Status	Beendet
Begonnen	Donnerstag, 5. Juni 2025, 11:46
Abgeschlossen	Donnerstag, 5. Juni 2025, 12:05
Dauer	19 Minuten 24 Sekunden
Bewertung	**10,00** von 10,00 (**100**%)

Frage 1

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the ground formula $F := f(g(a)) = f(c) \wedge c = g(b) \wedge g(g(c)) \neq g(g(b))$ in the theory of equality $\square_E$. Which one of the answers below is correct?

a. F is unsatisfiable.

b. F is satisfiable, but not valid. ✓

c. F is valid.

Frage 2

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the following formula $F := f(d) = a \wedge f(a) \neq f(f(d)) \wedge f(f(d)) \wedge c = f(c)$. Which of the following statements hold?

Note: More than one answer might be correct.

a. All formulas in the other options are unsatisfiable. ✓

b. $F \wedge (f(f(a)) \neq d \wedge f(d) = c)$ is satisfiable.

c. $F \wedge (f(c) = f(d) \wedge f(a) = c)$ is satisfiable.

d. $F \wedge (a \neq c \vee d \neq a)$ is satisfiable.

Frage 3

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := q(f(a), f(c)) \vee f(a) \neq f(b) \vee p(c, f(a)) \vee f(c) = b$ in the theory $\square_E$ of equality and the fresh symbols f_p, f_q and t. Which of the following formulas is equisatisfiable to F?

a. $f(a) \neq f(b) \vee f(c) = b$

b. $f_q(f(a), f(c)) = t \vee f(a) \neq f(b) \vee f_p(c, f(a)) = t \vee f(c) = b$ ✓

c. $f_q(f(a), f(c)) \neq t \vee f(a) \neq f(b) \vee f_p(c, f(a)) \neq t \vee f(c) = b$

d. $f_q(f(a), f(c)) = t \vee f(a) \neq f_p(b) \vee f_p(c, f_q(a)) = t \vee f_p(c) = b$

Frage 4

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(write(A,b,d),b) = c \wedge d \neq c$ in the theory of arrays $\square_A$ where b,c,d are constants and A is an array constant. Which one of the answers below is correct?

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

Frage 5

Richtig

Erreichte Punkte 1,00 von 1,00

Which of the following formula is valid in the theory $\square_A$ of arrays where a,b,c,d are constants and A is an array constant?

- a. $read(write(A,a,d),d) = b \wedge a = d \implies d = b$ ✓
- b. $read(write(A,b,a),d) = a \wedge d = c \implies a = b$
- c. $read(write(A,b,b),a) = d \wedge b = a \implies d = c$
- d. $read(write(A,b,a),d) = d \wedge d = d \implies c = a$

Frage 6

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(write(A,c,b),a) = d$ in the theory $\square_A$ of arrays where a,b,c,d are constants and A is an array constant. Which formula is valid:

- a. $F \wedge c \neq a \implies read(A,a) = d$ ✓
- b. $F \wedge c \neq d \implies read(A,a) = d$
- c. $F \wedge c \neq b \implies read(A,a) = d$

Frage 7

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(A,f(b)) \neq read(B,f(b)) \wedge f(c) = f(c) \wedge g(c) = g(c)$ in the theory $\square_A$ of arrays and f_A, f_B and t are fresh symbols. Which of the following formulas is equisatisfiable to F?

- a. $f_A(f(b)) \neq f_B(f(b)) \wedge f(c) = f(c) \wedge g(c) = g(c)$ ✓
- b. $f(c) = f(c) \wedge g(c) = g(c)$
- c. $f(f(b)) \neq f(f(b)) \wedge f(c) = f(c) \wedge g(c) = g(c)$
- d. $f_A(f(b)) \neq t \wedge f(c) = f(c) \wedge g(c) = g(c)$

Frage 8

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the following formula
$F := (g(c) + x \neq f(c) + 3 \vee b + 2 = z + 2) \wedge (write(A, x, 1) \neq write(A, y, 1) \vee write(A, x, 1) \neq z + 2)$ in the theory of equality $\square_E$, arrays $\square_A$ and linear integer arithmetic $\square_Z$. Which one of the following answers is a correct Boolean abstraction of F?

Note: Use atoms to denote positive literals. For instance, the atom p is the abstraction of $a = b$. Do not use p as the abstraction of $a \neq b$.

- a. $(\neg p_1 \vee p_2) \wedge (\neg p_3 \vee \neg p_4)$ ✓
- b. $(p_1 \vee p_2) \wedge (p_3 \vee p_4)$
- c. $(\neg p_1 \vee p_2) \wedge (\neg p_2 \vee \neg p_4)$
- d. $(\neg p_1 \wedge p_2) \wedge (\neg p_3 \wedge \neg p_4)$

Frage 9

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the set of formulas $\square$ as given below, in which the formulas might not belong to a single theory. Furthermore, let a, b, c, d be constants.

$$\square = \{\ f(h(a)) = c,\\ a + 1 = b + 1,\\ write(A, d, c) = a\ \}$$

Which constant symbols are shared among different theories?

Note: Multiple answers might be correct.

- [x] a ✓
- [ ] d
- [x] c ✓
- [ ] b

Frage 10

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the set of formulas $\square$ as given below, in which the formulas might not belong to a single theory.

$$\square = \{\ f(a+4) \neq g(c+6)+6,\\ (a+c = g(c)+6),\\ write(A, read(A, y+6), x) \neq x)\ \}$$

Which variables and equalities need to be introduced to allow theory separation?

- $c_1 = a+4,\ c_2 = c+6,\ c_3 = g(c_2),\ c_4 = c_3+6,\ c_5 = a+c,\ c_6 = g(c),\ c_7 = c_6+6,\ c_8 = y+6$ ✓
- $c_1 = a+4,\ c_2 = c+6,\ c_3 = g(c+6)+6,\ c_4 = a+c,\ c_5 = g(c)+6,\ c_6 = y+6$
- $c_1 = a+4,\ c_2 = c+6,\ c_3 = g(c+6)+6,\ c_4 = a+c,\ c_5 = g(c)+6$
- $c_1 = a+4,\ c_2 = c+6,\ c_3 = g(c_2)+6,\ c_4 = a+c,\ c_5 = g(c)+6,\ c_6 = y+6$