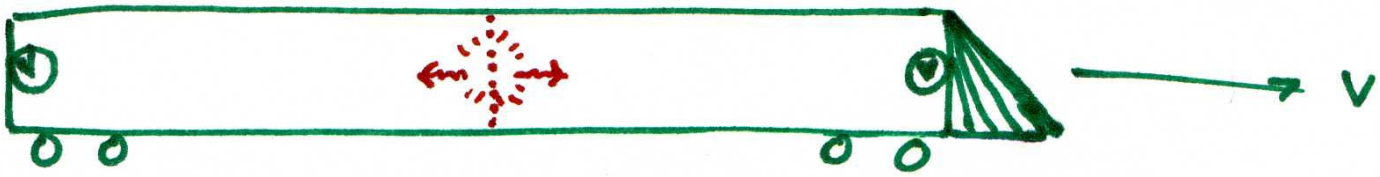
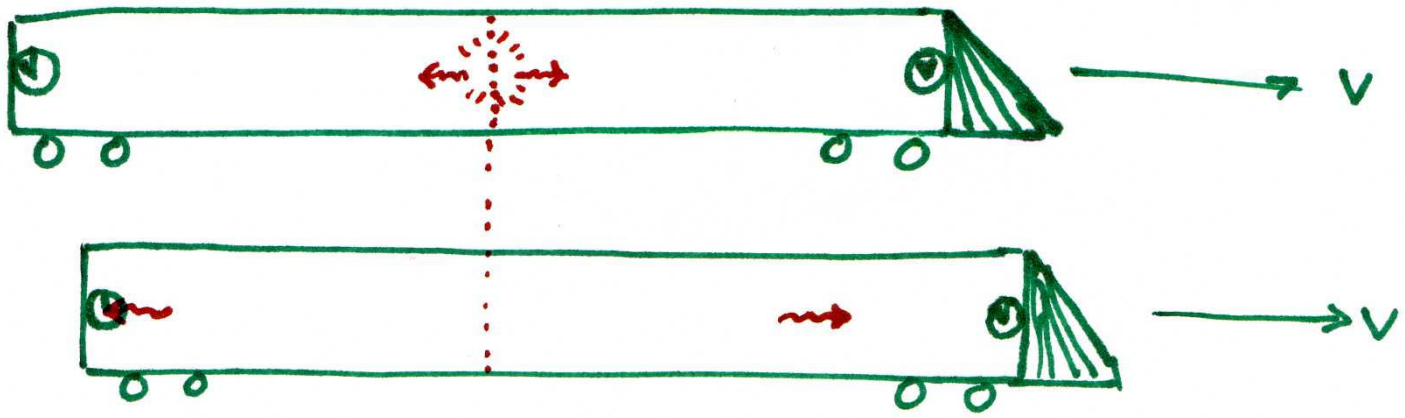


A light flashes exactly in the middle of a train moving along a track. Observers in the train measure the light to hit each end of the train at exactly noon. According to observers on the track:

A) Light hits the front of the train before the back of the train. The clock at the back is observed to read an earlier time than the front clock.
B) Light hits the front of the train before the back of the train. The clock at the back is observed to read a later time than the front clock.
C) Light hits the back of the train before the front of the train. The clock at the back is observed to read an earlier time than the front clock.
D) Light hits the back of the train before the front of the train. The clock at the back is observed to read a later time than the front clock.
E) Light hits the back of the train first. The two clocks are observed to read the same time.

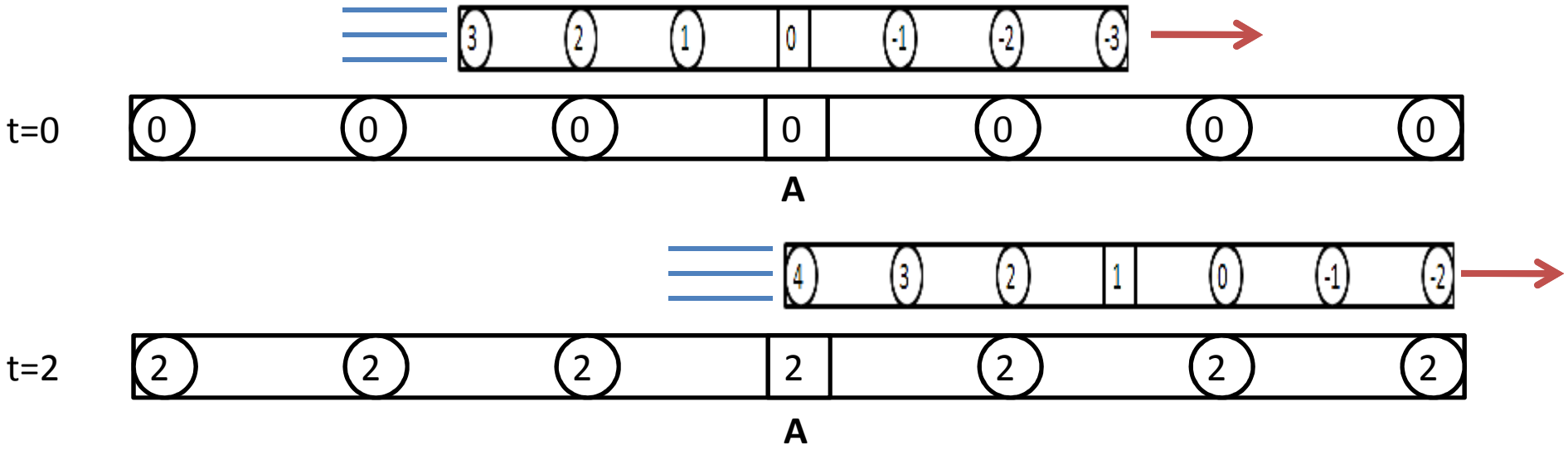
Extra: if the train has length L and is moving at speed v, how would you calculate the observed time difference between the clocks at either end?



Answer:

D) Light hits the back of the train before the front of the train. The clock at the back is observed to read a later time than the front clock.

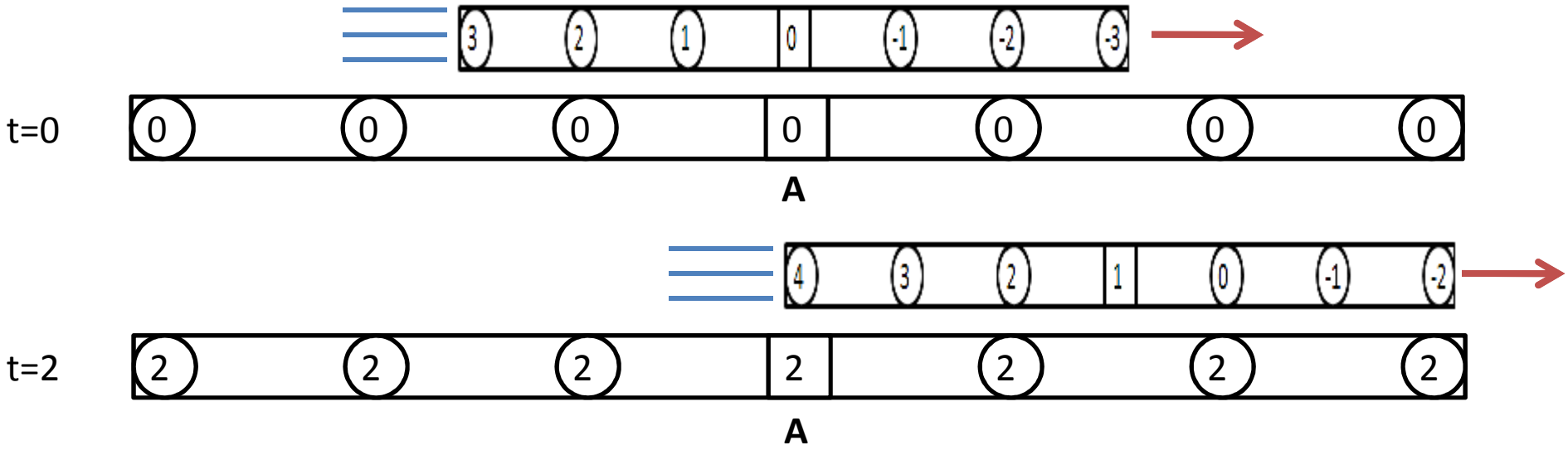
According to observers on the track, when the light hits the back of the train, the front of the train is further from the place where the light flashed, so the light cannot have reached it yet. We know that the light hits each clock when it reads noon, so in the lower picture, the back clock reads noon, while the front clock must read an earlier time. Earlier by $v\,L/c^2$ to be precise.



At what time in the frame of the upper ruler does the clock A on the lower ruler read the time 2?

A) 0 B) 1 C) 2 D) 4

E) The time is different depending on the location of the observer along the upper ruler.

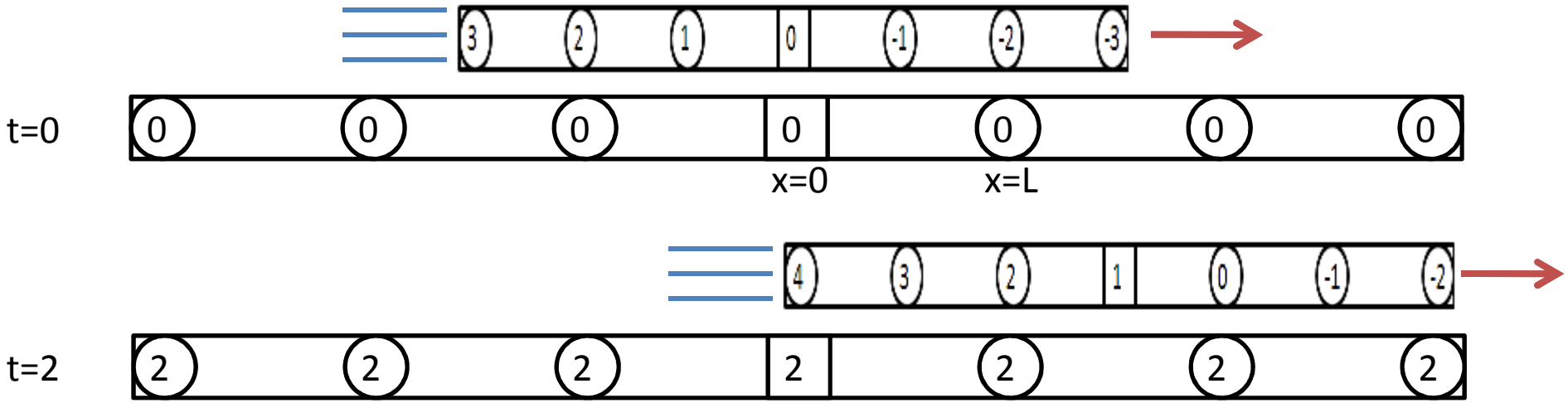


At what time in the frame of the upper ruler does the clock A on the lower ruler read the time 2?

A) 0 B) 1 C) 2 **D) 4**

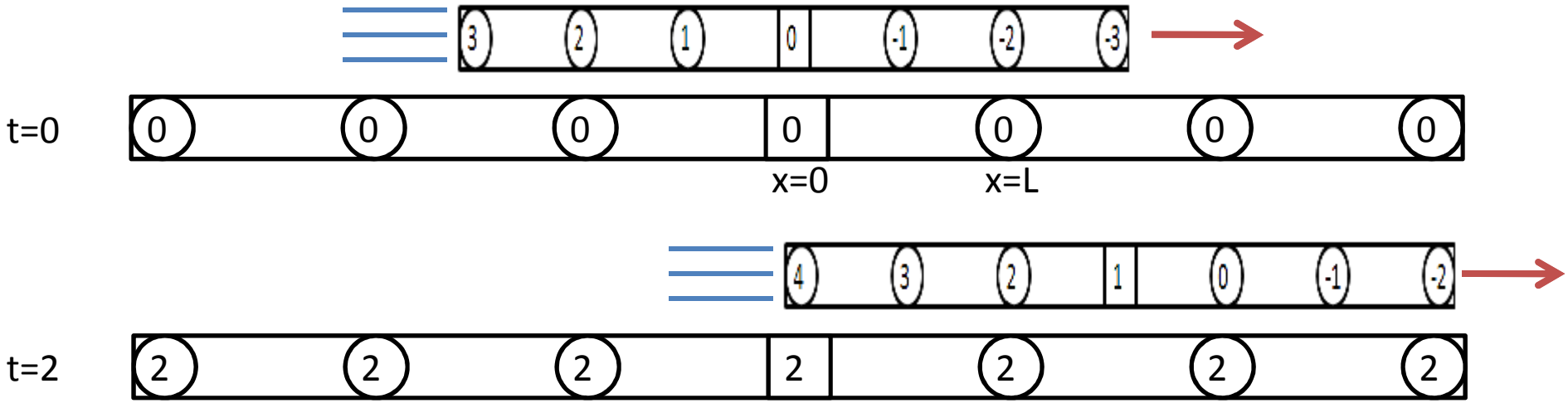
E) The time is different depending on the location of the observer along the upper ruler.

Any event occurs at some specific time in a given frame of reference. The clock in the moving frame that is present at the event reads 4, so this is the time of the event in the frame of the upper ruler.



A firecracker explodes at position x=2L and time t=2 in the frame of the lower ruler. Where and when does this event occur in the frame of the upper ruler?

A) x'=2L, t'=0
B) x'=4L, t'=1
C) x'=L, t'=1
D) x'=L, t'=0
E) x'=L, t'=4



A firecracker explodes at position x=2L and time t=2 in the frame of the lower ruler. Where and when does this event occur in the frame of the upper ruler?

A) x'=2L, t'=0
B) x'=4L, t'=1
C) x'=L, t'=1
D) x'=L, t'=0
E) x'=L, t'=4