

Question	Scheme	Marks	AOs
11(a)	Sets $H = 0 \Rightarrow 1.8 + 0.4d - 0.002d^2 = 0$	M1	3.4
	Solves using an appropriate method, for example $d = \frac{-0.4 \pm \sqrt{(0.4)^2 - 4(-0.002)(1.8)}}{2 \times -0.002}$	dM1	1.1b
	Distance = awrt 204(m) only	A1	2.2a
		(3)	
(b)	States the initial height of the arrow above the ground.	B1	3.4
		(1)	
(c)	$1.8 + 0.4d - 0.002d^2 = -0.002(d^2 - 200d) + 1.8$	M1	1.1b
	$= -0.002((d - 100)^2 - 10000) + 1.8$	M1	1.1b
	$= 21.8 - 0.002(d - 100)^2$	A1	1.1b
		(3)	
(d)	(i) 22.1 metres	B1ft	3.4
	(ii) 100 metres	B1ft	3.4
		(2)	
(9 marks)			
Notes:			
(a) M1: Sets $H = 0 \Rightarrow 1.8 + 0.4d - 0.002d^2 = 0$ M1: Solves using formula, which if stated must be correct, by completing square (look for $(d - 100)^2 = 10900 \Rightarrow d = ..$) or even allow answers coming from a graphical calculator A1: Awrt 204 m only			
(b) B1: States it is the initial height of the arrow above the ground. Do not allow "it is the height of the archer"			
(c) M1: Score for taking out a common factor of -0.002 from at least the d^2 and d terms M1: For completing the square for their $(d^2 - 200d)$ term A1: $= 21.8 - 0.002(d - 100)^2$ or exact equivalent			
(d) B1ft: For their '21.8+0.3' =22.1m B1ft: For their 100m			