

# Vectors (AS)

- J1 Use vectors in two dimensions.
- J2 Calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form.
- J3 Add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations.
- J4 Understand and use position vectors; calculate the distance between two points represented by position vectors.
- J5 Use vectors to solve problems in pure mathematics and in context, including forces.

For a brief commentary on this content go to the [MEI outline SoW](#).

## Pre-requisites

- GCSE: Pythagoras' Theorem to be able to calculate distances between points and magnitudes of vectors.
- Trigonometry to be able to convert between different forms in which vectors can be expressed.

## Teaching it!

- A series of three [videos](#) designed to support students on this topic.
- [Properties of vectors](#): Arranging a set of vectors so that each property is satisfied ([Solution](#)).
- [Vector addition and subtraction](#): A useful GeoGebra file for introducing this topic.
- [Hit the spot](#): An interactive challenge from Underground Mathematics involving combining vectors.
- [Grid moves](#): A very simple intro to vectors from Don Steward for use with struggling students.
- Introduction to vectors (student task): [Autograph](#), [GeoGebra](#)

## Common student errors

- Taking insufficient care with notation, such as writing 5 rather than  $5\mathbf{i}$ .
- Confusing position vectors with displacement vectors.
- Failing to sketch the vector, particularly when the context involves bearings.
- Making sign errors when calculating the magnitude of vectors with negative components.

## Getting them thinking

- Change one component of  $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ ,  $\mathbf{c} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$  so that  $\mathbf{a} + \mathbf{b}$  is parallel to  $\mathbf{c}$ .
- Give me an example of a vector with magnitude 5...now give me an unusual example.
- Prove that the medians of any triangle are concurrent.
- Varignon's Theorem states that for any quadrilateral, the midpoints of the sides form the vertices of a parallelogram. Prove this using vectors.