

DS Exam 3 – NumPy

- Answer all the questions below.
- No material / computers are allowed.
- Exam time: 1.5 hours.
- Good luck!

Question 1

What will be the result of the following expressions (treat each cell independently):

```
a = np.linspace(2, 5, 5)
print(a)
```

```
a = np.arange(12).reshape(4, 3)
print(a[1:3])
```

```
a = np.arange(12).reshape(3, 4)
print(a[:, ::-1])
```

```
a = np.array([[1, 2, 3], [4, 5, 6]])
b = np.array([0, 10, 100])
print(a * b)
```

```
a = np.array([[1, 2, 3], [4, 5, 6]])
b = np.array([0, 10, 100])
print(np.dot(a, b))
```

```
a = np.arange(1, 6)
print(np.vstack((a, a ** 2, a ** 3)).T)
```

```
a = [[1, 3, 4], [2, 3, 5], [0, 1, -1]]
a @ a
a @ a @ a
```

```
a = np.arange(8).reshape((4, 2))
a = np.insert(a, 2, 0, axis=1)
print(a)
```

```
dtype = [('name', 'S10'), ('height', float), ('age', int)]
values = [('Arthur', 1.8, 41), ('Lancelot', 1.9, 38), ('Galahad', 1.7, 38)]
a = np.array(values, dtype=dtype)
a['height'][1]
```

Question 2

Write a function that gets a 1D NumPy array of integers, and returns the numbers in the array, **not div of 10** | the even
For example, given the array [4, 2, 7, 11, 8, 5, 10, 14].

Question 3

Write a function that gets a 2D NumPy array and a number, and returns how many rows in the array contain the given number.

For example, given the array

```
[[5 2 7 6]
 [8 3 0 3]
 [1 7 3 7]
 [0 2 1 2]]
```

and the number 7, the function should return 2 (since two rows contain the number 7). Again you shouldn't use any loops.

Question 4 **with comp, use "np.where"**

Write a function that gets a matrix (NumPy 2D array), and returns all the saddle points of the matrix. An element is said to be a **saddle point** of a matrix if it is both a minimum of its row and a maximum of its column or vice versa.

For example, in the matrix

10	12	7	3	12
3	10	6	2	8
18	24	17	6	10
15	21	10	8	12
1	18	22	4	15

The saddle points are 10 (maximum in its row and minimum in its column) and 8 (minimum in its row and maximum in its column). Thus, in this case your function should return [10, 8].

You are not allowed to use any loops.