12Ma Mechanics Mini Test 02
Vectors and Kinematics (Vertical Motion)

Question 1

June 2008 MEI M1 Q2

A particle has position vector $\mathbf{r}$, where $\mathbf{r} = 4\mathbf{i} - 5\mathbf{j}$.
$\mathbf{i}$ and $\mathbf{j}$ are unit vectors in the directions east and north respectively.

(a) Sketch $\mathbf{r}$ on a diagram, showing $\mathbf{i}$ and $\mathbf{j}$ and the origin O. **[1]**

(b) Calculate the magnitude of $\mathbf{r}$ and its direction as a bearing. **[4]**

(c) Write down the vector that has the same direction as r and three times its magnitude. **[1]**

Question 2

June 2007 OCR M1 Q5

A particle P is projected upwards, from horizontal ground, with speed 8.4 ms^{-1}.

(a) Show that the greatest height above the ground reached by P is 3.6 m.

[3]

A particle Q is projected vertically upwards, from a point 2 m above the ground, with speed u ms^{-1}. The greatest height **above the ground** reached by Q is also 3.6m.

(b) Find the value of u.

[2]

It is given that P and Q are projected simultaneously.

(c) Show that, at the instant when P and Q are at the same height, the particles have the same speed and are moving in opposite directions.

[6]