

1. Functional vs. Imperative vs. Logic Languages:
What do you think are the main distinguishing characteristics between functional, imperative, and logic languages (one per language class is sufficient)?
2. Rules in Prolog:
Restate the following Prolog rule using (universal and existential) quantifiers.

```
sibling(X, Y) :- mother(M, X), mother(M, Y), father(F, X), father(F, Y).
```

3. List manipulation:
Scheme uses `car` and `cdr` for extraction of the head and tail of a list. What is the equivalent in Prolog?
4. A simple database in Prolog:
Consider the following set of facts and rules in the Prolog database:

```
takes(jane_doe, his201).  
takes(jane_doe, cs254).  
takes(ajit_chandra, art302).  
takes(ajit_chandra, cs254).  
classmates(X, Y) :- takes(X, Z), takes(Y, Z).
```

The query

```
?- classmates(jane_doe, X)
```

will succeed three times: twice with $X = jane_doe$ and once with $X = ajit_chandra$. Show how to modify the `classmates(X, Y)` rule so that a student is not considered a classmate of him or herself.