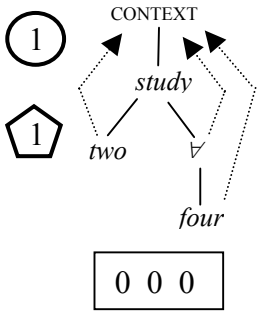


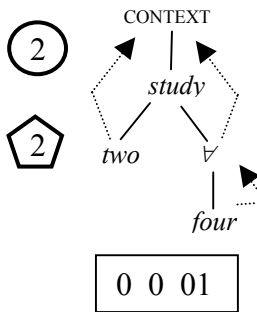
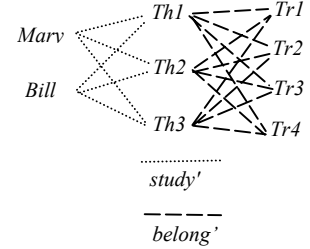
THE NINE INTERPRETATIONS OF THE SENTENCE

Two students studied all theorems of four theories



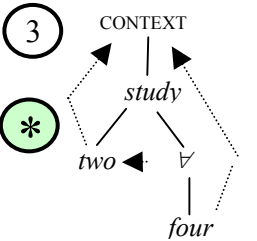
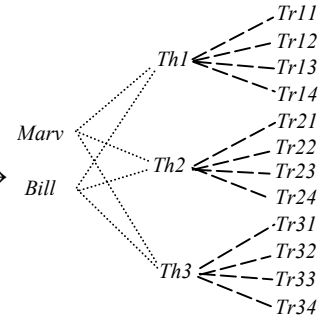
There are two students (Mary and Bill) each of which studied all theorems which belong to a well-defined group of four theories (Tr1, Tr2, Tr3, Tr4).

$$\begin{aligned} & \exists_{x_1} \exists_{x_2} \exists_{z_1} \exists_{z_2} \exists_{z_3} \exists_{z_4} \\ & [x_1 \neq x_2 \wedge z_1 \neq z_2 \neq z_3 \neq z_4 \wedge \\ & \forall_x [(x = x_1 \vee x = x_2) \rightarrow \text{student}'(x)] \wedge \\ & \forall_z [(z = z_1 \vee z = z_2 \vee z = z_3 \vee z = z_4) \rightarrow \text{theory}'(z)] \wedge \\ & \forall_x \forall_y [((x = x_1 \vee x = x_2) \wedge \text{theorem}'(y) \wedge \\ & \quad \forall_z [(z = z_1 \vee z = z_2 \vee z = z_3 \vee z = z_4) \rightarrow \text{belong}'(y, z)]) \rightarrow \\ & \quad \text{study}'(x, y)]] \end{aligned}$$



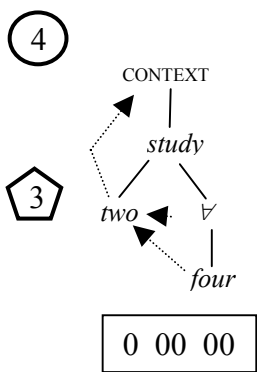
There are two students (Mary and Bill) each of which studied all theorems that belong to any four theories.

$$\begin{aligned} & \exists_{x_1} \exists_{x_2} [x_1 \neq x_2 \wedge \\ & \forall_x [(x = x_1 \vee x = x_2) \rightarrow \text{student}'(x)] \wedge \\ & \forall_x \forall_y [((x = x_1 \vee x = x_2) \wedge \text{theorem}'(y) \wedge \\ & \quad \exists_{z_1} \exists_{z_2} \exists_{z_3} \exists_{z_4} [z_1 \neq z_2 \neq z_3 \neq z_4 \wedge \\ & \quad \forall_z [(z = z_1 \vee z = z_2 \vee z = z_3 \vee z = z_4) \rightarrow \text{theory}'(z)] \wedge \\ & \quad \forall_z [(z = z_1 \vee z = z_2 \vee z = z_3 \vee z = z_4) \rightarrow \text{belong}'(y, z)])] \rightarrow \\ & \quad \text{study}'(x, y)]] \end{aligned}$$



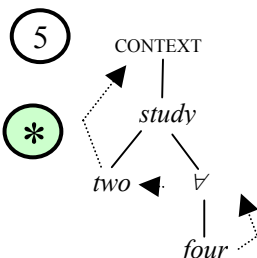
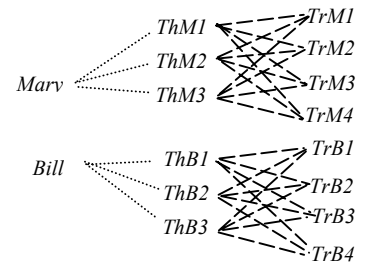
Conflates in 1.

$$0 \ 0 \ 0 \ 0$$



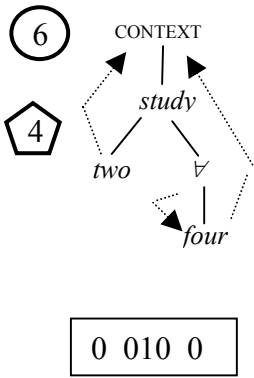
There are two students (Mary and Bill). Each student chooses four theories (TrM1, TrM2, TrM3, TrM4, TrB1, TrB2, TrB3, TrB4) and studies all the theorems that belong to all of those theories. [N.B. The semdep arc of the quantifier is moved to CONTEXT; this would make the arc from two to four unacceptable for constraint 2; but the constraint is applied before the movement]

$$\begin{aligned} & \exists_{x_1} \exists_{x_2} [x_1 \neq x_2 \wedge \\ & \forall_x [(x = x_1 \vee x = x_2) \rightarrow \text{student}'(x)] \wedge \\ & \forall_x [(x = x_1 \vee x = x_2) \rightarrow \\ & \quad \exists_{z_1} \exists_{z_2} \exists_{z_3} \exists_{z_4} [z_1 \neq z_2 \neq z_3 \neq z_4 \wedge \\ & \quad \forall_z [(z = z_1 \vee z = z_2 \vee z = z_3 \vee z = z_4) \rightarrow \text{theory}'(z)] \wedge \\ & \quad \forall_y [(\text{theorem}'(y) \wedge \\ & \quad \quad \forall_z [(z = z_1 \vee z = z_2 \vee z = z_3 \vee z = z_4) \rightarrow \\ & \quad \quad \quad \text{belong}'(y, z)]) \rightarrow \\ & \quad \quad \text{study}'(x, y)]]] \end{aligned}$$



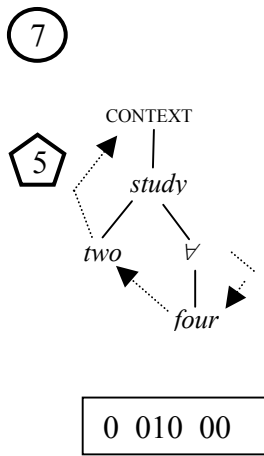
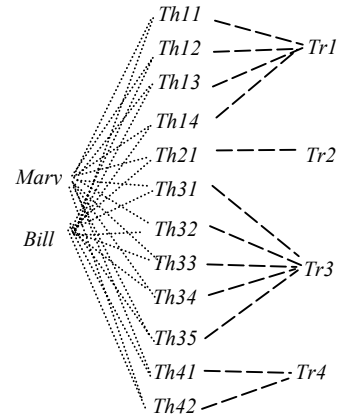
Conflates in 1.

$$0 \ 0 \ 0 \ 0 \ 1$$



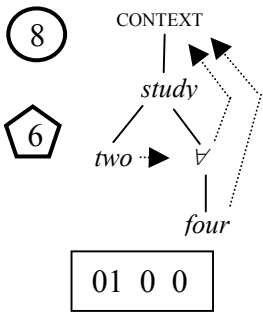
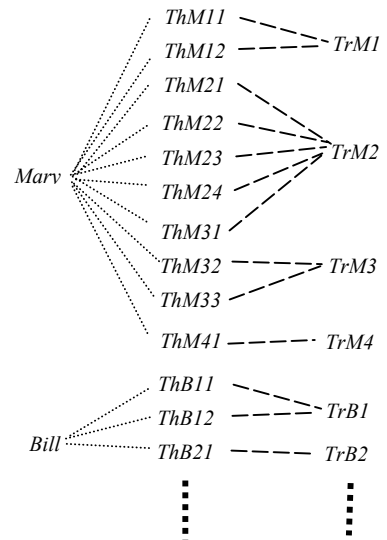
There are two students (Mary and Bill), four theories (Tr1, Tr2, Tr3, Tr4), Each student studies all theorems that belong to at least one of those theories.

$$\begin{aligned} & \exists_{x1} \exists_{x2} \exists_{z1} \exists_{z2} \exists_{z3} \exists_{z4} [x1 \neq x2 \wedge z1 \neq z2 \neq z3 \neq z4 \wedge \\ & \forall_x [(x=x1 \vee x=x2) \rightarrow \text{student}'(x)] \wedge \\ & \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \text{theory}'(z)] \wedge \\ & \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \\ & \quad \forall_x \forall_y [((x=x1 \vee x=x2) \wedge \\ & \quad \quad \text{theorem}'(y) \wedge \text{belong}'(y,z)) \rightarrow \\ & \quad \quad \text{study}'(x,y)]]] \end{aligned}$$



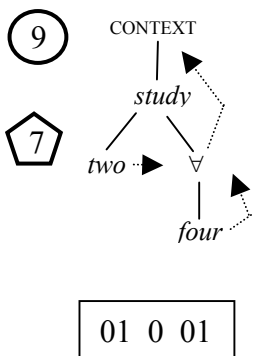
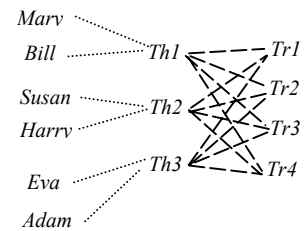
There are two students (Mary and Bill) and, for each of them, four theories (TrM1, TrM2, TrM3, TrM4 and TrB1, TrB2, TrB3, TrB4). Each student studies all theorems of each of the theories associated with her/him.

$$\begin{aligned} & \exists_{x1} \exists_{x2} [x1 \neq x2 \wedge \\ & \forall_x [(x=x1 \vee x=x2) \rightarrow \text{student}'(x)] \wedge \\ & \forall_x [(x=x1 \vee x=x2) \rightarrow \\ & \quad \exists_{z1} \exists_{z2} \exists_{z3} \exists_{z4} [z1 \neq z2 \neq z3 \neq z4 \wedge \\ & \quad \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \\ & \quad \quad \text{theory}'(z)] \wedge \\ & \quad \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \\ & \quad \quad \forall_y [(\text{theorem}'(y) \wedge \text{belong}'(y,z)) \rightarrow \\ & \quad \quad \quad \text{study}'(x,y)]]]]] \end{aligned}$$



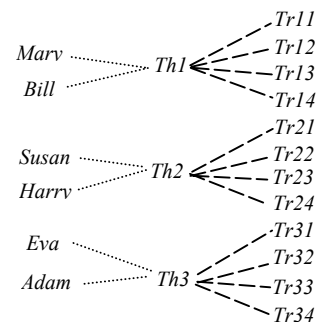
There are four theories (Tr1, Tr2, Tr3, Tr4). For each theorem that belong to all of those theories (Th1, Th2, Th3) there are two students, possibly different, who study it.

$$\begin{aligned} & \exists_{z1} \exists_{z2} \exists_{z3} \exists_{z4} [z1 \neq z2 \neq z3 \neq z4 \wedge \\ & \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \text{theory}'(z)] \wedge \\ & \forall_y [(\text{theorem}'(y) \wedge \\ & \quad \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \text{belong}'(y,z)] \rightarrow \\ & \quad \exists_{x1} \exists_{x2} [x1 \neq x2 \wedge \\ & \quad \quad \forall_x [(x=x1 \vee x=x2) \rightarrow \text{student}'(x)] \wedge \\ & \quad \quad \forall_x [(x=x1 \vee x=x2) \rightarrow \text{study}'(x,y)]]]]] \end{aligned}$$



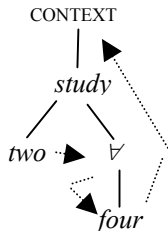
For each theorem that belongs to any group of four theories, possibly different (Tr11, Tr12, Tr13, Tr14, Tr21, Tr22, Tr23, Tr24 and Tr31, Tr32, Tr33, Tr34) there are two students, possibly different, who study it.

$$\begin{aligned} & \forall_y [(\text{theorem}'(y) \wedge \\ & \quad \exists_{z1} \exists_{z2} \exists_{z3} \exists_{z4} [z1 \neq z2 \neq z3 \neq z4 \\ & \quad \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \text{theory}'(z)] \wedge \\ & \quad \forall_z [(z=z1 \vee z=z2 \vee z=z3 \vee z=z4) \rightarrow \\ & \quad \quad \text{belong}'(y,z)]] \rightarrow \\ & \quad \exists_{x1} \exists_{x2} [x1 \neq x2 \wedge \\ & \quad \quad \forall_x [(x=x1 \vee x=x2) \rightarrow \text{student}'(x)] \wedge \\ & \quad \quad \forall_x [(x=x1 \vee x=x2) \rightarrow \text{study}'(x,y)]]] \end{aligned}$$



10

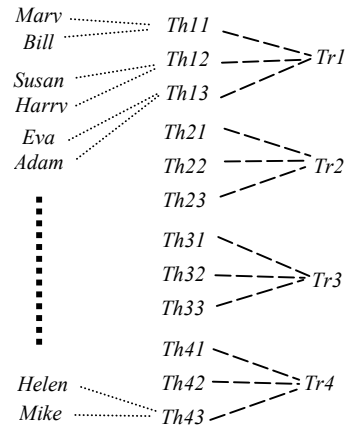
8



01 010 0

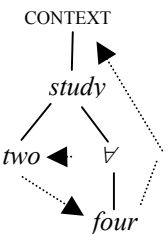
There are four theories (Tr1, Tr2, Tr3, Tr4). For each theorem (Th11, Th12, Th13, Th21, Th22, Th23 and Th31, Th32, Th33) that belong to any of those theories there are two, possibly different, students who study them.

$$\begin{aligned} & \exists z_1 \exists z_2 \exists z_3 \exists z_4 [z_1 \neq z_2 \neq z_3 \neq z_4 \wedge \\ & \forall z [(z=z_1 \vee z=z_2 \vee z=z_3 \vee z=z_4) \rightarrow \text{theory}'(z)] \wedge \\ & \forall z [(z=z_1 \vee z=z_2 \vee z=z_3 \vee z=z_4) \rightarrow \\ & \quad \forall y [(\text{theorem}'(y) \wedge \text{belong}'(y, z)) \rightarrow \\ & \quad \quad \exists x_1 \exists x_2 [x_1 \neq x_2 \wedge \\ & \quad \quad \quad \forall x [(x = x_1 \vee x = x_2) \rightarrow \text{student}'(x)] \wedge \\ & \quad \quad \quad \forall x [(x = x_1 \vee x = x_2) \rightarrow \text{study}'(x, y)]]]]] \end{aligned}$$



11

*

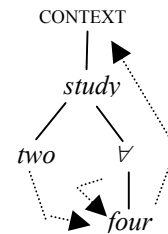


010 00 0

*** [The DTS would not be acceptable, because, after moving the dependency of the quantifier to the context, it does not respect constraint 2; also, it is hard to build a paraphrase and a model. However, this is in contrast with 4 above, where the check is made before moving the arc, which would make this DTS acceptable]

12

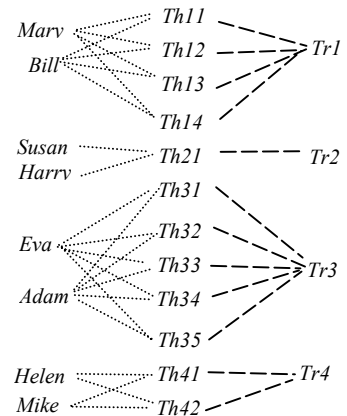
9



010 010 0

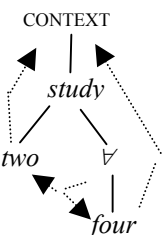
There are four theories (Tr1, Tr2, Tr3, Tr4). For each of them there are two, possibly different, students (who chose them). Each student who chose a given theory studies all the theorems of that theory.

$$\begin{aligned} & \exists z_1 \exists z_2 \exists z_3 \exists z_4 [z_1 \neq z_2 \neq z_3 \neq z_4 \wedge \\ & \forall z [(z=z_1 \vee z=z_2 \vee z=z_3 \vee z=z_4) \rightarrow \text{theory}'(z)] \wedge \\ & \forall z [(z=z_1 \vee z=z_2 \vee z=z_3 \vee z=z_4) \rightarrow \\ & \quad \exists x_1 \exists x_2 [x_1 \neq x_2 \wedge \\ & \quad \quad \forall x [(x = x_1 \vee x = x_2) \rightarrow \text{student}'(x)] \wedge \\ & \quad \quad \forall x \forall y [((x = x_1 \vee x = x_2) \wedge \\ & \quad \quad \quad \text{theorem}'(y) \wedge \text{belong}'(y, z)) \rightarrow \\ & \quad \quad \quad \text{study}'(x, y)]]]] \end{aligned}$$



13

*



Conflates in 1 or in 6.

010 00+010 0