Question #55071, Physics / Other |

A kangaroo can bound across a flat stretch of ground with each jump carrying it 10 m from the takeoff point. If the kangaroo leaves the ground at a 22 degree angle, what is its takeoff speed? What is its horizontal speed?

Answer:

The distance is connected with the angle and intial velocity by the equation:

$d = [v_0^2 \sin 2\theta]/g$, where θ – the angle of the jump.

Thus, $v_0^2 = gd/(\sin 2\theta) = (9.8 \times 10)/0.6947 = 141.06$

$v_0 = 11.88$ m/s (the take off speed).

The horizontal velocity equals:

$v_x = v_0 \cos 22^0 = 11.88 \text{ m/s} \times 0.9272 = 11.01 \text{ m/s}$