



4.2.8 Vectors

- 1) A game represents the position and movement of a character using 2D vectors.

The character's current position is:

$$p = (4, 3)$$

The character moves according to the movement vector:

$$m = (2, -1)$$

- a) Calculate the character's new position.

[1 mark]

- b) The character's movement vector is multiplied by the scalar **3**. State what happens to the character's movement in terms of magnitude and direction.

[2 marks]

- 2) Two vectors are given:

$$a = (3, 2, 1)$$

$$b = (4, -1, 5)$$

Calculate the dot product $a \cdot b$

Show your working.

[2 marks]

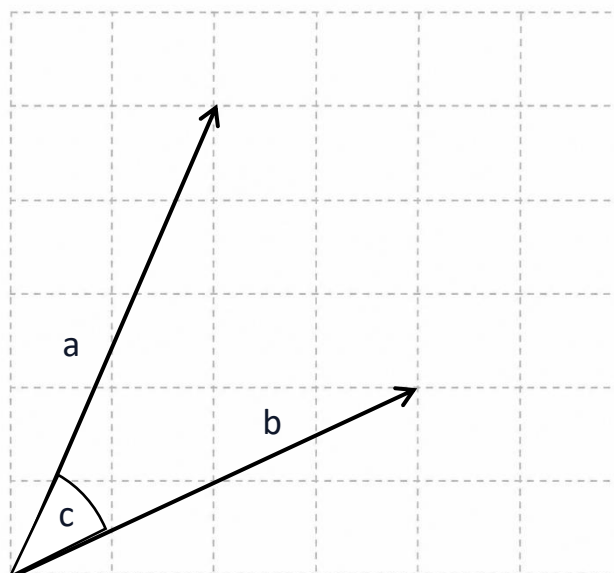




- 3) A game represents the position and movement of a character using 2D vectors.

Figure 1 shows two vectors **a** and **b** and the angle between them, **c**.

Figure 1



$$\mathbf{a} = (2, 5)$$

$$\mathbf{b} = (4, 2)$$

The magnitude of a vector, represented as an arrow, is the length of the arrow. The magnitude of vector **a** is 5 because $\sqrt{4^2 + 3^2} = 5$

- a) What is the magnitude of vector **b**?

[1 mark]

- b) Calculate the dot product of vectors **a** and **b**. You should show your working.

[2 marks]

- c) Describe what will happen to the angle **c** and the magnitude of vector **a** when **a** is multiplied by the scalar 2.

[2 marks]

- d) Describe what will happen to the angle **c** and the magnitude of vector **a** when **a** is multiplied by the scalar -1.

[2 marks]





4) Given the vectors in Figure 1:

Figure 1

$$u = (2, 4)$$

$$v = (8, 10)$$

$$w = 0.25u + 0.75v$$

a) Calculate w .

[1 mark]

b) Explain why this is a convex combination.

[2 marks]

