# Unit 7: Applications of Vectors

## Chapter 1: Vectors as Forces

Studying Tips: this chapter introduces you to some vector applications to physics, such as forces (resultant and equilibrium) and tension. When solving both forces and tension problems, the students may want to sketch the direction of the vectors and resolve the vector into its component, so that it would be easier to find the resultant forces/tension or the components. Word problems from this chapter may worth up to 2 marks.

## Chapter 2: Velocity

Studying Tips: when solving for the velocity of an object, it is important for the students to clearly identify what the question is asking you to solve, such as the airspeed, windspeed, ground speed, etc. Sketch the direction and the magnitude will help you to comprehend the question. Word problems from this chapter may be worth up to 5 marks.

## Chapter 3: Dot Products and Geometric Vector

Studying Tips: This chapter introduces a new concept - dot product, which is also known as the scalar product since its result is always a scalar. The dot product involves the angle between two nonzero vectors connected tail-to-tail and the magnitude of the vectors. The most important observation to be made in this chapter is that the result of the dot product is zero when two nonzero vectors are perpendicular. Knowing the properties of dot product, such as communicative, magnitudes, associative, and distributive property will make it easier for you to simplify the formulas.

## Chapter 4: Dot Product Algebraic Vectors

Studying Tips: This chapter introduces another way to calculate the dot product; the formula in this chapter is used when the angle between two nonzero vectors is not given. By using the equation introduced in this chapter, the students can find the dot product and the angle between two nonzero vectors given the coordinates of the vectors.

## Chapter 5: Scalar and Vector Projections

Studying Tips: this chapter introduces to you scalar and vector projections; you can basically picture projection as the shadow of the line when the sun is directly overhead. The students must understand the difference of scalar and vector projection, and the equation for each project given two vectors.

## Chapter 6: Cross Product of Two Vectors

Studying Tips: cross product is referred to as the vector product because it results in a vector. The cross product only exists in ; the cross product is a third vector that is perpendicular to the plane in which the given vector lies. The important thing to know in this chapter is that a vector crossed with itself would result in 0, and if two vectors are parallel or collinear, the cross product would also be 0.

## Chapter 7: Application of Dot and Cross Product

Studying Tips: The main focus in this chapter is the use of dot and cross product to solve word problems in geometry and physics. For example, the magnitude of the cross product is equal to the area of a parallelogram given two vectors, the dot product can be used to find the Work done, and the cross product can be used to find the value of Torque.