**Practice Questions**

**5\10:**

1. **Array Creation:**
   * Create a 2D array of shape (4, 3) filled with random floats between 0 and 1.
2. **Indexing:**
   * Given the following array:

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arr = np.array([[10, 20, 30],

[40, 50, 60],

[70, 80, 90]])

* + - Extract the second row and the last column from this array.

1. **Slicing:**
   * Create a 1D array with 20 elements. Slice the array to get the first 10 elements and then the last 5 elements.
2. **Boolean Indexing:**
   * Given the array:

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arr = np.array([5, 12, 15, 22, 28, 30])

* + - Use boolean indexing to create a new array containing only the values greater than 15.

1. **Reshaping:**
   * Create a 1D array of 12 elements. Reshape it into a 3D array of shape (2, 2, 3).
2. **Matrix Operations:**
   * Create two 2D arrays of shape (2, 3) filled with random integers from 0 to 10. Perform matrix addition and matrix multiplication on these arrays.
3. **Statistical Functions:**
   * Create a 2D array of shape (5, 5) with random integers from 1 to 100. Calculate the mean and standard deviation for each column.
4. **Aggregations:**
   * Given the array:

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arr = np.array([[1, 2, 3],

[4, 5, 6],

[7, 8, 9]])

* + - Calculate the sum of each row and the overall sum of the array.

1. **Sorting:**
   * Create a 1D array of 10 random integers between 1 and 100. Sort the array in descending order.
2. **Random Sampling:**
   * Use np.random.choice() to randomly sample 5 elements from the array [1, 2, 3, 4, 5, 6] with equal probability. Do this without using a loop.

**Bonus Question**

1. **Linear Algebra:**
   * Given the following matrices:

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A = np.array([[1, 2],

[3, 4]])

B = np.array([[5, 6],

[7, 8]])

* + - Calculate the dot product of A and B.

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1. **Array Creation and Reshaping:**
   * Create a 4x5 array of random integers between 1 and 20. Then, reshape this array into a 2x2x5 array.
   * Generate a 6x6 matrix with values ranging from 1 to 36, and then reshape it into a 3D array of shape (3, 2, 6).
2. **Indexing and Slicing:**
   * Create a 5x5 array of integers from 0 to 24. Extract all the corner elements from the array (i.e., top-left, top-right, bottom-left, and bottom-right).
   * Create a 6x6 matrix of random integers, then select all elements greater than 10 and replace them with 0.
3. **Broadcasting:**
   * Create two arrays: one of shape (4, 1) and another of shape (1, 5), both with random integers. Use broadcasting to add them together and produce a 4x5 array.
4. **Linear Algebra:**
   * Create two 3x3 matrices and compute their dot product using NumPy. Also, find the inverse of the resulting matrix.
   * Given a 3x3 matrix, find its determinant and eigenvalues.
5. **Stacking and Splitting:**
   * Create two 1D arrays of length 5 and stack them both horizontally and vertically. Then split the resulting stacked array into two equal parts.
   * Create a 3x4 array and split it into two 2D arrays along the second axis.
6. **Statistical Functions:**
   * Create a 5x5 array of random integers between 1 and 100, and find the mean, median, variance, and standard deviation of the entire array.
   * Find the row and column that contains the maximum value in a 4x4 array of random numbers.
7. **Boolean Indexing:**
   * Create an array of random integers between 0 and 50, and filter out all values greater than 20.
   * Given a 5x5 array of random integers, count how many elements are greater than 10.
8. **Random Sampling:**
   * Use np.random.choice() to create a 1D array of length 10, sampling random integers between 1 and 100 with a specified probability for each number.
   * Generate a 2x3 matrix where each element is a random number drawn from a normal distribution with a mean of 5 and standard deviation of 2.
9. **Sorting and Searching:**
   * Create a 1D array of random integers between 1 and 20. Sort the array and find the indices of the elements in sorted order.
   * Given a sorted array, use np.searchsorted() to insert the number 15 into the correct position and return the new array.
10. **Advanced Array Manipulation:**
    * Create a 3D array of shape (4, 4, 4) with random values, and then flatten it into a 1D array.
    * Create a 6x6 array of integers from 0 to 35. Use slicing to reverse the rows and columns of the array.