FOUNDATION LESSON

WEEK 4 · LESSON 4

Select cells, rows and matching values

Two indices select axes; a Boolean mask selects matching entries

THE IDEA BEHIND THE OPERATION

MENTAL MODEL

The idea behind the operation

Two indices select axes; a Boolean mask selects matching entries

A CELL, A COLUMN AND A ROW

CODE WALKTHROUGH W04-L04-S03

```
01  import numpy as np
02  stock = np.array([[12, 0, 7], [5, 9, 4]])
03  print("Cell:", stock[1, 2])
04  print("Column:", stock[:, 1])
05  print("Row:", stock[0, :])
```

WHAT TO TRACK

Rows: warehouses. Columns: products.

PREDICT THE RESULT

Predict the output.
Explain each operation.
Pause before continuing.

A CELL, A COLUMN AND A ROW — RESULT

CODE WALKTHROUGH W04-L04-S04

```
01  import numpy as np
02  stock = np.array([[12, 0, 7], [5, 9, 4]])
03  print("Cell:", stock[1, 2])
04  print("Column:", stock[:, 1])
05  print("Row:", stock[0, :])
```

WHAT TO TRACK

Rows: warehouses. Columns: products.

VALIDATE THE RESULT

```
Cell: 4
Column: [0 9]
Row: [12  0  7]
```

QUANTITIES INSIDE AN ALLOWED BAND

CODE WALKTHROUGH W04-L04-S05

```
01  import numpy as np
02  units = np.array([0, 5, 12, 20])
03  mask = (units >= 5) & (units < 20)
04  selected = units[mask]
05  selected[0] = 99
06  print("Mask:", mask)
07  print("Selected:", selected)
08  print("Source:", units)
```

WHAT TO TRACK

Include 5; exclude 20. Boolean selection creates a copy.

PREDICT THE RESULT

Predict the output.
Explain each operation.
Pause before continuing.

QUANTITIES INSIDE AN ALLOWED BAND — RESULT

CODE WALKTHROUGH W04-L04-S06

```
01  import numpy as np
02  units = np.array([0, 5, 12, 20])
03  mask = (units >= 5) & (units < 20)
04  selected = units[mask]
05  selected[0] = 99
06  print("Mask:", mask)
07  print("Selected:", selected)
08  print("Source:", units)
```

WHAT TO TRACK

Include 5; exclude 20. Boolean selection creates a copy.

VALIDATE THE RESULT

```
Mask: [False  True  True
False]
Selected: [99 12]
Source: [ 0  5 12 20]
```

A MASK MUST FIT ITS AXIS

CODE WALKTHROUGH W04-L04-S07

```
01  import numpy as np
02  values = np.array([10, 20, 30])
03  mask = np.array([True, False])
04  print(values[mask])
```

WHAT TO TRACK

Three positions cannot be filtered by two Boolean decisions.

PREDICT THE RESULT

Predict the output.
Explain each operation.
Pause before continuing.

A MASK MUST FIT ITS AXIS — RESULT

CODE WALKTHROUGH W04-L04-S08

```
01  import numpy as np
02  values = np.array([10, 20, 30])
03  mask = np.array([True, False])
04  print(values[mask])
```

WHAT TO TRACK

Three positions cannot be filtered by two Boolean decisions.

VALIDATE THE RESULT

```
IndexError: boolean index
did not match indexed array
along axis 0; size of axis
is 3 but size of
corresponding boolean axis
is 2
```

GUIDED MODIFICATION

LEARNER PRACTICE

Guided modification

Filter [2, 6, 10, 14] to keep values at least six and at most ten. Print the mask and result. Explain both inclusive boundaries.

PREDICT · MODIFY · RUN

01 Restate the supplied rules.

02 Predict the result.

03 Modify and run the code.

04 Compare actual output.

05 Explain any difference.

INDEPENDENT APPLICATION

LEARNER PRACTICE

Independent application

For stock [[3, 0], [8, 5], [0, 2]], select whole rows where the first product is positive. Separately select every positive cell. Print both shapes and explain their difference.

PREDICT · MODIFY · RUN

01 Restate the supplied rules.

02 Predict the result.

03 Modify and run the code.

04 Compare actual output.

05 Explain any difference.

RECAP AND NEXT STEP

Recap and next step

Choose selectors for each axis, match mask shape to the task and combine comparisons element by element. Boolean selections create copies. Next, we calculate across arrays and predict broadcasting from shapes.

UNDERSTAND APPLY VALIDATE EXPLAIN