# TP: POO - Numpy

## Exercise 1: Library Management System (OOP)

Create a simple library management system with the following specifications:

### Requirements:

a) Create a class `Book` with the following attributes:

- title
- author
- ISBN
- available (boolean)

b) Create a class `Library` that can:

- Add new books
- Remove books
- Search books by title or author
- Display all books
- Borrow and return books

### Expected Output:

```
Library Inventory:
1. "Python Programming" by John Smith (ISBN: 123) - Available: Yes
2. "Data Science" by Jane Doe (ISBN: 456) - Available: No

Search Results for "Python":
- "Python Programming" by John Smith (ISBN: 123)

Book borrowed successfully!
Book returned successfully!
```

## Exercise 2: NumPy Array Operations

Create a program that performs the following NumPy operations:

### Requirements:

a) Create two 3x3 matrices with random integers between 1-10

b) Perform basic matrix operations:

- Addition
- Multiplication
- Transpose
- Inverse

c) Calculate:

- Sum of all elements
- Mean of each row
- Maximum value in each column

## Exercise 3: Student Grade Management

Create a program to manage student grades using NumPy arrays.

### Requirements:

a) Input:

- Number of students
- Number of subjects
- Marks for each student in each subject (0-20)

b) Calculate:

- Total marks per student
- Percentage per student
- Average per subject
- Grade (A: 16, B: 14, C: 12, D: 10, F: ¡10)

### Expected Output:

```
Student Results:
Student 1: Total=55/60 (91.67%) Grade: A
Student 2: Total=48/60 (80.00%) Grade: B
[...]

Subject Averages:
Subject 1: 16.5
Subject 2: 15.3
Subject 3: 14.8
```

## Exercise 4: Image Processing

Create a program that performs basic image processing operations using NumPy.

### Requirements:

a) Load an image and convert it to a NumPy array

b) Perform the following operations:

- Extract RGB channels
- Convert to grayscale
- Flip horizontally and vertically
- Adjust brightness

### Expected Output:

```
Image Properties:
Dimensions: 800x600
Channels: 3

Operations Complete:
- RGB channels extracted
```

```
- Grayscale conversion
- Image flipped
- Brightness adjusted
```

## Challenge: Color Image Filter

Create a custom color filter that applies the following transformation:

- Enhance red channel by 20%
- Reduce blue channel by 10%
- Keep green channel unchanged
- Apply a simple blur effect