

Name: _____ Block: _____

Length Contraction & Time Dilation

1. A spaceship is travelling at $0.7c$ on a trip to the Andromeda galaxy and returns to Earth 25 years later (from the reference frame of the people who remain on Earth). How many years have passed for the people on the ship?

17.85 years

2. A 16-year-old girl sends her 48-year-old parents on a vacation trip to the centre of the Universe. When they return, the parents have aged 10 years, and the girl is the same age as her parents. How fast was the ship going? (Give your answer in terms of a fraction of the speed of light.)

$0.971 c$

3. The starship Voyager has a length of 120. m and a mass of 1.30×10^6 kg at rest. When it is travelling at $2.88 \times 10^8 \frac{\text{m}}{\text{s}}$:

(a) what is its apparent length according to a stationary observer?

33.6 m

(b) what is its apparent mass according to a stationary observer?

4.64×10^6 kg