Note: *If they have a sign error on the 15, their values for (a) and (b,c) will be swapped around. Apply follow through as per the mark scheme, for their values.*

Question Number	Scheme	Marks
8a	$\leftrightarrow : 3u\cos\theta = 50$ $\updownarrow : 3u\sin\theta - 4.9\times 9 = -15 \quad (3u\sin\theta = 29.1)$ Solve for u or θ : $\tan\theta = \frac{29.1}{50}$, $\theta = 30.2$ or 30 $u = 19.3$ or 19	B1 M1A1 M1A1 A1 **(6)**
8b	Conservation of energy: $\frac{1}{2}mv^2 = \frac{1}{2}m\times 19.3^2 + 15mg$ follow their u $v = 25.8$ (m s^{-1}) or 26	M1A1ft A1
8b alt	Use of Pythagoras on horizontal and vertical components: $\rightarrow \frac{50}{3} \quad \uparrow \frac{29.1}{3} - 3\times 9.8 (= -19.7)$ $v = \sqrt{\left(\frac{50}{3}\right)^2 + "19.7"^2}$ $v = 25.8$ (m s^{-1}) or 26	M1A1ft A1 **(3)**
8c	Use of trig to find direction: angle $= cos^{-1}\left(\frac{\frac{"50"}{3}}{"25.8"}\right)$ or $tan^{-1}\left(\frac{"19.7"}{\frac{"50"}{3}}\right)$ Downwards at $49.8°$ to the horizontal/ground $(50°)$	M1 A1 **(2)** **Total 11**

Notes	
a	
B1	$3u\cos\theta = 50$
M1	Use of $s = ut + \frac{1}{2}at^2$ for vertical motion. Condone sign errors.
A1	Fully correct equation
M1	Solve equations for either θ or u.
A1	$\theta = 30.2$ or 30 (question states degrees, so radians score A0)
A1	$u = 19.3$ or 19 (N.B. Only penalise more than 3 s.f. once per question) (Note: If they get sin/cos the wrong way round, they will still get the correct value, but score A0)
b	
M1	Conservation of energy from start to finish. Must have 2 K.E. and 1 GPE.
A1ft	Correct equation. Follow through their u.
A1cao	$v = 25.8$ or 26
alt	
M1	Use SUVAT to find vertical component of velocity at B **and** use Pythagoras to find speed.
A1ft	Correct (unsimplified) components. Follow through values of u and θ if used. Condone slip in processing a correct expression for vertical component before putting into Pythagoras.
A1	$v = 25.8$ or 26
c	
M1	Use their components/speed, with cos or tan to find angle.
A1	50^o (49.8^o) below horizontal o.e. **Must specify downwards/below/o.e. Allow a clear diagram included in, or explicitly referred to in (c)**

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