**1. Definition:** mother(X,Y) :- female(X), parent(X,Y) .

%Setting people to test if they are the mother

male(frank) .

male(fred) .

male(matt) .

male(bob) .

female(emma) .

female(marge) .

female(jazmin) .

female(sam) .

parent(sam, bob) . % sam is the parent of bob

parent(matt, bob) . % matt is the parent of bob

parent(matt, jazmin) . % matt is the parent of jazmin

parent(frank, emma) . % frank is the parent of emma

parent(frank, marge) . % frank is the parent of marge

parent(frank, fred) . % frank is the parent of fred

* Case(X is the mother of bob)

?- mother(X,bob) .

X = sam.

* Case(is sam the mother of bob)

?- mother(sam,bob) .

true.

* Case(is matt the mother of bob)

?- mother(matt,bob) .

false.

* Case(is frank the mother of bob)

?- mother(frank,bob) .

false.

* Case(is marge the mother of bob)

?- mother(marge,bob) .

false.

* Case(is frank the mother of emma)

?- mother(frank,emma) .

false.

**2. Definition:** sister(X, Y) :- female(X), parent(Z,X), parent(Z,Y) .

%Setting people to test if they are a sister

male(frank) .

male(fred) .

male(matt) .

male(bob) .

female(emma) .

female(marge) .

female(jazmin) .

female(sam) .

parent(sam, bob) . % sam is the parent of bob

parent(matt, bob) . % matt is the parent of bob

parent(matt, jazmin) . % matt is the parent of jazmin

parent(frank, emma) . % frank is the parent of emma

parent(frank, marge) . % frank is the parent of marge

parent(frank, fred) . % frank is the parent of fred

* Case(jazmin is the sister of bob)

?- sister(jazmin, bob) .

true.

* Case(is bob the sister of jazmin)

?- sister(bob, jazmin) .

false.

* Case(is sam the sister of bob)

?- sister(sam, bob) .

false.

* Case(is emma the sister of jazmin)

?- sister(emma, jazmin) .

false.

* Case(is marge the sister of bob)

?- mother(marge,bob) .

false.

* Case(is sam the sister of matt)

?- mother(sam,matt) .

false.

**3. Definition:** second(X, [\_, Y| \_]) :- X=Y .

?- second(a, [b, a, x, y]) .

true.

?- second(a, [a, b, x, y]) .

false.

?- second(a, [b, c, x, y]) .

false.

?- second([a,b], [b, [a,b], x, y]) .

true.

?- second([a,b], [b, [b,a], x, y]) .

false.

**4. Definition:** twice([X| Y],[X, X| Z]) :- twice(Y, Z) .

twice([],[]) .

?- twice([a],[a,a]) .

true.

?- twice([a,b,c,d],[a,a,b,b,c,c,d,d]) .

true.

?- twice([a,[b,c]],[a,a,b,b,c,c,d,d]) .

false.

?- twice([a,[b,c]],[a,a,[b,c],[b,c]]) .

true.

?- twice([a,a],[a]) .

false.

?- twice([[a],[b]],[[a],[b],[a],[b]]) .

false.

?- twice([[a],[b]],[[a],[a],[b],[b]]) .

true.

**5. Definition:** interleave([X|Y], [A|B], [X,A|Z]) :- interleave(Y,B,Z) .

interleave([],[],[]) .

?- interleave([a,b,c],[d,e,f],X) .

X = [a, d, b, e, c, f].

?- interleave([a,[x,y,z]], [b,[i,j,k]], X).

X = [a, b, [x, y, z], [i, j, k]].

?- interleave([x,y,z,[a,[b,[c]]]], [[r,g,h],l,[i,k],o], X).

X = [x, [r, g, h], y, l, z, [i, k], [a, [...|...]], o].

?- interleave([a],[b],X) .

X = [a, b].

?- interleave([a,a,a,a],[b,b,b,b],X) .

X = [a, b, a, b, a, b, a, b].