**Student handout**

Write one thing you know about the dot product.

# 1 Instructor's Guide

## 1.1 Prerequisite Knowledge

This swbq will not work unless most students in the class have seen and used the dot product before. Use it at the beginning of term if the students need a review. If some students in your class have not seen the dot product before, you can refer them to the section The Dot Product in our online text.

## 1.2 Introduction

Prompt: On your small whiteboard, write one thing you know about the dot product.

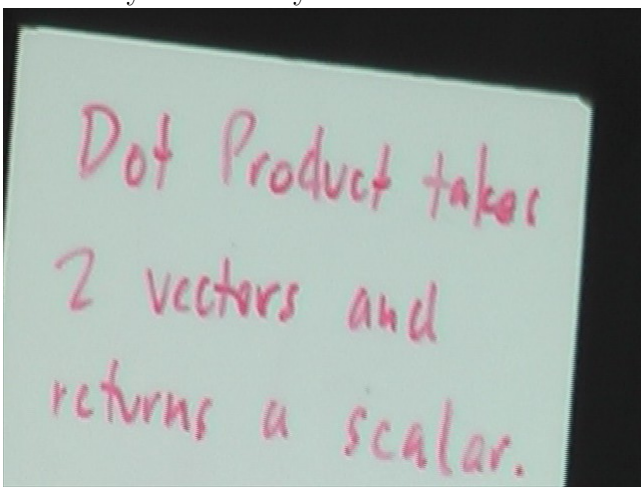
(The generic term "one thing" in the prompt is important. Do not use a more specific word that cues students to give an algebraic definition or a drawing, etc.)

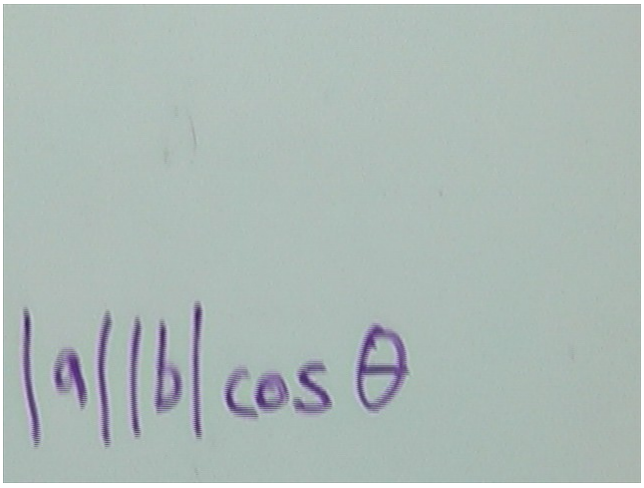
## 1.3 Student Conversations

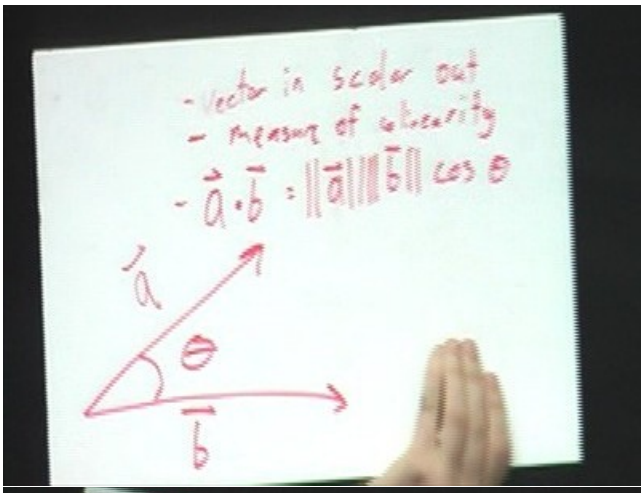
Walk around the room as students are answering this question and quickly pick up an example of each different representation or statement. Quickly order them in the order you would like to talk about them and prop them on the chalkboard tray. Pick up each one (or more than one if you are comparing them) and give whatever review "lecture" you would normally give. The students are far more invested if they see that you are talking about their answers and some students will even vie with each other to get you to choose their answer. You can add in any extra representations that the students haven't mentioned as you go along.

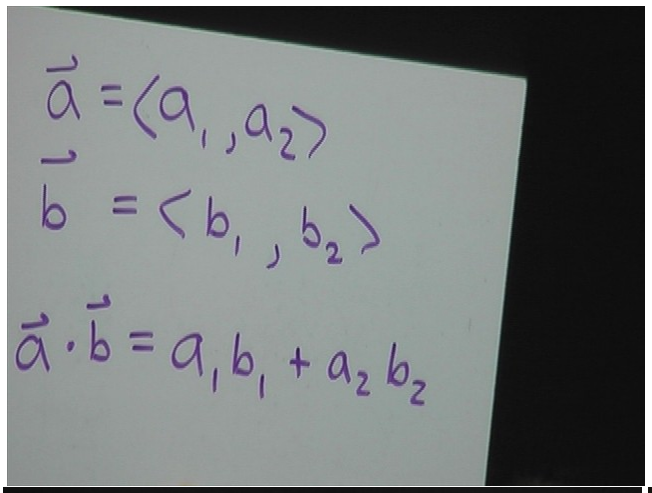
The most important thing to emphasize is that the professional physicist knows and uses all of these representations/facts.

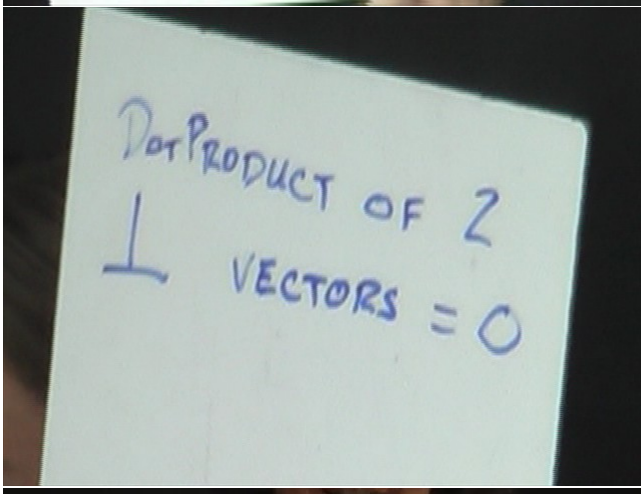
Answers you are likely to see:

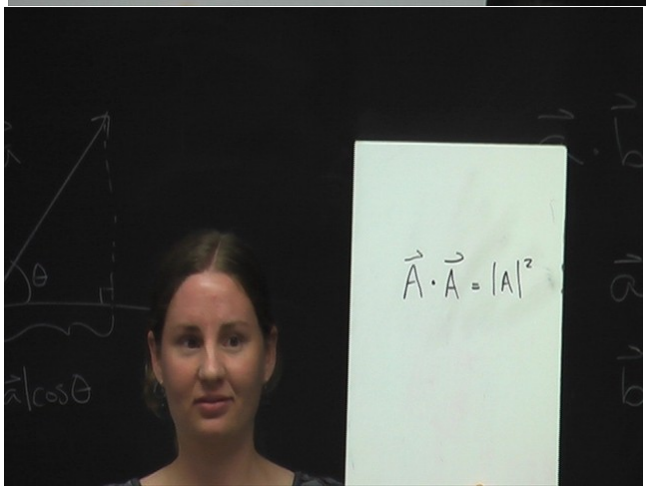


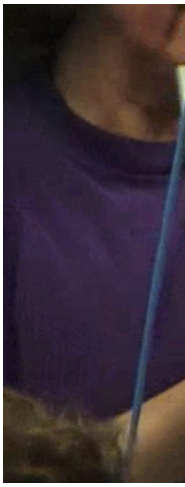



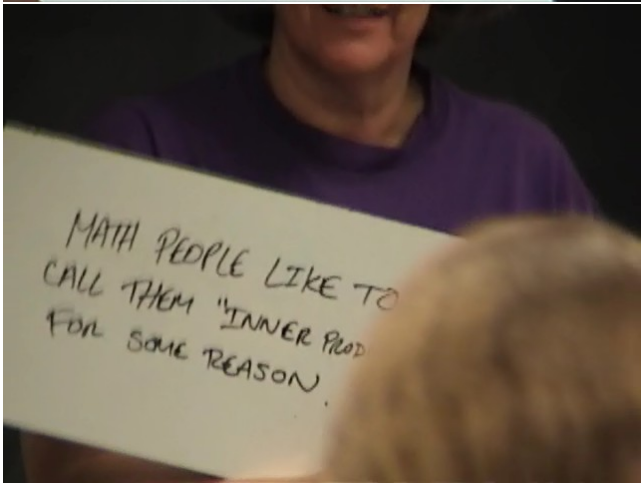

- Vector is scalar out
- measure of similarity
- $\vec{a}\cdot\vec{b} = \|\vec{a}\|\|\vec{b}\|\cos\theta$
$\vec{a}$
$\theta$
$\vec{b}$

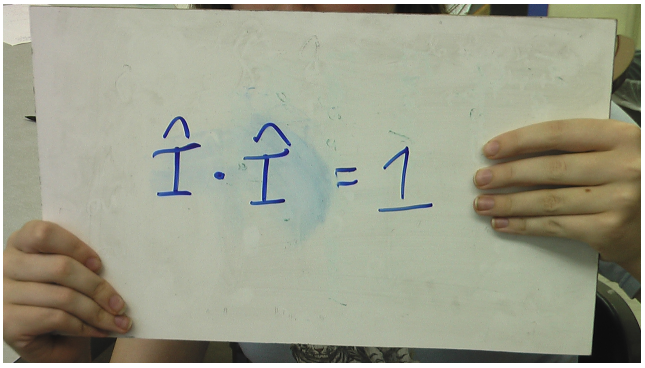

$\vec{a} = \langle a_1, a_2 \rangle$
$\vec{b} = \langle b_1, b_2 \rangle$
$\vec{a}\cdot\vec{b} = a_1 b_1 + a_2 b_2$

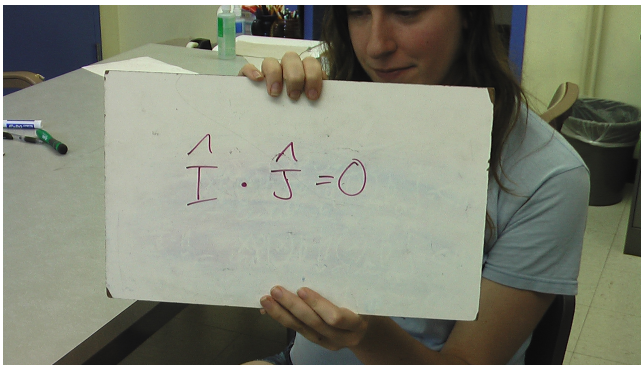

DOT PRODUCT OF 2
⊥ VECTORS = 0


$\vec{A}\cdot\vec{A} = |A|^2$




MATH PEOPLE LIKE TO
CALL THEM "INNER PROD
FOR SOME REASON.


$\hat{I}\cdot\hat{I} = 1$




## 1.4 Extensions

You may also want to assign the homework problem Tetrahedron which requires students to use both the algebraic and geometric definitions of the dot product to solve the problem successfully.