R for Data Science Assignment 2

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1. Construct and store a 4 x 2 matrix that's filled row-wise with the values 4.3, 3.1, 8.2, 8.2, 3.2, 0.9, 1.6, and 6.5, in that order.

2. Confirm the dimensions of the matrix from (1.) are 3 x 2 if you remove any one row.

3. Overwrite the second column of the matrix from (1.) with that same column sorted from smallest to largest.

4. What does R return if you delete the fourth row and the first column from (3.)? Use matrix to ensure the result is a single-column matrix, rather than a vector.

5. Store the bottom four elements of (3.) as a new 2 x 2 matrix.

6. Overwrite, in this order, the elements of (3.) at positions (4;2), (1;2), (4;1), and (1;1) with -1/2 of the two values on the diagonal of (e).

7. Calculate the following:

$$\frac{2}{7}\left(\begin{bmatrix}1 & 2\\ 2 & 4\\ 7 & 6\end{bmatrix} - \begin{bmatrix}10 & 20\\ 30 & 40\\ 50 & 60\end{bmatrix}\right)$$

8. Store these two matrices:

$$A = \begin{bmatrix}1\\ 2\\ 7\end{bmatrix}, and\ B = \begin{bmatrix}3\\ 4\\ 8\end{bmatrix}$$

Which of the following multiplications are possible? For those that are, compute the result.

i. $A \cdot B$
ii. $A^T \cdot B$
iii. $B^T \cdot (A \cdot A^T)$
iv. $(A \cdot A^T) \cdot B^T$
v. $[(B \cdot B^T) + (A \cdot A^T) - 100I_3]^{-1}$

9. For

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 5 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

confirm that $A^{-1} - A - I_4$ provides a 4 x 4 matrix of zeros.

10. Create and store a three-dimensional array with six layers of a 4 x 2 matrix, filled with a decreasing sequence of values between 4.8 and 0.1 of the appropriate length.

11. Extract and store as a new object the fourth- and first-row elements, in that order, of the second column only of all layers of (10.).

12. Use a fourfold repetition of the second row of the matrix formed in (11.) to fill a new array of dimensions 2 x 2 x 2 x 3.

13. Create a new array comprised of the results of deleting the sixth layer of (10.).

14. Overwrite the second and fourth row elements of the second column of layers 1, 3, and 5 of (13.) with -99.

15. Construct a 5 x 3 matrix filled column-wise with a sequence of numbers from 1 to 15. Verify the matrix is correctly populated.

16. If you add a new row to the matrix created in question (15.), confirm its new dimensions.

17. Sort the first column of the matrix from question (15.) in descending order. Keep other columns unchanged.

18. What would the result be if you remove the second row and the third column from the sorted matrix in question (17.)? Ensure the result remains a matrix.

19. From the matrix in question (17.), create a new 2 x 2 matrix using the top four elements of the last column.

20. Replace the elements at positions (2,1), (2,3), (5,1), and (5,3) in the matrix from question (17.) with the average of the four corner elements of that matrix.

21. Calculate the below operation.

$$3\left(\begin{bmatrix}2 & 5\\ 3 & 7\end{bmatrix} - \begin{bmatrix}5 & 10\\ 15 & 20\end{bmatrix}\right)$$

22. Store these two matrices:

$$A = \begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}, and\ B = \begin{bmatrix}5\\ 6\end{bmatrix}$$

which of the following multiplications are valid? For valid cases, compute the results.

i. C . D

ii. C^T . D

iii. D^T . (C . C^T)

23. For

$$B = \begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 0 & 0 & -2\end{bmatrix}$$

confirm that B^{-1} - B – I_3 provides a 3 x 3 matrix of zeros.

24. Construct a three-dimensional array with four layers, each a 3 x 3 matrix filled with random numbers between 1 and 9. Then, extract the elements of the first row of the third column across all layers and store them as a new vector.

*****Finished*****