

U18CO018

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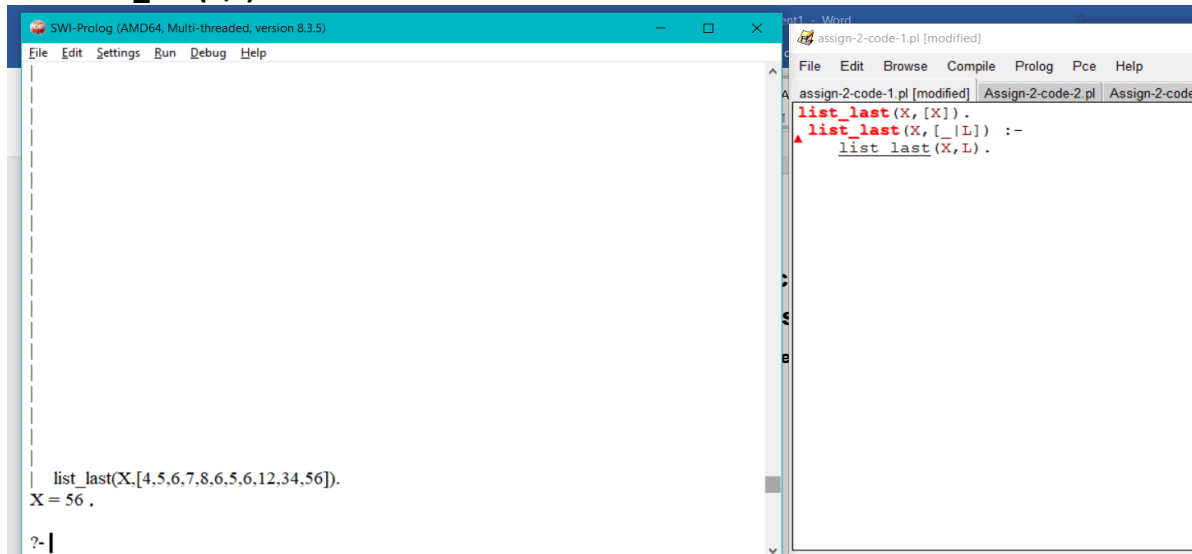
Assignment-2 (AIML)

1-> Find the last element of a list.

`list_last(X,[X]).`

`list_last(X,[_|L]) :-`

`list_last(X,L).`



The screenshot shows two windows. The left window is SWI-Prolog (AMD64, Multi-threaded, version 8.3.5) with a menu bar (File, Edit, Settings, Run, Debug, Help). The right window is a text editor (Word) showing the Prolog code for finding the last element of a list. The code is as follows:

```
list_last(X,[X]).
list_last(X,[_|L]) :-
    list_last(X,L).
```

The SWI-Prolog window shows the following output:

```
list_last(X,[4,5,6,7,8,6,5,6,12,34,56]).
X = 56 .
?- |
```

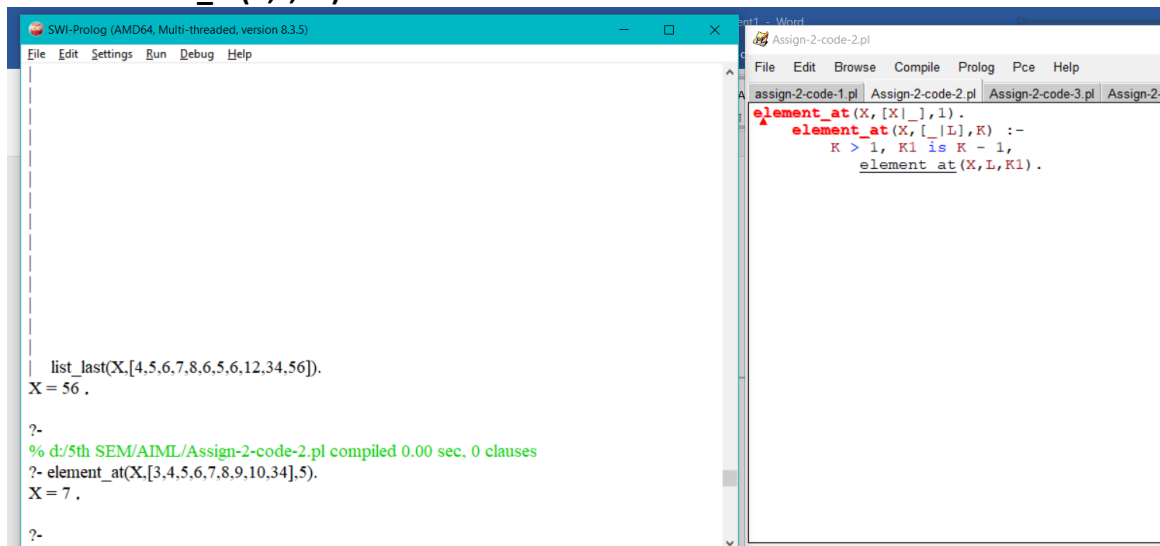
2-> Find the K'th element of a list.

`element_at(X,[X|_],1).`

`element_at(X,[_|L],K) :-`

`K > 1, K1 is K - 1,`

`element_at(X,L,K1).`



The screenshot shows two windows. The left window is SWI-Prolog (AMD64, Multi-threaded, version 8.3.5) with a menu bar (File, Edit, Settings, Run, Debug, Help). The right window is a text editor (Word) showing the Prolog code for finding the K'th element of a list. The code is as follows:

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element_at(X,[X|_],1).
element_at(X,[_|L],K) :-
    K > 1, K1 is K - 1,
    element_at(X,L,K1).
```

The SWI-Prolog window shows the following output:

```
list_last(X,[4,5,6,7,8,6,5,6,12,34,56]).
X = 56 .

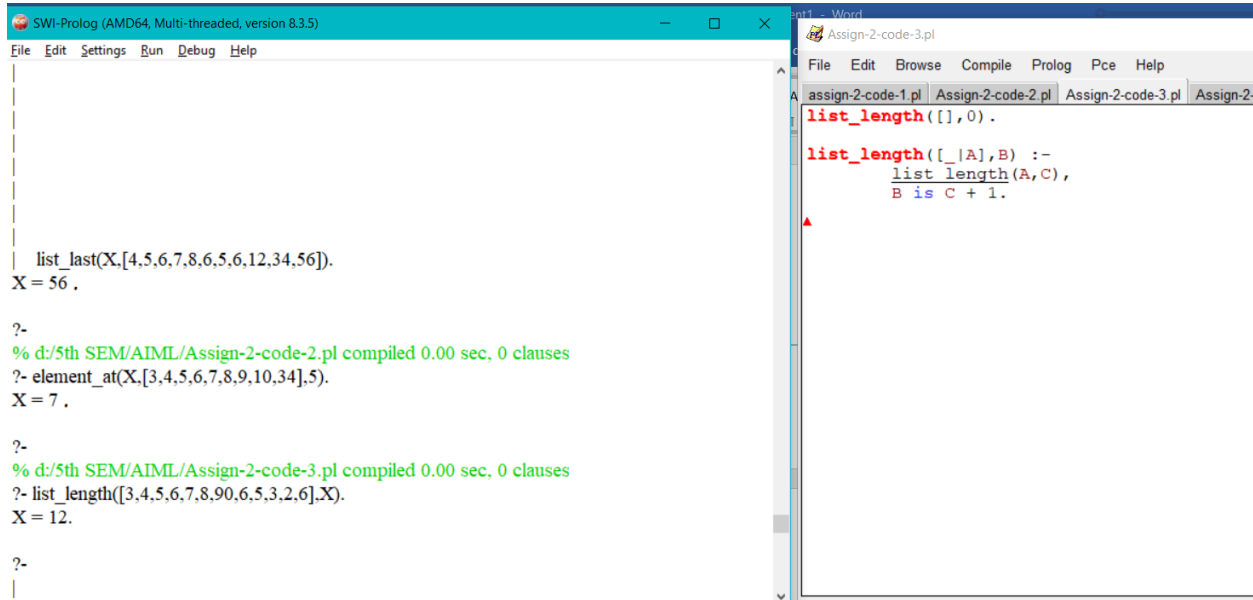
?-
% d:/5th SEM/AIML/Assign-2-code-2.pl compiled 0.00 sec, 0 clauses
?- element_at(X,[3,4,5,6,7,8,9,10,34],5).
X = 7 .

?-
```

3-> Find the number of elements in list.

`list_length([],0).`

`list_length([_|A],B) :-
 list_length(A,C),
 B is C + 1.`



The screenshot shows two windows. The left window is SWI-Prolog (AMD64, Multi-threaded, version 8.3.5) with a menu bar (File, Edit, Settings, Run, Debug, Help). The right window is a text editor titled 'Assign-2-code-3.pl' with a menu bar (File, Edit, Browse, Compile, Prolog, Pce, Help). The text editor contains the following Prolog code:

```
list_length([],0).  
  
list_length([_|A],B) :-  
    list_length(A,C),  
    B is C + 1.
```

The SWI-Prolog window shows the following output:

```
list_last(X,[4,5,6,7,8,6,5,6,12,34,56]).  
X = 56 .  
  
?-  
% d:/5th SEM/AIML/Assign-2-code-2.pl compiled 0.00 sec, 0 clauses  
?- element_at(X,[3,4,5,6,7,8,9,10,34],5).  
X = 7 .  
  
?-  
% d:/5th SEM/AIML/Assign-2-code-3.pl compiled 0.00 sec, 0 clauses  
?- list_length([3,4,5,6,7,8,9,6,5,3,2,6],X).  
X = 12.  
  
?-  
|
```

4-> Find out whether a list is a palindrome.

`concat([],List,List).`

`concat([X|List1],List2,[X|List3]) :-
 concat(List1,List2,List3).`

`rev([],[]).`

`rev([X|Tail],List) :-
 rev(Tail,Tail1),
 concat(Tail1,[X],List).`

`palindrome(List) :-
 reverse(List,List).`

The screenshot shows the SWI-Prolog IDE with two windows. The left window is the Prolog REPL, and the right window is the code editor for 'Assign-2-code-4.pl'.

Prolog REPL:

```

|
|
| list_last(X,[4,5,6,7,8,6,5,6,12,34,56]).
X = 56.

?-
% d:/5th SEM/AIML/Assign-2-code-2.pl compiled 0.00 sec, 0 clauses
?- element_at(X,[3,4,5,6,7,8,9,10,34],5).
X = 7.

?-
% d:/5th SEM/AIML/Assign-2-code-3.pl compiled 0.00 sec, 0 clauses
?- list_length([3,4,5,6,7,8,90,6,5,3,2,6],X).
X = 12.

?-
|
% d:/5th SEM/AIML/Assign-2-code-3.pl compiled 0.00 sec, 0 clauses
| palindrome([2,3,4,5,6,7,6,5,4,3,2]).
true.

?-|

```

Code Editor (Assign-2-code-4.pl):

```

File Edit Browse Compile Prolog Pce Help
assign-2-code-1.pl Assign-2-code-2.pl Assign-2-code-3.pl Assign-2-
concat([],List,List).

concat([X|List1],List2,[X|List3]) :-
    concat(List1,List2,List3).

rev([],[]).
rev([X|Tail],List) :-
    rev(Tail,Tail1),
    concat(Tail1,[X],List).

palindrome(List) :-
    reverse(List,List).

```

5-> Eliminate consecutive duplicates of list elements.

compress([],[]).

compress([X],[X]).

compress([X,X|Y],Z) :- compress([X|Y],Z).

compress([X,Y|Z],[X|P]) :-

X\=Y,

compress([Y|Z],P).

The screenshot shows the SWI-Prolog IDE with two windows. The left window is the Prolog REPL, and the right window is the code editor for 'Assign-2-code-5.pl'.

Prolog REPL:

```

?-
% d:/5th SEM/AIML/Assign-2-code-2.pl compiled 0.00 sec, 0 clauses
?- element_at(X,[3,4,5,6,7,8,9,10,34],5).
X = 7.

?-
% d:/5th SEM/AIML/Assign-2-code-3.pl compiled 0.00 sec, 0 clauses
?- list_length([3,4,5,6,7,8,90,6,5,3,2,6],X).
X = 12.

?-
|
% d:/5th SEM/AIML/Assign-2-code-3.pl compiled 0.00 sec, 0 clauses
| palindrome([2,3,4,5,6,7,6,5,4,3,2]).
true.

?-
% d:/5th SEM/AIML/Assign-2-code-5.pl compiled 0.00 sec, 0 clauses
?- compress([2,2,2,3,4,5,6,6,4,3,3,2],X).
X = [2, 3, 4, 5, 6, 4, 3, 2].

?-|

```

Code Editor (Assign-2-code-5.pl):

```

File Edit Browse Compile Prolog Pce Help
assign-2-code-1.pl Assign-2-code-2.pl Assign-2-code-3.pl Assign-2-
compress([],[]).
compress([X],[X]).
compress([X,X|Y],Z) :- compress([X|Y],Z).
compress([X,Y|Z],[X|P]) :-
    X\=Y,
    compress([Y|Z],P).

```

6-> Duplicate the elements of a list a given number of times.

duplicate([H], 1, [H]).

duplicate([H], N, [H|X]) :-

M is N - 1,

$M > 0$,
duplicate([H], M, X).

duplicate([H|T], N, X) :-
duplicate([H], N, Y),
duplicate(T, N, Z),
concat(Y, Z, X).

```

SWI-Prolog (AMD64, Multi-threaded, version 8.3.5)
File Edit Settings Run Debug Help
?- list_length([3,4,5,6,7,8,90,6,5,3,2,6],X).
X = 12.

?-
|
% d:/5th SEM/AIML/Assign-2-code-3.pl compiled 0.00 sec, 0 clauses
?- palindrome([2,3,4,5,6,7,6,5,4,3,2]).
true.

?-
|
% d:/5th SEM/AIML/Assign-2-code-5.pl compiled 0.00 sec, 0 clauses
?- compress([2,2,2,3,4,5,6,6,4,3,2],X).
X = [2, 3, 4, 5, 6, 4, 3, 2] .

?-
|
% d:/5th SEM/AIML/Assign-2-code-6.pl compiled 0.00 sec, 0 clauses
?- duplicate([1,2,3,4,5,6],3,X).
X = [1, 1, 1, 2, 2, 2, 3, 3, 3] .

?- duplicate([1,2,4,6],2,X).
X = [1, 1, 2, 2, 4, 4, 6, 6] .

?-
|

Assign-2-code-6.pl [modified]
File Edit Browse Compile Prolog Pce Help
assign-2-code-1.pl Assign-2-code-2.pl Assign-2-code-3.pl Assign-2-code-4.pl
duplicate([H], 1, [H]).

duplicate([H], N, [H|X]) :-
    M is N - 1,
    M > 0,
    duplicate([H], M, X).

duplicate([H|T], N, X) :-
    duplicate([H], N, Y),
    duplicate(T, N, Z),
    concat(Y, Z, X).
  
```

7-> Drop every N'th element from a list.
drop(L1,N,L2) :- drop(L1,N,L2,N).

drop([],_,[]).
drop([_|P],N,Q,1):- drop(P,N,Q,N).
drop([X|P],N,[X|Q],K):-
K > 1,
K1 is K - 1,
drop(P,N,Q,K1).

```

SWI-Prolog (AMD64, Multi-threaded, version 8.3.5)
File Edit Settings Run Debug Help

ERROR: ** here **
ERROR:
md_select([a,f,e,g,s,h,t,u,x],2,X).
?-
|
% d:/5th SEM/AIML/Assign-2-code-9.pl compiled 0.00 sec, 0 clauses
?- md_select([a,f,e,g,s,h,t,u,x],2,X).
X = [f, s] .

?-
|
% d:/5th SEM/AIML/Assign-2-code-10.pl compiled 0.00 sec, 0 clauses
?- md_permutation([e,v,f,g,h,t,f,d,d],X).
X = [d, e, v, f, h, g, f, t, d] .

?-
|
ERROR: [Thread pce] d:/5th sem/aiml/assign-2-code-7.pl:3:9: Syntax error: Operator expected
% d:/5th SEM/AIML/Assign-2-code-7.pl compiled 0.00 sec, -1 clauses
% d:/5th SEM/AIML/Assign-2-code-7.pl compiled 0.00 sec, 1 clauses
?- drop([a,b,c,f,r,t,d,g,y,g,f,d],3,X).
X = [a, b, f, r, d, g, g, f] .

Assign-2-code-7.pl
File Edit Browse Compile Prolog Pce Help
Assign-2-code-7.pl Assign-2-code-8.pl Assign-2-code-9.pl Assign-2-code-10.pl
drop(L1,N,L2) :- drop(L1,N,L2,N).

drop([],_,[]).
drop([_|P],N,Q,1) :- drop(P,N,Q,N).
drop([X|P],N,[X|Q],K) :-
    K > 1,
    K1 is K - 1,
    drop(P,N,Q,K1).
  
```

8-> Rotate a list N places to the left.

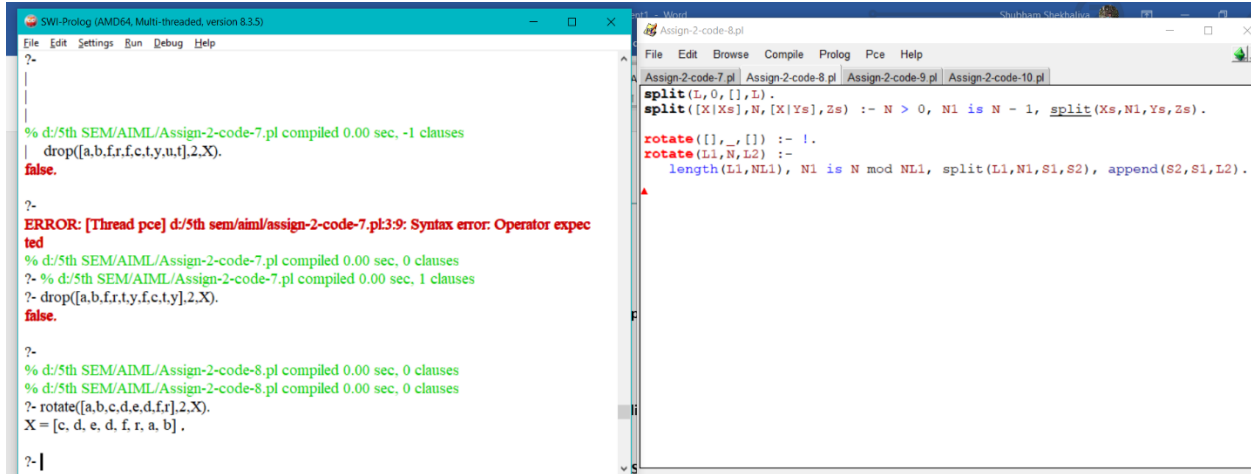
`split(L,0,[],L).`

`split([X|Xs],N,[X|Ys],Zs) :- N > 0, N1 is N - 1, split(Xs,N1,Ys,Zs).`

`rotate([],_,[]) :- !.`

`rotate(L1,N,L2) :-`

`length(L1,NL1), N1 is N mod NL1, split(L1,N1,S1,S2), append(S2,S1,L2).`



The screenshot shows the SWI-Prolog IDE with two windows. The left window displays the Prolog code for the rotate function, and the right window shows the execution output. The code defines `split` and `rotate` predicates. The output shows the compilation of the code and the execution of the `rotate` predicate on the list `[a,b,c,d,e,d,f,r]` with `N=2`, resulting in the list `[c,d,e,d,f,r,a,b]`.

```
?-
|
|
|
% d:/5th SEM/AIML/Assign-2-code-7.pl compiled 0.00 sec, -1 clauses
?- drop([a,b,f,r,f,c,t,y,u,t],2,X).
false.

?-
ERROR: [Thread pce] d:/5th sem/aiml/assign-2-code-7.pl:3:9: Syntax error: Operator expected
% d:/5th SEM/AIML/Assign-2-code-7.pl compiled 0.00 sec, 0 clauses
?- % d:/5th SEM/AIML/Assign-2-code-7.pl compiled 0.00 sec, 1 clauses
?- drop([a,b,f,r,t,y,f,c,t,y],2,X).
false.

?-
% d:/5th SEM/AIML/Assign-2-code-8.pl compiled 0.00 sec, 0 clauses
% d:/5th SEM/AIML/Assign-2-code-8.pl compiled 0.00 sec, 0 clauses
?- rotate([a,b,c,d,e,d,f,r],2,X).
X = [c, d, e, d, f, r, a, b] .

?-|
```

9-> Extract a given number of randomly selected elements from a list.

`remove_at(X,[X|Xs],1,Xs).`

`remove_at(X,[Y|Xs],K,[Y|Ys]) :- K > 1,`

`K1 is K - 1, remove_at(X,Xs,K1,Ys).`

`rnd_select(_,0,[]).`

`rnd_select(Xs,N,[X|Zs]) :- N > 0,`

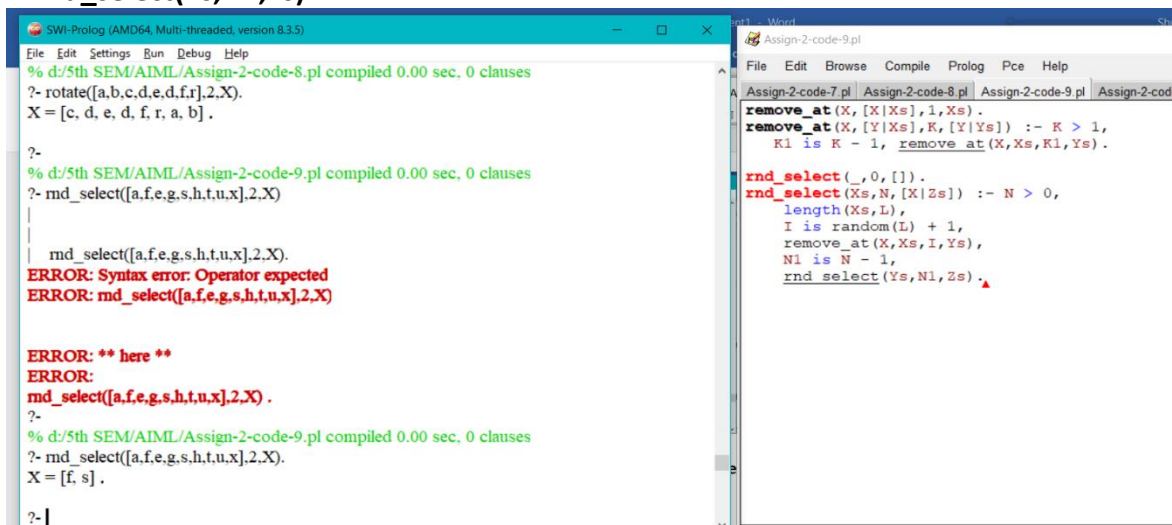
`length(Xs,L),`

`I is random(L) + 1,`

`remove_at(X,Xs,I,Ys),`

`N1 is N - 1,`

`rnd_select(Ys,N1,Zs).`



The screenshot shows the SWI-Prolog IDE with two windows. The left window displays the Prolog code for the `remove_at` and `rnd_select` predicates, and the right window shows the execution output. The code defines `remove_at` and `rnd_select` predicates. The output shows the compilation of the code and the execution of the `rnd_select` predicate on the list `[a,f,e,g,s,h,t,u,x]` with `N=2`, resulting in the list `[f,s]`.

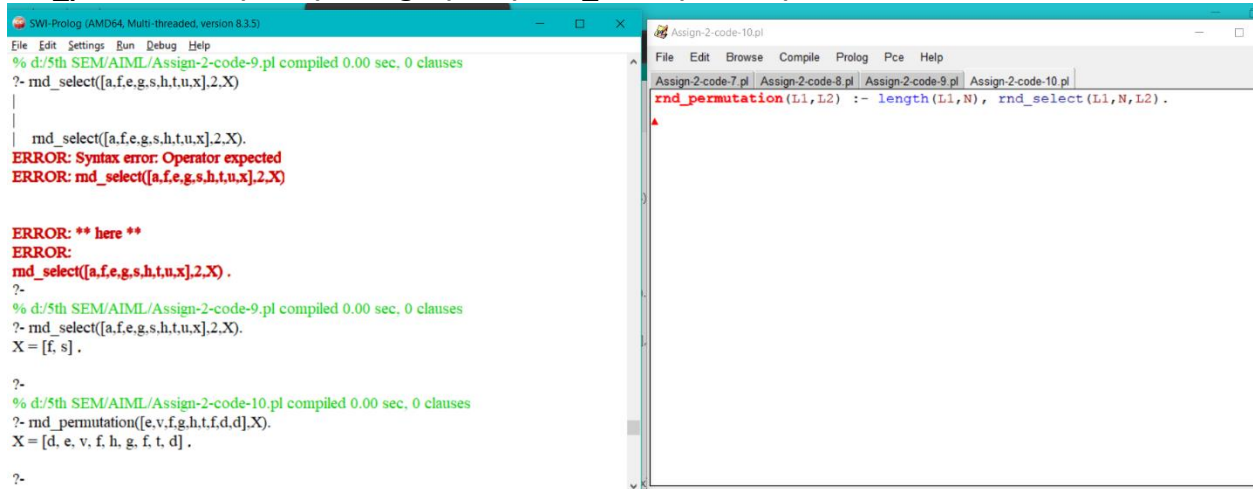
```
?- rotate([a,b,c,d,e,d,f,r],2,X).
X = [c, d, e, d, f, r, a, b] .

?-
% d:/5th SEM/AIML/Assign-2-code-9.pl compiled 0.00 sec, 0 clauses
?- rnd_select([a,f,e,g,s,h,t,u,x],2,X)
|
|
|
rnd_select([a,f,e,g,s,h,t,u,x],2,X).
ERROR: Syntax error: Operator expected
ERROR: rnd_select([a,f,e,g,s,h,t,u,x],2,X)

ERROR: ** here **
ERROR:
rnd_select([a,f,e,g,s,h,t,u,x],2,X) .
?-
% d:/5th SEM/AIML/Assign-2-code-9.pl compiled 0.00 sec, 0 clauses
?- rnd_select([a,f,e,g,s,h,t,u,x],2,X).
X = [f, s] .

?-|
```

10-> Generate a random permutation of the elements of a list.
`rnd_permutation(L1,L2) :- length(L1,N), rnd_select(L1,N,L2).`



```
SWI-Prolog (AMD64, Multi-threaded, version 8.3.5)
File Edit Settings Run Debug Help
% d:/5th SEM/AI/ML/Assign-2-code-9.pl compiled 0.00 sec, 0 clauses
?- md_select([a,f,e,g,s,h,t,u,x],2,X)
|
| md_select([a,f,e,g,s,h,t,u,x],2,X).
ERROR: Syntax error: Operator expected
ERROR: md_select([a,f,e,g,s,h,t,u,x],2,X)

ERROR: ** here **
ERROR:
md_select([a,f,e,g,s,h,t,u,x],2,X) .
?-
% d:/5th SEM/AI/ML/Assign-2-code-9.pl compiled 0.00 sec, 0 clauses
?- md_select([a,f,e,g,s,h,t,u,x],2,X).
X = [f, s] .

?-
% d:/5th SEM/AI/ML/Assign-2-code-10.pl compiled 0.00 sec, 0 clauses
?- md_permutation([e,v,f,g,h,t,f,d],X).
X = [d, e, v, f, h, g, f, t, d] .

?-
```

```
Assign-2-code-10.pl
File Edit Browse Compile Prolog Pce Help
Assign-2-code-7.pl Assign-2-code-8.pl Assign-2-code-9.pl Assign-2-code-10.pl
rnd_permutation(L1,L2) :- length(L1,N), rnd_select(L1,N,L2) .
```