1 Tarzan wants to get a coconut from a coconut tree by throwing a stone at the coconut to knock it down. The coconut is 18.0 m above the ground as shown in Fig. 1.1.

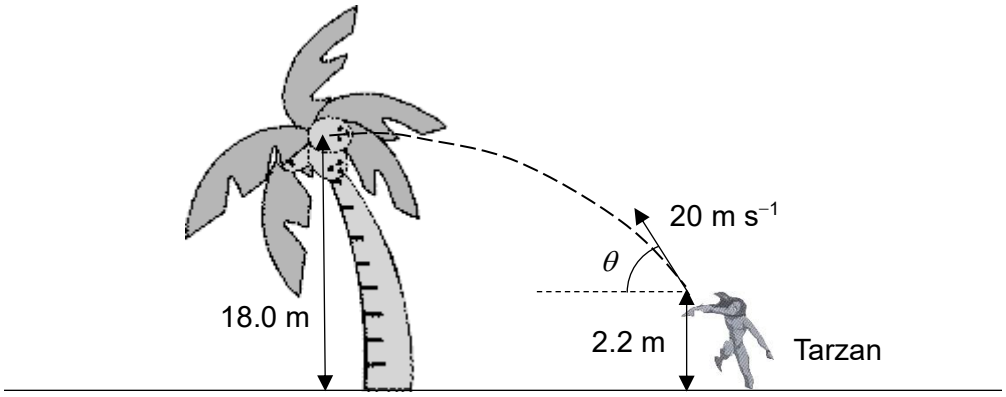

Fig. 1.1

Tarzan throws a stone such that it hits the coconut horizontally. The stone is projected with an initial speed of 20 m s^{-1} at 2.2 m above the ground. Air resistance is negligible.

(a) Determine the angle θ to the horizontal at which the stone has to be projected so that it will hit the coconut horizontally.

θ = ... ° [3]

(b) Determine the time taken for the stone to reach the coconut at this angle of projection.

time taken = ... s [2]

(c) Hence, calculate the horizontal displacement from the coconut at which Tarzan should project the stone so that it hits the coconut horizontally.

horizontal displacement = ... m [2]

(d) If air resistance is not negligible, state and explain how the angle θ calculated in **(a)** and the horizontal displacement calculated in **(c)** should change so that the stone is still able to hit the coconut horizontally when the stone is projected with the same initial speed.

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