, it is NOT a square matrix.
- a(3,4) = 2.

Scan to watch