

factorization

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The *factorization* command extracts a formula that is a common factor in both sub-formulae. Some of these are inverses of *distribution* steps. Unusually, these steps are organized by the syntax of the result, not that of the original formula.

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1.1. Conjunctions

$$\begin{aligned}
 p_1 \wedge p_2 \wedge (p_1 \wedge p_3) &\implies p_1 \wedge (p_2 \wedge p_3) \\
 p_1 \wedge p_3 \wedge (p_2 \wedge p_3) &\implies p_1 \wedge p_2 \wedge p_3 \\
 p_1 \wedge p_2 \vee p_1 \wedge p_3 &\implies p_1 \wedge (p_2 \vee p_3) \\
 p_1 \wedge p_3 \vee p_2 \wedge p_3 &\implies (p_1 \vee p_2) \wedge p_3
 \end{aligned}$$

1.2. Disjunctions

$$\begin{aligned}
 p_1 \vee p_2 \vee (p_1 \vee p_3) &\implies p_1 \vee (p_2 \vee p_3) \\
 p_1 \vee p_3 \vee (p_2 \vee p_3) &\implies p_1 \vee p_2 \vee p_3 \\
 (p_1 \vee p_2) \wedge (p_1 \vee p_3) &\implies p_1 \vee p_2 \wedge p_3 \\
 (p_1 \vee p_3) \wedge (p_2 \vee p_3) &\implies p_1 \wedge p_2 \vee p_3
 \end{aligned}$$

1.3. Implications

$$\begin{aligned}
 (p_1 \Rightarrow p_2) \wedge (p_1 \Rightarrow p_3) &\implies p_1 \Rightarrow p_2 \wedge p_3 \\
 (p_1 \Rightarrow p_3) \wedge (p_2 \Rightarrow p_3) &\implies p_1 \vee p_2 \Rightarrow p_3 \\
 p_1 \wedge p_2 \Leftrightarrow p_1 \wedge p_3 &\implies p_1 \Rightarrow (p_2 \Leftrightarrow p_3)
 \end{aligned}$$

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1.4. Universal quantifications

$$\begin{aligned}
 (\forall s \bullet p_1) \wedge (\forall s \bullet p_2) &\implies \forall s \bullet p_1 \wedge p_2 \\
 (\forall s \bullet p_1) \vee (\forall s \bullet p_2) &\implies \forall s \bullet p_1 \vee p_2 \text{ where } s \text{ has only } == \text{ decs} \\
 (\forall s \bullet p_1) \Rightarrow (\forall s \bullet p_2) &\implies \forall s \bullet p_1 \Rightarrow p_2 \text{ where } s \text{ has only } == \text{ decs}
 \end{aligned}$$

1.5. Existential quantifications

$$\begin{aligned}
 (\exists s \bullet p_1) \wedge (\exists s \bullet p_2) &\implies \exists s \bullet p_1 \wedge p_2 \text{ where } s \text{ has only } == \text{ decs} \\
 (\exists s \bullet p_1) \vee (\exists s \bullet p_2) &\implies \exists s \bullet p_1 \vee p_2 \\
 (\exists s \bullet p_1) \Rightarrow (\exists s \bullet p_2) &\implies \exists s \bullet p_1 \Rightarrow p_2 \text{ where } s \text{ has only } == \text{ decs}
 \end{aligned}$$

1.6. Unique existential quantifications

$$\begin{aligned}
 (\exists_1 s \bullet p_1) \wedge (\exists_1 s \bullet p_2) &\implies \exists_1 s \bullet p_1 \wedge p_2 \text{ where } s \text{ has only } == \text{ decs} \\
 (\exists_1 s \bullet p_1) \vee (\exists_1 s \bullet p_2) &\implies \exists_1 s \bullet p_1 \vee p_2 \text{ where } s \text{ has only } == \text{ decs} \\
 (\exists_1 s \bullet p_1) \Rightarrow (\exists_1 s \bullet p_2) &\implies \exists_1 s \bullet p_1 \Rightarrow p_2 \text{ where } s \text{ has only } == \text{ decs}
 \end{aligned}$$

2. Tactic example

“factorization” $p_4 \ p_5$

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This example applies the *factorization* command to predicates p_4 and p_5 .

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