

Precalculus · Matrices and Matrix Operations · Worksheet

Common Core N-VM.C.6, N-VM.C.7, N-VM.C.8, N-VM.C.9, N-VM.C.10 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This precalculus matrices worksheet gives 23 problems on matrices and matrix operations, ordered from easy to hard, with a separate answer key.

These 23 problems practice matrices at the Precalculus level, aligned with Common Core N-VM.C.6 through N-VM.C.10: reading and organizing data in matrices, adding and scaling, multiplying 2×2 and 3×3 matrices, and using determinants and inverses.

The last problems apply matrices to sales, inventory and coded messages. Work from easiest to hardest and show every row-by-column calculation.

Precalculus Common Core: N-VM.C.6 · N-VM.C.7 · N-VM.C.8 · N-VM.C.9 · N-VM.C.10

Precalculus Matrices Worksheet: problems 1-5

Problem 1: Dimensions and entries

State the dimensions of matrix G . Then find the entry in row 2, column 3 and the entry in row 3, column 4, and give the row and column of the entry 7.

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

Matrix G .

Problem 2: Organize data in a matrix

Write a matrix for the bake sale data below with one row per item and one column per day. State its dimensions, then find the total number of muffins sold.

Item	Friday	Saturday
Cookies	24	36
Brownies	18	27

Item	Friday	Saturday
Muffins	30	21

Problem 3: Add matrices

Find $A+B$.

$$A = \begin{bmatrix} 3 & -2 \\ 5 & 0 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 4 \\ 2 & 6 \end{bmatrix}$$

Matrices A and B.

Problem 4: Subtract matrices

Find $C-D$.

$$C = \begin{bmatrix} 7 & 2 & -3 \\ 0 & 5 & 1 \end{bmatrix} \quad D = \begin{bmatrix} 4 & -1 & 2 \\ 3 & 5 & -6 \end{bmatrix}$$

Matrices C and D.

Problem 5: Scalar multiples

Using A and B from the Add matrices problem, find $3A$ and $-2B$.

Precalculus Matrices Worksheet: problems 6-10

Problem 6: Combine operations

Using A and B from the Add matrices problem, find $2A-3B$.

Problem 7: Solve for unknowns

Find x and y .

$$\begin{bmatrix} x & 2 \\ 5 & y \end{bmatrix} + \begin{bmatrix} 3 & y \\ x & 1 \end{bmatrix} = \begin{bmatrix} 7 & 5 \\ 9 & 4 \end{bmatrix}$$

A matrix equation with two unknowns.

Problem 8: Is the product defined?

For each pair, decide whether AB is defined. If it is, give the dimensions of AB .

- a. A is 2×3 and B is 3×4
- b. A is 3×2 and B is 3×2
- c. A is 1×3 and B is 3×1
- d. A is 3×1 and B is 1×3

Problem 9: Multiply 2×2 matrices

Find PQ .

$$P = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} \quad Q = \begin{bmatrix} 4 & 0 \\ -2 & 5 \end{bmatrix}$$

Matrices P and Q .

Problem 10: Multiply a 2×3 by a 3×2

Find RS and state its dimensions.

$$R = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 3 & 1 \end{bmatrix} \quad S = \begin{bmatrix} 2 & 1 \\ 0 & -2 \\ 4 & 3 \end{bmatrix}$$

Matrices R (2×3) and S (3×2).

Precalculus Matrices Worksheet: problems 11-15

Problem 11: Matrix times a column

Find the product of the 2×2 matrix and the 2×1 column.

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

A 2×2 matrix times a 2×1 matrix.

Problem 12: Compare AB and BA

Find AB and BA . Then state whether $AB = BA$.

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 0 \\ 1 & 1 \end{bmatrix}$$

Matrices A and B.

Problem 13: Identity and zero matrices

Let I be the 2×2 identity matrix and O the 2×2 zero matrix. Find each result.

$$A = \begin{bmatrix} 4 & -3 \\ 2 & 7 \end{bmatrix}$$

Matrix A.

- a. AI
- b. $A+O$
- c. AO
- d. $-A+A$

Problem 14: Check the distributive property

Show that $A(B+C) = AB+AC$ for the matrices below by computing both sides.

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -1 \\ 0 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix}$$

Matrices A, B and C.

Problem 15: Multiply 3×3 matrices

Find XY .

$$X = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -1 \\ 3 & 1 & 0 \end{bmatrix} \quad Y = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 2 & 1 \end{bmatrix}$$

Matrices X and Y (both 3×3).

Precalculus Matrices Worksheet: problems 16-20

Problem 16: Find determinants

Find the determinant of each matrix.

$$\begin{matrix} \begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix} & \begin{bmatrix} -2 & 6 \\ 1 & -3 \end{bmatrix} & \begin{bmatrix} 0 & 4 \\ -3 & 7 \end{bmatrix} & \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix} \\ \text{(a)} & \text{(b)} & \text{(c)} & \text{(d)} \end{matrix}$$

Four 2×2 matrices.

Problem 17: Find k for a singular matrix

A square matrix with no inverse is called singular. Find every value of k that makes the matrix singular.

$$\begin{matrix} \begin{bmatrix} k & 6 \\ 2 & 3 \end{bmatrix} & \begin{bmatrix} k & 2 \\ 8 & k \end{bmatrix} \\ \text{(a)} & \text{(b)} \end{matrix}$$

Two matrices that depend on k .

Problem 18: Find a 2×2 inverse

Find the inverse of each matrix.

$$\begin{matrix} \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix} & \begin{bmatrix} 4 & 2 \\ 3 & 2 \end{bmatrix} \\ \text{(a)} & \text{(b)} \end{matrix}$$

Two invertible matrices.

Problem 19: Verify an inverse

Show that B is the inverse of A by computing AB and BA .

$$A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$$

Matrices A and B.

Problem 20: School store revenue

Aisha runs the school store. The sales matrix S shows the number of pencils, erasers and notebooks sold on Monday and Tuesday. Pencils cost \\$0.50, erasers \\$0.75 and notebooks \\$2.25. Multiply to find the revenue for each day.

$$S = \begin{matrix} & \begin{matrix} \text{Pencils} & \text{Erasers} & \text{Notebooks} \end{matrix} \\ \begin{matrix} \text{Mon} \\ \text{Tue} \end{matrix} & \begin{bmatrix} 12 & 8 & 5 \\ 15 & 6 & 9 \end{bmatrix} \end{matrix} \quad P = \begin{bmatrix} 0.50 \\ 0.75 \\ 2.25 \end{bmatrix} \text{ Dollars each}$$

Sales matrix S and price matrix P .

Precalculus Matrices Worksheet: problems 21-23

Problem 21: Farmers market inventory

Mei sells apples, pears and peaches by the crate at a farmers market. Matrix A shows the crates on hand Saturday and Sunday morning. Matrix B shows the crates delivered on each of those days. Find the total crates available each day, then the amounts needed if she doubles those totals next month.

$$A = \begin{matrix} & \begin{matrix} \text{Apple} & \text{Pear} & \text{Peach} \end{matrix} \\ \begin{matrix} \text{Sat} \\ \text{Sun} \end{matrix} & \begin{bmatrix} 40 & 25 & 30 \\ 35 & 20 & 45 \end{bmatrix} \end{matrix} \quad B = \begin{matrix} & \begin{matrix} \text{Apple} & \text{Pear} & \text{Peach} \end{matrix} \\ \begin{matrix} \text{Sat} \\ \text{Sun} \end{matrix} & \begin{bmatrix} 10 & 15 & 5 \\ 20 & 10 & 15 \end{bmatrix} \end{matrix}$$

Crates on hand (A) and delivered (B).

Problem 22: Encode and decode a message

Priya encodes the number pair $(7,12)$, written as a column, by multiplying on the left by the key matrix K . Find the coded column. Then find K^{-1} and use it to decode the result.

$$K = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} \quad X = \begin{bmatrix} 7 \\ 12 \end{bmatrix}$$

The key matrix K and the message column X .

Problem 23: Does the matrix have an inverse?

Noah claims that the matrix N has an inverse because all of its entries are positive. Decide

whether Noah is right, and explain using the determinant.

$$N = \begin{bmatrix} 6 & 9 \\ 4 & 6 \end{bmatrix}$$

Matrix N.

How to use this precalculus matrices worksheet

Print this precalculus matrices worksheet as a PDF, solve every problem on paper, then compare with the answer key.

