

Answer on Question #70524, Physics / Mechanics | Relativity

A truck traveling north at 18 m/s and a car 500 m north traveling south at 24 m/s applies breaks with an acceleration of 3.5 m/s^2 . Where will they meet

Solution:

Kinematic equation for truck:

$$d_1 = v_1 t$$

where $v_1 = 18 \text{ m/s}$.

Kinematic equation for car:

$$d_2 = v_0 t + \frac{at^2}{2}$$

where $v_0 = 24 \text{ m/s}$, $a = -3.5 \text{ m/s}^2$.

The car travels distance

$$d_2 = \frac{v^2 - v_0^2}{2a} = \frac{0 - 24^2}{2 \times (-3.5)} = 83.8 \text{ m}$$

The time to stop is

$$t_2 = \frac{v - v_0}{a} = \frac{0 - 24}{-3.5} = 6.86 \text{ s}$$

For this time truck will travel only

$$d_1 = v_1 t_2 = 18 \times 6.86 = 123.4 \text{ m}$$

So, truck will move to stopped car

$$d = 500 - d_2 = 500 - 83.8 = 416.2 \text{ m}$$

Answer: The cars will meet at 416.2 m to north from truck's start point.

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