

CS 114 Tutorial 8

Nov 7 2025

Goals for this Week:

- ❑ Have assignment 04 started (due next friday)
- ❑ Understand the idea of masking
 - where*** true, do something instead of ***if*** true, do something
- ❑ Recognize np.logical_and as &
- ❑ Recognize np.logical_or as |
- ❑ Be familiar with left hand slicing/ slice assignments
- ❑ Understand how to use left hand masking

Using masking, complete the following two tasks:

- Replace all positive numbers with 0 in an array
- Extract all numbers greater than 3 and less than 9

Write a function called `clean(a: np.ndarray)` that does the following:

- Replace all negative values in `a` with 0
- Reverses the order of the array (use slicing)
- Return the mutated array

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Masking & Boolean

```
a = np.array([-1, 0, 2])  
mask = a > 0  
a[mask] = a[mask] - 1  
print(a)
```

What does this code print?

- A. [-2, -1, 0]
- B. [1]
- C. [-1, 0, 1]
- D. Error, will not run



Masking & Boolean

```
import numpy as np

a = np.array([-2, -1, 0, 1, 2])
mask = a < 0
a[a < 1] += 2
a[mask] *= -1
print(a)
```

What does this code print?

- A. [0, 1, 2, 1, 2] B. [0, -1, 2, 1, 2] C. [2, 1, 0, 1, 2] D. [-2, -1, 0, 1, 2]



Masking with Logic

```
a = np.array([0, -1, 2, 13, -4, 5, 10, 9])  
mask = np.logical_not((a >= 10) | (a <= 0))  
print(a[mask])
```

What does this code print?

- | | |
|--------------------|---------------|
| A. [0 2 5 10 9] | B. [-1 13 -4] |
| C. [0 -1 13 -4 10] | D. [2 5 9] |



Masking Concept

Which of the following best describes what happens when you write `b = a[a > 5]` in NumPy?

- A. It sets every value of `a` greater than 5 to `True` and every other value to `False`.
- B. It creates a boolean array of the same shape as `a`, then uses it to select only the elements of `a` where the mask is `True`.
- C. It modifies `a` so that only values greater than 5 remain.
- D. It creates a mask, but `b` stores the mask rather than the values.



Left Slicing

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

What is printed?

- A. [0, 4, 4, 4, 4] B. [4, 4, 4, 3, 4] C. [0, 4, 4, 3, 4] D. Error, will not run

The following temperature data is collected over 24 days:

Temps = [-3, -2, 0, -5, -3, 2, 5, 4, 8, 11, 15, 13, 9, 12, 7, 4, 5, 6, 3, -1, 0, -2, -5, -11]

Plot this as a line graph over the 24 day period.

Then using masking, plot each temperature as a coloured point ontop of the line graph.

Freezing should be blue, temp < 0

Cold should be green, temp < 10

Warm should be red, temp >= 10

Add all proper elements of a graph including a legend, labels, and a title.