The speed of light is always \( c \) in all frames.

In the rest frame of clock:

\[
\Delta t_0 = \frac{2L_0}{c} = 2 \text{ ns} = 2 \times 10^{-9} \text{ s}
\]

\[\Delta t > \Delta t_0\]

Time Dilution

\[\Delta t = \gamma \Delta t_0\]

\[\gamma = \frac{1}{\sqrt{1 - \beta^2}}\]

\[\beta = \frac{u}{c}\]

\(\gamma\) always \(> 1\)

as \(u \to c\) (limiting)

\(\gamma \to \infty\)

Go at \(u = 0.999c\), \(\gamma = 22.4\)

1 second passes in moving frame

22 seconds pass in "rest" frame.
Length Contraction

\[ L \neq L_0 \]

\[ L = \frac{L_0}{\gamma} \]

\[ \rightarrow \]

\[ u \]

\[ L = L_0 + u \Delta t_1 \]

\[ \Rightarrow \Delta t_1 = \frac{L}{c-u} \]

\[ \Delta t_1 = \frac{L}{c-u} \]

\[ \Rightarrow \Delta t_2 = \frac{L}{c+u} \]

\[ \Delta t_2 = \frac{L}{c+u} \]

\[ \Delta t = \frac{L}{c-u} + \frac{L}{c+u} \]

\[ = \frac{L(c+u) + L(c-u)}{c^2-u^2} = \frac{2cL}{c^2-u^2} \]

\[ \Delta t = \frac{2L}{c} \frac{1}{1-(\frac{u}{c})^2} \leftarrow \text{BIGGER!} \]

\[ \Delta t = \gamma^2 \frac{2L}{c} \leq \Delta t_0 \]

\[ \Delta t_0 = \gamma \frac{2L_0}{c} \]

\[ \gamma \Delta t_0 = \gamma \frac{2L_0}{c} \]

\[ L = \frac{L_0}{\gamma} \]

Length Contraction.
Box $v_0$ w/r to Box

$\text{horl box velocity } u$

$V \neq V_0 + U$

$\rightarrow \text{what if } V_0 = 0.99c$\n$u = 0.99c$?

$V = \frac{V_0 + U}{1 + \frac{V_0 u}{c^2}}$  \text{"Relativistic"}

Evaluate:

$V_0 = \frac{c}{2}$\n$u = \frac{c}{2}$

\begin{align*}
A & : V = c \\
B & : V = \frac{c}{2} \\
C & : V = \frac{4}{5} c \\
D & : V = \frac{9}{10} c
\end{align*}
The Lorentz Boost Factor can be either <1 or >1

A) TRUE
B) FALSE