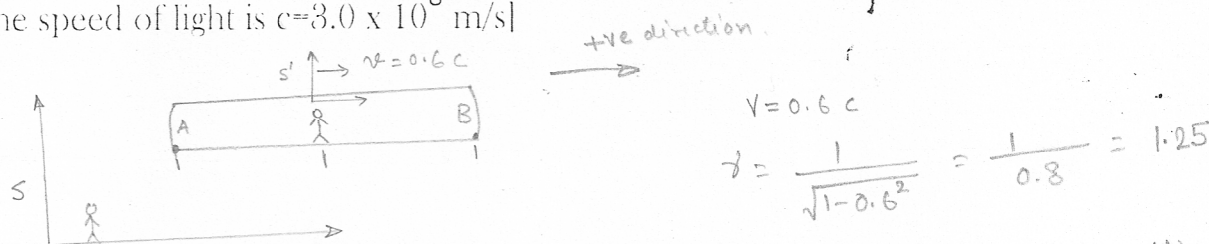


SOLUTION.

NAME:	Quiz #8a: Phys270
	Section 0102

1. [10 pts] A 50-m long rocket train is traveling from Rome to Moscow at $0.6c$ when a light at the center of the train flashes. When the light reaches the front of the train, it immediately ignites a green flare. Light reaching the back of the train immediately ignites a red flare.

Is the ignition of the red and green flare simultaneous events for a pedestrian waiting to cross the tracks? If not, which event occurs first and by how much time? [Hint: Finding the space-time coordinates of the events in the train's reference frame is recommended to tackle this problem. Note the speed of light is $c = 3.0 \times 10^8$ m/s]



For the observer in the train the green flare (B) and red flare (A) flashes simultaneously since A and B are at the same distance from him and a part of the same reference frame S' (moving train)

$\therefore$ The space-time coordinates in S' are

$$\text{Event A} \equiv (x'_A = -25\text{m}, t'_A = \frac{25}{300} \mu\text{s})$$

$$\text{Event B} \equiv (x'_B = +25\text{m}, t'_B = \frac{25}{300} \mu\text{s})$$

On making a Lorentz transformation from S' to S

$$t_A = \gamma \left(t'_A + \frac{v x'_A}{c^2} \right) = 1.25 \left(\frac{25}{300} + \frac{(0.6c)(-25)}{c^2} \right) \mu\text{s} = -0.0417 \mu\text{s}$$

$$t_B = \gamma \left(t'_B + \frac{v x'_B}{c^2} \right) = 1.25 \left(\frac{25}{300} + \frac{(0.6c)(+25)}{c^2} \right) \mu\text{s} = 0.1667 \mu\text{s}$$

$t_A \neq t_B \Rightarrow$ The two events A and B are 'not' simultaneous for the pedestrian.
the 'red' flame ignites before 'green' flame by $0.125 \mu\text{s}$.