Arguments

Rule of universal instantiation: If some property is true of everything in a domain, then it is true of a particular thing in the domain.

ex. All computer science majors must take Math 2534.
   (∀x, if x is a computer science major, then x must take Math 2534.)

Universal Modus Ponens:

∀x, if P(x) then Q(x)

P(a) for a particular a

∀ Q(a)

ex.

Universal Modus Tollens:

∀x, if P(x) then Q(x)

~ Q(a) for a particular a

∀ ~ P(a)
ex. All computer science majors must take Math 2534.

We can use diagrams to test the validity of an argument. (Recall that an argument is valid if the fact that all the premises are true forces the conclusion to be true.)

ex.
ex. All computer science majors must take Math 2534. 
   Sam must take Math 2534. 
   Sam is a computer science major.

ex. All computer science majors must take Math 2534. 
   Mary is not a computer science major. 
   Mary doesn’t have to take Math 2534.
ex. No college cafeteria food is good.
   No good food is wasted.
   \[\text{No college cafeteria food is wasted.}\]

ex. All dogs who live outdoors have fleas.
   No animal that has fleas is welcome in my house.
   My dog Fido lives outdoors.
   My dog Rover does not have fleas.

Which conclusions are valid?
1. Fido is not welcome in my house.
2. Rover does not live outdoors.
3. Rover is welcome in my house.
4. Cats who live outdoors are not welcome in my house.
ex. All people who drive contribute to air pollution.
    All people who contribute to air pollution make life a little worse.
    No person who walks contributes to air pollution.

Which conclusions are valid?

1. No person who walks makes life a little worse.
2. All people who drive make life a little worse.
3. All people who contribute to air pollution drive.
4. No one who contributes to air pollution walks.
5. No person who makes life a little worse walks.
Do: Valid or Invalid?

1. All car buyers make payments.
   I make payments.
   \[\text{I am a car buyer.}\]

2. No people are mice.
   All mice are mortal.
   \[\text{No people are mortal.}\]

3. Nobody doesn’t like Sara Lee.
   No people who like Sara Lee get fat.
   \[\text{Nobody is fat.}\]