LESSON MAKER PRO

Matrix Move Lab

Organize data, then operate with purpose.

HIGH SCHOOL · MA.912.NSO.4.1

MA.912.NSO.4.1 "Given a mathematical or real-world context, represent and manipulate data using matrices."

NAME _____ DATE _____

MATRIX OPERATIONS

A matrix organizes data in rows and columns. You can add or subtract matrices only when they have the same dimensions, matching entries in the same positions. To multiply matrices, multiply each row of the first matrix by each column of the second matrix, and make sure the inner dimensions match.

WORKED EXAMPLE

Find the product: [[11, 12], [13, 14]] [[15, 16], [17, 18]]

1. Multiply the first row by the first column: 11(15) + 12(17) = 369.
2. Multiply the first row by the second column: 11(16) + 12(18) = 392.
3. Multiply the second row by the first column: 13(15) + 14(17) = 433.
4. Multiply the second row by the second column: 13(16) + 14(18) = 460.

Answer: [[369, 392], [433, 460]]

PRACTICE 6 problems

1 Add: [[3, -2], [4, 1]] + [[-1, 5], [2, -3]]

ANSWER _____

2 Subtract: [[5, 0], [-2, 3]] - [[1, -4], [2, -1]]

ANSWER _____

3 Multiply by the scalar: -3[[2, -1], [0, 4]]

ANSWER _____

4 Find the product: [[2, -1, 3], [0, 4, -2]][[1, 2], [3, 0], [-1, 1]]

ANSWER _____

5 Find the product: [[1, 2, 0], [-1, 1, 2]][[2, -1], [1, 2], [0, 1]]

ANSWER _____

6 Multiply by the scalar: 1/2[[6, -4], [2, 0]]

ANSWER _____

APPLY IT Show your work

1 A student-run concert sells shirts, stickers, and water bottles. On Friday, it sells 3 shirts, 2 stickers, and 1 water bottle. On Saturday, it sells 1 shirt, 4 stickers, and 2 water bottles. Shirts cost $4, stickers cost $6, and water bottles cost $5. Write a quantity matrix with rows for Friday and Saturday, then multiply it by a price matrix. Find the revenue for each day.

WORK SPACE

ANSWER _____

2 An art club sells posters, pins, and stickers at two pop-up events. At the first event, it sells 4 posters, 2 pins, and 6 stickers. At the second event, it sells 7 posters, 3 pins, and 5 stickers. Write each event as a 1 by 3 row matrix, then subtract the first-event matrix from the second-event matrix. What does the result show?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let A = [[1, 2, 0], [3, -1, 4]] and B = [[2, 1], [0, 3], [1, -2]]. Find AB and BA. Explain in one sentence why the two products cannot be equal.

WORK SPACE AND ANSWER

ANSWER KEY # Matrix Move Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Add: [[3, -2], [4, 1]] + [[-1, 5], [2, -3]]	**[[2, 3], [6, -2]]**
2	Subtract: [[5, 0], [-2, 3]] - [[1, -4], [2, -1]]	**[[4, 4], [-4, 4]]**
3	Multiply by the scalar: -3[[2, -1], [0, 4]]	**[[-6, 3], [0, -12]]**
4	Find the product: [[2, -1, 3], [0, 4, -2]][[1, 2], [3, 0], [-1, 1]]	**[[-4, 7], [14, -2]]**
5	Find the product: [[1, 2, 0], [-1, 1, 2]][[2, -1], [1, 2], [0, 1]]	**[[4, 3], [-1, 5]]**
6	Multiply by the scalar: 1/2[[6, -4], [2, 0]]	**[[3, -2], [1, 0]]**

PART 2 · APPLY IT

1. **Quantity matrix: [[3, 2, 1], [1, 4, 2]]. Price matrix: [[4], [6], [5]]. Revenue matrix: [[29], [38]], so Friday revenue is $29 and Saturday revenue is $38.** Use the quantity matrix [[3, 2, 1], [1, 4, 2]] and multiply by the price column matrix [[4], [6], [5]]. The resulting entries are the daily revenues.
2. **[[7, 3, 5]] - [[4, 2, 6]] = [[3, 1, -1]]. The club sold 3 more posters, 1 more pin, and 1 fewer sticker at the second event.** Represent the first event by [[4, 2, 6]] and the second event by [[7, 3, 5]]. Subtract corresponding entries to compare second-event sales with first-event sales.

CHALLENGE

AB = [[2, 7], [10, -8]]. BA = [[5, 3, 4], [9, -3, 12], [-5, 4, -8]]. They cannot be equal because AB has 2 rows and 2 columns, while BA has 3 rows and 3 columns.

Accept equivalent matrix formatting when entries, signs, and dimensions are correct. For word problems, accept a correct matrix setup with rows and columns clearly identified.