What should we expect to see on MT#1?

There will be three or four questions, very much in the form of a Big Exam! that you have taken in class. It may ultimately ask for a number, but the goal (and credit for the question) is not to find the numerical answer. You will be graded on the reasoning and support you provide for your answers.

1) For all questions, you will be expected to draw a relevant picture, and state your assumptions.
2) To get a "D", you will draw the above and choose a lens or lenses and state why this is a good lens. Essentially, you will provide one of the following:
   a) Momentum. State what's going on with momentum "because $\Delta\vec{p} = \vec{F}\Delta t$, and either there's no outside force so momentum is conserved," or "the change in momentum is caused by a force acting on this body." This might be handy when outside forces are negligible compared to forces between two bodies like there is an explosion blowing something apart, or a collision when two things come together.
   b) Energy. You will provide an energy insight such as, "E_{gp} => E_k" or "The work done on the system results in a change in kinetic energy."
   c) Dynamics. State what's going on with forces, like "the forces on the person cause her to accelerate", or "these forces change momentum".
   d) Kinematics, because we have kinematic variables (position, velocity, acceleration) as *an explicit function of time*.
3) Then what? It depends on which lens:
   - To get a "C", you must do #1 and #2 above and take the next step (described below).
   - To get a "B", you must do the above and set up the equations (described below).
   - To get an "A", you solve the equations and reflect on the answer (described below).

Momentum, for instance see the "pushing off the boat" or "fusion" problem:
For a "C" – We know $\Delta\vec{p} = \vec{F}\Delta t$, and in this problem $\sum \vec{F}_{system} = 0$, so there's no change in the total momentum of the system. That means the sum total of momenta before is the same as sum total after. If the system began at rest, the total momenta afterwards must add to zero.
Remember momentum is a vector!
For a "B" – set up these equations.

Energy, Such as #7 on SP #3, throwing the box.
For a "C" – conserve energy! Make sure that the sum of initial energies in the system equals all the final energies in the system. However, you might have to add energy if work is put into the system, or take out energy if energy leaves the system, for instance in the form of heat.
For a "B" set up the equations.

Dynamics, Such as an elevator problem like Big Exam! #2.
For a "C", You'll write down $\vec{a} = \frac{\sum \vec{F}}{m}$, state which forces are causing acceleration (or a = 0), and then identify these forces and the direction of acceleration (if possible) in a good, large, clear Free Body Diagram (FBD).
For a "B", You'll show how you can add the force vectors to get the net force, which must be in the same direction as the acceleration, so check your FBD.

Kinematics, you will use your equations, definitions, and graphs to distinguish displacement from velocity, from acceleration.