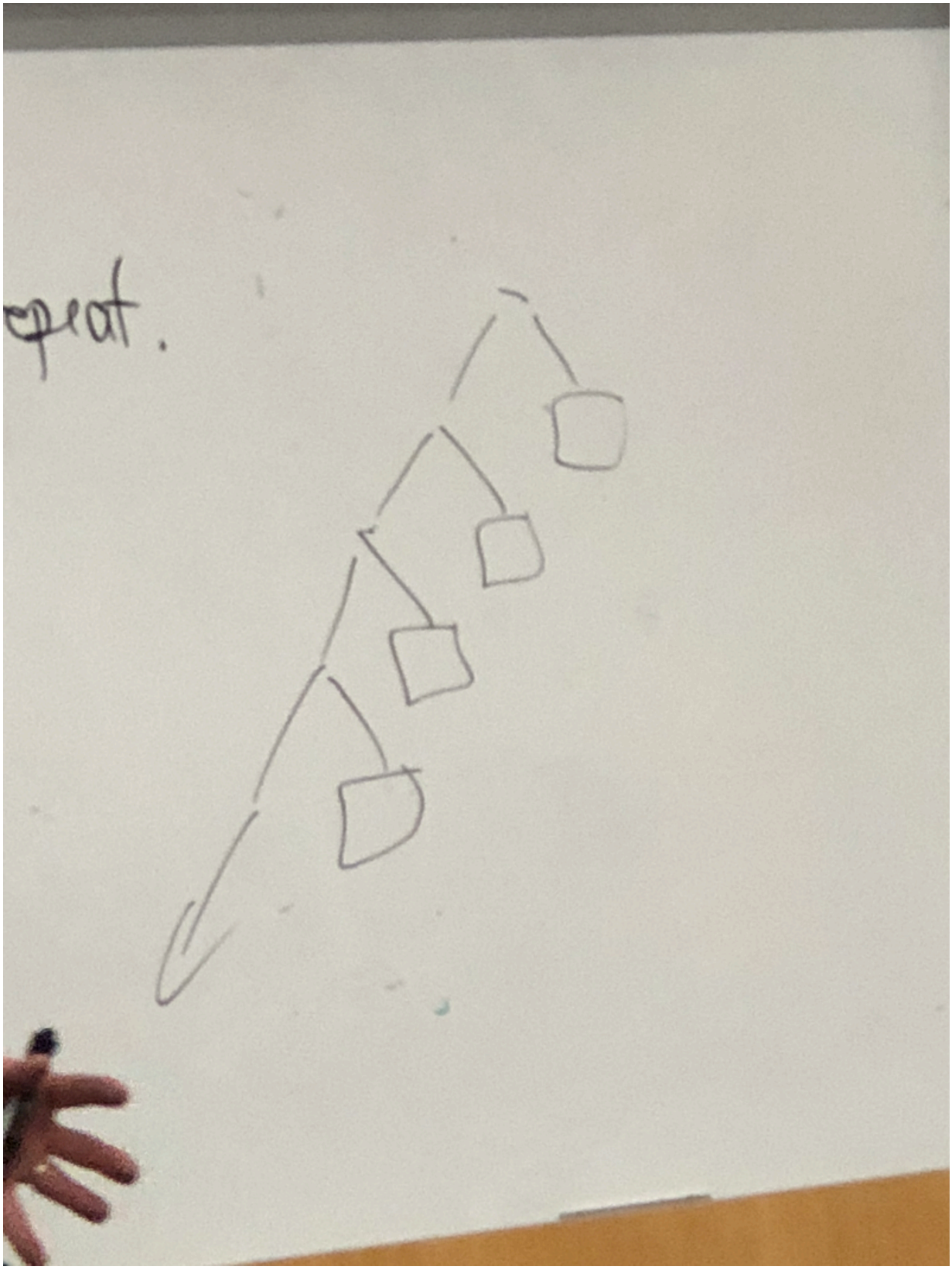
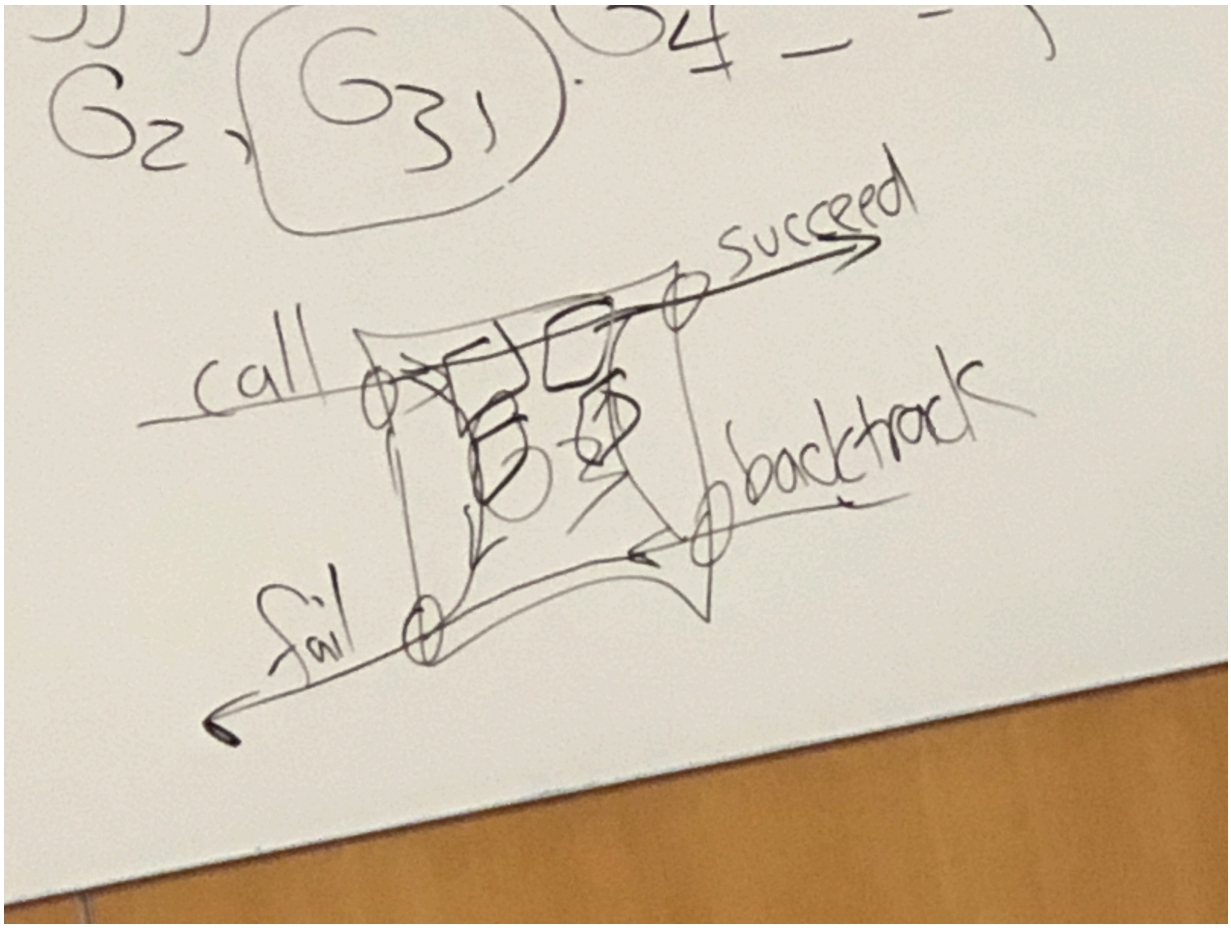


Debugging

- simplest way to debug is to **print**

- "Understanding"
  - ?- trace
  - 4 port debugging model
  - G1 > G2 > G3 > G4 > _ _ _ > G100



Variables and Unification

2 ways to bind vars

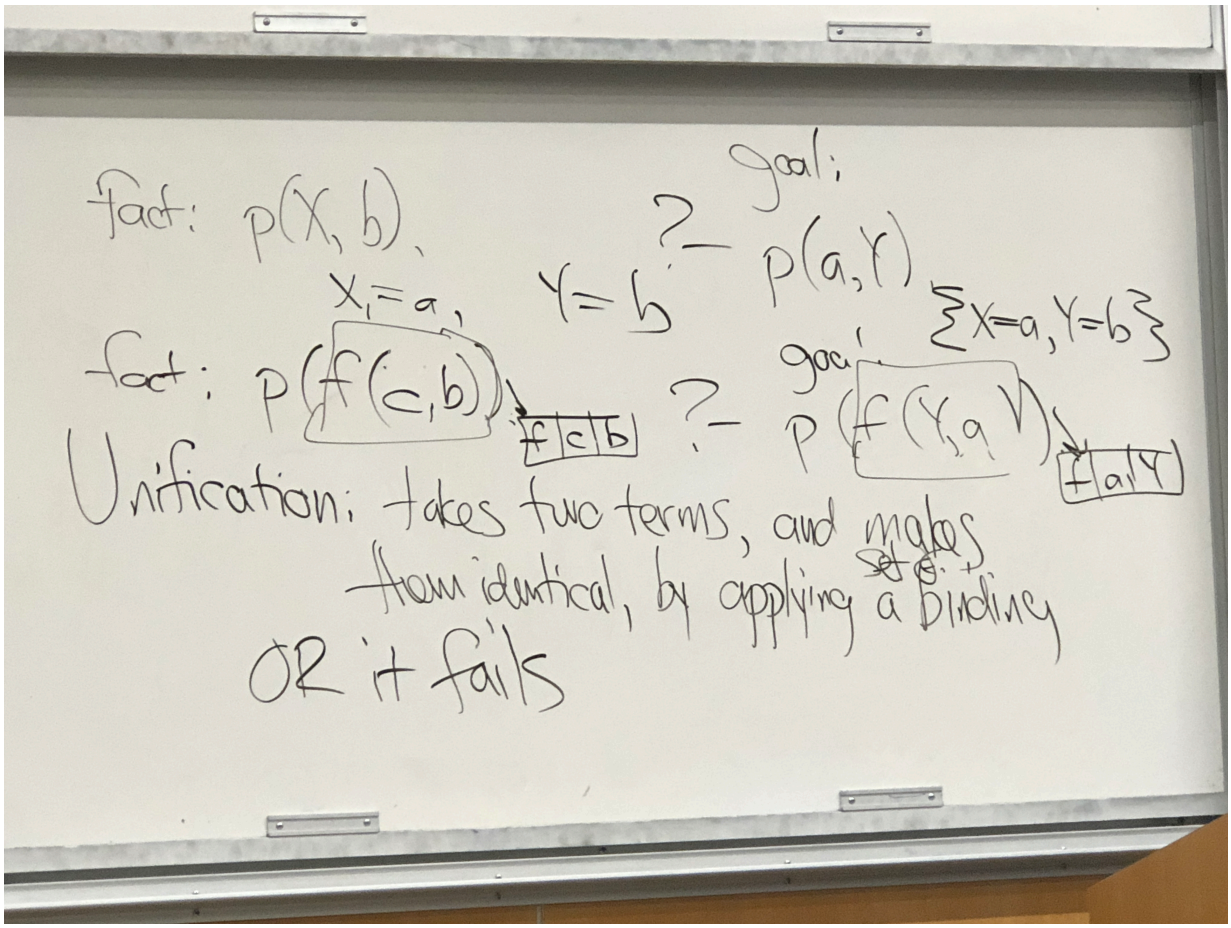
fact: p(a, b).
query: ?- p(X, Y)
X = a, Y = b

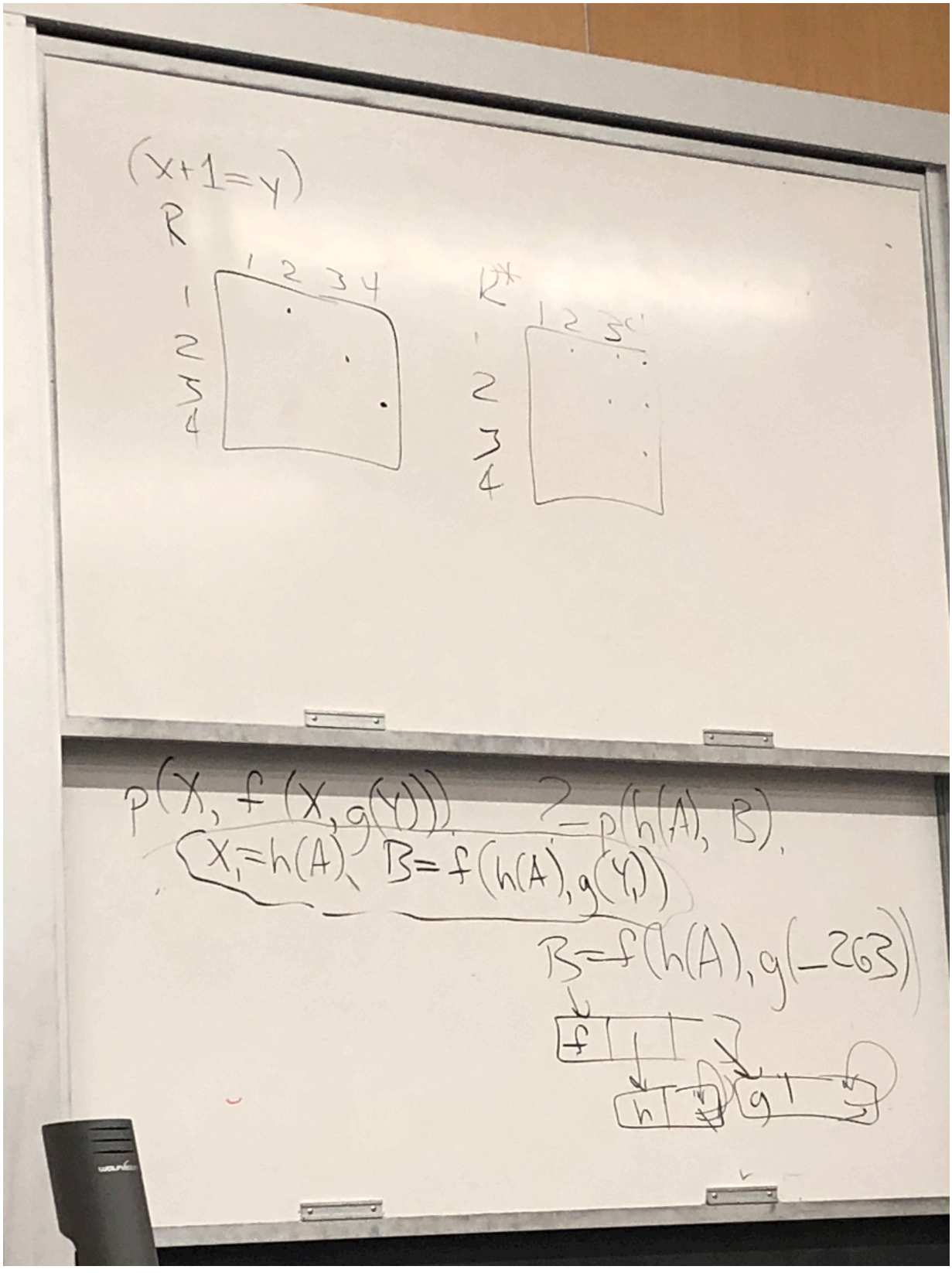
bind goal vars to program values.

---

p(X, Y)
X1 = a, Y1 = b
?- p(a, b).
yes

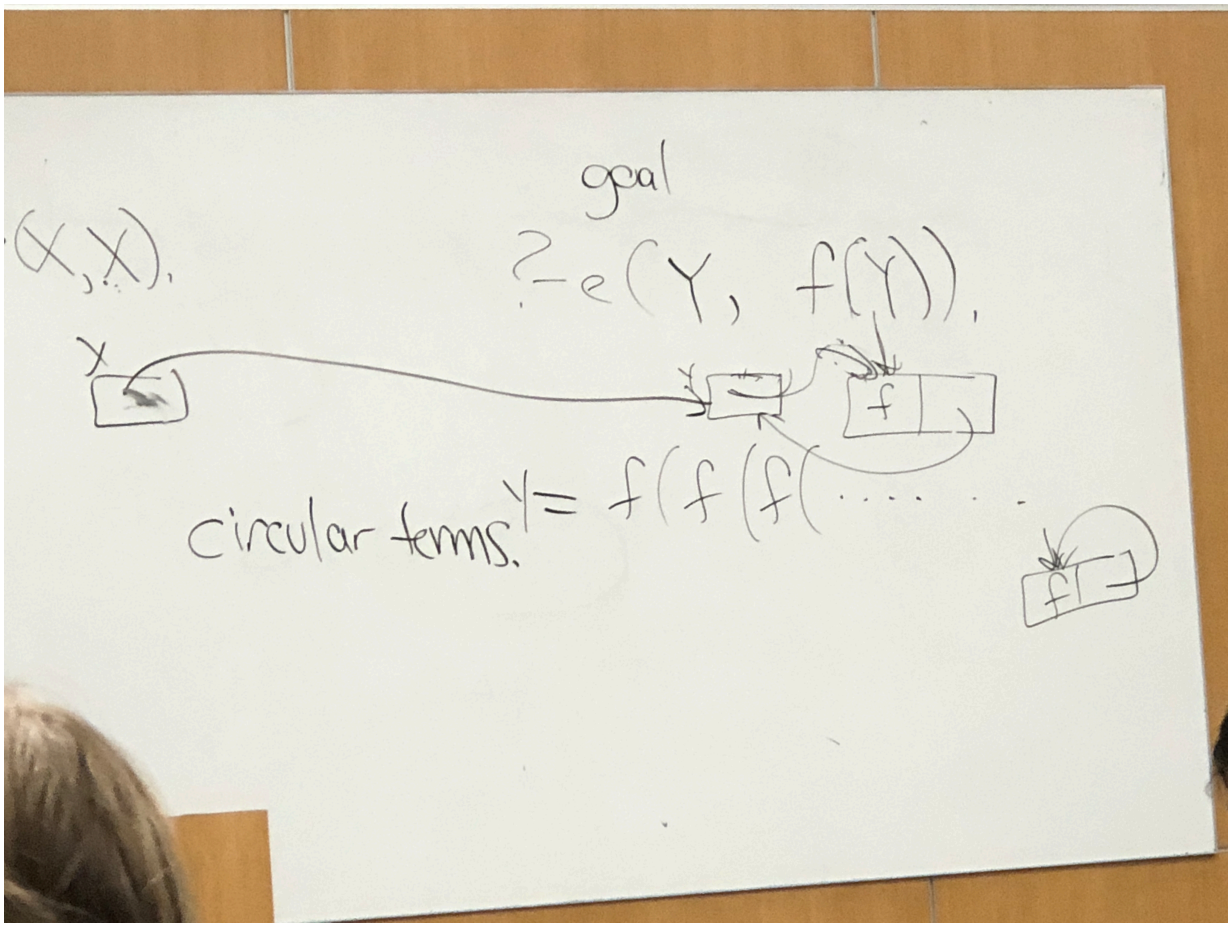
bind program vars to goal values




(x+1=y)
R
1 2 3 4
1
2
3
4
R*
1 2 3
1
2
3
p(X, f(X, g(Y))) ?- p(h(A), B).
X=h(A), B=f(h(A), g(Y))
B=f(h(A), g(-263))
f
h
g

Problem of Circular Terms
Fucked up Prolog fact:
e(X, X).

Goal:
?- e(Y, f(Y)).



Circular terms break the prolog program

2nd half of lecture:

'=' (X, X).
fact: X = X.

goal
?- Y = f(g(h(a, Y)), q(C))

Peano Arithmetic

Nonnegative integer addition
z = s(X)
zero = X+1

add(z, X, X).
add(s(X), X, s(X plus Y)) :- add(X, Y, X plus Y).
sub(X, Y, Z) :- add(Y, Z, X).
?- add(s(s(z)), s(s(z)), R).

eq(X, X).
lt(X, s(X)).
lt(s(X), Y) :- lt(X, Y)
X+1<Y if X<Y
le(X, Y) :- eq(X, Y).
le(X, Y) :- lt(X, Y).

PROBLEM:
// if you want to do OR, just put 2 predicates not on the same line
// with lt(N, N) and lt(X, s(X)).
// will match N = X, N = s(X)
// therefore N = s(s(s(s(s(...)))))
// N = inf
infinite terms are verboten

FIX: change
lt(X, s(X1)) :- unify with occurs check (X, X1)
lt(X, s(Y)) :- lt(X, Y)

X = Y: O(min(|X|, |Y|))

unify with occurs check (X, X1) :- acts like X=Y, but refuses to create cycles. fails if it would create one
// O(max(|X|, |Y|))
// dunno how to implement this

fact:
generate(X, L, Y), membercheck(X, L), check(X, L, Y).
^a ^[q,a,b,a,a,c]

fail -> true -> <-

```
membercheck(X, [X|_]) :-      -> ! -><-              // this is the CUT symbol
membercheck(X, [_|L]) :- membercheck (X, L).
```

Operators

- :-
- if
- <-
- ,
- and
- &
- ;
- or
- |

```
(P; Q) :- P.
(P; Q) :- Q.

not(P) :- P, !, fail.
not(_).

?- not(a=b).
yes
?- not(a=a).

?- X=3, not(X=4).
X=3
?- not(X=4), X=3.
```

Some symbol definitions

I - P	P is provable
I = P	P is true
I - P (3 bar =)	I = P
I \+ P	P is not provable

What is a cut

http://www.learnprolognow.org/lpnpage.php?pagetype=html&pageid=lpn-htmlse43

— 2/15/18