*This is a general algorithm for all of forces. See these shaded sections for FBD.

1st Law

1. Read and re-read the whole problem carefully.
2. Visualize the scenario. Mentally try to understand what the object(s) are doing and what forces are acting on them.
   a. If the object of interest is maintaining a constant velocity, then the net external force acting on them must sum to zero.
   b. If the object's velocity is changing, then there must be a net external force that does not sum to zero.

FBD

3. Define your system(s) of interest.

Friction

4. If there is friction present (if not go to step 5), consider the following:
   a. Identify the two surfaces in contact that have friction between them.
   b. Determine if the two contact surfaces are moving relative to one another.
      i. If they are moving relative to one another, its kinetic friction.
      ii. If they are not moving, its static friction.
   c. If it is static friction, determine if you have enough information to determine the direction and if it is the maximum allowed value before the object begins to slip relative to one another.

FBD

5. Draw a FBD for the system(s). Be sure to label each force with the following:
   a. The force type (e.g. gravity, normal, friction, etc...)
   b. The object the force is acting on.
   c. The object that is causing the force.
6. Include any important angles from the physical representation or written description on the FBD.
7. Define a coordinate system for the FBD(s). To do so, consider the following:

UCM

   a. Determine if the object is in UCM. If not, skip to step 7.b.
      i. Determine the radial direction and tangential direction.
      ii. Orient the coordinate system so that one of the axis is parallel to the direction of radial acceleration.
      iii. Determine if the other direction should be the tangential direction (tangent to the circle) or if it should be in the traditional x or y direction that would be normal to the circle AND radial direction.

INCLINED PLANES

a. Determine, or define if not known, the direction of linear acceleration the object would have.
   i. If the object is not accelerating, orient the coordinate system such that you will have the least number of forces to decompose into components.
   ii. If the object is accelerating, orient the coordinate system such that one axis is parallel to the direction of acceleration. This will set the object's component of acceleration along the other axis to be zero.

FBD

8. Double check that you have all of the external forces. The number of forces you should have should be equal to all of the visible forces that cross the boundary plus the number of objects that create friction with the system plus all of the non-contact forces.

3^{rd} Law

9. Look for any force pairs if multiple objects are present.
   a. Identify forces that are acting in opposite directions.
   b. Of the forces found in the step above, find which forces are the same type of force (e.g. normal, friction, etc...)
   c. Of the forces that are the same type, find the forces that act on the same two bodies. In the notation used in class, they will have the same subscripts, but reversed order (e.g. $\left|\vec{F}_{12}\right| = \left|\vec{F}_{21}\right|$
   d. Either scale and mark the force pairs on the FBD, or write out the mathematical expression like the one in the step above.

COUPLED SYSTEMS

10. Identify any connecting information if multiple objects are present.
   a. If there are objects that are coupled, then identify what it is that is coupling them.
   b. Determine how the motion of the two objects are affected by this coupling (e.g. if connected by a string are the magnitudes of the acceleration the same? Do the objects travel the same distance in the same amount of time? Are there pulleys that scale the distances traveled by each object in the same amount of time?).

2^{nd} Law

11. Apply Newton's 2^{nd}Law in each direction of the coordinate system chosen. You will need to decompose the force vectors into their components on the chosen coordinate system, this process will return positive vales since all the angles we use to decompose vectors are smaller than 90 degrees. Thus, you must insert negative signs by hand based off of your choice of coordinate system.
12. Simplify each Newton's 2^{nd}Law equation as best as possible, putting in definitions of things like, $\left|\vec{F}^G\right|$, $\left|\vec{F}^F\right|$ if known, radial acceleration definition if applicable, force pair equations, and any connecting information.
13. Rearrange equations to solve for the required quantity. This can involve some ugly algebra, including solving simultaneous equations.
14. Evaluate your answer, make sure units are correct and the results are within reason.