**Problem 4:** (20 pts.) A 120-kg block is subject to 2 forces. The first force has a magnitude of 20.0 N, and is directed at an angle of 30.0°. (All angles are measured in the usual convention of degrees counterclockwise from the positive x-axis.) The acceleration of the object is found to be $0.2887 \, \mathrm{m/s}^2$ at an angle of 120°. What is the magnitude and direction of the second force?

Problem 4: (20 pts.) A 120-kg block is subject to 2 forces. The first force has a magnitude of 20.0 N, and is directed at an angle of 30.0°. (All angles are measured in the usual convention of degrees counterclockwise from the positive x-axis.) The acceleration of the object is found to be $0.2887\,\text{m/s}^2$ at an angle of 120°. What is the magnitude and direction of the second force?
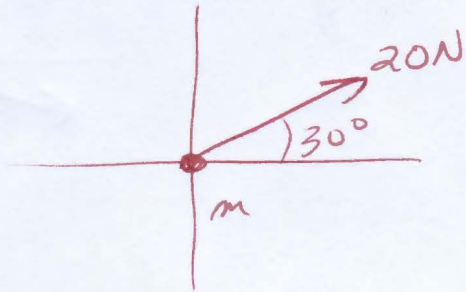
$$\vec{F_1} + \vec{F_2} = m\vec{a}$$

$$\vec{F_2} = m\vec{a} - \vec{F_1}$$

x-components: $F_{2x} = ma_x - F_{1x}$

$$= (120)(0.2887)\cos 120° - 20\cos 30°$$

$$= -34.64\,N$$

y-components: $F_{2y} = ma_y - F_{1y}$

$$= (120)(0.2887)\sin 120° - 20\sin 30°$$

$$F_{2y} = 20\,N$$

$$F_2 = \sqrt{F_{2x}^2 + F_{2y}^2} = \boxed{40N}$$

$$\theta = \tan^{-1}\left(F_{2y}/F_{2x}\right) = \boxed{150°}$$