**Problem:**

Rory, Aurora and Raoul are three lions fighting over a piece of meat of mass 12 kg. Each lion exerts a horizontal pull. Rory pulls with a force of 800 N. Aurora, who is 120 degrees to Rory's right, exerts a force of 400 N. Raoul is 140 degrees to Rory's left. The meat accelerates in Rory's direction.

(a) Find the force which Raoul is exerting.
(b) Find the magnitude of the acceleration.

Solution:
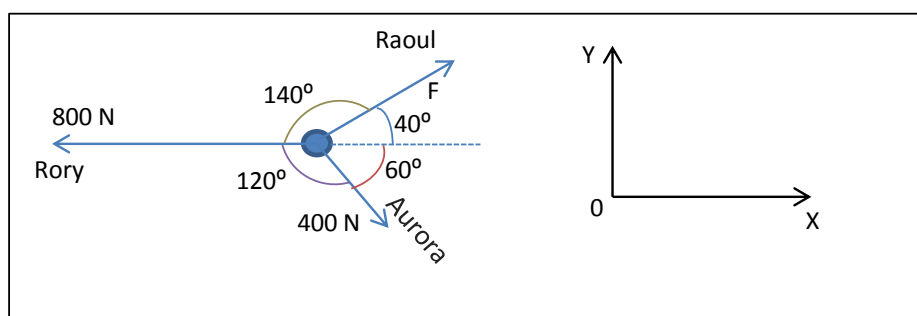
Let

m=12 kg – mass of meat;

$F_1 = 800\ N; F_2 = 400\ N$ – Rory's and Aurora's pull force;

According to second Newton's law:

$$\begin{cases} OX: & F_1 - F cos40^0 - F_2 cos60^0 = ma \\ OY: & F sin40^0 = F_2 sin60^0 \end{cases}$$

Thus,

$$F = \frac{F_2 sin60^0}{sin40^0} = \frac{400 * 0.87}{0.64} = 539\ N$$

$$a = \frac{F_1 - F cos40^0 - F_2 cos60^0}{m} = \frac{800 - 539 * 0.77 - 400 * 0.5}{12} = 15.4\ [m/s^2]$$

Answer: $F = 539\ N;\ a = 15.4\ [m/s^2]$.