**Y12 AS Mathematics**

**12 Vectors 1 week**

## Teaching objectives

**a** To review knowledge of addition and subtraction of vectors and multiplication by a scalar from GCSE.

b To ensure students understand: Calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form.

c To understand and know efficient routines for adding vectors diagrammatically and performing the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations.

d To understand and use position vectors.

e To gain fluency and calculate the distance between two points represented by position vectors.

fTo gain fluency and use vectors to solve problems in pure mathematics and in context, including forces, (and kinematics).

**Resources for advance preparation:**

[**MEI: Properties of Vectors**](https://integralmaths.org/sow-resources.php)– 1 sheet + cards prepared per pair

[**UM: Hit**](https://undergroundmathematics.org/geometry-of-equations/lots-of-lines) **the Spot** – 1 sheet per student or use interactive file

[**UM: Vector Squares**](https://undergroundmathematics.org/geometry-of-equations/simultaneous-squares) – 1 problem and sheet per student

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|  | **Starter** | **Main teaching**  Including key questions, key teaching points, models and resources | **Notes**  Including Support and Extension | **Consolidation/Plenary**  Including key questions and homework |
| **1** | [**UM:Hit**](https://undergroundmathematics.org/geometry-of-equations/lots-of-lines) **the Spot** | Students need to be familiar with column vectors and with the use of **i** and **j** vectors in two dimensions.  Students should know and be able to use the arrow notation and calculate the distance between two points represented by position vectors.  Understand and use position vectors  [MEI ICT (geogebra) task](http://mei.org.uk/files/ict/geogebra-as-core-tasks.pdf%23page=12) | **A lot of this is review from GCSE, suggested order for lessons.**  **Prior knowledge:**  Surds  Trigonometry  GCSE Vectors  Understand the language and focus on notation.  Careful that position vectors and direction vectors aren’t confused. | <https://www.mathsgenie.co.uk/resources/as-pure-vectors.pdf>  Solutions: https://www.mathsgenie.co.uk/resources/as-pure-vectorsans.pdf  Review of GCSE  [Defining Vectors (review)](https://www.tes.com/teaching-resource/defining-vectors-11135742)  [Vectors review](http://m4ths.com/web_documents/the_vector.pdf) |
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| **2** | Mini-whiteboard starter – quick questions recapping notation, calculating distances. | Calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form  Add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations  Geogebra: <https://www.geogebra.org/m/ieoM91WG>  (showing vector addition and subtraction)  Key Questions from task:      KEY QUESTIONS: | Use geogebra to explore and consolidate vector diagrams and magnitude.  (Pearson Ede**xcel books are hyperlinked with geogebra files)**  Alternative resource  [Converting between forms](https://www.dropbox.com/sh/y906if4mju9sxml/AAAPOg88Es48eLNNisAuzcdSa/4%20A-Level%20Maths/2016%20A-Level%20Maths/Core%204/15.7%20Vectors?dl=0&preview=Vector+Notation.doc&subfolder_nav_tracking=1) | Routine practice including exam type questions from old resources, or new resources  [**Solomon worksheet**](http://pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Worksheets-Notes/Solomon/C4%20Vectors%20A%20-%20Questions.pdf)  [**Solutions**](http://pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Worksheets-Notes/Solomon/C4%20Vectors%20A%20-%20Answers.pdf) |
| Could ask students to review these notes here as part of independent work: [NRich: Intro to Vectors](http://nrich.maths.org/2390)  Worksheet on magnitude  [Magnitude task](https://drive.google.com/file/d/0B9L2lYGRiK2baHlHZHkyQWtDTVExdW9VUnNYNlFXRTVoSzM4/view) |
|  | **Starter** | **Main teaching**  Including key questions, key teaching points, models and resources | **Notes**  Including Support and Extension | **Consolidation/Plenary**  Including key questions and homework |
| **3** | [**Properties of vectors (MEI)**](http://mei.org.uk/files/sow/11-vectors-res.pdf) | [**UM: Vector Squares**](https://undergroundmathematics.org/geometry-of-equations/simultaneous-squares)  Note that vector equations of lines are no longer required for Mathematics (only FM), so this activity may need a little adaptation.  Review questions  <https://undergroundmathematics.org/vector-geometry/r9629>  <https://undergroundmathematics.org/vector-geometry/r6009>  <https://undergroundmathematics.org/vector-geometry/r5992> | Use the properties of vectors task as a review from previous tasks on Geogebra. |  |
| **4** | Mini-whiteboards to recap converting between component form, magnitude & direction. | Use vectors to solve problems in pure mathematics and in context, (including forces)  <https://undergroundmathematics.org/vector-geometry/r6009>  [UM: Make it equal](https://undergroundmathematics.org/vector-geometry/make-it-equal)  Opportunities for proof (from MEI SOW):   1. Prove that the medians of a triangle are concurrent. 2. Varignon’s Theorem: For any quadrilateral, the midpoints of the sides form the vertices of a parallelogram. | Includes interpreting the resultant force.  Link solving problems to kinematics and 3D in Year 2. | **Homework:**  Topic assessment (integral) |