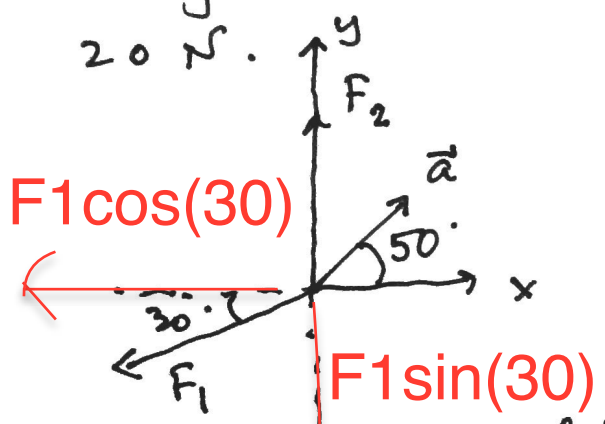
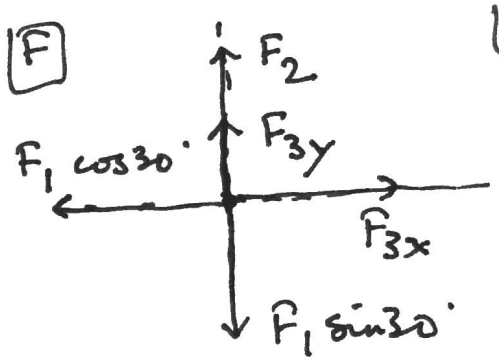
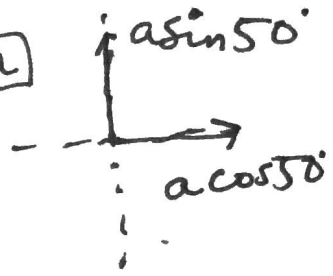
Example 1

A 2 kg cookie tin is accelerated at $3\ m s^{-2}$ in the direction shown by $\vec{a}$. over a frictionless horizontal surface. The acceleration is caused by three horizontal forces, only 2 of which are shown: $\vec{F}_1$ of magnitude 10 N and $\vec{F}_2$ of magnitude 20 N.







QUESTION: FIND THE THIRD FORCE, $\vec{F}_3$?

let's assume $\vec{F}_3 = F_{3x}\hat{i} + F_{3y}\hat{j}$

Applying N-2 law:

x: $F_{net,x} = m a_{net,x}$

$F_{3x} - F_1 \cos 30° = m\, a \cos 50°$

$F_{3x} =$ ☐ N

y: $F_{net,y} = m a_{net,y}$

$F_2 + F_{3y} - F_1 \sin 30° = m\, a \sin 50°$

$F_{3y} =$ ☐ N

$\vec{F}_3 = F_{3x}\hat{i} + F_{3y}\hat{j}$.

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