

Context:

A car (mass $m=1.0 \times 10^3 \text{ kg}$) moves at $v_1=36 \text{ km/h}$. When $s=20 \text{ m}$ from a crosswalk, it sees a line of children (length $l=6 \text{ m}$) crossing. The car brakes to stop with constant force. Reaction time is zero.

Question:

With a road width of $L=6 \text{ m}$ and children walking at $v_0=0.5 \text{ m/s}$, how long must the car wait for all children to cross completely?

Model Output:

Step 1: Using $0^2 = v_1^2 + 2as$, where $v_1 = 36 \text{ km/h} = 10 \text{ m/s}$ and $s = 20 \text{ m}$, we get $a = -2.5 \text{ m/s}^2$.

Step 2: Then using $0 = v_1 + at$, we find the stopping time $t = 4 \text{ s}$.

Step 3: With road width $L=6 \text{ m}$ and walking speed $v_0=0.5 \text{ m/s}$, **the crossing time can be calculated as $t_c = \frac{L}{v_0}$.**

Step 4: Therefore, $t_c = \frac{6 \text{ m}}{0.5 \text{ m/s}} = 12 \text{ s}$.

Evaluation:

Error Location:

Step 1 & Step 2: No errors found.

Step 3: Physical Condition Analysis Error

Step 4: Errors inherited from Step 3

Error Analyze:

Step 3: Ignoring the length of children line when calculating passing time, leading to Physical Condition Analysis Error.