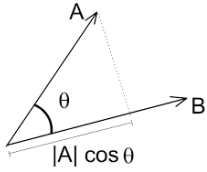


## 1. Goals



By the end of this unit, students:

- understand the concepts and techniques in combinatorics, geometry and vectors
- apply reasoning skills and solve problems in combinatorics, geometry and vectors
- communicate their arguments and strategies when solving problems
- construct proofs in a variety of contexts including algebraic and geometric
- interpret mathematical information and ascertain the reasonableness of their solutions to problems.

This week's focus:

- Dot Product
- Vector Projections

## 2. Theoretical Components

STEP 1:

Readings:

Read examples:

ABOUT/RESOURCES/2021S1/WK15

Dot Product:

- [Notes & Worked Examples](#)
- [More Examples & Quiz](#)
- [Better explained](#)

Watch the following videos:

**Dot Product**

- <https://goo.gl/y3hlrj>
- <https://goo.gl/2rYWLn>

**Vector Projections:**

- <https://goo.gl/q5Sf9B>
- <https://goo.gl/yKTPp4>
- <https://goo.gl/H41y35>
- <https://goo.gl/y3BAVP>

## 3. Practical Components

STEP 2:

Attempt all the questions:

ABOUT/RESOURCES/2021 S1/

- WK15 Scalar Products
- WK15 Mathspace\_DotProduct

## 4. Investigation

A: Determine whether the vectors  $\langle 1, -1, -1 \rangle$ ,  $\langle 0, 2, 7 \rangle$  and  $\langle 1, 1, 6 \rangle$  are linearly dependent.

B: Points A and B have position vectors  $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j} - 4\mathbf{k}$  and  $\mathbf{b} = 2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ . Point C has position vector  $\mathbf{c} = 2\mathbf{i} + (1 + 3t)\mathbf{j} + (-1 + 2t)\mathbf{k}$ .

a) Find in terms of t:

i)  $\overrightarrow{CA}$

ii)  $\overrightarrow{CB}$

b) Find the values of t for which  $\angle BCA = 90^\circ$ .

(20marks)

## 5.QFO

Quiz/Forum/Other

Additional reading on multiplying vectors: <http://goo.gl/6rVbQ0>