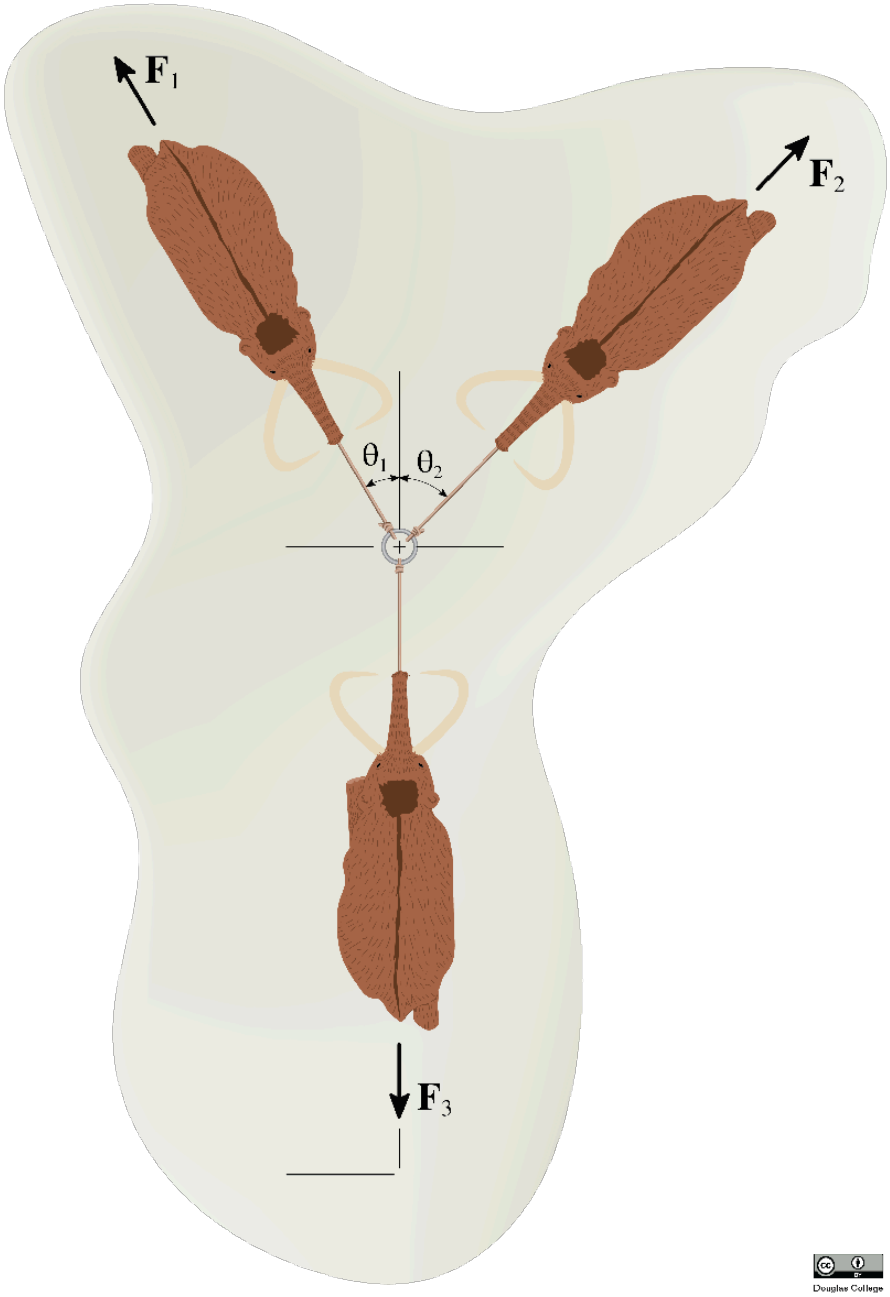
21-S-3.3-RP-06



Mocha the Mammoth is playing tug-of-war with her two friends: Truffle and Daisy. Mocha is the strongest mammoth among her friends and exerts a force F_3 on the ring. In order to prevent the ring from moving, Truffle and Daisy exert unknown forces F_1 and F_2 respectively. Determine the forces exerted by Truffle and Daisy.

Assume the positive x axis points to the right and the positive y axis points upwards.

$+\rightarrow \Sigma F_x = 0 : -F_1 \sin\theta_1 + F_2 \sin\theta_2 = 0$

$\Rightarrow F_2 = F_1 \dfrac{\sin\theta_1}{\sin\theta_2}$

$$+\uparrow \Sigma F_y = 0 : F_1 \cos\theta_1 + F_2 \cos\theta_2 - F_3 = 0 \rightarrow F_1 \left(\cos\theta_1 + \frac{\sin\theta_1}{\tan\theta_2} \right) = F_3$$

$$\Rightarrow F_1 = \frac{F_3}{\cos\theta_1 + \frac{\sin\theta_1}{\tan\theta_2}}$$

$$\Rightarrow F_2 = \frac{F_3}{\cos\theta_2 + \frac{\sin\theta_2}{\tan\theta_1}}$$