Solution 5

Module 5: Vectors and Matrices

1.

Answer:

a) scalar b) vector c) matrix d) index e) dot product

2.

Answer:

1. yields = np.array([4.2, 5.1, 3.8, 4.7])
2. yields[1] → 5.1
3. yields + 0.5 → [4.7, 5.6, 4.3, 5.2]
4. np.dot([1,2,3],[4,5,6]) = 1×4+2×5+3×6 = 4+10+18 = 32

3.

Answer:

[4, 7, 10] | [6, 12, 18] | [2, 3, 4] | 45

4.

Answer:

a) ph_data.shape = (3, 2) 3 rows (fields), 2 columns (days)
b) Field C has the lowest Monday pH (5.9)
c) ph_data[1][1] = 7.0 row 1 (Field B), column 1 (Tuesday)
d) ph_data[0][1] = 6.8 row 0 (Field A), column 1 (Tuesday)

5.

Answer:

a) A scalar is a single number (e.g. 23.5°C). A vector is a list of numbers (e.g. temperatures for 5 days).
b) Shape (4, 3) means 4 rows and 3 columns — 12 values in total.
c) Any reasonable answer: daily milk yield per cow, sensor readings over a week, NDVI values per field.
d) Any reasonable answer: soil moisture for 5 fields over 7 days (5×7), pH values per field per week (fields×days).