# HW6: Combinatorial Models Part 2

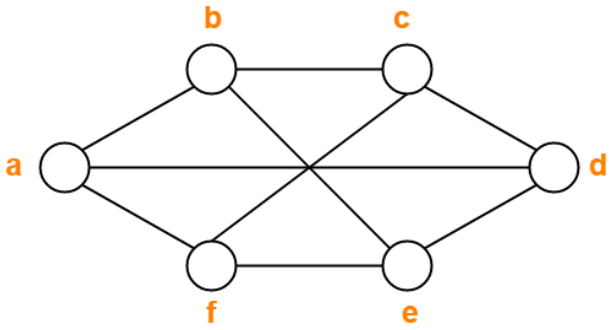
**Problem 1:** ITSD is attempting to backup data on some external harddrives and have asked you for help. The data files have sizes 240, 462, 117, 560, 379, 110, 341, 294, 503, 469, 90, 65, 617, 500, 550, and 400 GB.

a) If the capacity of a harddrive is 780 GB, write a concrete integer programming model to determine the minimum number of harddrives needed to backup all files. *Hint: You need two types of variables: one of which tells you which file is assigned to a hard drive and one of which tells you if a hard drive is used. Make sure you include logical constraints to relate these variables.*

b) Convert your concrete model to a parameterized model.

c) How many total variables does your model have?

**Problem 2:** Consider the following graph:




You are interested in coloring the nodes of this graph so that no node is adjacent to another node of the same color (thus for example, if node a is red, none of nodes b, d, or f can be red). Suppose that each node can be colored either red, teal, green, or yellow.

a) Formulate an integer program whose solution would minimize the number of colors used. You can formulate as either a concrete or parameterized model. If you formulate a concrete model, do not try writing out all of the constraints, just write enough so that the pattern is clear. *Hint: Just like in problem 1, you need two variables for this problem.*

b) How many total constraints does this model have?