Q	Scheme	Marks	Notes
7a	$-8 = 8 - gT_1$ **OR** $0 = 8T_1 - \frac{1}{2} \times 9.8T_1^2$ **OR** $0 = 8 - gt$ and $T_1 = 2 \times \frac{8}{g}$	M1	Complete method using *suvat*. Condone sign error
	$T_1 = 1.63$ *	A1*	Given single answer correctly obtained (Allow T or t = 1.63 or just 1.63)
		[2]	
7b	$0 = u^2 - 2g \times 2$	M1	Complete method to find speed immediately after 1st impact **N.B.** Could use energy.
	$u = 2\sqrt{g} = 6.26099..$	A1	Seen or implied. Do not penalise for > 3 sf
	Use of $I = mv - mu$	DM1	Dependent on M1, condone sign errors and a recalculated '8'.
	$I = 0.1(8 - (-6.3))$	A1	Must have 8 and 6.3 or better.
	= 1.4 or 1.43 (Ns)	A1	2sf or 3sf
		[5]	
7c	Equal heights	M1	Complete method using *suvat* to form an **equation** in T_2 Allow with $T_2 + 1, T_2$ with $T_2 + 1$ used for A and T_2 used for B Allow t instead of T_2 **N.B.** M0 if they use the same times for both or a mixture of t and $t + 1$. **ALT 1** At $t = 1$, A is (8 – 4.9) = 3.1m above the ground and moving downwards with speed $(9.8 - 8) = 1.8$ m s^{-1} then use $h - s_A = s_B$ oe to find $T_2 - 1$. Must find **both** height and speed.
	$8T_2 - \frac{1}{2}gT_2^2 = 5(T_2 - 1) - \frac{1}{2}g(T_2 - 1)^2$ **OR** $8(T_2 + 1) - \frac{1}{2}g(T_2 + 1)^2 = 5T_2 - \frac{1}{2}gT_2^2$	A1 A1 A1 A1	One distance correct Both distances correct One distance 'correct' Both distances 'correct'

	ALT 1: $3.1-(1.8t+4.9t^2)=(5t-4.9t^2)$	A1 A1	Allow t instead of T_2 in either. One side correct Both sides correct
	($t=\frac{3.1}{6.8}$) $(T_2=)$ 1.5 or 1.46 **ALT 2:** $8(T_1-T_2)-\frac{1}{2}g(T_1-T_2)^2=5(T_2-1)-\frac{1}{2}g(T_2-1)^2$	A1 A1 A1	Must be rounded to 2 sf or 3 sf A0 for $\frac{99}{68}$ = 1.45588.. **N.B.** Only penalise overaccuracy after g = 9.8, ONCE for parts (b) and (c) only.
		[4]	
		(11)	

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