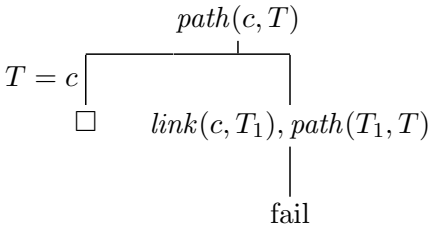
Resolution: Solutions

1 Exercise

Consider the following Prolog code:

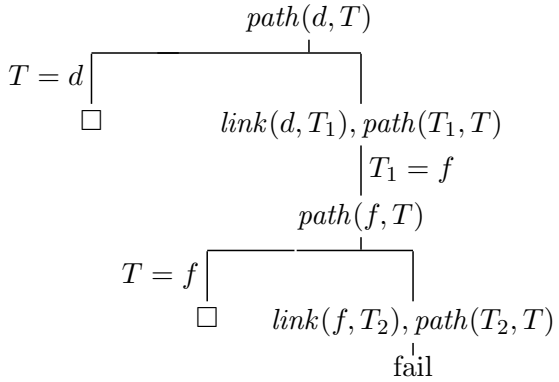
```
link(a,b).
link(a,c).
link(a,d).
link(b,e).
link(d,f).

path(X,X).
path(X,Y):- link(X,Z), path(Z,Y).
```

1. $?-$ `path(c,T)`.



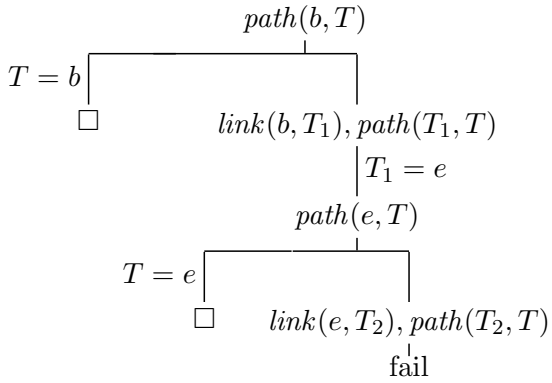
There is only one solution $T = c$.

2. $?-$ `path(d,T)`.



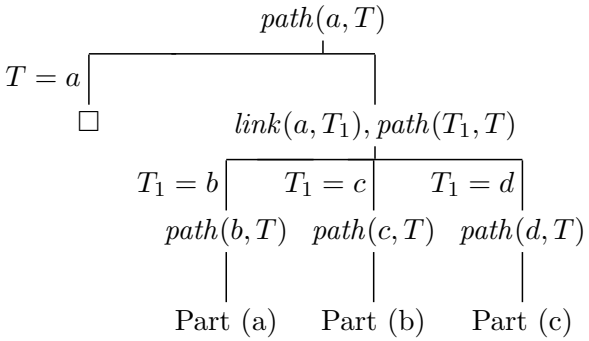
There are two solutions $T = d$ and $T = f$.

3. ? – `path(b, T)`.



There are two solutions $T = b$ and $T = e$.

4. ? – `path(a, T)`.



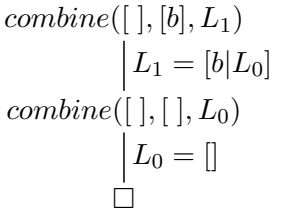
There are five solutions $T = a$, $T = b$, $T = c$, $T = d$ and $T = e$.

2 Exercise

Consider the following Prolog code:

```
combine([],[],[]).
combine([X|Xs],Ys,[X|Zs]):- combine(Xs,Ys,Zs).
combine(Xs,[Y|Ys],[Y|Zs]):- combine(Xs,Ys,Zs).
```

1. ? – `combine([ ], [b], L1)`.



There is one solution $L_1 = [b]$.

2. $? - \texttt{combine}([\texttt{a}], [\,], \texttt{L}_1)$.

$$\begin{array}{l} combine([a], [\,], L_1) \\ \quad\Big| L_1 = [a|L_0] \\ combine([\,], [\,], L_0) \\ \quad\Big| L_0 = [] \\ \quad\Box \end{array}$$

There is one solution $L_1 = [a]$.

3. $? - \texttt{combine}([\texttt{a}], [\texttt{b}], \texttt{L}_2)$.

$$\begin{array}{c} combine([a], [b], L_2) \\ L_2 = [a|L_1] \Big| \qquad\qquad \Big| L_2 = [b|L_1] \\ combine([\,], [b], L_1) \quad combine([a], [\,], L_1) \\ \Big| \qquad\qquad\qquad \Big| \\ \text{Part (a)} \qquad\qquad \text{Part (b)} \end{array}$$

There are two solutions: $L_2 = [a, b]$ and $L_2 = [b, a]$.

4. $? - \texttt{combine}([\texttt{a}, \texttt{a}], [\,], \texttt{L}_3)$.

$$\begin{array}{l} combine([a, a], [\,], L_3) \\ \quad\Big| L_3 = [a|L_1] \\ combine([a], [\,], L_1) \\ \quad\Big| \\ \quad \text{Part (b)} \end{array}$$

There is one solution $L_3 = [a, a]$.

5. $? - \texttt{combine}([\texttt{a}, \texttt{a}], [\texttt{b}], \texttt{L}_4)$.

$$\begin{array}{c} combine([a, a], [b], L_4) \\ L_4 = [a|L_2] \Big| \qquad\qquad \Big| L_4 = [b|L_3] \\ combine([a], [b], L_2) \quad combine([a, a], [\,], L_3) \\ \Big| \qquad\qquad\qquad \Big| \\ \text{Part (c)} \qquad\qquad \text{Part (d)} \end{array}$$

There are three solutions: $L_4 = [a, a, b]$, $L_4 = [a, b, a]$ and $L_4 = [b, a, a]$.