CMSC 105: Elementary Programming

Homework Assignment 8

Due: Tuesday, Oct. 10 at class time

1. Write complete truth tables for each of the following compound expressions, assuming that a and b are Boolean expressions:

   a) !( a and b)
   b) !(a or b)
   c) !a and !b
   d) !a or !b
   e) !(a or (b and c))
   f) !a and !(b or c)

2. From Question 1, list the pairs of expressions that are logically equivalent (i.e., always have the same truth values). Provide your own real-world examples (substituting for the Boolean expressions a, b) to support your answers.

3. Recall our bunny experiment from class. It is well known that bunnies love to eat, especially lettuce, apples, and carrots. However, the choice of meal is subject to a bunny's preference, based on the type of meal (lettuce, apple, or carrot) and its associated color (and hence its taste). For example, the favorite of bunnies is an orange carrot; bunnies also enjoy red apples, but not as much as red lettuce; etc. Your task is to create an Alice world that simulates a bunny-food-preference experiment.

   The assignment involves completing the Alice world that you started in class. More specifically, modify the BunnyPrefers.a2w world that you worked on in class, addressing the following items:

   a) Add a third meal to tempt the bunny – a carrot (use a Cone object from “Shapes” folder).

   b) Each time through the infinite loop, color each meal (lettuce, apple, and carrot) either orange, red, or green with equal probability 1/3.

   c) The bunny will choose a meal based on the following bunny preferences, listed in order from most preferable to least preferable:

      1) orange carrot,
      2) green lettuce,
      3) red lettuce,
      4) green apple,
      5) red carrot,
      6) red apple,
      7) all other combinations unappealing.

   d) If none of the first six combinations are present, the bunny will stay in place on the circle and say "Not feeling hungry...".

   e) Otherwise the bunny will face and then hop to the meal that has highest preference, say "Scrumptious!", then face and return to the circle, and finally face the camera.

   f) This process will repeat ad infinitum.

Submit your Alice world by dropping into my Netfiles inbox before class on Tuesday.