**Activity 8.5.4 Using Technology to Solve Matrix Equations**

You will use technology and matrices to solve the problem in Activity 8.5.3 and then make alterations to the problem.

The equation for the value in dollars of the collected items is: (1)

The equation for the weight in pounds of the collected items is: (2)

The equation for the reduction in pounds of CO2 emissions is: (3)

Suppose we wished to know what combination of aluminum cans, plastic bottles and newsprint collected would result in $1000 gained, 1000 pounds collected, and a 5000 pound reduction in carbon dioxide emissions into the atmosphere?

Here is a screenshot of the original matrix.



1. Choose a matrix name and enter the data for the matrix into your calculator. After you do this, set the calculator for two decimal place rounding. To find the inverse of a matrix, first bring up the matrix such as and then use the inverse key to find

You should see the following. The calculator cannot display the entire result on a single screen, so you will need to scroll over to see the other part. The two parts are shown below.

 

1. Write the inverse matrix below:

Check to see how well this matches the result we found by hand using cofactor expansion.

1. We could easily have made the result as accurate as we want by changing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Next, create a 3×1 matrix with the values desired outcomes in dollars earned, pound collected and CO2 emission reduction:
3. Enter this new matrix in your graphing calculator:



1. Multiply the inverse matrix by this output matrix.



What result did you get?

Now we make some minor changes in the output values from the original equations:

With a value of $1000, a with weight of 1000 pounds and reduce carbon dioxide emission by 5000 pounds, we had these equations

=5000

1. Create new equations with ***minor*** changes in outputs and use technology to solve the new system of equations. For example, you could have $900 in collections instead of $1000. Write your new system below. If you only change one value, edit the previous matrix.
2. Write down the inverse matrix you are using to solve your system.
3. Write down the solution matrix your obtained with technology.
4. State the solution:
5. We will now make some ***minor*** changes in the coefficient matrix, perhaps the value of aluminum cans has increased.

Example, aluminum cans are now worth 7 cents each because aluminum has become more costly to produce. This makes recycling the aluminum more important. Write the new system of equations.

Solve your new system of equations with technology. Edit the original matrix and the solution can be found quickly.

1. Write down the new inverse matrix here.

1. The solution is in matrix form
2. The solution is:
3. Now make up your own new system and solve it by altering the outputs or making minor changes in the coefficient matrix.