

Problems of Special relativity

1) A starship at rest has a mass of 4.30×10^7 kg (proper mass). At what speed does the starship move if its mass (measured by an observer at rest) is 5.48×10^7 kg?

Data: $c = 3 \times 10^8$ m/s.

Answer: $0.62 c = 1.86 \times 10^8$ m/s.

2) A subatomic particle at rest has a half-life of 5.27×10^{-8} s. If its speed is 2.58×10^8 m/s, calculate its half-life and the distance before half decayed when they are measured by an observer at rest.

Data: $c = 3 \times 10^8$ m/s.

Answer: 1.03×10^{-7} s, 26.6 m.

3) A stick at rest has a length of 60 m (proper length). At what speed does the stick move if its length (measured by an observer at rest) to shrink to 26.2 m?

Data: $c = 3 \times 10^8$ m/s.

Answer: $0.9 c = 2.70 \times 10^8$ m/s.

4) A starship at rest has a mass of 1.12×10^9 kg (proper mass). Find its mass (when it's measured by an observer at rest) if the starship is travelling at $0.56 c$.

Data: $c = 3 \times 10^8$ m/s.

Answer: 1.35×10^9 kg.

5) A starship at rest has a length of 76 m (proper length). Calculate its length (measured by an observer at rest) if it is travelling at $0.55 c$.

Data: $c = 3 \times 10^8$ m/s.

Answer: 63.5 m.