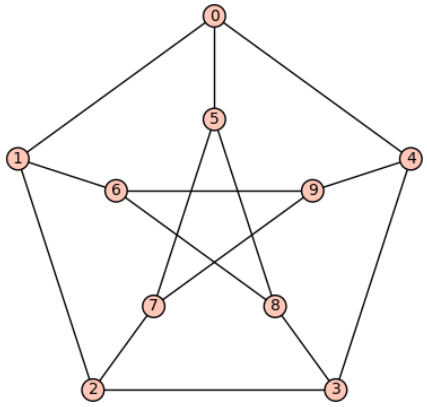
Last name _____

First name _____

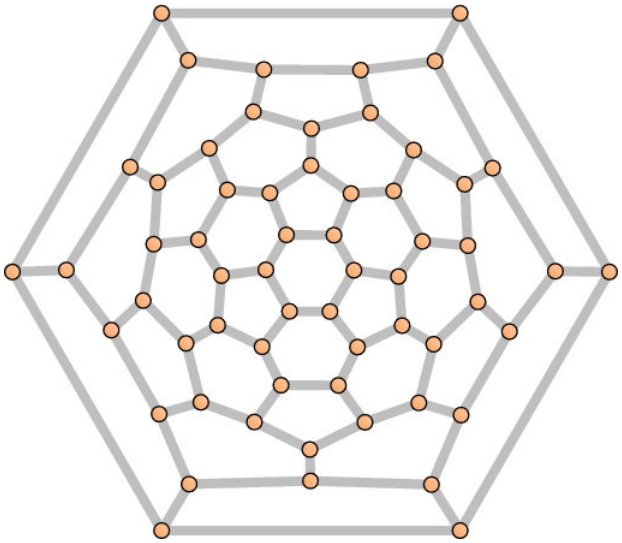
LARSON—MATH 356—CLASSROOM WORKSHEET 02
Introduction.

- What is a *graph*? (From Sec. 1.6 of Wilf)
- What does it mean for vertices to be *adjacent*?
- What is a *drawing* of a graph? (The drawing is not unique!)
- What are graphs, and what can they be used for?
- What is the history of graph theory, what are its origins?
- What is an *independent set* of vertices?

Independent sets and Independence number



1. Find a largest (maximum) independent set in the *Petersen graph*? (Can you prove it is maximum?) Find its *independence number* (denoted $maxset(G)$ in our book). If G is the Petersen graph, what is $maxset(G)$?



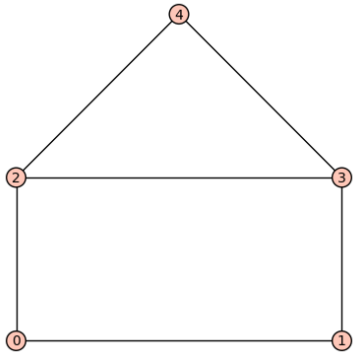
2. Find a largest (maximum) independent set in the *Buckyball graph*? (Can you prove it is maximum?)

Algorithms

3. *How* can we find a maximum independent set in a graph?

4. What is a *set*? What is a *subset* of a set?

5. List all the subsets of $\{0, 1, 2, 3, 4\}$. How many subsets are there?



6. For each subset, check if it is an independent set in the house graph.

7. Describe an algorithm (recipe) to find a maximum independent set in a graph?

8. This algorithm requires checking all the subsets of vertices of a graph. How many are there? (How many subsets are there to check for a graph with n vertices?)

9. Suppose you are running a computer program that requires 2^{1000} iterations. How long would that take on a computer that can do 1 trillion of these iterations per second?

10. The universe is estimated to be 14 billion years old. How many iterations could a computer that 1 trillion iterations per second do if it started computing 14 billion years ago?