

4 Vectors – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English

Write it 3 times (English)

vector

magnitude

Recall

You may have met vectors already:

- A vector has a size **and** a direction, like a push of “5 newtons east”.
- You have added movements: 3 steps east then 4 steps north.
- Pythagoras finds the straight-line distance of a right-angle journey.

This sheet lines up vectors. Each idea has a worked example.

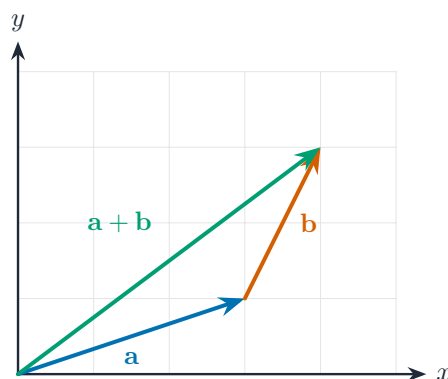
New ideas

■ 1 What a vector is

A **vector** has both **magnitude** (length) and **direction**. We write it by its components, $\langle a, b \rangle$ – a across and b up.

■ 2 Adding vectors

Add two vectors component by component: $\langle a, b \rangle + \langle c, d \rangle = \langle a + c, b + d \rangle$.



Worked example. $\langle 3, 1 \rangle + \langle 2, 4 \rangle = \langle 5, 5 \rangle$.

■ 3 Magnitude

The **magnitude** (length) of $\langle a, b \rangle$ is found with Pythagoras:

$$|\langle a, b \rangle| = \sqrt{a^2 + b^2}.$$

Worked example. $|\langle 3, 4 \rangle| = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$.

■ 4 Scaling

Multiplying a vector by a number scales each component: $2\langle 3, 1 \rangle = \langle 6, 2 \rangle$ (same direction, twice as long).

Watch out: add vectors **component by component** – do not add their magnitudes. $\langle 3, 0 \rangle + \langle 0, 4 \rangle$ has magnitude 5 (by Pythagoras), not $3 + 4 = 7$.

Practice

Try these in order. The methods are all above.

2.1 State the two things a vector has.

[2]

2.2 Find $\langle 2, 3 \rangle + \langle 5, 1 \rangle$.

[2]

2.3 Find the magnitude of $\langle 6, 8 \rangle$.

[2]

2.4 Find $3\langle 2, 4 \rangle$.

[2]

2.5 A vector goes $\langle 5, 0 \rangle$ and another $\langle 0, 12 \rangle$. Find the magnitude of their sum.

[3]