Score for this attempt: **19** out of 20
Submitted Mar 15 at 10:20am
This attempt took 75 minutes.

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Question 1

1 / 1 pts

Is the following statement true or false?

Propositional logic cannot deal with modifiers like "there exists," "all," and "only," while First-Order Logic can.

Correct!

- (•) True
- ( ) False

Question 2

1 / 1 pts

Consider the following formula, in which the occurrences of variables are numbered from 1 to 6 for reference:

$$\exists x(P(x,y) \rightarrow \forall y P(y,x))$$

$$\quad 1 \quad 2 \; 3 \quad\quad 4 \quad 5 \; 6$$

Question 2

1 / 1 pts

Consider the following formula, in which the occurrences of variables are numbered from 1 to 6 for reference:

$$\exists x(P(x,y) \rightarrow \forall y P(y,x))$$

1 2 3 4 5 6

Which occurrence of variables denotes a free occurrence of a variable in this formula?

Correct!

- (●) 3
- ( ) 2
- ( ) 5
- ( ) 6

6

Question 3

1 / 1 pts

Is the following statement true or false?

Consider 2 sets: A={1,2} and B={a,b,c}. There are 0 onto-functions from A to B.

Correct!

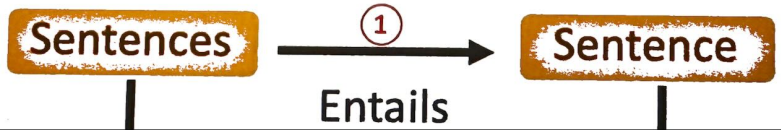
- (•) True
- ( ) False

Question 4

1 / 1 pts

Consider the graph below, noting that each arrow is labeled with a number in red.

Which arrow denotes the step in which we write a clingo program to represent the Sudoku problem?



Question 4

1 / 1 pts

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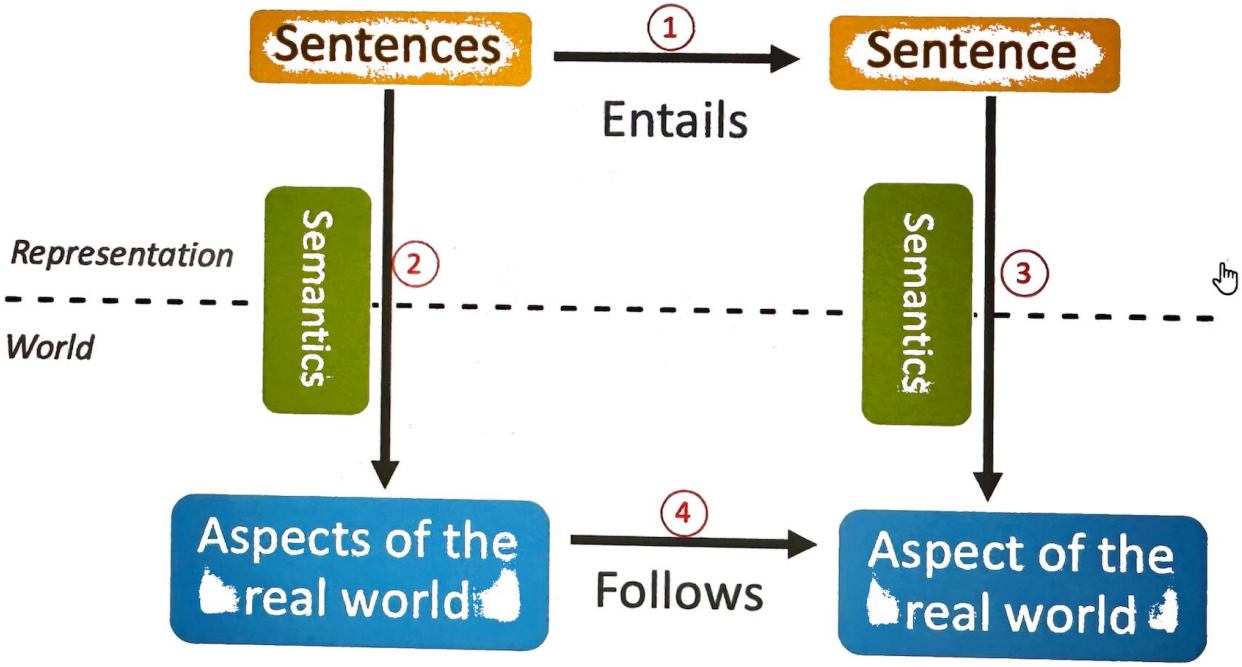

Correct!

- (●) 2
- ( ) 3
- ( ) 1

1

4

Question 5

1 / 1 pts

Let $\Gamma = \{p \vee q,\ q\}$ be a set of formulas where p and q are atoms. Which of the following formulas does Γ entail?

$p \wedge q$

Correct!

$p \longrightarrow q$

p

$q \longrightarrow p$

Question 6

0 / 1 pts

How many stable model have the following program:

{p(X): X=3..5}.

p

$q \longrightarrow p$

Question 6

0 / 1 pts

How many stable model have the following program:

{p(X): X=3..5}.

:- p(3).

:- not p(5).

You Answered

- (●) 4

Correct Answer

- ( ) 2
- ( ) 5
- ( ) 3

Question 7

Original Score: 1 / 1 pts Regraded Score: 1 / 1 pts

ⓘ This question has been regraded.

Question 7

Original Score: 1 / 1 pts Regraded Score: 1 / 1 pts

This question has been regraded.

Recall the definition of propositional formula, provided below.

A propositional formula of signature σ is defined recursively as follows:

- every atomic formula of σ is a formula

- both 0-place connectives $\top, \bot$ are formulas

- if F is a formula, then $\neg F$ is a formula

- For any binary connective $\odot$, if F and G are formulas then $(F \odot G)$ is a formula

-if F is a formula then $\forall x$ F and $\exists x$ F are formulas

Which of the options listed below is a propositional formula strictly according to the above definition? (Select all that apply.)

Let $\sigma = \{a, P, Q\}$, where a is an object constant, P is a unary and Q, S are binary predicate constant. x,y,z are general variables.

- $p \leftarrow \bot$

You Answered

- q

It is not in signature.

Correct Answer

- p

Question 8

1 / 1 pts

What is the correct translation of the following statement into mathematical logic?

"Some integers are negative".

- ∃x (integer(x) v negative(x))
- ∀x (integer(x) →negative(x))

Correct!

- ∃x (integer(x) ∧ negative(x))
- ∃x (integer(x) → negative(x))

Question 9

1 / 1 pts

Which option is the value of the following aggregate?

#sum{M*N,M,N : M=1..3, N=1..3}

- 25

$\exists x$ (integer(x) → negative(x))

Question 9

1 / 1 pts

Which option is the value of the following aggregate?

#sum{M*N,M,N : M=1..3, N=1..3}

- 25
- 6
- 9

Correct!

- (●) 36

Question 10

1 / 1 pts

Which answer option is equivalent to the following Clingo program?

p(X**Y, X*|Y*X|) :- X=-2 . . 0, Y= -5 . . -2, X<=Y.

Correct!

- (●) p(0, -8)
- p(0, 8)

Question 11

1 / 1 pts

Which of the formulas listed below has a model but not a Herbrand model? (Select all that apply.)

- $P(a) \wedge \neg P(a)$
- $\neg P(a) \rightarrow P(a)$
- Correct! ☑ $a=b$
- Correct! ☑ $P(a) \wedge P(b) \wedge (\forall x\, P(x) \rightarrow x=c)$

Question 12

1 / 1 pts

Which statement listed below correctly describes the stable models of the following propositional rule?

$r \leftarrow \neg r$

- Correct! ◉ It has no stable model.
- ○ Its stable model is ∅.
- ○ Its stable models are ∅ and {p}.
- Its stable model is {p}.

Question 13

1 / 1 pts

Is the following statement true or false?

If a propositional program contains a rule of form $F \leftarrow \bot$ then removing that rule doesn't change its stable models.

Correct!

- (●) True
- ( ) False

Question 14

1 / 1 pts

Which option listed below shows all of (and only) the local variables in the following clingo program?

```
{q(I,J): J=1..2} :- I = 1..3.
```

- ( ) Both I and J

Correct!

- (●) J
- ( ) I
- ( ) Neither I nor J

Question 15

1 / 1 pts

What is the value of the following aggregate when n = 6?

#count{X*Y:X=2..n, Y=2..n, X*Y <=n}

- 3
- 16
- 25

Correct!

- 2

By placing n = 6 into the rule, we can get #count{X*Y:X=2..6, Y=2..6, X*Y <=6}. The potential value of X could be the integer in the interval of 2 to 6, and the same for Y, however, not all of the them are the correct values because of the condition X*Y <=6.

Enumerate the value of X and Y to satisfy the condition and we can get (X, Y) to be (2,2), (2, 3), (3, 2). However, the value of X*Y when (X, Y) is (3, 2) is equal to (2,3), so we only need to count one of them, and so we get the return value to be 2.

Question 16

1 / 1 pts

Assuming the signature consists of p, q, r. Which of the options are **models** of the following program?

$p \leftarrow q \wedge r$

Question 16

1 / 1 pts

Assuming the signature consists of p, q, r. Which of the options are **models** of the following program?

$p \leftarrow q \wedge r$

$q \leftarrow p$

$r \leftarrow p$

Choose all that apply.

Correct! ☑ {p, q, r}

Correct! ☑ {q}

☐ {p, q}

Correct! ☑ {r}

☐ {p}

☐ {q, r}

Correct! ☑ ø (empty set)

Question 17

1 / 1 pts

Correct!

- [x] ∅ (empty set)

Question 17

1 / 1 pts

Which option is equivalent to the following clingo program?

p(1,1). p(1,2). p(2,1). p(2,2).

- p(1;2, 1;2).
- p(X, X**|X-Y|) :- X=1..2, Y=2..3.
- p(X,Y) :- X=1..2, Y=1..X.

Correct!

- (•) p(1..2, 1..2).

Question 18

1 / 1 pts

Find the reduct of (the propositional image of) the following clingo program relative to the interpretation {q(a)}.

{p(a)}.

q(X) :- p(X).

⊥ ∨ ⊤

Question 18

1 / 1 pts

Find the reduct of (the propositional image of) the following clingo program relative to the interpretation {q(a)}.

{p(a)}.

q(X) :- p(X).

- $\bot \vee \top$
  $q(a) \leftarrow \bot$
- $p(a) \vee \top$
  $q(a) \leftarrow \bot$
- $p(a) \vee \neg p(a)$
  $q(a) \leftarrow p(a)$

Correct!

- $p(a) \vee \top$
  $q(a) \leftarrow p(a)$

Question 19

1 / 1 pts

Question 19

1 / 1 pts

The following clingo program represents what will happen when we roll a dice. However, not all stable models (e.g., {roll_dice, get(1), get(2)}) of this program represent solutions of rolling a dice. Choose the option such that: adding the option to the clingo program can weed out the elements of the search space that do not represent solutions.

```
roll_dice.

{get(N): N=1..6} :- roll_dice.
```

- ○ `:- roll_dice, get(1), get(2).`

Correct!

- `:- get(N1), get(N2), N1 != N2.`
- ◉ `:- not get(1), not get(2), not get(3), not get(4), not get(5), not get(6).`
- ○ `:- get(N1), get(N2), N1 != N2.`
- ○ `:- 1{get(N): N=1..6}1.`

Question 20

1 / 1 pts

:- not get(1), not get(2), not get(3), not get(4), not get(5), not get(6).

:- get(N1), get(N2), N1 != N2.

:- 1{get(N): N=1..6}1.

Question 20

1 / 1 pts

In Hamiltonian Cycle problem, we use "edge(X,Y)" to represent that "there is a directed edge from X to Y", and use "in(X,Y)" to represent that "edge from X to Y is in the Hamiltonian cycle". Then which option is represented by the following clingo rule?

1{in(X,Y): edge(X,Y)}1 :- node(Y).

Every node is reachable.

For each node Y, we choose exactly 1 edge of it to be in the Hamiltonian cycle.

Every node in the graph has exactly 1 outgoing edge.

Correct!

Every node in the graph has exactly 1 incoming edge.

Quiz Score: **19** out of 20