**Mathematics Extension 2**

**Vectors Q15b-transcript**

(Duration 3 minute 33 seconds)

This is the HSC hub Mathematics curriculum support for the New South Wales Department of Education. My name is Daniel Proctor. This video provides a solution to question fifteen b from the sample examination provided by the New South Wales Education Standards Authority for the Mathematics Extension 2 course. This question looks at vectors.

The solution provided in this video demonstrates one way to unpack a question there may be other methods, and we encourage you to discuss any alternative solutions with your teacher. This question shows a position vector away in 3 dimensions. Click pause now to read the question and consider some of the key pieces of information in the question.

The first point to note is the allocation of four marks to this question. This indicates there will be multiple stages that need to be communicated clearly. Inspecting the information in the question shows vectors are represented as a column vector. And unit factors IJ&K. The question provides some direction to the method to be used. In this case the dot product.

Lastly, supplement the information in the diagram with the information in the question. It is not easy to read the angles Alpha, Beta and Gamma from the diagram and it only becomes clear when you read it in conjunction with the text. This question asks us to prove the result cos squared Alpha plus cos squared beta plus cos squared gamma is equal to one

To start will define the vector away using unit factors. Applying the geometric form of the dot product to A and the unit vector, I give this result and linking this to the algebraic form of the dot product gives this. Which simplifies, to this result. Attempting to determine this result, or one mark out of a possible four. Similar results can be determined using both forms of the dot product of OA with the unit vectors J&K. And determining all three equations would gain 2 marks.

Drawing links to the result that needs to be proved directs us to square both sides of each equation to form expressions with Cos squared terms. Adding the left hand sides, and the right of these three equations collects the three cos squared terms into one equation, like the one to be proved. Determining this equation would gain 3 marks. The final mark can be achieved by realizing that the magnitude of the vector OA is equal to the square root of the sum of the squares AB&C. Substituting this result into the equation and simplifying generates the result needed.

End of transcript