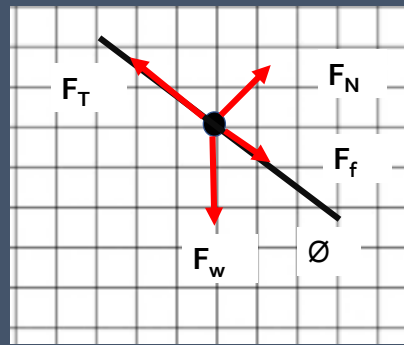


SAMPLE PROBLEM - COMPLEX

A block of mass m is pulled along a rough surface up a hill with angle of θ . The block accelerates up the hill to the left. As shown in the diagram below. Write the equations for the sum of forces.

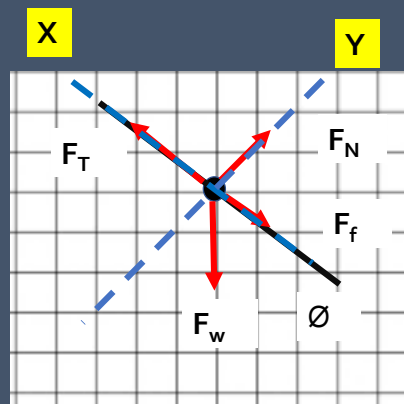
1. **Draw the free-body diagram and identify the variables.**



SAMPLE PROBLEM (CONTINUED)

2. **Select a coordinate system & apply it to the free-body diagram.**

- Choose the x-axis parallel to and the y-axis perpendicular to the incline of the table
- To simplify the problem, always choose the coordinate system in which as many forces as possible lie on the x- and y-axes.
- only one force needs to be resolved into x and y components.



SAMPLE PROBLEM (CONTINUED)

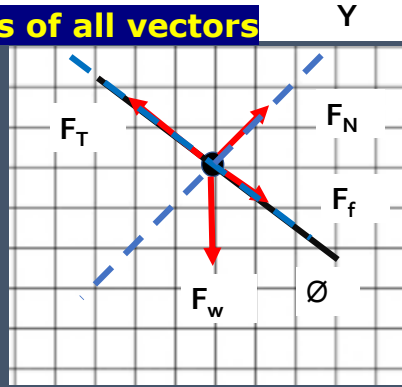
3. Find the x and y components of all vectors

Any vectors not on the x & y axis must be broken into its x & y components

F_w must be broken up into F_{wx} & F_{wy}

- The angle of the incline was θ
- Indicate angle is also θ

$$F_{wx} = F_w \cos \theta \quad F_{wy} = F_w \sin \theta$$



$$\begin{aligned} \sum F_x &= ma_x \\ \sum F_x &= F_f - F_T + F_{wx} = ma \\ F_f - F_T + F_{wx} &= ma \end{aligned}$$

$$\begin{aligned} \sum F_y &= ma_y \\ \sum F_y &= F_N - F_{wy} = ma \\ F_N - F_{wy} &= 0 \end{aligned}$$

