Summary 8:

1. Find the net force exerted on each body in the problem
   - Draw the free body diagram including all forces acting ON this body
   - Define your coordinate system (positive x, positive y)
   - If necessary, split up forces in horizontal and vertical components (x and y)
   - Determine the net force $\vec{F}_{net} = \sum \vec{F}$ separately for x and y, if necessary:
     \[ F_{Netx} = \sum F_x \quad F_{Nety} = \sum F_y \]

2. Apply Newton’s 2nd Law
   $\vec{F}_{net} = m \vec{a}$
   separately for x and y, if necessary:
   \[ F_{Netx} = ma_x \quad F_{Nety} = ma_y \]
   - m is the mass of this body
   - a is the acceleration of this body

3. Solve equations for unknowns
1. Free Body Diagram and Coordinate system

2. Vertical

\[ F_N + F_x - mg = 0 \]  (no acceleration)

3. Horizontal

\[ F_x = ma_x \]  (acceleration)
Normal Force $F_N$
Force exerted by a surface on an object with which it is in contact. Directed perpendicular to the surface.

1. $F_{net} = F_N - mg$
2. $F_N - mg = 0$
3. $F_N = mg$

Drawings Courtesy of L. Gladding

Apparent Weight

1. $F_{net} = F_N - mg$
2. 2nd Law: $F_N - mg = -ma$
3. $F_N = m(g - a)$

($F_N = \text{apparent weight}$)

Drawings Courtesy of L. Gladding
Objects on an inclined surface

Y: \[ F_N - mg \cos \Theta = 0 \]

X: \[ F - mg \sin \Theta = ma \]

Choose your coordinate system wisely!