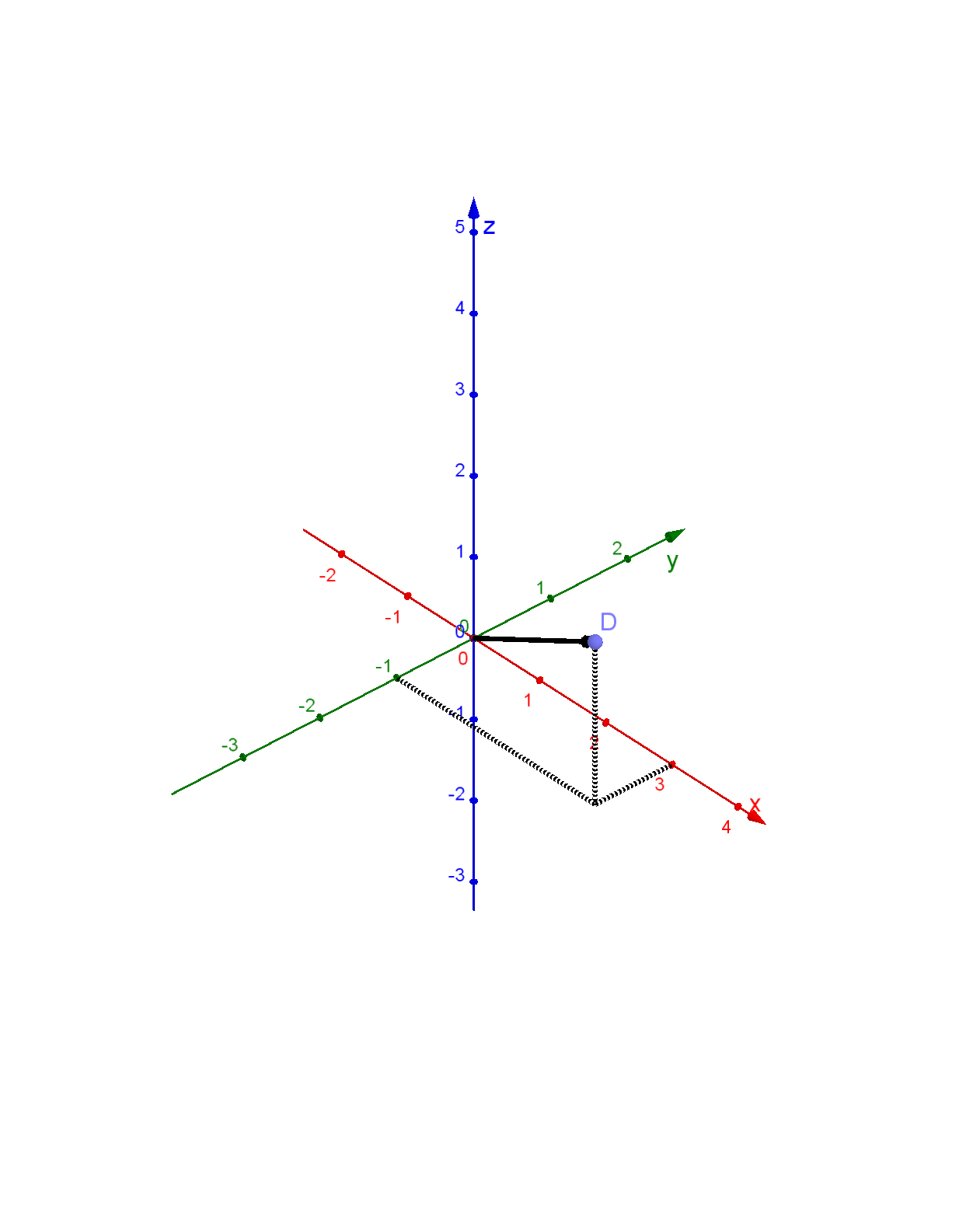
 MEX-V1 Sample questions

V1.1: Introduction to three-dimensional vectors

V1.2: Further operations with 3D vectors

Calculating the Magnitude of a Vector in 3D

1. Draw a diagram to illustrate the position vector .



1. If and
   1. express the vectors and as ordered triples
   2. find .
2. Find all possible values of if where and
3. Use vector methods to locate the midpoint of the interval joining the points and

or

where is the position vector of the midpont

**Note**: the question asks for vector methods (plural)

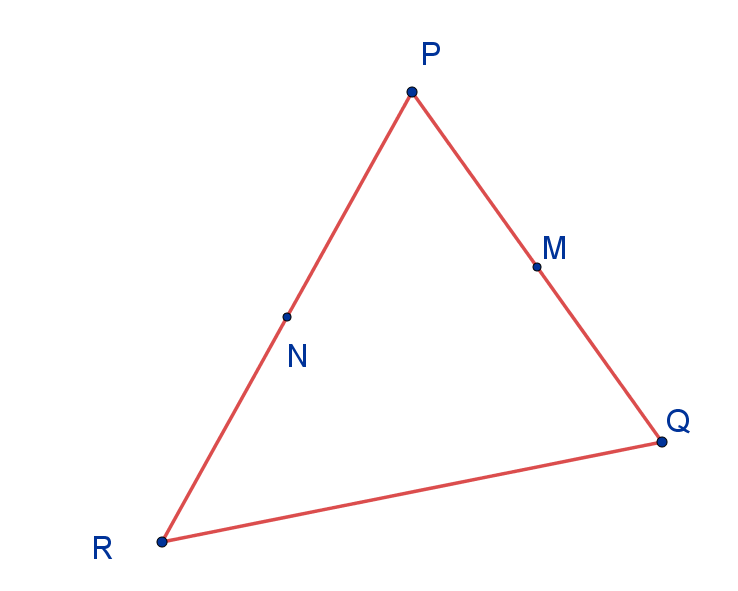
1. Given that and , describe the geometric relationship between and .

is a point that lies on the interval such that it splits in interval internally in the ratio .

1. Use vector methods to find the coordinates of the point that divides the interval joining and in the ratio .

Or

1. In is the midpoint of and is the midpoint of . Use vector methods to prove that and .



end to end vectors with the same start and terminal points.

Following the vector path from M to P to N gives

If , where is a scalar, then .

Therefore .

1. Classify the triangle formed by joining the points , and .

Analysing side lengths:

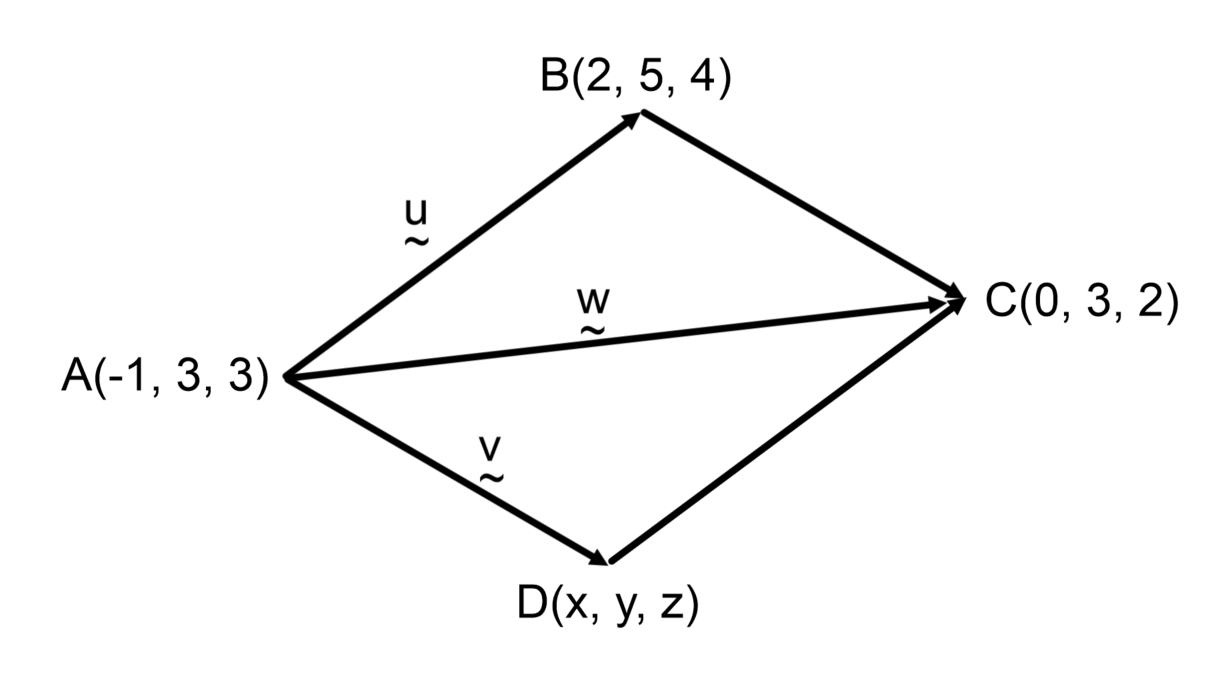
Analysing angles:

From above , therefore .

and , use the scalar product of the direction vectors to determine if andare perpendicular.

Therefore andare perpendicular. The triangle ABC is a right angled triangle with a right angle at C.

1. The four points , , and form a parallelogram. Use vector methods to find .



, and

The point D is

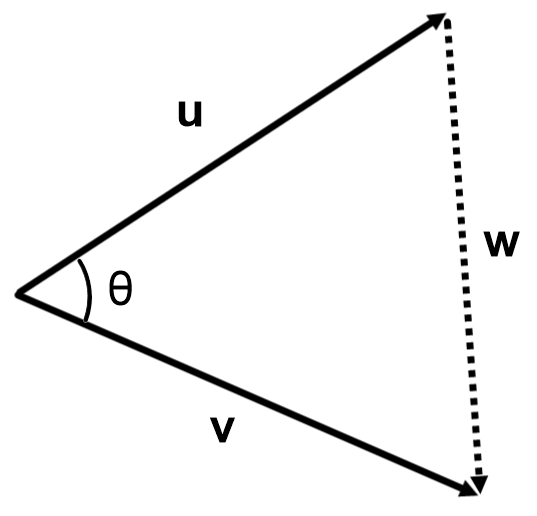
Applying the Scalar Product in 3D

1. Given and verify numerically that where , ) and is the angle between them.

Scalar Product result 1:

Scalar Product result 2:

Connect andtip-to-tail as shown.



Cosine rule: which rearranges to

Scalar Product result 1

is verified numerically.

Use vectors to prove geometric results in three dimensions

1. Find the angle between and
2. Determine if and are perpendicular or parallel.

By inspection so is not parallel to

If then and are perpendicular.

and are not perpendicular.

1. If is a rectangular prism as illustrated below, and is the midpoint of , use vector methods to find the size of and .

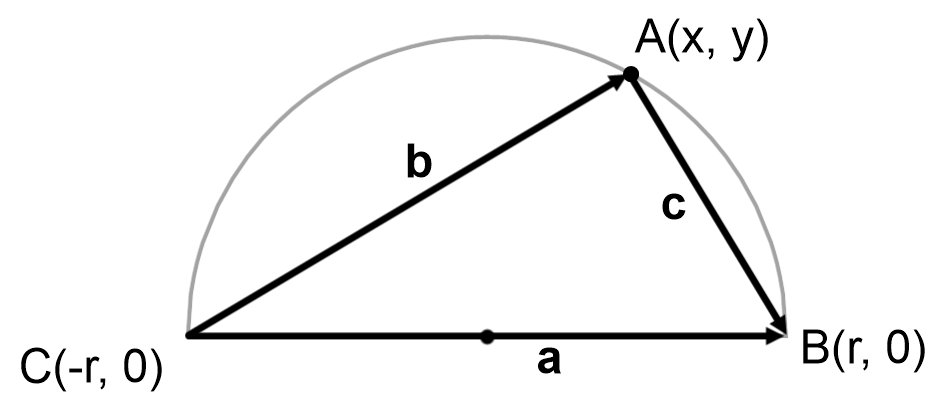
Rectangular prism ABCDEFGH with dimensions 10 by 3 by 4 and M is the midpoint of EF. AB=CD=10, BC=DA=4. H is below A, G below B, F below C and E below D.


, ,

and

and

1. Use vector methods to prove that the angle in a semicircle is a right angle.



, , and or

and are perpendicular and the angle in a semi-circle is a right angle.