

Physics 123 – Spring 2013 – Workshop module 1

1. Spaceman Spiff takes off from Earth in his trusty spacecraft and moves at a speed $0.99c$ toward the planet Zorgon which is 26 light years distant. How much time will have elapsed by Earth clocks when Spiff arrives at Zorgon? According to Spiff, how much older is he when he arrives at Zorgon than he was when he left Earth. (*Ignore any non-inertial effects in the problem*).
2. As Spiff zips through the Gorgon atmosphere at $0.5c$ in the x-direction, he spots a Zorogonese sailing ship also moving in the x-direction. The Zorogonoids manufacture sailing ships with masts of length 10m that lean away from the direction of movement with an angle that makes 60 degrees with the horizontal. What does Spiff measure for the angle which the Zorgon mast makes with the horizontal?
3. A spaceship approaches the earth with a speed $0.50c$. A passenger in the spaceship measures his heartbeat as 70 beats per minute. What is his heartbeat rate according to an observer that is at rest relative to the earth?
4. In his spare time, Spaceman Spiff hunts AQAB (Al-Qaeda Asteroid Belt) members who are up to no good. While approaching an asteroid at $0.6c$, he spots several AQAB members on the asteroid throwing darts at pictures of Danish cartoonists. Spiff fires a missile at the asteroid. Spiff perceives the missile to move at $0.8c$ relative to him. The AQAB guys on the asteroid notice the missile and observe it to approach them at what speed?
5. Suppose an observer in frame of reference S observes two events to be separated in space by 220 meters and separated in time by 0.8×10^{-6} seconds. How fast must an observer in frame S' be moving relative to S in order for him to observe the two events to take place at the same location in space.