Question	Scheme	Marks	AOs
10(a)	$H = A(x-3)^2 + 1$	M1	3.3
	$x = 0,\ H = 0 \Rightarrow 0 = A(0-3)^2 + 1 \Rightarrow A = -\frac{1}{9}$	dM1	3.1b
	$H = -\frac{1}{9}(x-3)^2 + 1$	A1	1.1b
		(3)	
(b)	$\{H = 0.5\} \Rightarrow 0.5 = -\frac{1}{9}(x-3)^2 + 1 \Rightarrow (x-3)^2 = 4.5$	M1	3.1b
	$x = 3 \pm \frac{3}{2}\sqrt{2}$	dM1	1.1b
	$3 + \frac{3}{2}\sqrt{2} - \left(3 - \frac{3}{2}\sqrt{2}\right)$ or $2 \times \frac{3}{2}\sqrt{2}$	ddM1	1.1b
	$\Rightarrow$ Greatest horizontal length $= 3\sqrt{2} =$ awrt 4.24 m	A1	3.2a
		(4)	
(c)	Gives a limitation of the model. Accept e.g., • The model is not valid before take-off (or after landing). • The take-off and landing might not be at the same height. • The ground might not be horizontal. • The snowboarder is modelled as a particle. • The poles may not be vertical. • The trajectory of the snowboarder is a perfect parabola. • There is no spin accounted for. • There is no wind resistance in the model.	B1	3.5b
		(1)	
		(8 marks)	

Notes:

(a)

M1: Translates the situation given into a suitable equation for the model.

e.g., uses the turning point $(3,1)$ to write $H = A(x-3)^2 + 1$

dM1: Applies a complete strategy with appropriate constraints to find all constants in their model.

e.g., uses $(0,0)$ or $(6,0)$ on their model and finds $A = \ldots$

A1: Finds a correct equation linking H with x, i.e., $H = -\frac{1}{9}(x-3)^2 + 1$ or equivalent.

Condone use of y in place of H for both the M1 and dM1 marks, but not for A1.

(b)

M1: Substitutes $H = 0.5$ into their quadratic equation and proceeds to obtain a 3TQ or a quadratic in the form $(x-a)^2 = b;\ a \neq 0,\ b > 0$

dM1: Correct method of solving their quadratic equation to give at least one solution.

ddM1: Subtracts their two solutions either way round. Alternatively, multiplies the surd part of their expression by 2. **A1:** Either $3\sqrt{2}$ or awrt 4.24 m. Correct units required. Must now be positive.	
(c) **B1:** See main scheme but accept any suitable comment.	