Newton's Second Law Problem Solving Guide

The Model

The only general assumption is that all objects do not rotate, and so are effectively treated as point particles.

Often other assumptions will come into play. Unless a problem states otherwise, it is typically assumed that:

- Ropes and strings are massless, so tension is the same on both ends.
- Pulleys are massless and frictionless, so they also do not affect the tension in a string or rope passing over them.
- Air resistance/drag is negligible.
- Some problems may also assume no friction, although problems will typically state this.

Problem Solving Steps

1) Organize and plan
   a) Draw a picture, if not already provided.
   b) Draw FBD(s)
      i) In some cases, combining multiple objects into a single system is helpful. In such a case, draw a FBD for the system.
   c) Choose appropriate axes.
   d) Take components of vectors not along axes. (May require some geometry).
2) Solve
   a) Write down N's second law for all objects along all axes.
   b) Add equations from 3rd law, friction, weight, and other known forces or accelerations. (Remember $n=mg$ and $f_s=\mu_s n$ are NOT always true)!
   c) Manipulate algebraically as needed. Add kinematics equations if needed.
3) Reflect
   a) Do your answers make sense?
   b) Are the units correct?
   c) Did you use any new techniques?
   d) Any other insights?