

## Answers to selected problems from Essential Physics, Chapter 26

3. (a) No. (b) The time interval as measured by Jenna is longer.
9. (a) The time is the distance over the speed of light – the time works out to 200 ns.  
(b) Using the spacetime interval, we can find that the spatial separation is 45 m.
11. Using the spacetime interval, we can find that the time interval is 112 m of time, or, equivalently, 373 ns.
19. (a) (i) 49.94 years. (ii) 43.3 years (iii) 15.6 years  
(b) (i) 2.5 lightyears (ii) 25 lightyears (iii) 47.5 lightyears
21. 0.894 c
23. (a) Yes, the faster Rajon travels, the shorter the distance gets, by length contraction. To contract the distance by a factor of 200, however, Rajon must be traveling at 99.99875% of the speed of light, with respect to you. (b) You measure the proper length – you are at rest with respect to the Earth and the star.
25. (a) The mirrors are length contracted. Remember that contraction only occurs for lengths that are parallel to the velocity. (b) The moving mirrors measure 20% shorter than the stationary mirrors.
33. (a) 0.90 microseconds (b) 889 feet, and 0.90 microseconds
39. (a) 0.8 c (b) 150 m of time, which is equivalent to 0.5 microseconds (c) 200 m of time, which is equivalent to 0.67 microseconds
41. (a) 5.7 milliseconds (b) 8.0 milliseconds
47. 0.968 c