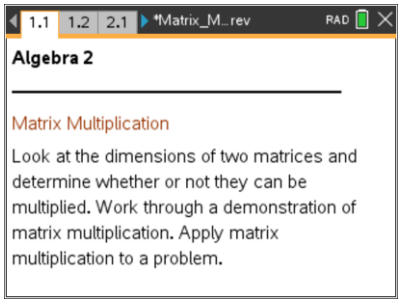
Matrix Multiplication
Student Activity

Name _____
Class _____

Open the TI-Nspire document *Matrix_Multiplication.tns.*

This activity examines the multiplication of two matrices. The dimensions of the matrices determine whether or not they can be multiplied. The multiplication process is broken down into steps.



Move to page 1.2.

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

1. Press enter to look at question 1. Given the two matrices shown, can they be multiplied? If you think the answer is yes, then type **q(yes);** if you think the answer is no, then type **q(no).** The program will tell you whether or not your answer is correct and why. Repeat the process with new examples by typing **q(2), q(3),** etc., until you are confident that you can tell when matrices can be multiplied.
   a. In your own words, write the conditions necessary for being able to multiply two matrices.

   b. If matrix [*A*] has dimensions 3×2 and matrix [*B*] has dimensions 2×4, is it possible to multiply [*A*] times [*B*]? Explain your answer.

   c. Using the matrices in part 1b, is it possible to multiply [*B*] times [*A*]? Explain your answer.

Move to page 2.1.

Press ctrl tab to move to the bottom panel on this page if necessary.

2. Click the ▲ arrow on the step slider to fill in the first few values in the answer matrix. Notice where the numbers are coming from in the two matrices being multiplied.
   a. Before going to step 3, predict the value of *c*. _____ Confirm your prediction.

   b. Repeat by predicting the values of *d*, *e*, and *f* before using the step slider to see the answers.

   c. If a 2×3 matrix is multiplied by a 3×5 matrix, what are the dimensions of the answer matrix?

   d. Give an example of the dimensions of two matrices that, when multiplied, will result in an answer matrix with dimensions 3×4. Is your answer the only possible one?

Move to page 3.1.

3. Click the ▲ arrow on the step slider to fill in the first few values in the answer matrix.
   a. Explain why the solution matrix is a 2×2 matrix.

   b. For *a*, *b*, *c*, and *d* in the solution matrix, show the work that results in the given answers.

$$\begin{bmatrix} & \\ & \end{bmatrix}$$

4. Josh, Jackie, and Jamilla have placed an order for lunch at a local fast-food restaurant. Josh ordered two cheeseburgers, two orders of fries, and a chocolate shake. Jackie ordered one cheeseburger and two chocolate shakes. Jamilla ordered one cheeseburger and one order of fries.
   The information for each item follows:

Item	Cost	Calories	Fat
Cheeseburger	$1	300	12
Fries	$1	380	19
Shake	$2	580	21

   a. Set up a 3×3 matrix that represents each person's order $([A])$.

   b. Set up a 3×3 matrix that represents the cost, calories, and fat of the items $([B])$.

Move to page 4.1.

Click the ▲ arrow on the step slider to check your answers to parts 4a and 4b.

c. Multiply the two matrices together $([A]\cdot[B])$. Show your work.

d. What do the numbers in the first column of the solution matrix represent?

e. Who had the meal with the lowest number of calories?

f. Josh's meal represents what percentage of the total fat of the group's meals?

5. In your own words, explain how to multiply two matrices.