Activity 1 – Beetle Survey

Scenario: Liz is a scientist studying beetle population in Georgia beaches. When she surveyed last Saturday she collected 153 female beetles and 92 male beetles. Of the 153 female beetles she collected 71 were black, 34 were gray, and 48 were white. Of the 92 male beetles she collected 43 were black, 28 were gray, and 21 were white.

1. Record this data in the table below.

|  |  |  |
| --- | --- | --- |
|  | Female | Male |
| Black |  |  |
| Gray |  |  |
| White |  |  |

1. Often we leave off the labels since we know what it is talking about. Fill in the matrix below with the information, but without labels.

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| --- | --- |
|  |  |
|  |  |
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 We often want to talk about specific *entries* in a matrix. In general we could write a 3x2 matrix as

|  |  |
| --- | --- |
| a1,1 | a1,2 |
| a2,1 | a2,2 |
| a3,1 | a3,2 |

 What is the element a3,1 in the matrix you filled out above? What is the significance of the subscripts? What is the significance of the number in a3,1?

1. Liz also collected beetles on Sunday. The matrix of values is given below.

|  |  |
| --- | --- |
| 103 | 142 |
| 76 | 82 |
| 52 | 15 |

 How many male beetles did she find that were gray?

Can we construct a matrix that represents the total data from the two collections? How would we go about doing that?

1. One way to do this is called matrix addition. Open up the matrix calculator at <http://www.mathsisfun.com/algebra/matrix-calculator.html> , set the matrices to the appropriate sizes, and enter Saturday’s data in matrix A and Sunday’s data in matrix B. Then press the A+B button. How did it get the resulting matrix? Does it agree with your method? Write down the answer here.
2. Liz also had to keep track of where she found these beetles since she sampled at two sites, Tybee Island and Sapelo Island. In Tybee she found 20% of the black beetles, 45% of the gray beetles, and 35% of the white beetles. Using this information (and decimal representations of these percents) create a 2x3 matrix below that describes this data completely. Then label the rows and the columns.

Can you write a matrix whose rows are the collecting sites and columns are the amount of each gender found over there over the weekend?? Write your matrix here. (Hint: Try to figure out one entry at a time.)

We can use the matrix in #5 together with the matrix you wrote for #4 to get this matrix. Enter your matrix from #5 for matrix A and the one from #4 for matrix B (You may have to change the size of your matrices). Then press the AB button to multiply the two matrices together. This should match your matrix above.

1. Again, make your matrix A the one from #5 and matrix B the one from #4. What happens if you press A⬄B and then AB? Note that this is the same as multiplying BA.

This is an example where AB and BA are different size matrices, so they are clearly not the same.

What if A and B were square matrices? Create your own and experiment with AB and BA. Are the results the same?

1. Open up the matrix calculator at <http://www.mathsisfun.com/algebra/matrix-calculator.html>. For this exercise, you will create 5 square matrices. Below, record the matrix. Then enter it as matrix A and press det(A). Record the value in the second column. Now press inv(A) to get the inverse matrix A-1. Record whether or not the matrix calculator gave you a matrix or if the inverse does not exist in the third column. Finally, if the inverse does exists, press the “to B” button. Now multiply A and B together and write down the matrix AB in the last column (leave it blank if there is no inverse).

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| --- | --- | --- | --- |
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What do you notice about the matrices in the fourth column?