# CS 354N LAB 2

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## Question 1

Code:

q1.pl

```
reverse([], []).
reverse([H|T], Rev) :- reverse(T, RT), append(RT, [H], Rev).

% reverse([1, 2, 3, 4], Rev).

```

Result:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  POLYGLOT NOTEBOOK  GITLENS  SPELL CHECKER

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?- reverse([1, 2, 3, 4], Rev).
Rev = [4, 3, 2, 1].

?-
```

## Question 2

Code:

q2.pl

```
element_at(H,[H|_],1):- !.
element_at(A,[_|T],N) :- N1 is N - 1, element_at(A,T,N1).

% query:
% element_at(X,[a,b,c,d,e],3).

```

Result:

```
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?- element_at(X,[a,b,c,d,e],3).
X = c.

?-
```
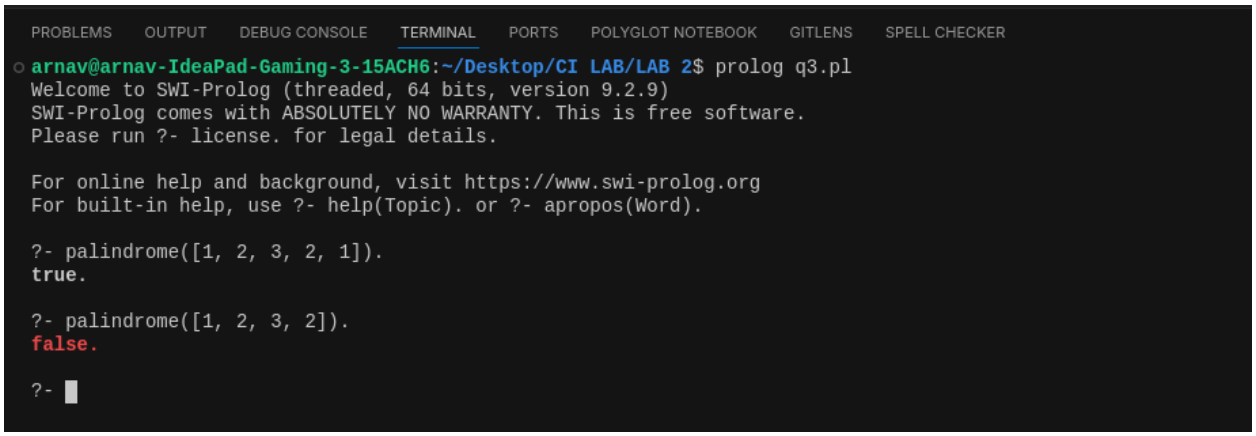

## Question 3

Code:


Result:



## Question 4

Code:

q4.pl

```
next_factor(_,2,3) :- !.
next_factor(N,F,NF) :- F * F < N, !, NF is F + 2.
next_factor(N,_,N).

prime_factors_mult(N,L) :- N > 0, prime_factors_mult(N,L,2).

prime_factors_mult(1,[],_) :- !.
prime_factors_mult(N,[[F,M]|L],F) :- division(N,F,M,R), !, next_factor(R,F,NF), prime_factors_mult(R,L,NF).
prime_factors_mult(N,L,F) :- !, next_factor(N,F,NF), prime_factors_mult(N,L,NF).

% query :
% prime_factors_mult(315, L).
% prime_factors_mult(1000, L).
```

Result:

```
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?- prime_factors_mult(315, L).
L = [[3, 2], [5, 1], [7, 1]].

?- prime_factors_mult(1000, L).
L = [[2, 3], [5, 3]].

?-
```
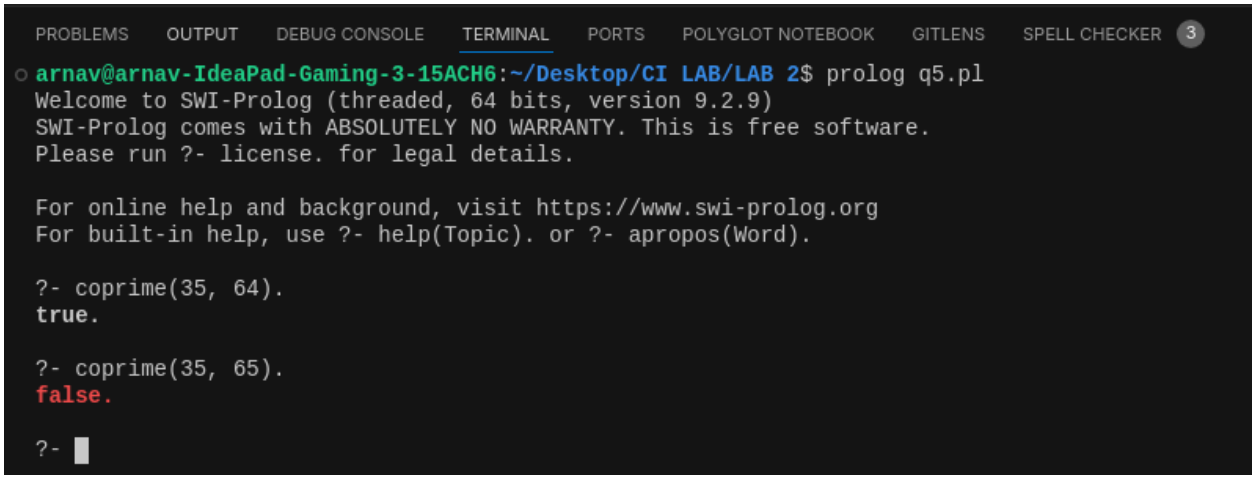

## Question 5

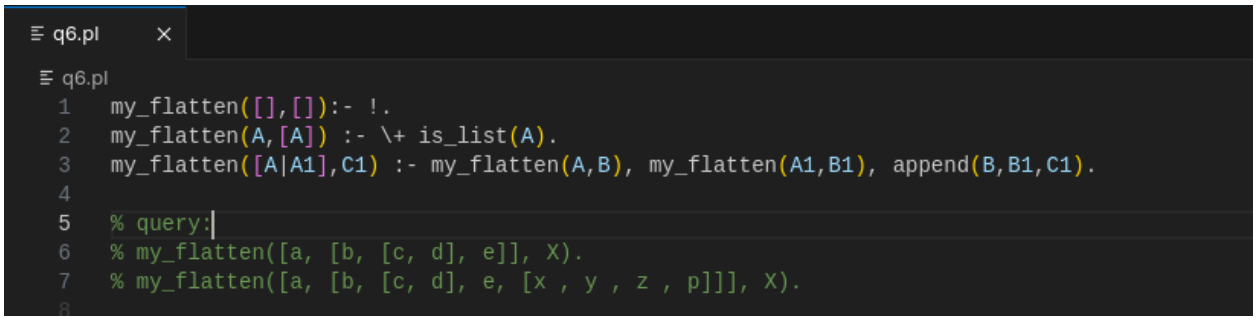
Code:


Result:

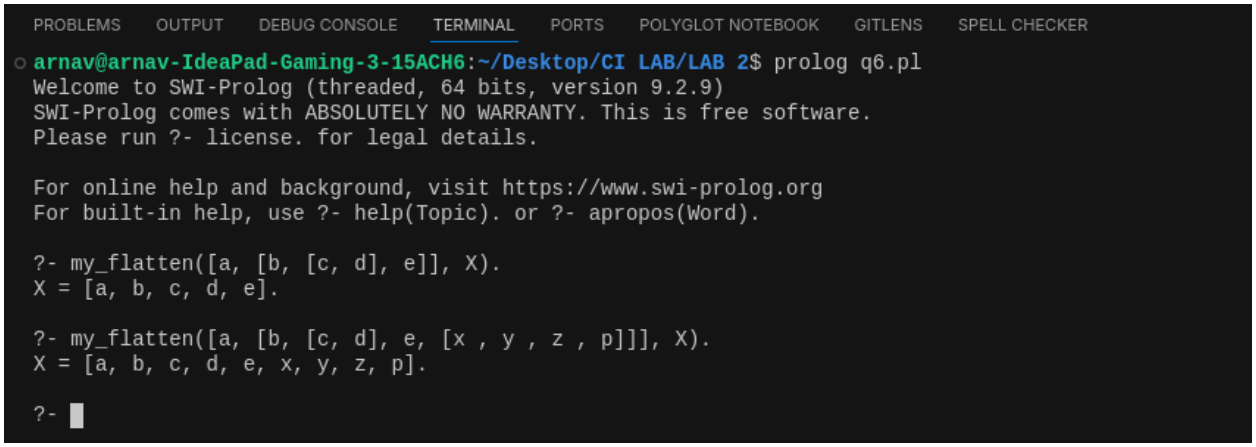


## Question 6

Code:




Result:



## Question 7

Code:

```prolog
compress([],[]).
compress([H], [H]).
compress([H,H|T], X) :- compress([H|T],X).
compress([H|T], [H|X]) :- compress(T, X).

% query:
% compress([a,a,a,a,b,c,c,a,a,d,e,e,e,e],X).
```

Result:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  POLYGLOT NOTEBOOK  GITLENS  SPELL CHECKER

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?- compress([a,a,a,a,b,c,c,a,a,d,e,e,e,e],X).
X = [a, b, c, a, d, e]
```

## Question 8

Code:

```
q8.pl
combination(0, _, []).

combination(K, [H|T], [H|Comb]) :- K > 0 , K1 is K - 1, combination(K1, T, Comb).

combination(K, [_|T], Comb) :- K > 0, combination(K, T, Comb).

% query:
% combination(3,[a,b,c,d,e,f],L).
```

Result:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  POLYGLOT NOTEBOOK  GITLENS  SPELL CHECKER
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?- combination(3,[a,b,c,d,e,f],L).
L = [a, b, c] ;
L = [a, b, d] ;
L = [a, b, e] ;
L = [a, b, f] ;
L = [a, c, d] ;
L = [a, c, e] ;
L = [a, c, f] ;
L = [a, d, e] ;
L = [a, d, f] ;
L = [a, e, f] ;
L = [b, c, d] ;
L = [b, c, e] ;
L = [b, c, f] ;
L = [b, d, e] ;
L = [b, d, f] ;
L = [b, e, f] ;
L = [c, d, e] ;
L = [c, d, f] ;
L = [c, e, f] ;
L = [d, e, f] ;
false.

?-
```
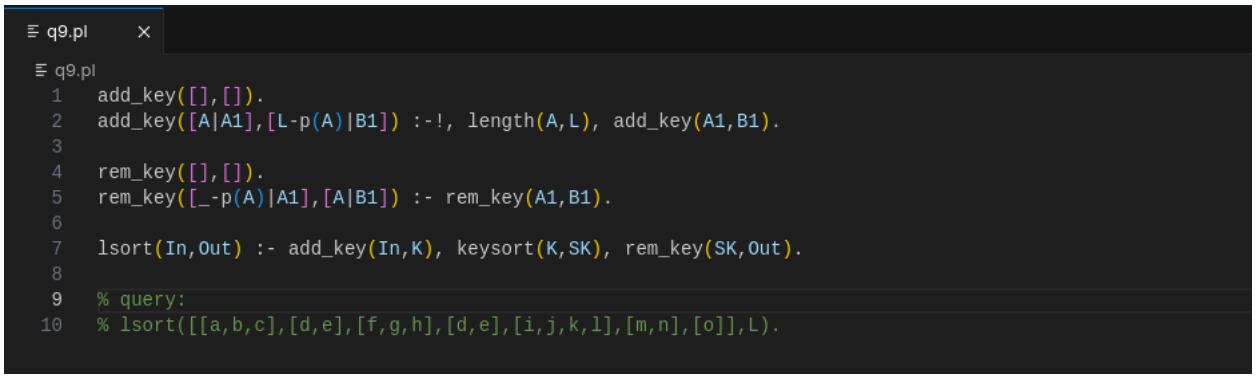
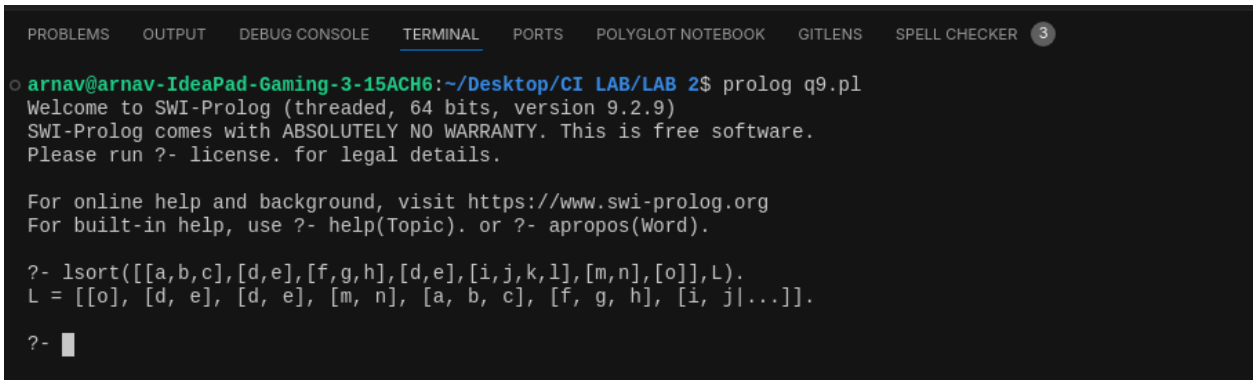

## Question 9

Code:



```
q9.pl
1   add_key([],[]).
2   add_key([A|A1],[L-p(A)|B1]) :-!, length(A,L), add_key(A1,B1).
3
4   rem_key([],[]).
5   rem_key([_-p(A)|A1],[A|B1]) :- rem_key(A1,B1).
6
7   lsort(In,Out) :- add_key(In,K), keysort(K,SK), rem_key(SK,Out).
8
9   % query:
10  % lsort([[a,b,c],[d,e],[f,g,h],[d,e],[i,j,k,l],[m,n],[o]],L).
```

Result:



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  POLYGLOT NOTEBOOK  GITLENS  SPELL CHECKER 3

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?- lsort([[a,b,c],[d,e],[f,g,h],[d,e],[i,j,k,l],[m,n],[o]],L).
L = [[o], [d, e], [d, e], [m, n], [a, b, c], [f, g, h], [i, j|...]].

?-
```

## Question 10

Code:

```
q10.pl
1   add_key([],[]).
2   add_key([A|A1],[L-p(A)|B1]) :-!, length(A,L), add_key(A1,B1).
3
4   rem_key([],[]).
5   rem_key([_-p(A)|A1],[A|B1]) :- rem_key(A1,B1).
6
7   lsort(In,Out) :- add_key(In,K), keysort(K,SK), rem_key(SK,Out).
8
9   pack([],[]).
10  pack([L-A|A1],[[L-A|C]|C1]) :- transf(L-A,A1,B1,C), pack(B1,C1).
11
12  transf(_,[],[],[]).
13  transf(L-_,[K-B|B1],[K-B|B1],[]) :- L \= K.
14  transf(L-_,[L-A|A1],B1,[L-A|C1]) :- transf(L-A,A1,B1,C1).
15
16  lfsort(In,Out) :- add_key(In,K), keysort(K,SK), pack(SK,PK), lsort(PK,SPK), flatten(SPK,FK), rem_key(FK,Out).
17
18  % query:
19  % lfsort([[a,b,c],[d,e],[f,g,h],[d,e],[i,j,k,l],[m,n],[o]],L).
20
```

Result:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  POLYGLOT NOTEBOOK  GITLENS  SPELL CHECKER 6

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?- lfsort([[a,b,c],[d,e],[f,g,h],[d,e],[i,j,k,l],[m,n],[o]],L).
L = [[o], [i, j, k, l], [a, b, c], [f, g, h], [d, e], [d, e], [m, n]]
```

## GitHub for the code files

https://github.com/arnavjain2710/Computational-Intelligence-Lab-CS354N/tree/main/LAB%202