

calc_logic_example

Student Group

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example for a simplification with the rule for boolean algebra

$$\overline{a \vee (b \wedge (\bar{a} \vee c) \wedge 1) \vee a} \wedge \overline{ab} \wedge \overline{ab}$$

At first we will switch the representation to the following:

$$\overline{a \vee (b \wedge (\bar{a} \vee c) \wedge 1) \vee a} \wedge \overline{ab} \wedge \overline{ab}$$

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1. Neutral Element

$$\overline{a \vee (b \wedge (\bar{a} \vee c) \wedge 1) \vee a} \wedge \overline{ab} \wedge \overline{ab}$$

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$$\overline{a \vee (b \wedge (\bar{a} \vee c) \wedge 1) \vee a} \wedge \overline{ab} \wedge \overline{ab}$$

2. Commutative Law

$$\overline{a \vee (b \wedge (\bar{a} \vee c) \wedge 1) \vee a} \wedge \overline{ab} \wedge \overline{ab}$$

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$$\overline{a \vee (b \wedge (\bar{a} \vee c) \wedge 1) \vee a} \wedge \overline{ab} \wedge \overline{ab}$$

`\\ \quad\quad\quad\quad\quad & \quad\quad\quad\quad\quad \\ \end{array} \end{align*}`

3. $\text{\color{blue}\{text{Idempotence}\}}$

`\begin{align*} \begin{array}{l} /(\color{blue}\{a + a\} + (b \cdot (/a + c)\quad \;)) & \\ \color{white}\{\overline{ab}\} \\ \quad\quad\quad\quad\quad & \\ \quad\quad\quad\quad\quad \\ \quad\quad\quad\quad\quad \\ \end{array} \\ \end{align*}`

3. $\text{\color{blue}\{text{Idempotence}\}}$

`\begin{align*} \begin{array}{l} /(a \quad \enspace \;: + (b \cdot (/a + c)\quad \;)) & \\ \color{white}\{\overline{ab}\} \\ \quad\quad\quad\quad\quad & \\ \quad\quad\quad\quad\quad \\ \quad\quad\quad\quad\quad \\ \end{array} \\ \end{align*}`

4. $\text{\color{blue}\{text{Distributive Law}\}}$

`\begin{align*} \begin{array}{l} /(a \quad \enspace \;: + (\color{blue}\{b \cdot (/a + c)\} \quad \;)) & \\ \color{white}\{\overline{ab}\} \\ \quad\quad\quad\quad\quad & \\ \quad\quad\quad\quad\quad \\ \quad\quad\quad\quad\quad \\ \end{array} \\ \end{align*}`

4. $\text{\color{blue}\{text{Distributive Law}\}}$

`\begin{align*} \begin{array}{l} /(a \quad \;, + ((b \cdot /a) + (b \cdot c))) & \\ \color{white}\{\overline{ab}\} \\ \quad\quad\quad\quad\quad & \\ \quad\quad\quad\quad\quad \\ \quad\quad\quad\quad\quad \\ \end{array} \\ \end{align*}`

5. $\text{\color{blue}\{text{Associative Law}\}}$

`\begin{align*} \begin{array}{l} /(\color{blue}\{a \quad \;, + ((b \cdot /a) + (b \cdot c))) & \\ \color{white}\{\overline{ab}\} \\ \quad\quad\quad\quad\quad & \\ \quad\quad\quad\quad\quad \\ \quad\quad\quad\quad\quad \\ \end{array} \\ \end{align*}`

5. $\text{\color{blue}\{text{Associative Law}\}}$

`\begin{align*} \begin{array}{l} /(a \quad \;, + \;, (b \cdot /a) + (b \cdot c)\;, \;,) & \\ \color{white}\{\overline{ab}\} \\ \quad\quad\quad\quad\quad & \\ \quad\quad\quad\quad\quad \\ \quad\quad\quad\quad\quad \\ \end{array} \\ \end{align*}`

$$\begin{array}{l} \color{blue}{a \cdot b} + \color{blue}{b \cdot a} \\ \hline \color{white}{a \cdot b} + \color{white}{b \cdot a} \end{array}$$

6. $\color{blue}{\text{Absorption Law}}$

$$\begin{array}{l} \color{blue}{a \cdot (a + b)} \\ \hline \color{white}{a \cdot a} + \color{white}{a \cdot b} \end{array}$$

6. $\color{blue}{\text{Absorption Law}}$

$$\begin{array}{l} \color{blue}{a + (a \cdot b)} \\ \hline \color{white}{a} + \color{white}{a \cdot b} \end{array}$$

7. $\color{blue}{\text{Absorption Law}}$

$$\begin{array}{l} \color{blue}{(a + b) \cdot a} \\ \hline \color{white}{a \cdot a} + \color{white}{b \cdot a} \end{array}$$

7. $\color{blue}{\text{Absorption Law}}$

$$\begin{array}{l} \color{blue}{(a + b) \cdot (a + b)} \\ \hline \color{white}{a \cdot a} + \color{white}{a \cdot b} + \color{white}{b \cdot a} + \color{white}{b \cdot b} \end{array}$$

8. $\color{blue}{\text{DeMorgan}}$

$$\begin{array}{l} \color{blue}{\overline{a \cdot b}} \\ \hline \color{white}{\overline{a}} + \color{white}{\overline{b}} \end{array}$$

8. $\color{blue}{\text{DeMorgan}}$

$$\begin{array}{l} \color{blue}{\overline{\overline{a}}} \\ \hline \color{white}{a} \end{array}$$

$$\begin{array} \\ \end{array}$$

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