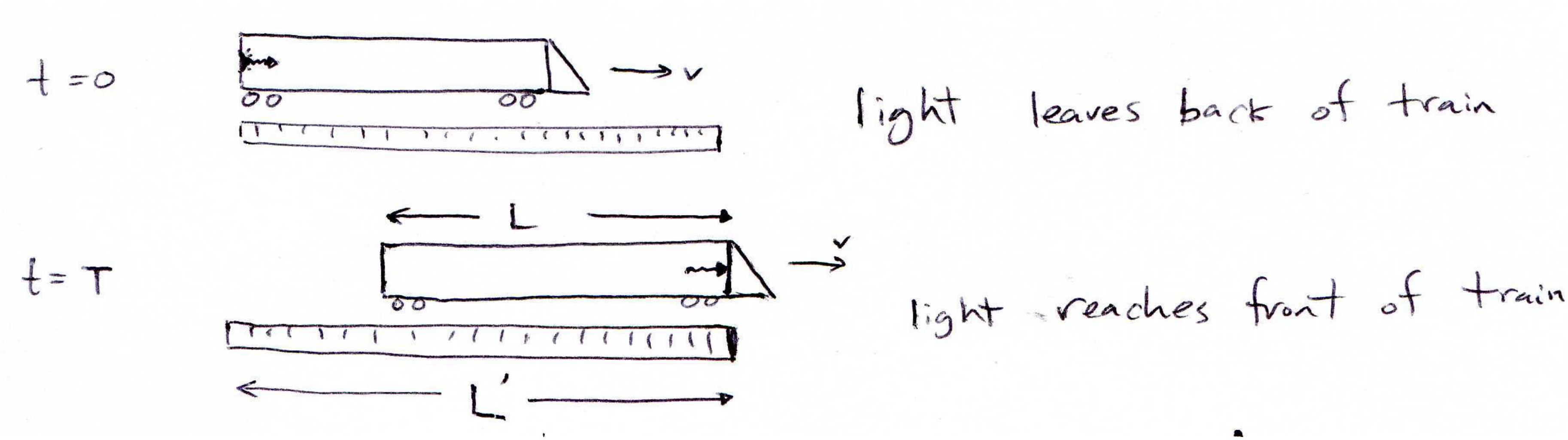
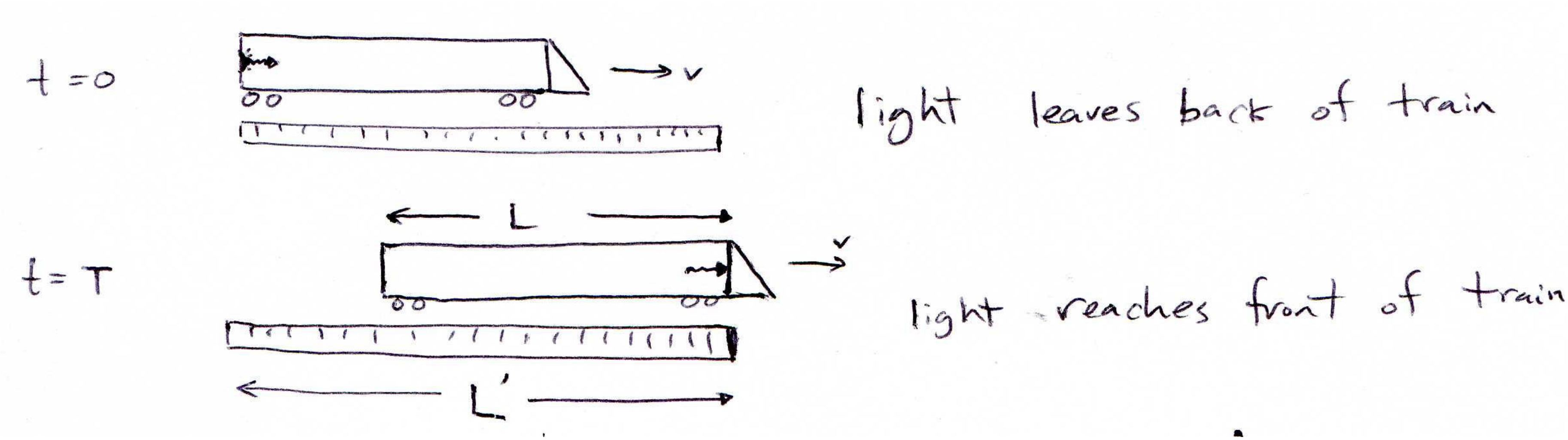


A train of length L moves along a track at speed **v**. At time t=0, a pulse of light leaves the back of the train. At time t=T, the pulse of light reaches the front of the train, as shown.

Using *conventional reasoning*, calculate the speed of light in the frame of the train and in the frame of the track, in terms of L, L', and T.

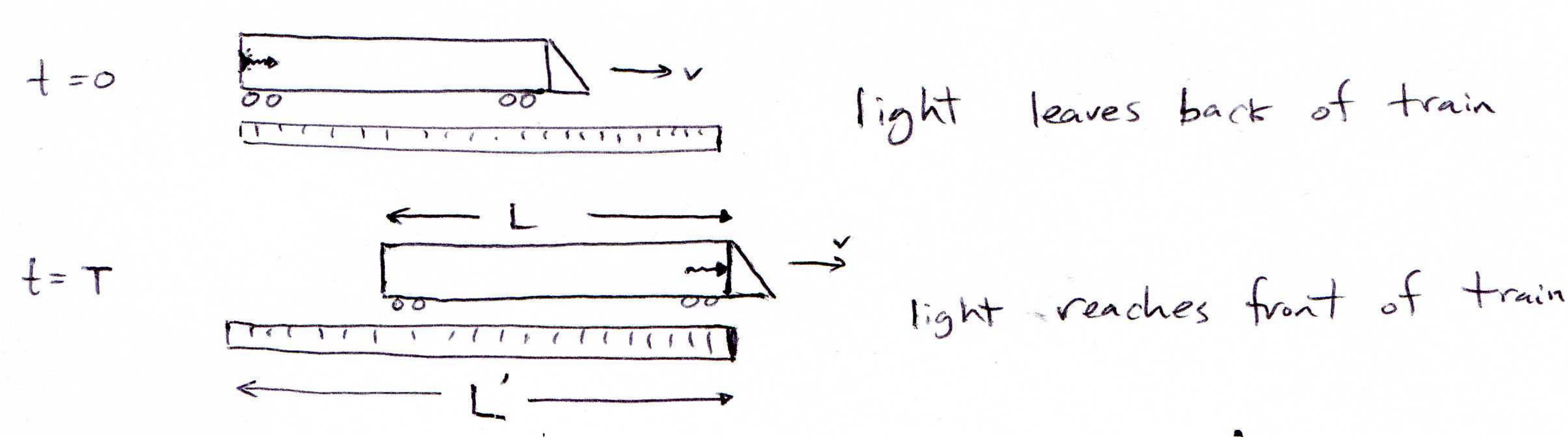
extra: what assumptions are we using here, and what assumptions must be changed in order for the results to agree with the Principle of Relativity?



Using conventional reasoning, calculate the speed of light in the frame of the train and in the frame of the track, in terms of L, L', and T.

choices:

A) L/T in both frames
B) L'/T in both frames
C) L/T in the frame of the train and L'/T in the frame of the track.
D) L'/T in the frame of the train and L/T in the frame of the track.
E) None of the above



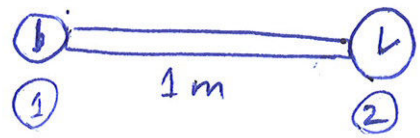
Using conventional assumptions, calculate the speed of light in the frame of the train and in the frame of the track, in terms of L, L', and T.

answer:

C) L/T in the frame of the train and L'/T in the frame of the track.

Assumptions: that observers on the track and in the train agree on times. For the results to be consistent with Einstein's Principle of Relativity, we must give up this assumption and/or the assumption that observers in relative motion agree on distances.

2) If light is emitted from clock 1 at 12:00, what time should clock 2 be set to when the light arrives (in order to synchronize the two clocks)?



A) 12:00

B) 12:00 + 1m/c

C) 12:00 - 1m/c

D) 12:00 + 0.5m/c

E) 12:00 - 0.5m/c

2) If light is emitted from clock 1 at 12:00, what time should clock 2 be set to when the light arrives (in order to synchronize the two clocks)?

A) 12:00

B) 12:00 + 1m/c

C) 12:00 - 1m/c

D) 12:00 + 0.5m/c

E) 12:00 - 0.5m/c

can assume: light travels at ~~velocity~~ speed c

∴ should arrive at clock 2 at 12:00 + 1m/c in this frame

3) Horizontal poles are placed at the same height at the front of two identical trains. One train then moves toward the other at a large velocity. Billy has just read a book on special relativity and predicts that the moving train will appear shorter to the fixed train, so its pole will make a hole in the fixed train below the fixed train's pole. Is Billy right? Which of the following arguments is correct?

A) Billy's scenario violates the principle of relativity: relativity implies that observers in different inertial frames always agree on distances. Thus, the fixed train must observe the moving train to have the same height.

B) Billy's scenario violates the principle of relativity: relativity implies that only the relative motion of the two trains is important. Thus, we can make no practical distinction between the two trains, and it cannot be that one would end up with a hole in it and the other wouldn't.

C) Billy's scenario is consistent with the principle of relativity, since the principle of relativity implies that two observers in relative motion will not agree on length measurements.

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A) Billy's scenario violates the principle of relativity: relativity implies that observers in different inertial frames always agree on distances. Thus, the fixed train must observe the moving train to have the same height. FALSE: P.O.R. ⇒ laws of physics same but not necessarily physical quantities

B) Billy's scenario violates the principle of relativity: relativity implies that only the relative motion of the two trains is important. Thus, we can make no practical distinction between the two trains, and it cannot be that one would end up with a hole in it and the other wouldn't.

C) Billy's scenario is consistent with the principle of relativity, since the principle of relativity implies that two observers in relative motion will not agree on length measurements. FALSE: only disagree on distances with component in direction of relative motion