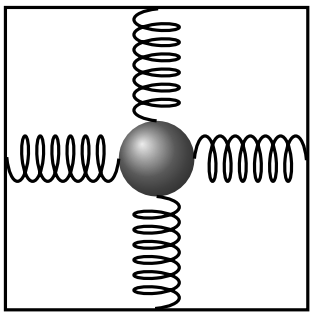
Please answer the questions below to the best of your ability either in the space provided. Everything should be scanned or photographed and submitted through gradescope.com.

Objective: *I can determine different potential microstates given a macrostate and use them to find the probability of an object having a certain amount of energy.*

1. A 2-dimensional analog to Einstein's Model of a Solid would just be a mass with springs attaching it to both sides of a box:



This situation could be modeled using only two springs, and thus there are only 2 "places" for energy to be. Suppose we added 7 "chunks" or quanta of energy to the atom.

(4) (a) Determine all the possible microstates given the above macrostate. Or in other words, write out all the ways that 7 quanta of energy could be distributed amongst two oscillators. You can draw balls in cups if you want like in class or you can just use numbers to indicate how many quanta in each oscillator (*eg. You could write 53 to indicate the microstate where 5 quanta are in the first spring and 3 quanta are in the second.*)

(4) (b) Consider now the situation where we bring another atom+box into contact with our original box. Energy is freely transferred between the two, so now the 7 quanta we started with could be spread out in any configuration between the two boxes. Determine the *total* number of ways in which the energy could be distributed amongst both boxes.

(3) (c) Sometime later you separate the boxes and take your original box to be measured. What are the odds that when you measure the energy in your box, it now has 4 quanta of energy? As a way of letting you check numbers, I'll tell you that the odds of your box having 1 quanta of energy are about 11.6%.