

5) Relation to reverse a list

$\text{reverse}([], Y, R) :- R = Y$

$\text{reverse}([H|T], Y, R) :- \text{reverse}(T, [H|Y], R).$

6) Palindrome predicate

~~$\text{palindrome}([]).$~~

~~$\text{palindrome}([_]).$~~

~~$\text{palindrome}(L) :- \text{conc}$~~

$\text{accRev}([], A, A).$

$\text{accRev}([H|T], A, R) :- \text{accRev}(T, [H|A], R).$

$\text{rev}(L, R) :- \text{accRev}(L, [], R).$

$\text{palindrome}(\text{list}) :- \text{rev}(\text{list}, \text{list}).$

7) maximum of 2 elements

$\text{max}(x, y, x) :- x \geq y$

$\text{max}(x, y, y) :- x < y$

8) Find max. in a list

$\text{maxlist}([x], x)$

$\text{maxlist}([x, y | \text{Rest}], \text{Max}) :- \text{maxlist}([y | \text{Rest}], \text{MaxRest}),$
 $\text{max}(x, \text{MaxRest}, \text{Max}).$

SSN COLLEGE OF ENGINEERING
RECORD SHEET

Sheet No.

Logic Programming
Assignment

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1) Delete last 3 elements using conc

$\text{deletelast3}(L, L1) :- \text{conc}(L1, [-, -, -], L)$

2) ~~See~~ Delete first and last 3 elements

$\text{deletefirstlast3}([-, - | \text{End}], \text{Middle}) :- \text{append}(\text{Middle}, [-, -, -], \text{End})$

3) Relation to add item at last

$\text{addend}(x, L, L1) :- \text{conc}(L, [x], L1)$

4) Relation to remove all items x from list

9) Find sum of list

$sumlist([], 0).$

$sumlist([_ | Tail], sum) :- sumlist(Tail, sum), sum is _ + sum$

10) Find if list is ordered

$ordered([_]).$

$ordered([_x, _y | Tail]) :- x \leq y, ordered([_y | Tail]).$

11) Factorial of no.

$factorial(0, 1).$

$factorial(N, M) :- N > 0, N_1 \text{ is } N-1, factorial(N_1, M_1),$
 $M \text{ is } N * M_1$

12) Sum of odd, even no in a list

$iseven(N) :- 0 \text{ is } mod(N, 2).$

$sum([], [_, 0])$

$sum([H | T], [even, odd]) :- sum(T, [even, odd]),$
 $iseven(H), even \text{ is } even + H$

$sum([H | T], [even, odd]) :- sum(T, [even, odd]),$ ~~is not~~
 $oddo \text{ is } odd + H$

13) Making a given list into palindrome

$\text{reverse}(L, Y, R) :- R = Y$

$\text{reverse}([H|T], Y, R) :- \text{reverse}(T, [H|Y], R).$

$\text{make_palindrome}(X, L) :- \text{reverse}(X, Y, R), \text{conc}(X, R, L).$

Logic Programming.
Assignment.

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- ① Delete last 2 elements using conc.
 $\text{delete_last_2}(L, L_1) :- \text{conc}(L, [_, _], L_1).$
- ② Delete first and last 2 elements.
 $\text{delete_first_last_2}(L, _ , _ , \text{middle}, _ , _ , \text{End}) :- \text{append}(\text{middle}, [_, _], \text{End})$
- ③ Relation to add item at last.
 $\text{append}(X, L, L_1) :- \text{conc}(L, [X], L_1).$
- ④ Relation remove all item x from list.
 $\text{Delete } [_, [], []]$
 $\text{delete}(X, [X, \text{tail}], \text{tail}) :- \text{delete}(X, \text{tail}, \text{tail})$
 $\text{delete}(X, [_ | \text{tail}], [_ | \text{tail}]) :- \text{delete}(X, \text{tail}, \text{tail})$
- ⑤ Relation to reverse a list.
 $\text{reverse}(L, Y, R) :- \text{rev}(L, Y, R).$
 $\text{reverse}([_ | \text{tail}], Y, R) :- \text{reverse}(\text{tail}, [_ | Y], R)$
- ⑥ Palindrome predicate.
 $\text{acc_rev}(L, A, A)$
 $\text{acc_rev}([_ | \text{tail}], A, R) :- \text{acc_rev}(\text{tail}, [_ | A], R)$
 $\text{rev}(L, R) :- \text{acc_rev}(L, [], R)$
 $\text{Palindrome}(\text{List}) :- \text{rev}(\text{List}, \text{List}).$
- ⑦ maximum of 2 elements.
 $\text{max}(X, Y, Z) :- X > Y, Z = X.$
 $\text{max}(X, Y, Z) :- X < Y, Z = Y.$

8) Find max in list.

maxlist([x], x)

maxlist([x, y|Rest], max) :- maxlist([y|Rest], maxRest),
max(x, maxRest, max).

9) Find the sum in list.

sumlist([], 0)

sumlist([_|Tail], sum) :- sumlist(Tail, sum), sum is + sum.

10) Find if list is ordered.

ordered([x])

ordered([x, y|Tail]) :- x < y, ordered([y|Tail])

11) Factorial of no.

factorial(0, 1)

factorial(N, m) :- N > 0, N is N-1, factorial(N, m1),
m is N * m1.

12) Sum is odd, even no is a list

is even (n) :- 0 is mod (N, 2).

sum([], [0, 0])

sum([H|T], [even, odd]) :- sum(T, [even1, odd]),
!even(H), even is even + H.

sum([H|T], [even, odd]) :- sum(T, [even, odd1]), not !even(H),
odd is odd + H.

13) Making a given list into palindrome.

reverse([], Y, R) :- R = Y.

reverse([H|T], Y, R) :- reverse(T, [H|Y], R)

more palindrome (Y, L) :- reverse(Y, Y, R), conc(X, R, L)

change to CNF form

$S \rightarrow aAB$
 $A \rightarrow aA$
 $B \rightarrow bB$

- (i) remove all ϵ productions
 (ii) remove ϵ

(i) $\boxed{A \rightarrow a}$
 $B \rightarrow b$
 $S \rightarrow aAbB$ not in the form of CNF
 $A \rightarrow aA$
 $B \rightarrow bB$

$A \rightarrow a$
 $C \rightarrow b$
 $S \rightarrow aCaCbB$
 now we have to split a and b

$S \rightarrow CaD$
 $D_1 \rightarrow AD_2$
 $D_2 \rightarrow CbB$

$A \rightarrow aA$
 $A \rightarrow CaA$
 $B \rightarrow bB$
 $B \rightarrow CbB$

The order we have to write is

$S \rightarrow CaD_1$
 $D_1 \rightarrow AD_2$
 $D_2 \rightarrow CbB$
 $A \rightarrow a$
 $A \rightarrow CaA$
 $B \rightarrow b$
 $B \rightarrow CbB$
 $C \rightarrow a$
 $C \rightarrow b$

$S \rightarrow XaY|Yb$
 $X \rightarrow YXaY|a$
 $Y \rightarrow SaX|b$

$X \rightarrow a$
 $Y \rightarrow b$
 $Y \rightarrow aX$
 $Y \rightarrow SS$
 $X \rightarrow XYaY$
 $S \rightarrow Yb - X$
 $S \rightarrow XaY - X$

$X \rightarrow XYaY$
 $X \rightarrow XD_1$
 $D_1 \rightarrow DYD_2$
 $D_2 \rightarrow DCaY$
 ~~$D_3 \rightarrow YX$~~

$S \rightarrow YCb|XD_2$
 $D_1 \rightarrow YD_2$
 $D_2 \rightarrow CaY$
 $D_3 \rightarrow CaY$

after this we can write the productions

include $C \rightarrow a$
 $C \rightarrow b$
 $X \rightarrow a$
 $Y \rightarrow b$
 $Y \rightarrow SS$
 $Y \rightarrow CaX$
 $X \rightarrow XYCaY$
 $S \rightarrow YCb$
 $S \rightarrow XCaY$ need to split a and b

$S \rightarrow XCaY$
 $S \rightarrow XD_3$
 $D_3 \rightarrow CaY$