**Problems that involve both force and motion over time**

 Newton’s definition of

equations motion 2nd law NET force possible forces

 Vo weight

BIG Five Vf

Equations a a = NET F NET F = ∑ forces normal

of Acc. Δt m force

Motion ΔX

 friction

 m = W Free-body diagram

 *g* other contact force

**IF an object moves across a surface THEN IF an object moves straight up or down THEN**

Σ X-components = NET force Σ Y-components = NET force

Σ Y-components = zero Σ X-components = zero

TO CALCULATE: TO CALCULATE:

 **weight** use W = m*g* or Σ Y-components = zero **weight** use W = m*g* or Σ Y-components = NET force

 **friction** use Σ X-components = NET force or $f= μN$ **vertical spring force** use Σ Y-components = NET F

 **normal force** use Σ Y-components = zero or $f= μN$ **other individual contact force** use

 **other individual contact force** use Σ Y-components = NET force

Σ X-components = NET force Σ X-components = zero

 Σ Y-components = zero