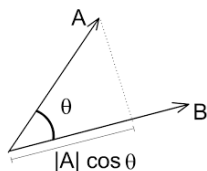


## 1. Goals



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 Applications (Relative Velocity & Forces)

## 2. Theoretical Components

STEP 1:

Readings:

<https://openstax.org/books/calculus-volume-3/pages/2-3-the-dot-product>

ABOUT/RESOURCES/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 listed:

ABOUT/RESOURCES

- Ex6G Relative Velocity (attempt even numbered questions)
- Ex6H Forces (read through all, attempt all the questions).

## 4. Investigation

When a constant force is applied to an object so the object moves in a straight line from point  $P$  to point  $Q$ , the work  $W$  done by the force  $\mathbf{F}$ , acting at an angle  $\theta$  from the line of motion, is given by

$$W = \mathbf{F} \cdot \overrightarrow{PQ} = \|\mathbf{F}\| \cdot \|\overrightarrow{PQ}\| \cdot \cos \theta$$

A conveyor belt generates a force  $\mathbf{F}=5\mathbf{i}-3\mathbf{j}+\mathbf{k}$  that moves a suitcase from point  $(1,1,1)$  to point  $(9,4,7)$  along a straight line. Find the work done by the conveyor belt. The distance is measured in meters and the force is measured in newtons.

(20 marks, see rubric)

## 5.QFO

Quiz/Forum/Other

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