

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS  
DEPARTMENT OF PHYSICS

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Instructor: Dr. A. Mekki

Physics 212 – Quiz #1  
Chapter 1

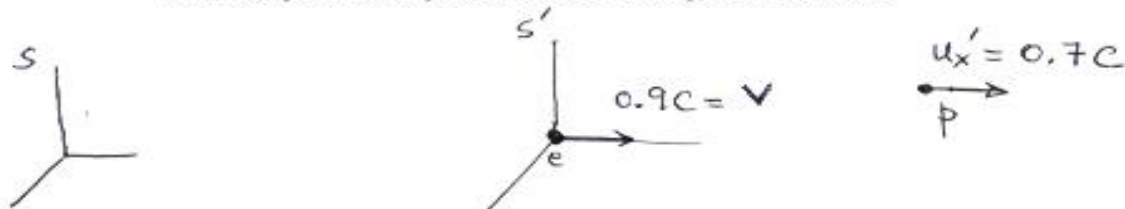
A spacecraft moves at a speed of  $0.9c$ . If its length is  $20\text{ m}$  as measured by an observer on the spacecraft, what is its length measured by an observer on the ground?

The proper length is  $L = 20\text{ m}$

We have a length contraction. The observer on the ground will see a length  $L' = \frac{L}{\gamma}$

$$L' = 20 \frac{1}{\sqrt{1-(0.9)^2}} = \frac{20}{2.294} = \boxed{8.78\text{ m}}$$

An electron moves to the right with a speed of  $0.90c$  relative to a ground observer. A proton moves to the right with a speed  $0.70c$  relative to the electron. Find the speed of the proton relative to the ground observer.



$$u_x = \frac{u'_x + v}{1 + \frac{u'_x v}{c^2}} = \frac{0.9c + 0.7c}{1 + \frac{(0.7c)(0.9c)}{c^2}} = \frac{1.6c}{1 + 0.63} = \boxed{0.98c}$$