1) ~~Ontolog~~ $dog(x)$; $own(x, y)$, $feed(x, y)$, $available(x)$, $happy(x)$

E, F, P, Fd

1) $dog(F) \wedge dog(P) \wedge own(E, F) \wedge own(E, P)$

2) $\forall x\, [dog(x) \wedge \exists y\, (own(y, x) \wedge feed(y, x))] \Rightarrow happy(x)$

3) $\forall x\, [dog(x) \wedge own(E, x)] \Rightarrow loves(E, x)$

4) $available(food) \Rightarrow \forall x\, \forall y\, [loves(x, y) \Rightarrow feed(x, y)]$

Th) $happy(F) \wedge happy(P) \to \neg Th)$. $\neg happy(F) \vee \neg happy(P)$

1a) $dog(F)$ 1b) $dog(P)$ 1c) $own(E, F)$ 1d) $own(E, P)$

2) $\forall x\, \forall y\, [dog(x) \wedge own(y, x) \wedge feed(y, x)] \Rightarrow happy(x)$

$(dog(x) \wedge own(y, x) \wedge feed(y, x)) \Rightarrow happy(x)$

$\neg dog(x) \vee \neg own(y, x) \vee \neg feed(y, x) \vee happy(x)$

3) $\neg dog(x) \vee \neg own(E, x) \vee loves(E, x)$

4) ~~$\neg available(food)$~~ $\forall x\, \forall y\, [available(food) \Rightarrow [loves(x, y) \Rightarrow feed(x, y)]]$

$\neg available(food) \vee \neg loves(x, y) \vee feed(x, y)$

5) $\neg happy(F) \vee \neg happy(P)$

6) WE ADD "$available(food)$"

1c) and 3) x/F $\to \neg dog(F) \vee loves(E, F)$ 7

1a) and 7) $loves(E, F)$ 8

8) and 4) $\neg available(food) \vee feed(E, F)$ 9

x/E, y/F

9) and 6) $feed(E, F)$ 10

10) and 2) y/E, x/F $\neg dog(F) \vee \neg own(E, F) \vee happy(F)$ 11

11) and 1a) + 11 and 1c) $\to happy(F)$ ...

$R(h(X), f(h(b), Y)) \stackrel{?}{=} R(Y, f(Y, h(g(a))))$

1) SAME NAME ✓
2) $m = n$ ✓

a) $h(X) \stackrel{?}{=} Y$, b) $f(h(b), Y) \stackrel{?}{=} f(Y, h(g(a)))$

a) $h(X) = Y$ $\quad \sigma = \{Y / h(X)\}$

we apply σ to b)

b) $f(h(b), h(X)) \stackrel{?}{=} f(h(X), h(g(a)))$

1) SAME NAME ✓
2) $m = 2$ ✓

c) $h(b) \stackrel{?}{=} h(X)$ $\quad$ d) $h(X) \stackrel{?}{=} h(g(a))$

c) $h(b) \stackrel{?}{=} h(X)$

1) SAME NAME ✓
2) $m = n = 1$ ✓

e) $b \stackrel{?}{=} X \Rightarrow \sigma = \{X / b, Y / h(b)\}$

we apply σ to d)

d) $h(b) \stackrel{?}{=} h(g(a))$

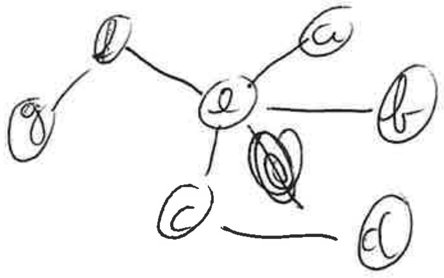
$m = n = 1$ ✓
SAME NAME ✓

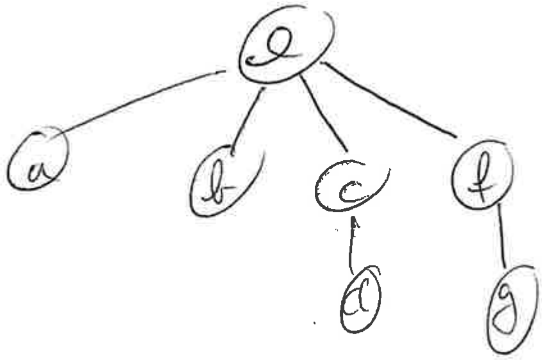
f) $b \stackrel{?}{=} g(a) \Rightarrow$ NO UNIFICATION IS POSSIBLE

NO

$e = 2a$ $\quad f = 2e + 1$ $\quad c = e + 1$

$b = e$ $\quad g = f - 2$ $\quad d = 2c - 2$





$$\overset{1}{e},\ \overset{2}{a},\ \overset{3}{b},\ \overset{4}{c},\ \overset{5}{d},\ \overset{6}{f},\ \overset{7}{g}$$

- $i = 7$
  Revise (γ, f, g) $\qquad f = g + 2 \ ;\ D_f = \{3, 4, 5, 6\}$

- $i = 6$
  Revise (γ, e, f) $\qquad e = \frac{f-1}{2} \ ;\ D_e = \{1, 2\}$

- $i = 5$
  Revise (γ, c, d) $\qquad c = \frac{d+2}{2} \ ;\ D_c = \{2, 3\}$

- $i = 4$
  Revise (γ, e, c) $\qquad e = c - 1 \ ;\ D_e = \{2\}$

- $i = 3$
  Revise (γ, e, b) $\qquad e = b \ ;\ D_e = \{2\}$

- $i = 2$
  Revise (γ, e, a) $\qquad e = 2a \ ;\ D_e = \{2\}$

$a = 1,\ b = 2,\ c = 3\ \ d = 4,\ f = 5,\ g = 3$

$\Delta = \{\{A, \neg C\}, \{B, C, E\}, \{B, \neg E\}, \{\neg A, C\}, \{D, E\}, \{B, \neg D\}, \{\neg D, \neg E\}, \{A, C\}\}$

- SR $A \to F$, $\Delta = \{\{\neg C\}, \{B, C, E\}, \{B, \neg E\}, \{D, E\}, \{B, \neg D\}, \{\neg D, \neg E\}, \{C\}\}$
  - $\hookrightarrow$ UP $C \to T$ conflict, we learn $\{A\}$

$\Delta' = \Delta \cup \{A\}$

- UP $A \to T$, $\Delta = \{\{B, C, E\}, \{B, \neg E\}, \{C\}, \{D, E\}, \{B, \neg D\}, \{\neg D, \neg E\}\}$
- UP $C \to T$, $\Delta = \{\{B, \neg E\}, \{D, E\}, \{B, \neg D\}, \{\neg D, \neg E\}\}$
- SR $B \to F$, $\Delta = \{\{\neg E\}, \{D, E\}, \{\neg D\}, \{\neg D, \neg E\}\}$
  - $\hookrightarrow$ UP $D \to F$ $\Delta = \{\{\neg E\}, \{E\}\}$
  - $\hookrightarrow$ UP $E \to T$ conflict, we learn $\{B\}$

$\Delta = \{\{B\}, \{B, \neg E\}, \{D, E\}, \{B, \neg D\}, \{\neg D, \neg E\}\}$

- UP $B \to T$, $\Delta = \{\{D, E\}, \{\neg D, \neg E\}\}$
- SR $D \to F$, $\Delta = \{\{E\}\}$
- UP $E \to T$, $\Delta = \{\}$ ✓

MODEL : $\boxed{A, B, C, \overline{D}, E}$

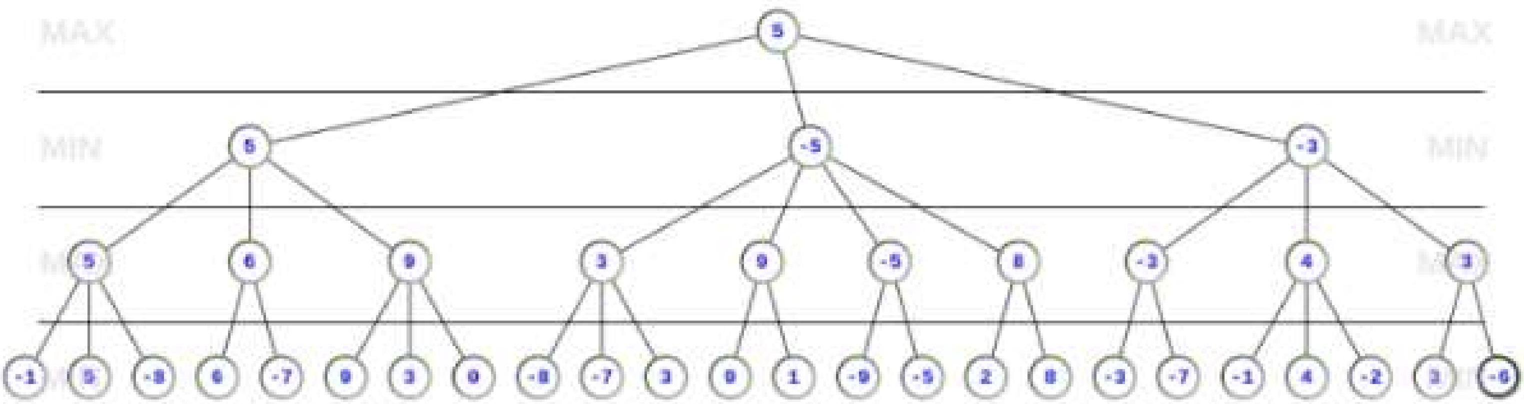


Figure 1: Caption

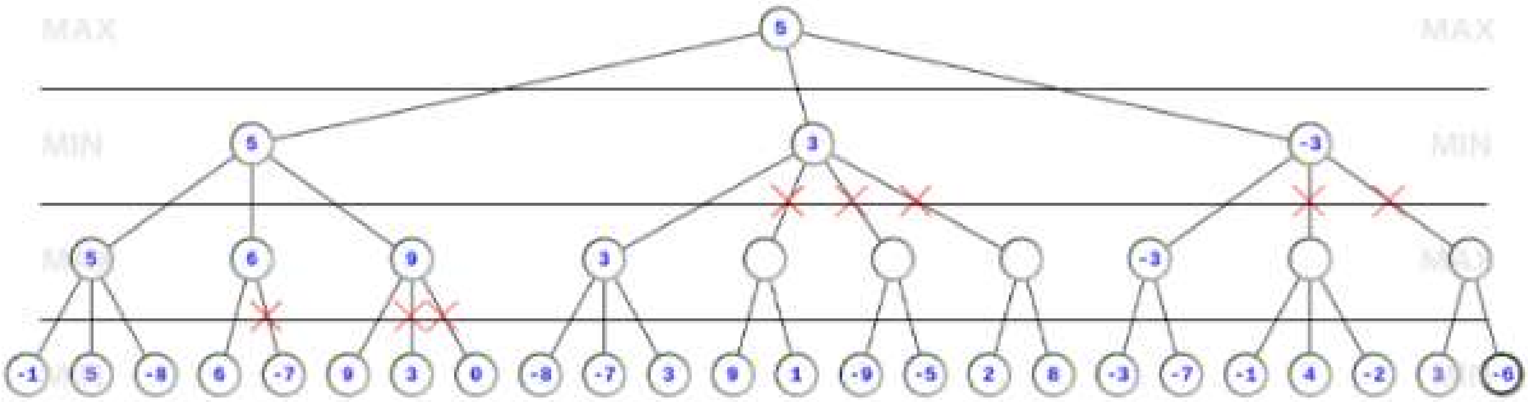


Figure 2: Caption