

**CS/PSYCH L271 – Intro to Cognitive Science – Fall 2009**

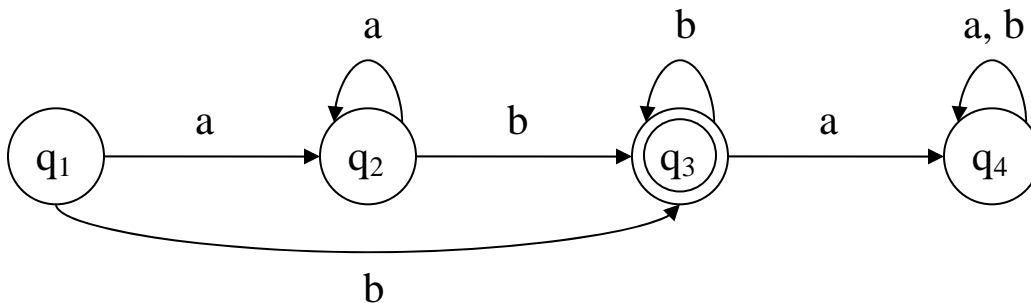
**Instructor: Marc Pomplun**

**Assignment #3**

**Posted on November 12 – due by November 24, 4pm**

**Question 1:**

- a) Draw a finite automaton that accepts the language  $L = \{a, ab, abb, abbb, abbbb, \dots\}$
- b) Draw a finite automaton that accepts the language  $L = \{aab, aaaab, aaaaaab, \dots\}$
- c) Describe the language that the finite automaton below accepts. You can use the set notation as given above, you can use notation for regular languages that we discussed, or you can just use plain English language (but it needs to be precise).



**Question 2:**

At a tennis tournament there is a pile of eight tennis balls. All of them look identical, but one of them is slightly heavier or lighter than the other ones. You can use a balance to compare the weight of two different groups of tennis balls. Draw a decision tree to find the odd ball with a minimum number of weighings.

The best way to do this may be to assign numbers 1 to 8 to individual balls. Then you could describe each weighing by giving two sets of numbers. For example, “1,2,3 – 4,5,6” means that you put balls number 1, 2, and 3 on the left side of the balance and balls number 4, 5, and 6 on its right side. From each weighing, up to three branches will extend downwards, corresponding to the three possible outcomes: (1) the left side is heavier, (2) the right side is heavier, or (3) they are equally heavy.

This way you can draw the entire decision tree. The leaves of this tree, i.e., the nodes that do not have any further branches extending downwards, indicate the result of the entire algorithm. Each of them should be labeled with a number from 1 to 8, which is the number of the ball that has been identified as the odd one. Just try to make the number of necessary weighings as small as possible. Any reasonable effort will receive full points, even if the solution requires more weighings than necessary.