2 An archer releases an arrow towards a target at a velocity of $65.0\,\text{ms}^{-1}$ at an angle of $4.30°$ above the horizontal, as shown in Fig. 2.1.
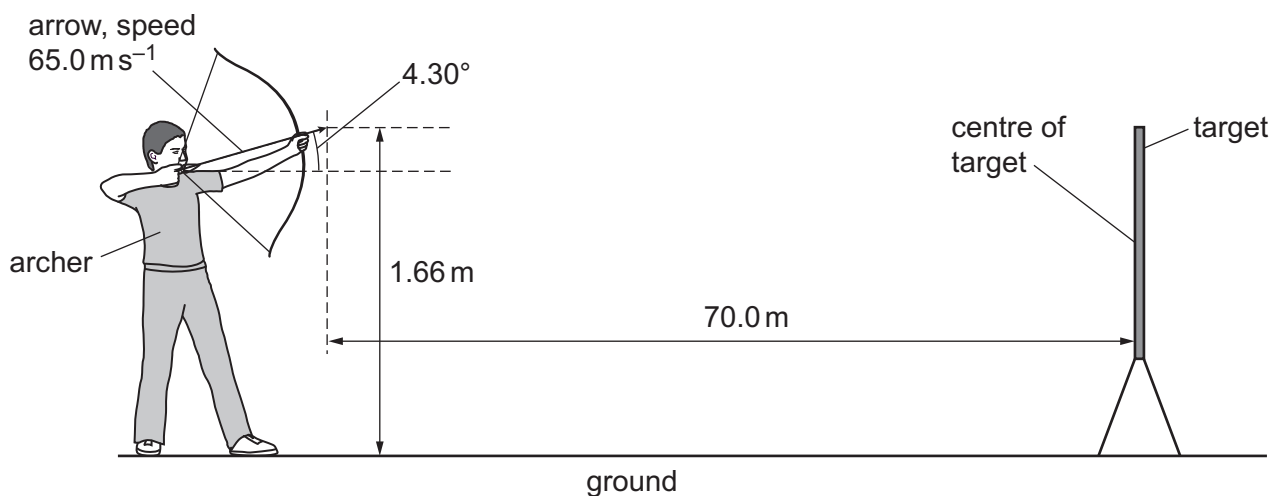

Fig. 2.1 (not to scale)

When released, the tip of the arrow is a horizontal distance of 70.0 m from the target and 1.66 m above the horizontal ground.

The arrow hits the centre of the target.

Assume that air resistance is negligible and that all the mass of the arrow is at its tip.

(a) Show that the time taken for the arrow to reach the target is 1.08 s.

[2]

(b) Calculate the height of the centre of the target above the ground.

height above ground = ... m [3]

(c) By considering energy changes, state and explain how the final kinetic energy of the arrow as it hits the target compares with its initial kinetic energy immediately after release. A numerical calculation is not required.

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.... [2]

[Total: 7]