

Chapter Audio Summary for McDougal Littell *Algebra 2*

Chapter 4 Matrices and Determinants

You began Chapter 4 by learning to add, subtract, and multiply matrices by a scalar and another matrix. Then you used those operations to solve real-life problems. You found determinants of 2×2 and 3×3 matrices and then used Cramer's rule to solve systems. After that you found inverse matrices and used them to solve real-life problems.

Turn to the lesson-by-lesson Chapter Review that starts on p. 240 of the textbook.

Lesson 4.1 Matrix Operations

Important words to know are: *matrix, dimensions of a matrix, entries of a matrix, row matrix, column matrix, square matrix, zero matrix, equal matrices, and scalar.*

The first goal of Lesson 4.1 is to add and subtract matrices, multiply a matrix by a scalar, and solve matrix equations. You can add the matrices in the first Example because the matrices have the same dimensions. Add corresponding entries such as 5 and 9 to get 14, or 0 and -4 to get -4 . You cannot subtract the matrices in the second Example because they have different dimensions. The third Example shows scalar multiplication. Multiply each entry by the scalar -3 . The fourth example shows how to solve a matrix equation. Equate corresponding entries such as $x + 2$ and -6 and solve for x , to get -8 .

The order of operations for matrix operations is similar to that for real numbers. Multiply by a scalar before adding or subtracting matrices.

The second goal of Lesson 4.1 is to use matrices in real-life situations, such as ordering data about health care plans.

Now try Exercises 1 through 10. If you need help, go to the worked-out Examples on pages 199 through 202.

Lesson 4.2 Multiplying Matrices

The first goal of Lesson 4.2 is to multiply two matrices. To find the entry -36 in the first row and first column of the product, multiply $(-6)(6)$ and add $(-1)(0)$. Use a similar procedure to find the other entries of the product.

Remember that to multiply two matrices, the number of columns in the first matrix must equal the number of rows in the second matrix.

Now try Exercises 11 through 13. If you need help, go to the worked-out Examples on pages 208 through 210.

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Lesson 4.3 Determinants and Cramer's Rule

Important words to know are: *determinant*, *Cramer's rule*, and *coefficient matrix*.

The first goal of Lesson 4.3 is to evaluate determinants of 2×2 and 3×3 matrices. Associated with each square matrix is a real number called its determinant. To find the determinant, find the products of the entries on the diagonals and subtract. In the 2×2 matrix, the products of the entries on the diagonals are $-2(4)$, or -8 , and $1(-6)$, or -6 . The difference is $-8 - (-6)$, or -2 .

The second goal of Lesson 4.3 is to use Cramer's rule to solve systems of linear equations. To use Cramer's rule to solve systems of linear equations, first find the determinant of the coefficient matrix and then use Cramer's Rule to solve for x and y . Cramer's Rule is described on pages 216 and 217.

Now try Exercises 14 through 21. If you need help, go to the worked-out Examples on pages 214 through 217.

Lesson 4.4 Identity and Inverse Matrices

Important words to know are: *identity matrix* and *inverse matrix*.

The first goal of Lesson 4.4 is to find and use inverse matrices. Two $n \times n$ matrices are inverses of each other if their product (in *both* orders) is the $n \times n$ identity matrix. The first part of the Example gives the equation for the general case of finding the inverse. Matrix A has entries 7, 3, 5, and 2. To find its inverse, substitute its entries in the equation for the general case.

The second goal of Lesson 4.4 is to use inverse matrices in real-life situations. One common form of a real-life matrix is a cryptogram, which is a message written according to a secret code.

Now try Exercises 22 through 27. If you need help, go to the worked-out Examples on pages 223 through 226.

Lesson 4.5 Solving Systems Using Inverse Matrices

Important words to know are: *matrix of variables* and *matrix of constants*.

The first goal of Lesson 4.5 is to solve systems of linear equations using inverse matrices. The Example shows how to use inverse matrices to solve a system of linear equations. First write the system in matrix form ($AX=B$). Then find the inverse of matrix A . Finally, multiply the matrix of constants by the inverse of matrix A .

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Remember that if matrix A does not have an inverse, then the system has either no solution or infinitely many solutions.

Now try Exercises 28 through 33. If you need help, go to the worked-out Examples on pages 230 through 232.