

Physics 123 – Spring 2013 – Problem Set 1 – Due January 24, 2013

1. In the first two lectures we discussed the canonical Sam-Sally-Train thought experiment. When we examined the light ray moving perpendicular to the motion of the train, we derived “time dilation”, i.e. the relationship between the time for the event (emit/detect the light) for Sam as compared to that for Sally. Look at the same problem ... but, this time, have the beam travel from the back of the train car to the front where it hits a mirror and returns. Sam and Sally each measure the time for this to happen and then from the constancy of the speed of light, each can extract a value for the length of the train car (along the direction of motion). Derive an expression relating the length as seen by Sally as compared to the length seen by Sam, i.e., derive the formula for “length contraction”.
2. 36-1 (meaning chapter 36, problem 1 on p. 982)
3. 36-2
4. 36-4
5. 36-13
6. 36-16
7. 36-17
8. 36-18
9. 36-19
10. 36-30