IBDP Mathematics (SL) Velocity vector

Velocity vector



r = a + tb

r is the position of an object after time t
a is the initial position
b is **Direction vector** (as known as **Velocity vector**)

The **speed** of an object is **|b|**.

IBDP Mathematics (SL) Velocity vector



- 1. $\binom{x}{y} = \binom{1}{3} + t\binom{4}{3}$ is the vector equation of an object. The time *t* is in seconds, the distance units are metres.
- (a) Find the initial position of an object.
- (b) Find the velocity vector of an object.
- (c) Find the speed of an object.
- (d) The speed of an object is increased to 25 ms^{-1} . Find the new velocity vector.



IBDP Mathematics (SL) Velocity vector



2. A plane is at its initial point (3, 2, 3). After 5 hours, it is at point (8, 12, 8). Find the velocity vector of the plane.





Distance = Speed x Time

1. $\binom{x}{y} = \binom{-4}{2} + t\binom{6}{8}$ is the vector equation of an object.

The time *t* is in hours, the distance units are metres.

Find the distance travelled during the 3 hours.

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2. $\binom{x}{y} = \binom{12}{20} + t\binom{15}{23}$ is the vector equation of an object. The time *t* is in hours, the distance units are metres.

Find the distance travelled during the 5 hours.

Paper 2



1. A motorcycle is travelling in constant velocity along line L. Its initial position is $A(2, -4, \sqrt{20})$. After one hour, the motorcycle has moved to $B(5, 3, 3\sqrt{200})$.

(a) Find the velocity vector \overrightarrow{AB} .

(b) Find the speed of motorcycle.

(c) Find the vector equation of L.



2. In this question, distance is in kilometers and time is in hours.

Two planes are each flying in a straight line.

At noon, the first plane is at point (1, 18, 3). Its position vector after

s hours is represented by
$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 18 \\ 3 \end{pmatrix} + s \begin{pmatrix} -2 \\ 3 \\ 1 \end{pmatrix}$$
.

(a) Find the speed of the plane.

At the same time, the second plane is at point (4, 2, 5). After 5 hours, it is at point (9, 12, 0).

(b) Show that its position vector after t hours is given by

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ 2 \\ 5 \end{pmatrix} + t \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}.$$

(c) The two planes meet at point K.

(i) When do the two planes meet?

(ii) Find the position of K.

(d) Find the angle between the two paths of the planes.



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