

# What is a Matrix?

## Worksheet

A matrix is a grid of numbers with  $m$  rows and  $n$  columns (an  $mn$  matrix). For a  $2 \times 2$  matrix, the determinant  $\det(A) = ad - bc$  tells you whether the matrix can be inverted.

## Questions

1. What is the determinant of  $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ ?

- A) 1
- B) 11
- C) -1
- D) 6

2. A  $2 \times 3$  matrix has how many entries?

- A) 5
- B) 6
- C) 2
- D) 3

3. Can a  $2 \times 3$  matrix be multiplied by a  $3 \times 4$  matrix?

- A) No, sizes never match
- B) Yes, result is  $2 \times 4$
- C) Yes, result is  $3 \times 3$
- D) No, only square matrices multiply

4. If  $\det(A) = 0$ , the matrix is...

- A) Always the identity matrix
- B) Invertible
- C) Not invertible (singular)
- D) Always symmetric

5. Find the determinant of  $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$ .

6. Add matrices  $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  and  $\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$ .

7. Multiply  $\begin{bmatrix} 1 & 2 \end{bmatrix}$  ( $1 \times 2$ ) by  $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$  ( $2 \times 1$ ).

8. Define: What is a matrix?

9. Define: What does an  $mn$  matrix mean?

10. Define: What is the determinant used for?

## Answer Key

1. A)  $1 - \det = 23 \ 51 = 6 \ 5 = 1$ .
2. B)  $6 - 2$  rows  $3$  columns =  $6$  entries.
3. B) Yes, result is  $24$  - Inner dimensions match ( $3=3$ ); the result is  $\text{rows}(A)\text{cols}(B) = 24$ .
4. C) Not invertible (singular) - A zero determinant means the matrix has no inverse.
5.  $a=4, b=3, c=2, d=1$   $\det = ad - bc = 4 \cdot 1 - 3 \cdot 2 = 4 - 6 = -2$
6. Add corresponding entries  $[[1+5, 2+6], [3+7, 4+8]] = [[6, 8], [10, 12]]$
7. Multiply row by column:  $13 + 24 = 3 + 8 = 11$  (a  $11$  matrix)
8. A rectangular array of numbers arranged in rows and columns.
9. It has  $m$  rows and  $n$  columns.
10. It tells you whether a matrix is invertible (non-zero) and how it scales area or volume under the transformation.

### **Bounlu**

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