# Plane vectors, geometry and relative motion

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A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the worked example, then show each step in the practice questions. Show the mathematical steps. A calculator, graphing tool or CAS may be used to check results where useful.

## What you will practise

• Vectors in the plane

Useful starting skills: Year 10 and relevant Year 10A algebra, functions and trigonometry; concurrent Methods supports these topics.

A vector has magnitude and direction. Add components to combine displacements or velocities; subtract to form relative quantities.

The dot product $a \cdot b = |a||b|\cos\theta$ finds angles and tests perpendicularity. Vector projection on to nonzero b is $[(a \cdot b)/(b \cdot b)]b$.

## Worked example

Find magnitude and unit vector of $v=(3, 4)$.

Use $\sqrt{(3^2+4^2)}$

divide each component by 5.

Answer: 5; (3/5, 4/5).

## Try it yourself

Name: _____ Date: _____

1. For a=(2, -1), b=(3, 4), find 2 a-b.

2. Find dot product of (1, 2) and (4, -2).

## Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. (1, -6).

Double a then subtract b.

2. 0; the vectors are perpendicular.

$1\times4+2\times(-2)=0$.

Curriculum reference: Specialist Mathematics Units 1–2 — Vectors in the plane

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