Status	Beendet
Begonnen	Mittwoch, 4. Juni 2025, 15:43
Abgeschlossen	Mittwoch, 4. Juni 2025, 15:59
Dauer	15 Minuten 58 Sekunden
Bewertung	**9,50** von 10,00 (**95**%)

Frage 1

Richtig

Erreichte Punkte 1,00 von 1,00

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

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

Frage 2

Teilweise richtig

Erreichte Punkte 0,50 von 1,00

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

Note: More than one answer might be correct.

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

Frage 3

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := q(f(a), f(c)) \wedge f(c) \neq a \wedge p(c, f(c)) \wedge b = f(b)$ 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. $f_q(f_p(a), f_q(c)) = t \wedge f_p(c) \neq a \wedge f_p(c, f_q(c)) = t \wedge b = f(b)$
- b. $f_q(f(a), f(c)) \neq t \wedge f(c) \neq a \wedge f_p(c, f(c)) \neq t \wedge b = f(b)$
- c. $f_q(f(a), f(c)) = t \wedge f(c) \neq a \wedge f_p(c, f(c)) = t \wedge b = f(b)$ ✓
- d. $f(c) \neq a \wedge b = f(b)$

Frage 4

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(write(A, d, b), a) = d \wedge d \neq c$ in the theory of arrays $\mathcal{T}_A$ where a, 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 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. $read(write(A, b, c), d) = c \wedge b = c \implies b = a$

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

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

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

Frage 6

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(write(A, c, b), a) = d$ 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. $F \wedge c \neq d \implies read(A, a) = d$

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

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

Frage 7

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(A, a) = read(A, g(b)) \wedge c = f(b) \wedge f(a) = f(c)$ 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. $c = f(b) \wedge f(a) = f(c)$

b. $f_A(a) = f_A(g(b)) \wedge c = f(b) \wedge f(a) = f(c)$ ✓

c. $f_A(a) = t \wedge c = f(b) \wedge f(a) = f(c)$

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

Frage 8

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the following formula
$F := read(write(A, x, 3), y + 1) = read(A, y + 3) \wedge (f(y) = f(c) + 3 \vee a + 1 \neq b + 2) \wedge write(A, y, 1) \neq write(A, x, 1)$ 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. $p_1 \wedge (p_2 \wedge \neg p_3) \wedge \neg p_4$

b. $p_1 \wedge (p_2 \vee p_3) \wedge p_4$

c. $p_1 \wedge (p_2 \vee \neg p_2) \wedge \neg p_4$

d. $p_1 \wedge (p_2 \vee \neg p_3) \wedge \neg p_4$ ✓

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, c, d be constants.

$$\begin{aligned}\mathcal{F} = \{\ & g(c) = a, \\ & a + 1 = d + 1, \\ & write(A, b, a) = c\ \}\end{aligned}$$

Which constant symbols are shared among different theories?

Note: Multiple answers might be correct.

- [x] a ✓
- [x] c ✓
- [ ] b
- [ ] d

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.

$$\begin{aligned}\mathcal{F} = \{\ & g(c + 5) \neq h(b + 6) + 6, \\ & (c + b = h(b) + 6), \\ & write(A, read(A, y + 6), x) \neq x)\ \}\end{aligned}$$

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

a. $c_1 = c + 5,\ c_2 = b + 6,\ c_3 = h(c_2) + 6,\ c_4 = c + b,\ c_5 = h(b) + 6,\ c_6 = y + 6$

b. $c_1 = c + 5,\ c_2 = b + 6,\ c_3 = h(c_2),\ c_4 = c_3 + 6,\ c_5 = c + b,\ c_6 = h(b),\ c_7 = c_6 + 6,\ c_8 = y + 6$ ✓

c. $c_1 = c + 5,\ c_2 = b + 6,\ c_3 = h(b + 6) + 6,\ c_4 = c + b,\ c_5 = h(b) + 6$

d. $c_1 = c + 5,\ c_2 = b + 6,\ c_3 = h(b + 6) + 6,\ c_4 = c + b,\ c_5 = h(b) + 6,\ c_6 = y + 6$