YEAR 12 - MATHEMATICS

HSC Topic 8 – Further Operations with Vectors

MATHEMATICS EXTENSION 1

LEARNING PLAN			
Learning Intentions Student is able to:	**Learning Experiences** Implications, considerations and implementations:	**Success Criteria** I can:	**Resources**
define, calculate and use the magnitude of a vector in two dimensions use the notation $\lvert\underset{\sim}{u}\rvert$ for the magnitude of a vector $\underset{\sim}{u} = x\underset{\sim}{i} + y\underset{\sim}{j}$ define and use the direction of a vector in two dimensions	– prove that the magnitude of a vector, $\underset{\sim}{u} = x\underset{\sim}{i} + y\underset{\sim}{j}$, can be found using: $\lvert\underset{\sim}{u}\rvert = \lvert x\underset{\sim}{i} + y\underset{\sim}{j}\rvert = \sqrt{x^2 + y^2}$ – identify the magnitude of a displacement vector $\overrightarrow{AB}$ as being the distance between the points A and B – convert a non-zero vector $\underset{\sim}{u}$ into a unit vector $\hat{\underset{\sim}{u}}$ by dividing by its length: $\hat{\underset{\sim}{u}} = \frac{\underset{\sim}{u}}{\lvert\underset{\sim}{u}\rvert}$	define, calculate and use the magnitude of a vector in two dimensions use the notation $\lvert\underset{\sim}{u}\rvert$ for the magnitude of a vector $\underset{\sim}{u} = x\underset{\sim}{i} + y\underset{\sim}{j}$	

define, calculate and use the scalar (dot) product of two vectors $\underset{\sim}{u} = x_1\,\underset{\sim}{i} + y_1\,\underset{\sim}{j}$ and $\underset{\sim}{v} = x_2\,\underset{\sim}{i} + y_2\,\underset{\sim}{j}$	– apply the scalar product, $\underset{\sim}{u}\cdot\underset{\sim}{v}$, to vectors expressed in component form, where $\underset{\sim}{u}\cdot\underset{\sim}{v} = x_1x_2 + y_1y_2$ – use the expression for the scalar (dot) product, $\underset{\sim}{u}\cdot\underset{\sim}{v} = \left\|\underset{\sim}{u}\right\|\left\|\underset{\sim}{v}\right\|\cos\theta$ where θ is the angle between vectors $\underset{\sim}{u}$ and $\underset{\sim}{v}$ to solve problems – demonstrate the equivalence, $\underset{\sim}{u}\cdot\underset{\sim}{v} = \left\|\underset{\sim}{u}\right\|\left\|\underset{\sim}{v}\right\|\cos\theta = x_1x_2 + y_1y_2$ and use this relationship to solve problems – establish and use the formula $\underset{\sim}{v}\cdot\underset{\sim}{v} = \left\|\underset{\sim}{v}\right\|^2$ – calculate the angle between two vectors using the scalar (dot) product of two vectors in two dimensions	define, calculate and use the scalar (dot) product of two vectors $\underset{\sim}{u} = x_1\,\underset{\sim}{i} + y_1\,\underset{\sim}{j}$ and $\underset{\sim}{v} = x_2\,\underset{\sim}{i} + y_2\,\underset{\sim}{j}$	
examine properties of parallel and perpendicular vectors and determine if two vectors are parallel or perpendicular	– examine properties of parallel and perpendicular vectors and determine if two vectors are parallel or perpendicular	determine if two vectors are parallel or perpendicular	
define and use the projection of one vector onto another	–		

solve practical problems involving vector concepts in two dimensions	–	solve problems involving displacement, force and velocity involving vector concepts in two dimensions	
prove geometric results and construct proofs involving vectors in two dimensions	– Prove the diagonals of a parallelogram meet at right angles if and only if it is a rhombus – Prove the midpoints of the sides of a quadrilateral join to form a parallelogram – Prove the sum of the squares of the lengths of the diagonals of a parallelogram is equal to the sum of the squares of the lengths of the sides	I can use vectors to prove properties of quadrilaterals.	
Past HSC Questions			

Established Goals (Syllabus Outcomes): ME12-2, ME12-6, ME12-7
Estimated Time: 1.5 Weeks