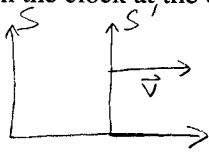


QUIZ 6  
 Spring 2005  
 3:30 Section Thursday Quiz  
 8:30 recitation  
 Frank De Lucia

Key

A clock located at the origin of the S' frame moves along the x-axis at a speed of  $0.6c$  and reads zero as it passes the origin of the S frame. At this point all the clocks in the S' frame are synchronized to read zero, as are the clocks in the S frame.

(a) When the clock at the origin of the S' frame reads one second, what is its location in the S frame?



$$v = |\vec{v}| = 0.6$$

Event 1: The clocks start

$$x_1 = x'_1 = 0 \quad t_1 = t'_1 = 0$$

Event 2: S' clock reads 1s

$$x_2 = ? \quad x'_2 = 0 \quad t'_2 = 1s$$

$$\Delta x' = x'_2 - x'_1 = 0$$

$$\Delta t' = t'_2 - t'_1 = 1s$$

$$\Delta x = x_2 - x_1 = x_2 = \gamma (\Delta x' + v \Delta t')$$

$$= \frac{1}{\sqrt{1 - (v/c)^2}} v \Delta t' = 1.25 (0.6c) (1s) = \boxed{0.75c}$$

(b) What does the clock in the S frame read at this point in space and time?

As above  $\Delta t' = 1s$ ,  $\Delta x' = 0$

$$\Delta t = t_2 - t_1 = t_2 = \gamma \left( \Delta t' + \frac{v \Delta x'}{c^2} \right)$$

$$= \gamma \Delta t' = 1.25 (1s) = \boxed{1.25s}$$