Q1. Which of the following are languages over the alphabet \{a, b\} (select all that apply)? *

- \{a\}
- \{b, a\}
- the empty set
- \{a, aa, aaa, aaaa\}

Feedback

A language here is a set of strings consisting of a's and b's. \{a\}, \{b, a\} and \{a, aa, aaa, aaaa\} are all languages, as well as the empty set. The only option that isn't a language is ab, because that is a single string and not a set.
Q2. Which of the following strings does this DFA accept? Select all that apply.

- baba
- baa
- bababa
- abb
- aba

Feedback

On inputs aba, baa, and bababa the DFA will end up in the accept (or final) state q3, so these are accepted. On abb, the machine will transition q0 → q1 → q0 and reject. On baba, the DFA will transition q0 → q2 → q3 → q0 → q1 and also reject.
Q3. How many different strings does this DFA accept? *

The only string this DFA will accept is the empty string, so the answer is 1. Note that once the machine reads any input it leaves start state q0 and can never come back. State q3 is unreachable because there are no arrows into it; the machine will never end up there. Thus every string but the empty string will be rejected.
Q4. Some DFAs can recognize more than one language. *

- True
- False

Feedback

False: a machine recognizes a language $L$ if $L$ consists of exactly those strings which the machine accepts. That means that $L$ is uniquely determined by the behavior of the machine. Review Sipser p. 36 (2nd/3rd ed).

Q5. All finite languages are regular. *

- True
- False

Feedback

True. First, observe that a language consisting of just one string is regular. We can easily build a DFA that accepts precisely that one string and nothing else. By Theorem 1.25 (see Sipser p 45) the union of two regular languages is regular. We can apply this finitely many times to see that any finite union of regular languages is regular. A finite language can be expressed as the union of a finite number of languages consisting of just one string, and each of those languages is regular.