CSPB 2824 - Stade - Discrete Structures

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Started on	Thursday, 7 September 2023, 2:40 PM
State	Finished
Completed on	Thursday, 7 September 2023, 2:44 PM
Time taken	4 mins 23 secs
Marks	15.00/15.00
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Consider the Tarski world below. Let the domain be the set of all figures in the image, where they may be referenced by the letter inside the shaded shape. For example, $x = a$ is in the domain, and is the element in the upper-left corner of the Tarski world.

Note that the propositional function *NextTo(...)* refers only to **adjacency** (left/right or above/below) and not to diagonal.

Select the statements that are **true**.

☑
$\neg \exists x \,(\text{Blue}(x) \wedge \text{NextTo}(\text{red}, x))$

☑
$\exists x \,(\text{Triangle}(x) \wedge \text{Gray}(x))$

☑
$\forall x \,(\text{Gray}(x) \rightarrow \text{NextTo}(\text{red}, x))$

☐
$\forall x \,(\text{Blue}(x) \rightarrow \text{Corner}(x))$

☑
$\forall x \,(\text{Vowel}(x) \rightarrow \neg\text{Gray}(x))$

☐
$\forall x \,(\text{Red}(x) \Leftrightarrow \text{NextTo}(\text{gray}, x))$

> **Your answer is correct.**
>
> (Correct)
>
> Marks for this submission: 1.00/1.00.

Question **2**

Correct

Mark 1.00 out of 1.00

Consider the Tarski world below. Also consider the following new elements you might add to the world. Which element should you add to make the following statement **false**?

$$\forall x \, (\text{Gray}(x) \rightarrow \text{NextTo}(\text{red}, x))$$
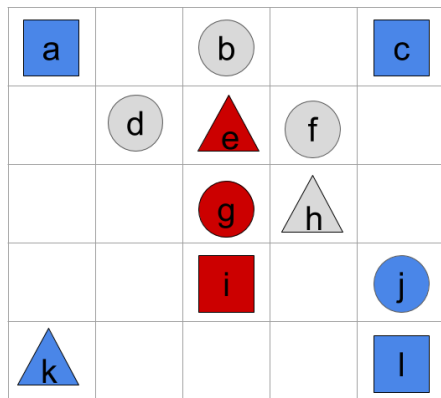
A note in case the colors are difficult to see:
- *a* is in a blue figure
- *b* is in a gray figure
- *e* is in a red figure

Select one:

- a.

- ◉ b.

- c.

- d.

Your answer is correct.

[Correct]

Marks for this submission: 1.00/1.00.

Question **3**

Correct

Mark 1.00 out of 1.00

Note: this question has two parts. Select only one response for each part.

Let $F(x, y, z)$ be the statement "$xy = z$". What are the truth values of the following statements, where the domain of all variables consists of all real numbers?

Part 1. $\forall x \; \forall y \; \exists z \; F(x, y, z)$ | True |

Part 2. $\exists z \forall x \forall y F(x, y, z)$ | False |

> Your answer is correct.
>
> (Correct)
>
> Marks for this submission: 1.00/1.00.

Question **4**

Correct

Mark 2.00 out of 2.00

Given that the domain of each variable consists of all real numbers, determine the truth value of these quantifications. Select only one response for each part.

A. $\forall x \; \exists y \; (x + y = z)$ | This is needs an extra quantifier to be a complete statement |

B. $\exists x \; \forall y \; (x + y = 0)$ | False |

C. $\exists x \; \exists y \; (x + y = 0)$ | True |

D. $\exists x \; \forall y \; (xy = 0)$ | True |

E. $\forall x \; \exists y \; (xy = 0)$ | True |

> Your answer is correct.
>
> (Correct)
>
> Marks for this submission: 2.00/2.00.

Question **5**

Correct

Mark 1.00 out of 1.00

Select the quantifier translation(s) that match the following English statement.

There is no brand of coffee that everyone likes.

Let $L(x, y)$ denote "*person x likes coffee y*".

Select one:

- ⊙ a. ¬(∃ y ∀ x $L(x, y)$)
- ○ b. ∀ y ¬∃ x $L(x, y)$
- ○ c. ∀ x ¬∃ y $L(x, y)$
- ○ d. $\neg(\forall x \exists y L(x,y))$

Your answer is correct.

(Correct)

Marks for this submission: 1.00/1.00.

Question **6**

Correct

Mark 1.00 out of 1.00

Select the quantifier translation that best matches the following English statement.

Some computer scientists like coffee, and some computer scientists like tea, but all people like coffee or tea.

Let $L(x,y)$ denote "x *likes* y", let $C(x)$ denote "x *is a computer scientist*" and suppose the domain for x is all people.

Select one:

- ○ a. $\forall x \left(L(x,\mbox{coffee}) \vee L(x,\mbox{tea}) \right) \wedge \forall x \left[C(x) \wedge \left(L(x,\mbox{coffee}) \vee L(x,\mbox{tea}) \right) \right]$
- ○ b. $\neg \exists x \neg \left(L(x,\mbox{coffee}) \vee L(x,\mbox{tea}) \right) \wedge \neg \forall x \left(C(x) \wedge L(x,\mbox{coffee}) \wedge L(x,\mbox{tea}) \right)$
- ○ c. $\forall x \left(L(x,\mbox{coffee}) \vee L(x,\mbox{tea}) \right) \wedge \exists x \left[C(x) \Leftrightarrow \left(L(x,\mbox{coffee}) \vee L(x,\mbox{tea}) \right) \right]$
- ⊙ d. $\neg \exists x \neg \left(L(x,\mbox{coffee}) \vee L(x,\mbox{tea}) \right) \wedge \exists x \left(C(x) \wedge L(x,\mbox{coffee}) \right) \wedge \exists x \left(C(x) \wedge L(x,\mbox{tea}) \right)$

Your answer is correct.

(Correct)

Marks for this submission: 1.00/1.00.

Question **7**

Correct

Mark 1.00 out of 1.00

Select the English translation that best matches the following quantifier statement.

$(\forall x\ \exists y\ L(x,y))$

Let $L(x,y)$ denote "x likes y", and let the domain for x be all people and the domain for y be all things.

Select one:

- ○ a. Not everyone likes everything.
- ○ b. Someone likes everything.
- ○ c. There is something everyone likes.
- ⊙ d. Everyone likes something.

> Your answer is correct.
>
> [Correct]
> Marks for this submission: 1.00/1.00.

Question **8**

Correct

Mark 1.00 out of 1.00

Select the English translation that best matches the following quantifier statement.

$(\neg (\forall y\ \forall x\ L(x,y)))$

Let $L(x,y)$ denote "*person x likes person y*".

Select one:

- ○ a. There are people who everyone like.
- ○ b. There's somebody that nobody likes.
- ○ c. Not everyone likes someone.
- ⊙ d. There is someone that not everyone likes.

> Your answer is correct.
>
> [Correct]
> Marks for this submission: 1.00/1.00.

Question **9**

Correct

Mark 2.00 out of 2.00

What rule(s) of inference is/are used in the following argument? (You may select multiple answers.) *Note: do not apply intermediate logical equivalences.*

"If I crash my bike, then I am sore the next day." (**premise**)

"I either am a happy camper or I crash my bike." (**premise**)

"I am not sore." (**premise**)

"I did not crash my bike."

"Therefore, I am a happy camper."

Select one or more:

☑ a. Disjunctive syllogism

☐ b. Resolution

☑ c. Modus tollens

☐ d. Modus ponens

☐ e. Hypothetical syllogism

Your answer is correct.

(Correct)

Marks for this submission: 2.00/2.00.

Question **10**

Correct

Mark 2.00 out of 2.00

Given the following premises, which conclusion(s), if any, may be logically drawn? (You may choose multiple answers.)

"If it rains or snows, then I will drive to work."

"It did not rain nor snow on Tuesday."

Select one:

○ a. "I drove to work on Tuesday."

○ b. "I did not drive to work on Tuesday."

◉ c. None of the above conclusions may be drawn.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **11**

Correct

Mark 2.00 out of 2.00

Given the following premises, which conclusion(s), if any, may be logically drawn?

"Chris has strange dreams if he eats too much pizza."

"Chris eats too much pizza only if he has a neat day."

"Chris did not have strange dreams."

Select one or more:

☐ a. "Chris had a neat day."

☐ b. "Chris did not have a neat day."

☐ c. "Chris ate too much pizza."

☑ d. "Chris did not eat too much pizza."

☐ e. None of the above conclusions may be drawn.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.