1. Create a NumPy array of even numbers from 2 to 100, then reverse it.

Ans:-

```
import numpy as np
arr = np.arange(2, 101, 2)[::-1]
print(arr)
```

2. Generate an 8x8 checkerboard pattern (alternating 0s and 1s) without using loops.

Ans:-

```
import numpy as np
checkerboard = np.indices((8, 8)).sum(axis=0) % 2
print(checkerboard)
```

3. Create a 5x5 identity matrix but replace the diagonal with values 1 to 5.

Ans:-

```
import numpy as np
matrix = np.zeros((5, 5))
np.fill_diagonal(matrix, np.arange(1, 6))
print(matrix)
```

4. Given a 5x5 random array, extract only the border elements (first/last row/column).

Ans:-

```
import numpy as np
arr = np.random.rand(5, 5)
border = np.concatenate((arr[0], arr[-1], arr[1:-1, 0], arr[1:-1, -1]))
print(border)
```

5. Extract unique rows from a 2D array.

```
[[1, 2],
 [3, 4],
 [1, 2]]
```

Ans:-

```
import numpy as np
a = np.array([[1, 2], [3, 4], [1, 2]])
unique = np.unique(a, axis=0)
print(unique)
```

6. Given an RGB image (3D array of shape (H,W,3)), swap the red and blue channels.

Ans:-

7. Calculate the determinant of a 3x3 matrix without using np.linalg.det.

Ans:

```
import numpy as np
```

```
m = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]])
det = (m[0,0]*((m[1,1]*m[2,2]) - (m[1,2]*m[2,1])) -
      m[0,1]*((m[1,0]*m[2,2]) - (m[1,2]*m[2,0])) +
      m[0,2]*((m[1,0]*m[2,1]) - (m[1,1]*m[2,0])))
print(det)
```

8. Append to an empty array arr = np.array([]).

Ans:-

```
import numpy as np
arr = np.array([])
arr = np.append(arr, [1, 2, 3])
print(arr)
```

9. Compare np.append() vs. np.concatenate() for 10,000 appends.

Ans:-

```
import numpy as np
import time
data = [1]

start = time.time()
a = np.array([])
for _ in range(10000):
    a = np.append(a, data)
print("append:", time.time() - start)

start = time.time()
b = []
for _ in range(10000):
    b.append(data)
b = np.concatenate(b)
print("concatenate:", time.time() - start)
```

10. Append only even numbers from [4, 5, 6] to arr = np.array([1, 2, 3]).

Ans:-

```
import numpy as np
arr = np.array([1, 2, 3])
arr = np.append(arr, [x for x in [4, 5, 6] if x % 2 == 0])
print(arr)
```

11. Generate a 200×300 grayscale image using NumPy where all pixel values are set to 128.

Ans:-

12. Given an image img with dimensions 500×600, use NumPy slicing to extract a 100×100 square region from the center of the image.

Ans:-