Question 1a


```
SWI-Prolog -- c:/Github/Unisa/Logic Based Reasoning/Assignment 2/question1.pl
File  Edit  Settings  Run  Debug  Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- split([1,2,3,4,5,6],3,L1,L2).
L1 = [3, 4, 5, 6],
L2 = [1, 2].

?-
```

```
question1.pl - Notepad
File  Edit  Format  View  Help
split([],_,L1,L2):-
L1 = [], L2 =[].

split([H|L],N,L1,L2):-
H>= N,!,
split(L,N,L1temp,L2temp),
L1 = [H|L1temp],
L2 = L2temp
;
split(L,N,L1temp,L2temp),
L1 = L1temp,
L2 = [H|L2temp].
```

Question 1b

Green cuts are cuts that do not affect the declarative meaning of the program. The order of the statements can be changed and it will not affect the meaning of the program. Red cuts, are cuts that do affect the declarative meaning of the program and reordering the statements will change the meaning of the program.

Question 2a

```
File  Edit  Settings  Run  Debug  Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- apply([1,2,3,4],fun,L).
L = [1, 8, 27, 64].

?-
```

question21.pl - Notepad

```
File  Edit  Format  View  Help
Fun(X,Y):-
        number(X),
        Y is X^3.

filter([],_,R):-
R = [].


filter([H|L],PredName,R):-
filter(L,PredName,R1),
F =.. [PredName,H,Result],
call(F),
R = [Result|R1].


apply([],_,R):-
R = [].

apply([H|L],PredName,R):-
apply(L,PredName,R1),
F =.. [PredName,H,Result],
call(F),
R = [Result|R1].
```

Question 2b

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- arg(7,primes(2,3,4,7,11,13,17,19,23,29),A).
A = 17.

?-
```

Question 3.1

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- breeds(L).
L = ['Basset', 'Beagles', 'GermanShephard', 'Labrador'].

?- count_hunt(L,N).
L = ['Beagles', 'Basset'],
N = 2.

?- sizes(N).
N = 3.

?-
```

```prolog
dog('Sasha','Beagle','Nadia').
dog('Zappa','Labrador','Sjanie').
dog('Domino','Dalmation','Peter').
dog('Daisy','Boxer','John').
dog('Ben','Ridgeback','Ben').
breed('Beagles','Medium','Hunting').
breed('Basset','','Hunting').
breed('Labrador','Large','GuideDog').
breed('GermanShephard','','GaurdDog').

breeds(L):-
        setof(B,Size^Job^breed(B,Size,Job),L).


count_hunt(L,N):-
        findall(B,breed(B,_,'Hunting'),L),
        length(L,N).

sizes(N):-
        setof(Size,B^J^breed(B,Size,J),L),
        length(L,N).
```

Question 3.2

Question 4a

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- roan(flame).
true.

?-
```

```prolog
paint(shadows).
clay_bank(colorado).

roan(blue_lightning).
roan(X):-
not(paint(X)),
        not(clay_bank(X)).
```

```
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- rm(24,52,T).
T = 1248 .

?-
```

```
question6.pl - Notepad
File Edit Format View Help
even(X) :- 0 is mod(X, 2).
odd(X) :- 1 is mod(X, 2).


rm(0,_,Total):-
        Total is 0.

rm(X,Y,Total):-
        even(X),!,
        X1 is X/2,
        Y2 is Y*2,
        rm( X1, Y2, T1),|
        Total is T1
        ;
        X1 is (X-1)/2,
        Y2 is Y*2,
        rm(X1, Y2, T1),
        Total is T1 + Y
        .
```

Question 4b

When the query roan(flame) is entered, Prolog first checks the statement "not paint(flame)". Because "paint(flame)" is not established and returns false, "not paint(flame)" returns true. The same is true for "not clay_bank(flame)". The fact "clay_bank(flame)" cannot be established and thus returns true. This means "not clay_bank(flame)" also returns true. Which leads to "roan(flame)" returning true

Question 4c

Closed world assumption

Question 5

A =:= B	Matches the values of the arithmetic expressions A and B
A=\=B	Check is 2 arithmetic expressions are not equal
A==B	Check if terms are identical
A\==B	Check if terms are not identical
A=B	See if terms match

Question 6

File   Edit   Settings   Run   Debug   Help

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- rm(24,52,T).
T = 1248 .

?-
```

question6.pl - Notepad

File   Edit   Format   View   Help

```prolog
even(X) :- 0 is mod(X, 2).
odd(X) :- 1 is mod(X, 2).


rm(0,_,Total):-
        Total is 0.


rm(X,Y,Total):-
        even(X),!,
        X1 is X/2,
        Y2 is Y*2,
        rm( X1, Y2, T1),
        Total is T1
        ;
        X1 is (X-1)/2,
        Y2 is Y*2,
        rm(X1, Y2, T1),
        Total is T1 + Y
        .
```

Question 7

File   Edit   Settings   Run   Debug   Help

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.0.3)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit http://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- q1(X,Y,Z).
X = a,
Y = Z, Z = 1 ;
X = a,
Y = 1,
Z = 2.

?- q2(X,Y,Z).
X = a,
Y = Z, Z = 1 ;
X = a,
Y = 1,
Z = 2 ;
X = b,
Y = 3,
Z = 5 ;
X = b,
Y = 3,
Z = 6.

?- q3(X,Y).
X = a,
Y = 1 ;
X = a,
Y = 2.

?- q4(X,Y,L).
Y = 1,
L = [a] ;
Y = 2,
L = [a].

?- q5(X,Y,L).
L = [1, 2, 3, 4].

?-
```

question7.pl - Notepad

File   Edit   Format   View   Help

```prolog
m(a).
m(b).
n(a,1).
n(a,2).
n(b,3).
n(b,4).
q(1,1).
q(1,2).
q(2,3).
q(2,4).
q(3,5).
q(3,6).
q(4,7).
q(4,8).

q1(X,Y,Z):-
        m(X),n(X,Y),!,q(Y,Z).

q2(X,Y,Z):-
        m(X),once(n(X,Y)),q(Y,Z).

q3(X,Y):-
        m(X),!,n(X,Y).

q4(X,Y,L):-
        bagof(X,(m(X),X=a,n(X,Y)),L).

q5(X,Y,L):-
        setof(X,Y^q(X,Y),L).
```