DQ8 (L8)

Due 19 Mar at 23:59 **Points** 20 **Questions** 9
Available after 13 Mar at 12:00 **Time limit** None
Allowed attempts Unlimited

Instructions

- This quiz is NOT GRADED. However, it is HIGHLY RECOMMENDED that you use these questions to complement your review of the lecture content.
- The questions are based on content from the Lecture 8 and from part of Chapter 7 of the AIMA (4th Ed.) textbook (i.e., 7.1-7.4).

Take the quiz again

Attempt history

	Attempt	Time	Score
KEPT	Attempt 2	1 minute	20 out of 20
LATEST	Attempt 2	1 minute	20 out of 20
	Attempt 1	10 minutes	17 out of 20

Submitted 13 Mar at 12:12

Question 1

1 / 1 pts

Which of the following statements regarding the Knowledge Base and the Inference Engine within a Logical Agent are true?

- [ ] Inference Engine refers to **domain-independent** algorithms.
- [ ] Inference Engine refers to **domain-specific** content.
- [x] Knowledge Base refers to **domain-independent** algorithms. Correct!
- [ ] Knowledge Base refers to **domain-specific** content.

Logical agents comprise:

- Inference engine - domain-independent algorithms
- Knowledge base - domain-specific content

Question 2

1 / 1 pts

What is the correct sequence of execution for a knowledge based agent?

1. Construction of logical expressions pertaining to **action executed**
2. Insertion of these logical expression into the knowledge base
3. Construction of logical expressions pertaining to **current percepts**
4. Insertion of these logical expressions into the knowledge base
5. Make **inferences** on the knowledge base to determine **action to be taken**

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1. Make **inferences** on the knowledge base to determine **action to be taken**
2. Construction of logical expressions pertaining to **action executed**
3. Insertion of these logical expression into the knowledge base
4. Construction of logical expressions pertaining to **current percepts**
5. Insertion of these logical expressions into the knowledge base

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Correct!

1. Construction of logical expressions pertaining to **current percepts**
2. Insertion of these logical expressions into the knowledge base
3. Make **inferences** on the knowledge base to determine **action to be taken**
4. Construction of logical expressions pertaining to **action executed**
5. Insertion of these logical expression into the knowledge base

1. Construction of logical expressions pertaining to **action executed**
2. Insertion of these logical expressions into the knowledge base
3. Make **inferences** on the knowledge base to determine **action to be taken**
4. Construction of logical expressions pertaining to **current percepts**
5. Insertion of these logical expressions into the knowledge base

None of the above.

TELL(KB, MAKE-PERCEPT-SENTENCE(action, t))
- Construction of logical expressions pertaining to current percepts
- Insertion of these logical expressions into the knowledge base

ASK(KB, MAKE-ACTION-QUERY(t))
- Grow the KB by making inferences that would enable the agent to determine what action may be taken

TELL(KB, MAKE-ACTION-SENTENCE(percept, t))
- Construction of logical expression pertaining to what action was executed
- Insertion of this logical expression into knowledge base

Question 3

2 / 2 pts

Determine if the following statement is true or false.

Semantics define the truth of each sentence with respect to each possible world.

Correct!

True

False

Semantics do indeed define the truth of each sentence with respect to each possible world.

For example, the ***semantics for arithmetic*** specifies that the sentence “x + y = 4” is true in a world where x is 2 and y is 2, but false in a world where x is 1 and y is 1. In standard logics, every sentence must be either true or false in each possible world—there is no “in between.”

Question 4

2 / 2 pts

Let x and y be non-negative integers. How many possible models are there that satisfy the sentence x + y = 4?

- 0
- 1
- 2
- 3
- 4
- Correct! 5
- 6
- 7
- 8
- 9
- 10

There are 5 models.

x = 0, y = 4;

x = 1, y = 3;

x = 2, y = 2;

x = 3, y = 1;

x = 4, y = 0

Question 5

2 / 2 pts

Which of the following statements regarding the soundness and completeness of an inference algorithm A is correct?

- Sound: If a sentence α is inferred from the KB by the inference algorithm A, then α must be entailed by KB
- Complete: If KB ⊨ α, then α must be inferred from KB by the inference algorithm A
- Correct! All of the above
- None of the above

As defined in the answer.

Question 6

3 / 3 pts

Which of the following statements regarding entailment is true?

Correct!

- [x] $\alpha \vDash \beta$ if and only if, in every model in which α is true, β is also true.
- [ ] $\alpha \vDash \beta$ if and only if, in every model in which β is true, α is also true.
- [ ] $\alpha \vDash \beta$ if and only if $M(\beta) \subseteq M(\alpha)$

Correct!

- [x] $\alpha \vDash \beta$ if and only if $M(\alpha) \subseteq M(\beta)$

Correct!

- [x] If $\alpha \vDash \beta$, then α is a **stronger assertion** than β
- [ ] If $\alpha \vDash \beta$, then β is a **stronger assertion** than α

- $\alpha \vDash \beta$ if and only if $M(\alpha) \subseteq M(\beta)$
  - That is, every model that satisfies α also satisfies β
  - Note that this also implies that there may be come models that satisfy β but not satisfy α
- Stronger assertions are generally more constraining. Consequently, since $(\alpha \vDash \beta) \Leftrightarrow (M(\alpha) \subseteq M(\beta))$, there are fewer models of α, and thus, it is more constraining; α is the stronger assertion.

Question 7

2 / 2 pts

A sentence α is inferred from the truth table enumeration inference algorithm if it is true in some models.

- ( ) True

Correct!

False

To be inferred, a sentence α must be true for **all models where the KB is true**, and not just "some models".

Question 8

3 / 3 pts

PIck all options that are true about the **truth table enumeration** algorithm.

Correct!

- [x] It has $O(2^n)$ time complexity and $O(n)$ space complexity
- [ ] It has $O(2^n)$ time complexity and $O(2^n)$ space complexity
- [ ] It is not sound

Correct!

- [x] It is sound
- [ ] It is not complete

Correct!

- [x] It is complete

- Checks all 2^n truth assignments to verify KB entails α
- $O(2^n)$ time complexity and $O(n)$ space complexity
- Is sound and complete

Question 9

4 / 4 pts

Given a KB with the following 4 statements:

- R_1: A
- R_2: C
- R_3: $A \wedge B$
- R_4: $B \vee \neg C$

And a query, α: ¬B

Fill in the following blanks to describe the application of the truth table enumeration algorithm over this context.

1. The number of variables considered in the truth table governing this KB is [3] .
2. Thus, the total number of possible worlds to consider is [8]
3. The size of the set of models for the KB, |M(KB)|, is [1] .
4. The size of the set of models for α, |M(α)|, is [4] .
5. The size of M(KB) \ M(α), |M(KB) \ M(α)|, is [1] .
6. The size of M(α) \ M(KB), |M(α) \ M(KB)|, is [4] .
7. Therefore, M(KB) ⊆ M(α) is [F] (T/F).
8. Finally, we know that KB ⊨ α is [F] (T/F).

Answer 1:

Correct!

3

Answer 2:

Correct!

8

Answer 3:

Correct!

1

Answer 4:

Correct!

4

Answer 5:

Correct!

1

Answer 6:

Correct!

4

Answer 7:

Correct!

F

orrect answer

False

orrect answer

false

orrect answer

f

Answer 8:

Correct!

F

orrect answer

False

orrect answer

false

orrect answer

f

Notice that within all the sentences in the KB and α, there are only 3 Boolean variables specified: A, B, and C.

The 2^3 possible *value assignments* then correspond to our set of possible worlds.

A	B	C	R_1	R_2	R_3	R_4	KB	α
0	0	0	0	0	0	1	0	1
0	0	1	0	1	0	0	0	1
0	1	0	0	0	0	1	0	0
0	1	1	0	1	0	1	0	0
1	0	0	1	0	0	1	0	1
1	0	1	1	1	0	0	0	1
1	1	0	1	0	1	1	0	0
1	1	1	1	1	1	1	1	0

Given each possible world, we then have a ***truth assignment*** for each depending on the rule in question, R_i.

That is, given the ***value assignments*** in a particular row, the ***truth assignment*** for R_i on that row is given by the evaluation of R_i using the ***value assignments***.

The truth assignment for the KB is equivalent to the conjunction over all the rules in the KB.

Notice that $|M(KB)| = 1$

The truth assignments for α are evaluated in the same manner as for each R_i.
Notice that $|M(\alpha)| = 4$. Also, since there is no intersection, we have $|M(\alpha)\backslash M(KB)| = 4$ and $|M(KB)\backslash M(\alpha)| = 1$.
Since, $M(KB) \nsubseteq M(\alpha)$, we can conclude that $KB \nvDash \alpha$.