

Status	Beendet
Begonnen	Montag, 7. April 2025, 16:46
Abgeschlossen	Montag, 7. April 2025, 17:03
Dauer	17 Minuten 9 Sekunden
Bewertung	10,00 von 10,00 (100%)

Frage 1

Richtig

Erreichte
Punkte 1,00 von
1,00

Given the formula $F = ((a \wedge b) \rightarrow c) \wedge c$, fill in the truth table:

a	b	c	F
0	0	0	0 ✓
0	0	1	1 ✓
0	1	0	0 ✓
0	1	1	1 ✓
1	0	0	0 ✓
1	0	1	1 ✓
1	1	0	0 ✓
1	1	1	1 ✓

0 1

Die richtige Antwort lautet:

Given the formula $F = ((a \wedge b) \rightarrow c) \wedge c$, fill in the truth table:

a	b	c	F
0	0	0	[0]
0	0	1	[1]
0	1	0	[0]
0	1	1	[1]
1	0	0	[0]
1	0	1	[1]
1	1	0	[0]
1	1	1	[1]

Frage 2

Richtig

Erreichte
Punkte 1,00 von
1,00

Given a formula $F = (\neg a \wedge \neg a) \vee \neg a$, which of the following is true?

- ☒ a. F is satisfiable but not valid ✓
- ☐ b. F is valid
- ☐ c. F is unsatisfiable

Die richtige Antwort ist: F is satisfiable but not valid

Frage 3

Richtig

Erreichte
Punkte 1,00 von
1,00

Let A be the formula $\neg(\neg a \rightarrow \neg b) \rightarrow (c \wedge \neg d)$. What is the subformula of A at position 2?

- ☒ a. $c \wedge \neg d$ ✓
- ☐ b. $\neg(\neg a \rightarrow \neg b) \rightarrow (c \wedge \neg d)$
- ☐ c. $\neg b$
- ☐ d. a
- ☐ e. $\neg a$
- ☐ f. b
- ☐ g. $\neg d$

Die richtige Antwort ist: $c \wedge \neg d$

Frage 4

Richtig

Erreichte
Punkte 1,00 von
1,00

Given the CNF

$$F = (\neg a \vee \neg b \vee \neg c \vee \neg d \vee \neg e) \wedge (\neg a) \wedge (\neg a \vee \neg b \vee e) \wedge (\neg b \vee c \vee \neg d \vee e) \wedge (a \vee b \vee \neg c \vee \neg d \vee \neg e)$$

what is the result from applying unit literal propagation on F until unit propagation can no longer be applied?

*You answer should be written as a sequence of clauses separated by a ";". The clauses are written between parentheses and each literal is separated by a coma and ordered **alphabetically**. A literal is preceded by "-" if it is negative. For example, the CNF $(\neg a \vee b) \wedge (d \vee c)$ can be written as "(-a,b);(c,d)" or "(c,d);(-a,b)".*

Note that you should keep the unit clauses in the set.

If the CNF can be concluded unsatisfiable with unit propagation, enter ";" instead.

The input formula can be written as "(-a,-b,-c,-d,-e);(-a);(-a,-b,e);(-b,c,-d,e);(a,b,-c,-d,-e)"

Antwort: ✓

Die richtige Antwort ist: (-b,c,-d,e);(b,-c,-d,-e);(-a)

Frage 5

Richtig

Erreichte
Punkte 1,00 von
1,00

Let A be the formula $(a \wedge \neg b) \rightarrow (c \vee d)$. Let I be an interpretation such that $I \models b$. Which of the following statements hold?

- ☐ a. $I \models A \leftrightarrow (\neg a \rightarrow (c \vee d))$
- ☐ b. $I \models A \leftrightarrow (a \rightarrow (c \vee d))$
- ☐ c. $I \models A \leftrightarrow \perp$
- ☐ d. $I \models A \leftrightarrow (c \vee d)$
- ☒ e. $I \models A \leftrightarrow \top$ ✓

Die richtige Antwort ist: $I \models A \leftrightarrow \top$

Frage 6

Richtig

Erreichte
Punkte 1,00 von
1,00

Let A be the formula $\neg((a \wedge \neg e) \vee \neg b) \wedge (\neg c \wedge d)$. What is the polarity of the subformula at position 1.1.1.1?

- ☒ a. -1 ✓
- ☐ b. 0
- ☐ c. 1

Die richtige Antwort ist: -1

Frage 7

Richtig

Erreichte
Punkte 1,00 von
1,00

Let S be the CNF formula $(a \vee b) \wedge (\neg b) \wedge (\neg a \vee \neg b \vee \neg c) \wedge (\neg a \vee b \vee c) \wedge (\neg a \vee \neg c \vee d)$. Which of the following holds?

- ☐ a. Using only unit propagation exhaustively can determine that S is unsatisfiable
- ☐ b. Unit propagation can be used within $\backslash(S)$, but the satisfiability of $\backslash(S)$ cannot be determined using only unit propagation
- ☐ c. Unit propagation cannot be used within $\backslash(S)$
- ☒ d. Using only unit propagation exhaustively can determine that $\backslash(S)$ is satisfiable ✓

Die richtige Antwort ist: Using only unit propagation exhaustively can determine that $\backslash(S)$ is satisfiable

Frage 8

Richtig

Erreichte
Punkte 1,00 von
1,00

Let $\varphi(F)$ be the propositional formula $((a \wedge \neg a) \vee \neg b) \rightarrow (c \wedge c)$. Which of the following is obtained from using only one iteration the pure atom simplification?

In other words, identify all the pure atoms in $\varphi(F)$, then simplify the formula accordingly. The obtained formula is the solution, regardless of whether it has pure atoms or not.

- ☒ a. $\top$ ✓
- ☐ b. $(\neg b \rightarrow c)$
- ☐ c. c
- ☐ d. $\bot$
- ☐ e. b

Die richtige Antwort ist: $\top$

Frage 9

Richtig

Erreichte
Punkte 1,00 von
1,00

Let S be the set of formulas $(\neg p \vee \neg q) \wedge (p \vee \neg q \vee \neg r) \wedge (p \vee \neg q)$. Which of the following holds?

- ☐ a. Satisfiability of S cannot be determined using only unit propagation
- ☒ b. Unit propagation cannot be used within S ✓
- ☐ c. Satisfiability of S can be determined using only unit propagation

Die richtige Antwort ist: Unit propagation cannot be used within S

Frage 10

Richtig

Erreichte
Punkte 1,00 von
1,00

Consider the formula $(\neg a \wedge \neg b) \rightarrow c$. Derive its clausal normal form using the optimized definitional clause form transformation, taking into account the polarity of its subformulas.

For this transformation consider the following constraints:

- do not introduce names for literals
- for introducing names, use the following approach to select the subformulas: *Start with the rightmost node in the tree. Then move to its left sibling, followed by their parent. From there, go to the rightmost descendant of the parent's sibling, and repeat this process until reaching the root.* For the formula $(a \vee d) \rightarrow (b \vee c)$, you would visit the tree in the following order: c , b , $(b \vee c)$, a , d , $(a \vee d)$, $(a \vee d) \rightarrow (b \vee c)$.
- use as names propositional variables of the form n_i with $i=0,1,\dots$
- the result should only contain clauses (the order of the clauses does not matter)
- the literals inside the clauses should be ordered alphabetically according to the corresponding propositional variables

Example: For the formula $(a \rightarrow (b \vee c))$, your answer should look as follows: $(b,c,-n_0);(-a,n_0,-n_1);(n_1)$

Antwort: ✓

Die richtige Antwort ist: $(a,b,n_0);(c,-n_0,-n_1);(n_1)$

