

Question #58750, Physics / Mechanics | Relativity

At the end of a race, a runner decelerates from a velocity of 9.00 m/s at a rate of 2.00 m/s².

(a) How far does she travel in the next 5.00 s? (b) What is her final velocity? (c) Evaluate the result. Does it make sense?

Solution.

The distance of the uniformly accelerated motion:

$$d(t) = v_0 t + \frac{at^2}{2}$$

The velocity:

$$v(t) = v_0 + at$$

- a. The distance traveled in 5 seconds:

$$d(5.00) = 9.00 \times 5.00 + \frac{-2.00 \times 5.00^2}{2} = 20 \text{ m};$$

- b. The final velocity:

$$v(5.00) = 9.00 - 2.00 \times 5.00 = -1 \text{ m/s}$$

- c. According to the results, the runner has decelerated to zero velocity and started running backward. However, she might want to return to finish line for some reason, i.e. to clarify the recorded time. In this case, the total distance will not be equal to the total displacement in the given timespan.