Vector Dot Products

Student Worksheet

7   8   9   10   **11**   **12**

TI-Nspire™   Investigation   Student   30 min

Introduction

A formula exists to compute the dot product of two vectors, but what does it mean? Can we 'see' the dot product? In this activity you will be able to manipulate two vectors a and b, and see the impact on the dot product. When is the dot product zero? When is the dot product negative?

Instructions

Open the TI-Nspire file "Dot Product" and navigate to page 1.2

Use the mouse to move over the head of vector b until the word "Point" appears. When the word "Point" appears (shown opposite) either:

- Click and hold the centre of the navigation pad for 1 second
             OR
- Press Ctrl + Click

Vector b can now be moved. Press [Esc] to release the vector. Note that the magnitude (length) of vectors a and b are shown at the base of the page.
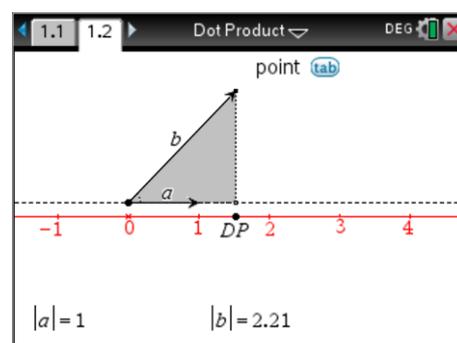
Question 1

Change the magnitude of vector a and b and also the angle between the two vectors.

a) Does vector a affect the dot product? (DP represents the dot product shown on the red number line.)

b) Does vector b affect the dot product?

c) Does the angle between vectors a and b affect the dot product?

For each of the above, describe the affect in detail. For example can the dot product be negative or zero?

Question 2

Adjust vectors a and b so the dot product is approximately equal to 2. Determine at least two different values for the magnitude of the two vectors and the approximate angle between them.
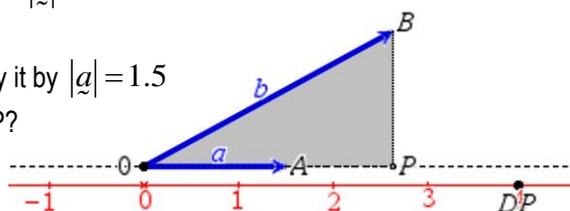
Question 3

In the diagram shown opposite vector a (OA) has a magnitude of 1.5, this can be written as: $\left| a \right| = 1.5$.

Vector b (OB) has a magnitude of 3, this can be written as: $\left| b \right| = 3$.

The angle between the two vectors is approximately 28°.

Use trigonometry to calculate the length of OP and multiply it by $\left| a \right| = 1.5$

How does this compare to the value for the dot product DP?

Question 4

Repeat Question 3 with some other values of your own.
The angle between the two vectors can be measured using: **Menu > Measure > Angle**.

Authors: Peter Fox