

CM Fall 00B

This is a problem in special relativity so ignore the effects of any and all accelerations or gravitational effects. It concerns a crime committed way into the future when rockets routinely travel with velocities which approach the speed of light, c .

At time $t=0$, two rockets are launched from their home base. According to home base, Rocket A travels with a velocity of $\vec{V}_a = (3/5)c \hat{x}$ heading for a distant prison, and Rocket B travels with a velocity $\vec{V}_b = (4/5)c \hat{y}$ heading for a distant bank. After traveling for 4 hours according to his watch, the pilot of Rocket A passes a prison and observes the release of a prisoner named Zantor. After traveling for 18 hours according to her watch, the pilot of Rocket B passes a bank and observes a robbery. After making these observations, the two rockets continue traveling with their original uniform velocities.

- A) How much time has elapsed between Zantor's release from prison and the bank robbery according to an observer on home base?
- B) Suppose that Zantor began his journey to rob the bank immediately after his release. What would have to be Zantor's minimal speed according to home base for Zantor to rob the bank?
- C) If Zantor did indeed rob the bank, what would have been the maximum duration of this journey according to Zantor's watch? What could have been the minimum duration of the journey according to Zantor's watch?
- D) How much time has elapsed between Zantor's release from prison and the bank robbery according to the pilot of Rocket A?