LAST TIME:

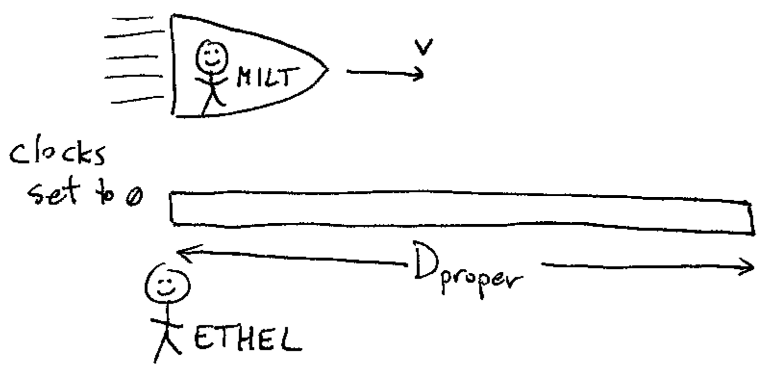
"Moving clocks appear to run slow"

$$(\Delta t)_{observed} = \gamma \, (\Delta t)_{proper}$$

$\gamma = \dfrac{1}{\sqrt{1 - v^2/c^2}}$

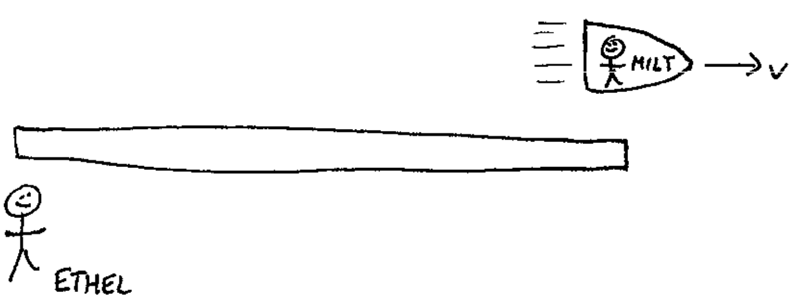
$(\Delta t)_{proper}$: time difference in frame where events are AT THE SAME PLACE

What about distances in direction of motion?



What length does moving observer measure?

Simple way: see how long it takes to go from one end to other, multiply by v.



Ethel's clock reads:

$$\tilde{T} = \frac{D_{proper}}{v}$$

Milt's clock reads:

$$T = \frac{\tilde{T}}{\gamma} = \frac{D_{proper}}{\gamma v}$$

Milt calculates length $\quad D_{observed} = T \cdot v = \dfrac{D_{proper}}{\gamma}$

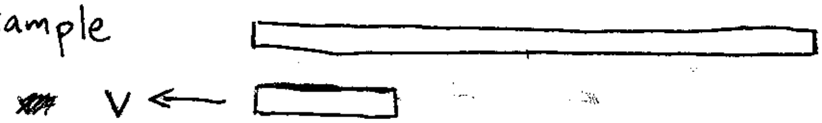
$$D_{observed} = \frac{D_{proper}}{\gamma}$$

← D_{proper}: length of object in its own frame

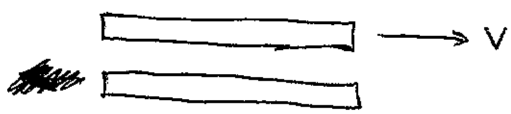
Objects moving relative to observer appear shorter in direction of motion — LENGTH CONTRACTION

CLICKER.

example



frame of upper rod: left ends line up before right ends



frame of ~~upper~~ lower rod: left ends line up at same time as right ends

☆ Simultaneous events in one frame NOT simultaneous in another frame (if separated in direction of motion) ☆