# AQA A level Maths Projectiles

## Section 1: Introduction

### Exercise level 1

**In this exercise take upwards as positive and use 9.8 $ms^{-2}$ for g**

1. In each case
   (a) Draw a diagram showing the initial velocity with its horizontal and vertical components,
   (b) Write the velocity after time *t* seconds in vector form,
   (c) Write the position after time *t* seconds in vector form.

   (i) Initial position 5 m above ground; initial velocity 5 $ms^{-1}$ horizontally,
   (ii) Initial position ground level; initial velocity 8 $ms^{-1}$ at an angle of 30° above the horizontal,
   (iii) Initial position 10 m above ground; initial velocity $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $ms^{-1}$.

2. In each case find
   (a) The time for the projectile to reach its highest point
   (b) The maximum height above the origin
   (i) Initial position 15 m above ground; initial velocity 5 $ms^{-1}$ an angle of 60° above the horizontal,
   (ii) Initial position 3 m above ground; initial velocity $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $ms^{-1}$.

3. Find the horizontal range for these projectiles which start from the origin.
   (i) Initial velocity $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $ms^{-1}$,
   (ii) Initial velocity $\begin{pmatrix} 5 \\ 1 \end{pmatrix}$ $ms^{-1}$.

4. A particle is projected from point O on horizontal ground at a speed of 25 $ms^{-1}$ and at an angle of 30° to the horizontal.
   (i) Draw a diagram showing the path of the projectile.
   (ii) Write down the initial components of the velocity in the horizontal and vertical directions.
   (iii) Write down equations for the velocity of the projectile at time *t*.
   (iv) Write down equations for the position at time *t*.

5. For the particle in question 4 find
   (i) The maximum height reached,
   (ii) The time that it takes to return to the same level as the point of projection,
   (iii) The horizontal range.