

Answer on Question 63162, Physics, Other

Question:

A child's vertical takeoff velocity when jumping on a trampoline is 5.3 m/s . Assuming takeoff and landing heights are the same, how long is the child airborne?

Solution:

Let's take the upwards as the positive direction. Then, we can find the time that the child needs to reach the maximum height from the kinematic equation:

$$v_f = v_i + gt,$$

here, v_f is the final velocity of the child, v_i is the initial velocity of the child, t is the time that the child needs to reach the maximum height, $g = -9.8 \text{ m/s}^2$ is the acceleration due to gravity.

Since $v_f = 0 \text{ m/s}$ at the maximum height, we get:

$$0 = v_i - gt,$$

$$t = \frac{-v_i}{-g} = \frac{-5.3 \text{ m/s}}{-9.8 \text{ m/s}^2} = 0.54 \text{ s}.$$

Because takeoff and landing heights are the same, the total time that the child spend in the air will be:

$$t_{total} = 2t = 2 \cdot 0.54 \text{ s} = 1.08 \text{ s}.$$

Answer:

$$t_{total} = 1.08 \text{ s}.$$