# Expanded NumPy Practice Problems

## Expanded Basic Operations

1. Create a 4x4 matrix with random integers ranging from 10 to 50.

2. Generate an array of 20 linearly spaced numbers between 0 and 1.

3. Extract all numbers from an array that are greater than a given threshold (e.g., array > 5).

4. Create a checkerboard pattern (8x8 matrix) with alternating 0s and 1s.

5. Reverse an array (1D) using slicing.

6. Find the index of the first occurrence of a value in an array.

7. Create a 1D array of size 10, filled with zeros, and replace the fifth element with 1.

8. Create a 2D array of size 3x3 filled with random integers, and flatten it into a 1D array.

9. Stack two arrays of shape (2, 2) vertically and horizontally.

10. Find the unique elements in an array and their counts.

## Expanded Matrix Operations

1. Create two random matrices of size (3, 3) and compute their sum, difference, and element-wise product.

2. Transpose a given matrix.

3. Generate a diagonal matrix with given diagonal elements: [10, 20, 30, 40].

4. Given a matrix, calculate the row-wise and column-wise sums.

5. Compute the inverse of a non-singular matrix. Example: [[4, 7], [2, 6]].

6. Compute the trace (sum of diagonal elements) of a square matrix.

7. Create a symmetric matrix from a random matrix.

8. Generate a random matrix of size (4, 4) and extract its upper and lower triangular matrices.

9. Perform element-wise division between two matrices and handle division by zero gracefully.

10. Solve a system of linear equations using NumPy’s linalg.solve function. Example: Solve for x in Ax = b, where:  
A = [[2, 3], [1, 2]]  
b = [8, 5].

## Intermediate Questions

1. Reshape a random 1D array of size 12 into a 3D array with shape (2, 2, 3).

2. Find the eigenvalues and eigenvectors of a square matrix. Example: [[2, 1], [1, 3]].

3. Calculate the Frobenius norm of a matrix.

4. Generate a matrix with random numbers and normalize it such that all elements are between 0 and 1.

5. Rotate a 2D matrix 90 degrees clockwise.