Matrices

Practice

1. Create a vector of 15 discrete random numbers between 1 and 200, then create a 3-row matrix with its values.

2. Create a vector of 40 normally distributed numbers with a mean of 10 and a standard deviation of 100. Next, create an 8-column matrix with its values.

3. Create a 2x5 matrix than contains the integers from 11 to 20.

4. Create a 3x4 matrix that contains only one value: 2.

5. Create three vectors of 6 discrete random numbers between 1 and 50, then create matrices with these vectors, using both the rbind() and cbind() functions.

6. Name the rows of the matrix created at #1 with the letters from a to c, and the columns with the letters from a to e.

7. Create a 4x6 matrix that contains 24 discrete random numbers between 1 and 100, with replacement, then access the data values on the following rows and columns:

   - row 3, column 5
   - row 3, columns 3 to 5
   - column 5, rows 1 to 3
   - row 4
   - column 6
   - intersection between rows 2 and 3 with columns 4 and 6
   - intersection between rows 1 and 2 with columns 5 and 6, and intersection between rows 3 and 4 with columns 2 and 3

   Then create a vector containing the fifth, the nineteenth and the twenty second element of the matrix.

8. Filter the matrix created at #7 using the following criteria:
   - elements greater than 30
   - elements lower than 65
   - elements equal to 32
   - elements greater than 20 and lower than 55
   - elements lower than 40 or greater than 85.

9. In the matrix created at #7:

   - change the element in row 2, column 5 to 100
   - change all the elements in the first row to 0
   - change all the elements in the fourth column row to 1500
   - change the elements in row 3, columns 4, 5 and 6 to 1001, 1002 and 1003, respectively.

10. Create a 3x3 matrix with any values (call it m). Then do the following:

    - create a vector with 3 components (20, 30, 40) and add it to the matrix as a new row (call the new matrix m1)
    - create a vector with 4 components (100, 200, 300, 400) and add it to the matrix m1 as a new column.

11. Create a 3x4 matrix with any values. Then create a vector with 2 values (0, 1). Add this vector to the matrix, first as a new row then as a new column. Notice what happens and explain.

12. In the matrix created at #7 find out the following:

    - the maximum value
    - the minimum value
    - the maximum values for each pair of elements in rows 2 and 4
    - the minimum values for each pair of elements in columns 3 and 6

13. In the matrix created at #7 do the following:
    - compute the sum and the mean for each row and column, respectively
    - compute the cumulative sum for each row and column, respectively

- compute the square root of each data element row-wise, and store the results in a new matrix
- compute the logarithm of each data element row-wise, and store the results in a new matrix
  Hint: use the apply() function.

14. In the matrix created at #7 use the swipe() function to do the following:
    - add the values 7, 28, -5 and 20 to each row, respectively
    - subtract the values 10, 37, 22, -1, 5 and -15 from each column, respectively
    - multiply each row by 3, 4, 5 and 6, respectively
    - divide each column to 7, 8, 9, 10, 11 and 12, respectively

15. Create a 2x4 matrix with any values and a 4x3 matrix with any values. Multiply them using the special multiplication operator. What are the dimensions of the new matrix?

16. Create a 4x4 matrix with discrete random numbers between 1 and 100. Compute its determinant, then extract the elements on the main diagonal.

17. If the determinant computed at #16 is different from zero, compute the inverse of the matrix.

18. Create a quadratic matrix that contains the values 23, 4, 51, 69, 14 and 36 on the main diagonal and zero everywhere else.

19. Create a 10x10 identity matrix using the diag() function.

20. Create two 3x4 matrices with any values, then create an array that contains these two matrices.

21. In the array created at #20, access the following elements:

    - the element in the first matrix, row 2, column 3
    - the third row in both matrices
    - the second column in both matrices
    - the elements on row 1, column 4 in both matrices.