

Chapter 39 Relativity I (Examples) (SM01)

Example 1: How fast must an object move for γ to be equal to 2?

Example 2: A bomb is set to explode in one hour (bomb time). If it is sent away from earth at $0.98c$, how far from the earth is it when it explodes?

Example 3: What is the speed of a meter stick with respect to you if you measure it to be 0.01 m long?

Example 4: Spaceship's life-support system will last for two years. The plans are to travel to a star that is 10 ly distance from Earth. What is the minimum speed for the ship if the people are to survive the round trip? Assume they start their return to Earth as soon as they arrive at the star. (Ignore all accelerations.)

Example 5: When two photons move away from each other, what is the speed of one as seen by the other?

Example 6: An observer sees a spacecraft moving at $0.90c$ toward them. The craft turns on its headlights. What is the speed of the light beam as seen by the observer?

Example 7: Two electrons are approaching each other. One's speed is $0.95c$ and the other's is $0.98c$. What is the speed of one as seen by the other?

Example 8: Twin A stays on earth while twin B travels at $0.98c$ to a star that is 30 ly away. How old is each when B returns to earth? B starts the trip at age 20 and spends 5 years exploring.