KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
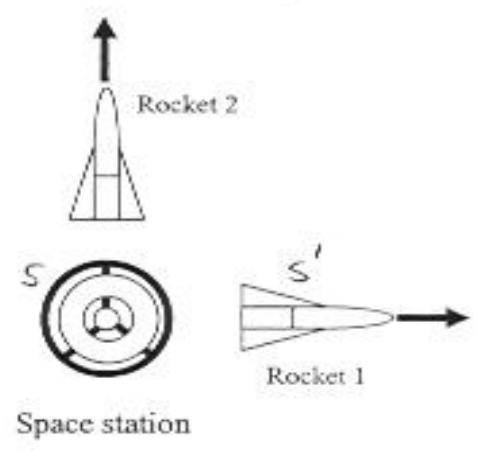DEPARTMENT OF PHYSICS
Term 032

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Physics 212 – Quiz #1a
Chapter 1

Two rockets are leaving their space station along perpendicular paths, as seen measured by an observer on the stationary space station. Rocket 1 moves at 0.60c and rocket 2 moves at 0.80c, both measured relative to the space station. What is the velocity of rocket 2 as observed by rocket 1?

Rocket 1 $\qquad u_x = 0.6c \qquad u_y = 0$

Rocket 2 $\qquad u_x = 0 \qquad u_y = 0.8c$

Rocket 2

S

S'

Rocket 1

Space station

$$\text{Rocket 2} \begin{cases} u'_x = \dfrac{u_x - v}{1 - \dfrac{u_x v}{c^2}} \\[4mm] u'_y = \dfrac{u_y}{\gamma\left(1 - \dfrac{u_x v}{c^2}\right)} \end{cases}$$

$$v = 0.6c \qquad \text{and} \qquad u_x = 0 \quad ; \quad \gamma = \frac{1}{\sqrt{1 - v^2/c^2}} = \frac{1}{\sqrt{1 - (0.6)^2}} = 1.25$$

$$\Rightarrow \quad u'_x = \frac{0 - 0.6c}{1 - 0} = -0.6c$$

$$u'_y = \frac{0.8c}{1.25(1 - 0)} = 0.64c$$

velocity is $\quad u' = \sqrt{(-0.6)^2 + (0.64)^2} = \boxed{0.87\ c\ \tfrac{m}{s}}$

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