# HW3: Logical Constraints Part 1

Problem 1: Charlene is considering opening a food stand to sell refreshments to tourists who visit Annapolis. She can sell each of the following: hamburgers, hotdogs, dark beer and IPA. Each hamburger requires two pieces of bread and 0.5 pound of meat. Likewise, each hot dog requires 1 piece of bread and 0.75 pounds of meat. She has 200 pieces of bread, 100 pounds of meat, 200 ounces of dark beer, and 160 ounces of IPA. Lastly, she can sell each hamburger for $5, each hotdog for $4, 12 ounces of dark beer for $5, and 12 ounces of IPA for $4.

1. Formulate an integer program that would allow Charlene to maximize her revenue.

2. Charlene is now considering adding fried chicken sandwiches to her menu. For $150, she can obtain 50 pounds of fried chicken tenders. She can then make a fried chicken sandwich with 2 piece of bread and 0.75 pounds of fried chicken and sell it for $6. If she does buy the chicken, she wants to sell at least 25 chicken sandwiches. Modify your model from part 1 to account for this new requirement.

Problem 2: The city of Annapolis is rezoning the city into 16 separate districts (see the figure below). Based on this rezoning, answer the following questions:
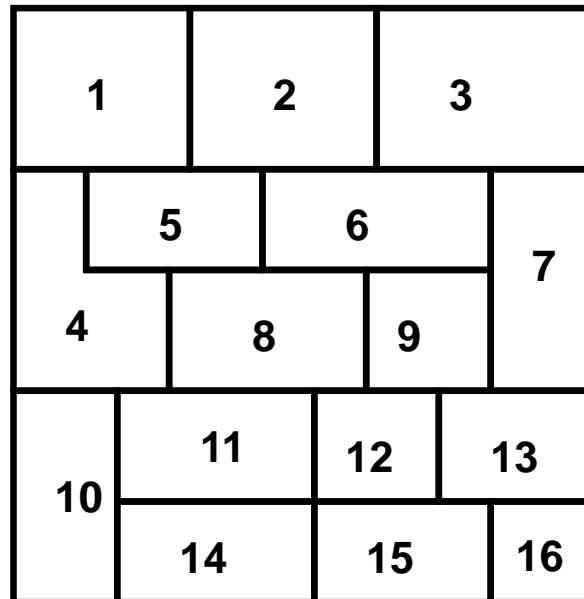
1. The city wants to build hospitals to service Annapolis. They want to make sure every district either contains a hospital, or is adjacent to another district containing a hospital. Formulate a concrete model that will allow them to make sure every district is serviced by a hospital while building the minimum number of hospitals.

2. Convert your concrete model from part 1 into a parameterized model *Hint: It may be helpful to define some extra sets that aren't directly in the problem or use the adjacency matrix idea from class.*