7a	$-12 = 12 - gt$	M1	Use *suvat* to find time taken
	$t = \frac{24}{g} \left(= 2.45\right)$	A1	
	$AB = 6t$	M1	Horizontal distance
	$= 14.7\left(15\right)\left(\text{m}\right)$	A1	3 sf or 2 sf Not $\frac{720}{49}$ (follows use of 9.8) Not $\frac{144}{g}$ (do not accept g in the denominator)
		(4)	
7b	Vertical component of velocity $= \left(\pm\right)8$	B1	
	$v^2 = u^2 + 2as$	M1	Complete method using *suvat* to find h
	$\Rightarrow 8^2 = 12^2 - 2gh$	A1	Correct unsimplified equation
	$h = 4.08 \quad \left(4.1\right)$	A1	3 sf or 2 sf Not $\frac{200}{49}$ (follows use of 9.8) Not $\frac{40}{g}$ (do not accept g in the denominator)
		(4)	
7b alt	$\mathbf{v} = \begin{pmatrix} 6 \\ 12 \end{pmatrix} - \begin{pmatrix} 0 \\ g \end{pmatrix} t \Rightarrow 12 - gt = \left(\pm\right)8$	B1	Correct expression for critical value(s) of t
	$h = 12t - \frac{1}{2}gt^2$	M1	Complete method using *suvat* to find h
	$= \frac{48}{g} - \frac{8}{g}$ or $= \frac{240}{g} - \frac{200}{g}$	A1	Correct unsimplified equation
	$h = 4.08 \quad \left(4.1\right)$	A1	3 sf or 2 sf
		(4)	
7b alt	Conservation of energy	M1	Need all terms and dimensionally correct
	$mgh + \frac{1}{2}m \times 10^2 = \frac{1}{2}m\left(12^2 + 6^2\right)$	A(B)1 A1	Unsimplified equation with at most one error Correct unsimplified equation
	$h = 4.08 \quad \left(4.1\right)$	A1	3 sf or 2 sf
		(4)	
			See over for (c)

7c	$\begin{pmatrix} 6 \\ -12 \end{pmatrix} \cdot \begin{pmatrix} 6 \\ v \end{pmatrix} = 0$	M1	Complete method to find vertical component at C.
	$\Rightarrow v = 3$	A1	
	$\mathbf{v} = 6\mathbf{i} + 3\mathbf{j}\ \left(\text{m s}^{-1}\right)$	A1	Must be a vector in terms of **i** and **j**
	If see $\begin{pmatrix} 6 \\ 12 \end{pmatrix} \cdot \begin{pmatrix} 6 \\ v \end{pmatrix} = 0$ leading to $\mathbf{v} = 6\mathbf{i} - 3\mathbf{j}$ mark as a misread: M1A0A0		
		(3)	
		[11]	
	Accept working in column vectors throughout apart from the final A1		