



# Vector Operations

Chapter: AI & Machine Learning · Level ★★★ ·  
Time: 30 min

SCORE

\_\_\_ / 20

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## AFTER THIS WORKSHEET YOU CAN

✓ Add and scale vectors   ✓ Dot product   ✓ Norms (length)   ✓ Cosine similarity idea

## Section A · Concept Check

• BEGINNER

 $4 \times 1 = 4$ 

- 1  $[1,2] + [3,4] =$ :  
☐ A. [4,6]   ☐ B. [3,8]   ☐ C. [4,8]   ☐ D. [1,2,3,4]
- 2 Dot product of [1,2] and [3,4]:  
☐ A. 11   ☐ B. 7   ☐ C. 12   ☐ D. [3,8]
- 3 The L2 norm of [3,4] is:  
☐ A. 5   ☐ B. 7   ☐ C. 12   ☐ D. 25
- 4 Dot product of perpendicular vectors is:  
☐ A. 0   ☐ B. 1   ☐ C. -1   ☐ D. undefined

## Section B · Problem Solving

• INTERMEDIATE

 $2 + 3 \times 3 = 11$ 

- 5  $2 * [1,3] = [2, \text{.....}]$ .
- 6 Dot product multiplies pairwise then .....
- 7 Compute  $[2,1].[4,3]$ .

- 8 Norm of [6,8]?

- 9 Why does ML use dot products constantly?

## Section C · Challenge

• CHALLENGE

5

- 10 Two docs as vectors – how tell similarity?

Reflection — the most useful thing I learned: .....

A \_\_\_/4   B \_\_\_/11   C \_\_\_/5   Total \_\_\_/20

Teacher's Signature

Parent's Signature

✂ ANSWER KEY — FOLD OR CUT BEFORE HANDING OUT

1-A   2-A   3-A   4-A | 5 6   6 sums/adds    $7 = 2 \times 4 + 1 \times 3 = 11$     $8 = \text{sqrt}(36+64) = 10$    9 = Neuron outputs, similarities, projections are all dot products | 10 = Cosine similarity of their embedding vectors