Status	Beendet
Begonnen	Montag, 9. Juni 2025, 16:06
Abgeschlossen	Montag, 9. Juni 2025, 16:22
Dauer	16 Minuten 52 Sekunden
Bewertung	**10,00** von 10,00 (**100**%)

Frage **1**

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the ground formula $F := f(a) = g(b, a) \land c = a \land f(c) \neq a$ in the theory of equality $\mathcal{T}_E$. Which one of the answers below is correct?

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

Frage **2**

Richtig

Erreichte Punkte 1,00 von 1,00

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

Note: More than one answer might be correct.

- a. $F \land (f(g(d)) = c \land f(a) = g(a))$ is satisfiable.
- b. $F \land (g(c) \neq g(g(c)) \lor d = a)$ is satisfiable.
- c. $F \land (g(d) = g(a) \land f(d) = f(a))$ is satisfiable.
- d. All formulas in the other options are unsatisfiable.

Frage **3**

Richtig

Erreichte Punkte 1,00 von 1,00

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

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

Frage 4

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(write(A, d, a), d) = d \land a \neq c$ in the theory of arrays $\mathcal{T}_A$ where a, 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 satisfiable, but not valid. ✓
- c. F is unsatisfiable.

Frage 5

Richtig

Erreichte Punkte 1,00 von 1,00

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

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

Frage 6

Richtig

Erreichte Punkte 1,00 von 1,00

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

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

Frage 7

Richtig

Erreichte Punkte 1,00 von 1,00

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

a. $f_B(b) \neq t \land c \neq f(b) \land a = f(b)$

b. $f_B(b) \neq f_A(g(a)) \land c \neq f(b) \land a = f(b)$

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

d. $f(b) \neq f(g(a)) \land c \neq f(b) \land a = f(b)$

Frage 8

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the following formula $F:= f(c) + 3 \neq y+2 \land (g(x+y) \neq read(write(A,x,3), y+1) \lor z+2 = write(A,x,1)) \land read(A, y + 3) \neq f(b+2)$ in the theory of equality $\mathcal{T}_E$, arrays $\mathcal{T}_A$ and linear integer arithmetic $\mathcal{T}_{\mathbb{Z}}$. 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. $p_1 \land (p_2 \lor p_3) \land p_4$

b. $\neg p_1 \land (\neg p_2 \lor p_3) \land \neg p_2$

c. $\neg p_1 \land (\neg p_2 \land p_3) \land \neg p_4$

d. $\neg p_1 \land (\neg p_2 \lor p_3) \land \neg p_4$

Frage 9

Richtig

Erreichte Punkte 1,00 von 1,00

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

$$\begin{align*} \mathcal{F} = \{ ~ &h(g(d)) = b, \\ &b + 1 = a + 1, \\ &write(A, a, b) = d ~ \}\end{align*}$$

Which constant symbols are shared among different theories?

Note: Multiple answers might be correct.

- a
- d
- b

Frage **10**

Richtig

Erreichte Punkte 1,00 von 1,00

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

$$\begin{align*} \mathcal{F} = \{ ~ &f(a + 7) = h(b + 2) + 2, \\ & (a + b \neq h(b) + 2), \\ & read(A, y + 2) \neq x) ~ \}\end{align*}$$

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

- (selected, correct) $c_1 = a + 7,~ c_2 = b + 2,~ c_3 = h(c_2), ~ c_4 = c_3 + 2,~ c_5 = a + b,~ c_6 = h(b), ~ c_7 = c_6 + 2,~ c_8 = y+2$
- $c_1 = a + 7,~ c_2 = b + 2,~ c_3 = h(c_2) + 2,~ c_4 = a + b,~ c_5 = h(b) + 2,~ c_6 = y+2$
- $c_1 = a + 7,~ c_2 = b + 2,~ c_3 = h(b + 2) + 2,~ c_4 = a + b,~ c_5 = h(b) + 2$
- $c_1 = a + 7,~ c_2 = b + 2,~ c_3 = h(b + 2) + 2,~ c_4 = a + b,~ c_5 = h(b) + 2,~ c_6 = y+2$