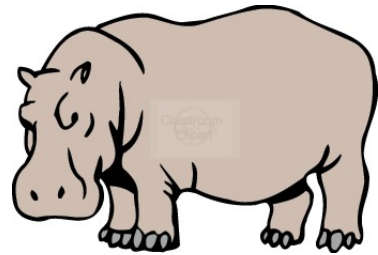


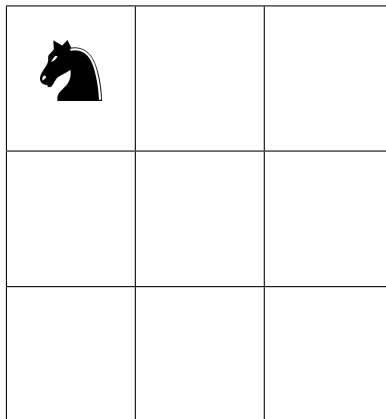
UW Math Circle  
February 5, 2015

1. Jenny works at a zoo and is in charge of building habitats for the animals. She needs to build a habitat for anteaters, brown bears, cougars, deer, elephants, flamingos, giraffes, hippopotamuses, iguanas, and jaguars. But, some of the animals are more ... predatory than others. Therefore,
  - (a) Hippopotamuses cannot live with deer or giraffes.
  - (b) Deer, flamingos, and anteaters all need separate habitats.
  - (c) Iguanas can share their habitats only with jaguars.
  - (d) Bears and elephants don't get along; neither do deer and elephants.
  - (e) Jaguars scare hippopotamuses, cougars, giraffes, and brown bears.
  - (f) Deer and flamingos are also afraid of jaguars.

What is the fewest number of habitats Jenny could build?

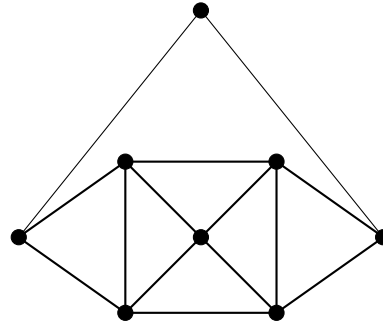
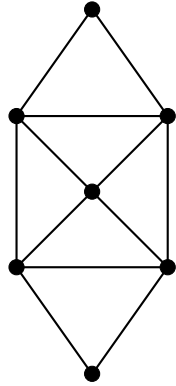


2. Suppose a knight is placed in the upper left hand corner of the chess board shown below. Is it possible to move the knight to the center square of the chess board after some number of moves?



3. Suppose you have a piece of wire that is 120 inches long. Without cutting the wire, can you bend it into the frame of a cube, each of whose edges is 10 inches long?

4. Which of the following graphs can you trace without ever lifting your pencil from the paper, going over every side exactly once? If you can trace the graph without lifting your pencil from the paper, can you also ensure that you start and end at the same vertex?



5. In the far away land of Tripleland, three roads lead in/out of each city. Is it possible that there can be 100 cities in Tripleland?

6. Prove that any graph must have an even number of vertices of odd degree.

7. A graph is called **planar** if it can be drawn in such a way that none of its edges cross. Are these graphs planar?

