

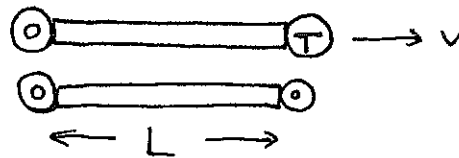
LAST TIME:

READING:

principle of relativity

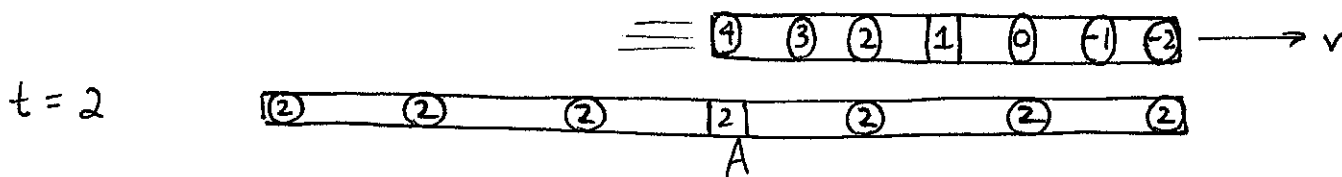
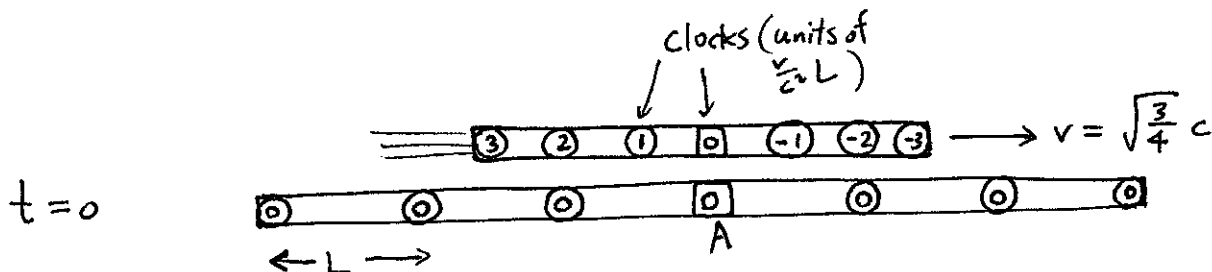
speed of light same in all frames

time dilation $T_{obs} = T_{proper} \gamma$
 length contraction $L_{obs} = \frac{L_{proper}}{\gamma}$
 relativity of simultaneity



$$T = -\gamma \frac{v}{c^2} L$$

Example: identical rulers & clocks



At $t=2$: all moving clocks observed to have advanced 1 unit

CLICKER

BUT: observers in upper frame see clock A read 2 at $t'=4$

\therefore Both observers see ~~each~~ others clocks run slow.

CLICKER

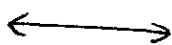
Pictures allow us to find coordinates of event in one frame from coordinates of event in other frame.

eg. event at

$$x = 2L$$

$$t = 2 \left(x \frac{v}{c^2} \right)$$

in frame of lower ruler



~~2L~~ $x' = L$

$$t' = 0$$

in frame of upper ruler.

General formula:

$$\begin{aligned} t' &= \gamma \left(t - \frac{v}{c^2} x \right) \\ x' &= \gamma (x - vt) \\ y' &= y \\ z' &= z \end{aligned}$$

LORENTZ
TRANSFORMATIONS

→ capture all effects
of special relativity

(t, x, y, z) : coordinates of a single event in one frame

(t', x', y', z') : coordinates of same event in frame moving at velocity v relative to first (in \hat{x} direction)

CLICKER 1
CLICKER 2