Status	Beendet
Begonnen	Montag, 9. Juni 2025, 17:10
Abgeschlossen	Montag, 9. Juni 2025, 17:21
Dauer	10 Minuten 57 Sekunden
Bewertung	**10,00** von 10,00 (**100**%)

Frage 1

Richtig

Erreichte Punkte 1,00 von 1,00

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

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

Frage 2

Richtig

Erreichte Punkte 1,00 von 1,00

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

Note: More than one answer might be correct.

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

Frage 3

Richtig

Erreichte Punkte 1,00 von 1,00

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

Frage 4

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(write(A, a, d), c) = b \wedge b \neq d$ 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 satisfiable, but not valid. ✓
- b. F is unsatisfiable.
- c. F is valid.

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

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

Frage 7

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the formula $F := read(A, b) \neq read(B, g(a)) \wedge a \neq f(a) \wedge f(a) = f(a)$ 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. $f_A(b) \neq t \wedge a \neq f(a) \wedge f(a) = f(a)$
- b. $a \neq f(a) \wedge f(a) = f(a)$
- c. $f(b) \neq f(g(a)) \wedge a \neq f(a) \wedge f(a) = f(a)$
- d. $f_A(b) \neq f_B(g(a)) \wedge a \neq f(a) \wedge f(a) = f(a)$ ✓

Frage 8

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the following formula
$F := (write(A, y, 1) = f(a) + 1 \vee f(c) + 3 \neq write(read(A, y, 4), x + 2) \vee read(A, x + 3) = write(A, y, 1)) \wedge write(A, x, 1) = f(a) + 1$
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. $(p_1 \vee p_2 \vee p_3) \wedge p_4$
- b. $(p_1 \wedge \neg p_2 \wedge p_3) \wedge p_4$
- c. $(p_1 \vee \neg p_2 \vee p_3) \wedge p_1$
- d. $(p_1 \vee \neg p_2 \vee p_3) \wedge p_4$ ✓

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.

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

Which constant symbols are shared among different theories?

Note: Multiple answers might be correct.

- [x] d ✓
- [x] c ✓
- [ ] b
- [ ] a

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.

$$\mathcal{F} = \{\ g(b+7) = f(c+1) + 1,\\ (b + c \neq f(c) + 1),\\ read(A, y+1) \neq x)\ \}$$

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

- $c_1 = b + 7,\ c_2 = c + 1,\ c_3 = f(c+1) + 1,\ c_4 = b + c,\ c_5 = f(c) + 1$
- $c_1 = b + 7,\ c_2 = c + 1,\ c_3 = f(c_2) + 1,\ c_4 = b + c,\ c_5 = f(c) + 1,\ c_6 = y + 1$
- $c_1 = b + 7,\ c_2 = c + 1,\ c_3 = f(c_2),\ c_4 = c_3 + 1,\ c_5 = b + c,\ c_6 = f(c),\ c_7 = c_6 + 1,\ c_8 = y + 1$ ✓
- $c_1 = b + 7,\ c_2 = c + 1,\ c_3 = f(c+1) + 1,\ c_4 = b + c,\ c_5 = f(c) + 1,\ c_6 = y + 1$