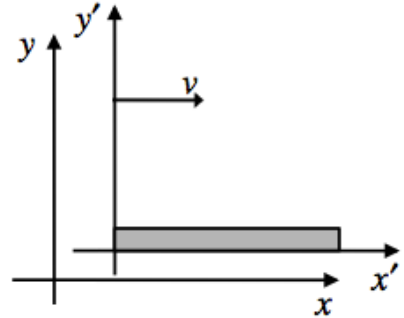15-Length Contraction

$$x' = \gamma\left(x - \beta ct\right)$$

$$ct' = \gamma\left(ct - \beta x\right)$$

A ruler (rest length L_0) is *at rest* in frame S', which is moving to the right with speed $v = \beta c$ relative to frame S. In other words, in frame S the ruler is moving to the right with speed v.

In frame S, the length of the ruler is measured by recording the time and position of the left and right ends of the ruler when the left end of the ruler is at $x = 0$:

- Event 1 = left end of ruler measured.
- Event 2 = right end of ruler measured.

In frame S, how is the time of Event 1 (t_1) related to the time of Event 2 (t_2)?
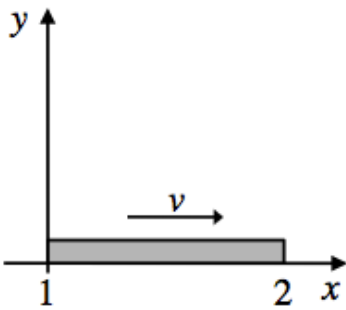
In frame S, the length of the (moving) ruler is L.
How are the positions of Event 1 (x_1) and Event 2 (x_2) related to L?

Write out the expressions for x_1' and x_2' (in terms of x and t) according to the Lorentz transformations at the top of the page.

$$x_1' =$$

$$x_2' =$$

Use these to determine the relationship between L and L_0.

Which event occurs first in frame S'? Briefly explain.