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| **Status** | Beendet |
| **Begonnen** | Dienstag, 10. Juni 2025, 19:04 |
| **Abgeschlossen** | Dienstag, 10. Juni 2025, 19:21 |
| **Dauer** | 17 Minuten 34 Sekunden |
| **Bewertung** | **10,00** von 10,00 (**100**%) |

**Frage 1**

Richtig

Erreichte Punkte 1,00 von 1,00

Consider the ground formula $F := g(b,a) \neq a \wedge c = g(c,a) \wedge c = b$ 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 unsatisfiable.
- c. $F$ is valid.

**Frage 2**

Richtig

Erreichte Punkte 1,00 von 1,00

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

**Note:** More than one answer might be correct.

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

**Frage 3**

Richtig

Erreichte Punkte 1,00 von 1,00

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

**Frage 4**

Richtig

Erreichte Punkte 1,00 von 1,00

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

**Frage 6**

Richtig

Erreichte Punkte 1,00 von 1,00

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

**Frage 7**

Richtig

Erreichte Punkte 1,00 von 1,00

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

**Frage 8**

Richtig

Erreichte Punkte 1,00 von 1,00

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

**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 $b, c, d$ be constants.

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

Which constant symbols are shared among different theories?

**Note:** Multiple answers might be correct.

- $b$ ✓
- $d$ ✓
- $c$ ✓

**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.

$$\mathcal{F} = \{\ h(c+2) \neq g(b+2)+2,\ (c+b = g(b)+2),\ read(A,y+2) \neq x)\ \}$$

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

- $c_1 = c+2,\ c_2 = b+2,\ c_3 = g(b+2)+2,\ c_4 = c+b,\ c_5 = g(b)+2,\ c_6 = y+2$
- $c_1 = c+2,\ c_2 = b+2,\ c_3 = g(c_2)+2,\ c_4 = c+b,\ c_5 = g(b)+2,\ c_6 = y+2$
- $c_1 = c+2,\ c_2 = b+2,\ c_3 = g(b+2)+2,\ c_4 = c+b,\ c_5 = g(b)+2$
- $c_1 = c+2,\ c_2 = b+2,\ c_3 = g(c_2),\ c_4 = c_3+2,\ c_5 = c+b,\ c_6 = g(b),\ c_7 = c_6+2,\ c_8 = y+2$ ✓