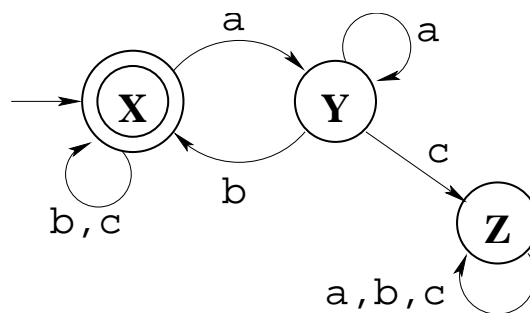# Daily Questions

(due September 9, 2005) Draw the state transition diagram for a finite automaton over the alphabet $\{a, b, c\}$ that accepts a string if-and-only-if every 'a' is followed by a 'b' without an intervening 'c'. For example, the strings abc, aaabbabbccbbabcab, and ϵ are in the language accepted by the machine, but the strings ac and ba are not.

Solution:

For this question, drawing the correct figure is sufficient to receive full marks. I'm including an explanation of my solution because I'm not getting any marks anyway.

My solution has **X** as the only accepting state. Note that the machine accepts the empty string as it satisfies the conditions (there are no 'a's in the empty string; thus, all of them are followed by a 'b' without an intervening 'c'). The automaton moves to state **Y** when it has read an 'a' that needs to be followed by a 'b'. State z is a "garbage state" – the machine moves here when it has read an 'a' that is followed by a 'c' without seeing a 'b' first. Once this has occured, there is no continuation of the string that will make it satisfy the acceptance conditions.

Note that the transition diagram is complete: for every state, there is an outgoing arc for every possible input symbol. Next week, we will study NFAs (Non-deterministic Finite Automata). For NFAs, a state may have outgoing arcs for only a subset of the input alphabet. If you already knew about NFAs and drew a solution for an NFA, then you must state that your solution is for an NFA.

More generally, you are permitted to know things that haven't been assigned in the reading list yet. However, the daily question is intended to be about the assigned reading. If you use something that hasn't been covered yet, you should state clearly that you are doing so – then it's OK.