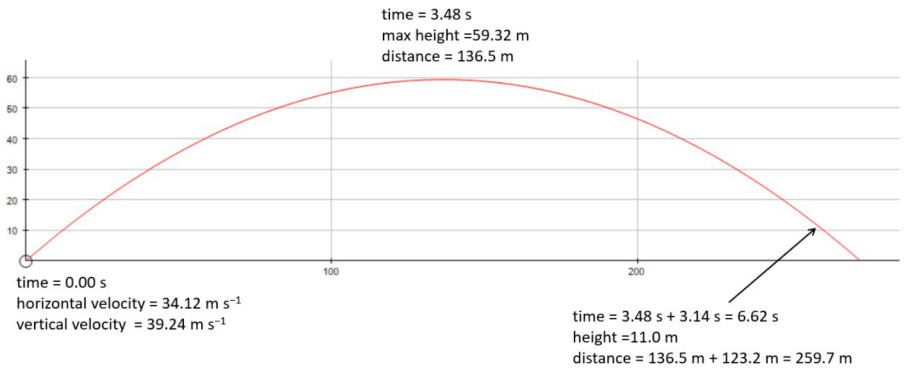
Question Number	Answer	Mark
18(a)	Use of trigonometry **(1)** Vertical component = 34 (m s^{-1}) **(1)** Example of calculation 52 m s^{-1} × sin 41° = 34.1 m s^{-1}	**2**
18(b)	Method 1: Use of $s = u\,t + ½\,a\,t^2$ with s = 11 m and a = − 9.81 m s^{-2} **(1)** Use of quadratic formula **(1)** t = 6.62 (s) [Allow ecf from (a)] **(1)** Method 2: Use of $v = u + at$, with v = 0 to find time to max height [3.48 s] **(1)** Use of $s = ½(u + v)\,t$, or other correct *suvat* equation, to find max height [59.3 m] **And** Use of $s = u\,t + ½\,a\,t^2$ to find time to fall to 11 m [3.14 s] **(1)** t = 6.62 (s) depending on rounding of (a) [Allow ecf from (a)] **(1)** (allow ecf from (a)) [Allow any valid *suvat* method] Example of calculation Let time to max height = t 11 m = 34.1 m s^{-1} × t − ½ × 9.81 m s^{-2} × t^2 4.91 × t^2 − 34.1 m s^{-1} × t + 11 m = 0 t = (34.1 ± √(34.1^2 − 4 × 11 × 4.91) m s^{-1} ÷ 9.81 m s^{-2} = 6.62 s (or 0.34 s)	**3**
18(c)	Resolves for horizontal component of velocity **(1)** Use of $s = v\,t$ **(1)** 260 m so no **(1)** (Allow ecf from (b) with correct conclusion based on student's value) Example of calculation Horizontal component of velocity = 52 m s^{-1} × cos 41° = 39.2 m s^{-1} s = 39.2 m s^{-1} × 6.62 s = 260 m Distance required 245 m to 255 m and 260 m > 255 m so no.  	**3**