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Contributors

User	🖒, Answers	User	?Added	User	
GO Classes for GATE CSE	45, 10	GO Classes for GATE CSE	15	Lakshman Patel	7
Akash Debnath	25, 5			Akash Debnath	2

First Order Logic (13) tops



1.1.1 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 1 top

Consider the following predicates:

- $\operatorname{bird}(x) : x$ is a bird.
- penguin(x): x is a penguin.
- fly(x): x can fly.

Consider the following sentence:

All birds except penguins' fly. (Note that Penguins may or may not fly)

Which of the following is/are a formula in first-order logic expressing the given fact?

- A. $\forall x. \left[(\operatorname{bird}(x) \land \neg \operatorname{penguin}(x)) \to \operatorname{fly}(x) \right]$
- B. $\forall x. [\neg \operatorname{bird}(x) \vee \neg \operatorname{penguin}(x) \vee \operatorname{fly}(x)]$
- C. $\forall x. [\neg \text{ bird } (x) \lor \text{ penguin } (x) \lor \text{ fly } (x)]$
- D. $\forall x. [\operatorname{bird}(x) \vee \operatorname{penguin}(x) \vee \operatorname{fly}(x)]$

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Answer key

1.1.2 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 10եօր



Which of the following formulas is a formalization of the sentence: "All babies are illogical"

- A. $\forall x (baby(x) \land illogical(x))$
- B. $\forall x (baby(x) \rightarrow illogical(x))$
- C. $\neg \exists x (baby(x) \land \neg illogical(x))$
- D. $\exists x (baby(x) \land \neg illogical(x))$

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Answer key

1.1.3 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 11top:



Consider the following predicates:

- sqroot((x):x has a square root.
- negative (x): x is negative.

Which of the following formulas is a formalization of the sentence, if the domain is set of all numbers:

"Every number is either negative or has a square root but not both"

- A. $\forall x \neg (\text{ negative } (x) \leftrightarrow \text{sqroot}(x))$
- B. $\neg \exists x ((negative (x) \leftrightarrow sqroot (x)))$
- C. $\forall x ((\text{negative}(x) \land \neg sqroot(x)) \lor (\neg \text{negative}(x) \land sqroot(x)))$
- D. $\forall x (\text{negative}(x) \lor \text{sqroot}(x))$

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Answer key

1.1.4 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 12top

Consider the following predicates:

- Real(x):x is a real number.
- Integer(x): x is an integer.

Which of the following formulas is a formalization of the sentence, if the domain is set of all integers. "Some integers



are not real numbers."

- A. $\exists x \neg Real(x)$
- B. $\neg \forall x \operatorname{Real}(x)$
- C. $\exists x (Integer(x) \land \neg Real(x))$
- D. $\exists x (Integer(x) \rightarrow \neg Real(x))$

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Answer key √

1.1.5 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 13top:

Which of the following formulas is a formalization of the sentence :

Not all that glitters is gold

- A. $\forall x [glitter(x) \rightarrow gold(x)]$
- B. $\neg \exists x [glitter(x) \land gold(x)]$
- C. $\neg \forall x (glitter(x) \rightarrow gold(x))$
- D. $\exists x (glitter(x) \land \neg gold(x))$

goclasses2024_wq9 goclasses mathematical-logic first-order-logic multiple-selects 2-marks

Answer key √

1.1.6 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 14եօգ

Let P(x), Q(x), R(x) and S(x) denote the following predicates with domain \mathbb{Z} :



$$Q(x): x^2 = 1,$$

$$R(x): x \text{ is odd},$$

$$S(x): x = x + 1.$$

Which of the following statements is/are true?

- A. $orall x \in \mathbb{Z}, \quad R(x) o S(x)$
- B. $\forall x \in \mathbb{Z}, \quad S(x) \to R(x)$
- C. $\exists x \in \mathbb{Z} \text{ such that } Q(x) \land \sim R(x)$
- D. $\exists x \in \mathbb{Z} \text{ such that } P(x) \to S(x)$

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1.1.7 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 15top

For a given predicate P(x), you might believe that the statements $\forall x P(x)$ or $\exists x P(x)$ are either true or false. $\exists x (\neg P(x))$ is false if and only if



- A. $\exists x(P(x))$ is true.
- B. $\forall x(P(x))$ is true.
- C. $\forall x(\neg P(x))$ is true.
- D. $\forall x(\neg P(x))$ is false.

goclasses2024_wq9 goclasses mathematical-logic first-order-logic 2-marks

Answer key

1.1.8 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 2եօթե

Consider the following English sentence:

"Agra and Gwalior are both in India".



A student has written a logical sentence for the above English sentence in First-Order Logic using predicate N(x, y), which means x is in y, as follows.

 $In(Agra, India) \vee In(Gwalior, India)$

Which one of the following is correct with respect to the above logical sentence?

- A. It is syntactically valid but does not express the meaning of the English sentence
- B. It is syntactically valid and expresses the meaning of the English sentence also
- C. It is syntactically invalid but expresses the meaning of the English sentence
- D. It is syntactically invalid and does not express the meaning of the English sentence

goclasses2024_wq9 goclasses mathematical-logic first-order-logic 1-mark

Answer key

1.1.9 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 5եթբ

Consider the following predicates.

- Rabbit(x) = x is a rabbit.
- Cute(x) = x is cute.

Consider the following statement E, where the domain of every variable is set of all animals in a jungleJ.

$$\mathrm{E} = \forall x (\mathrm{Rabbit}(x) \wedge \mathrm{Cute}(x))$$

If statement E is true, then which of the following is true?

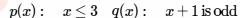
- A. There is no animal other than rabbits in the jungle J.
- B. Every rabbit is cute in jungle J.
- C. It is possible that there is some animal in J who is not a rabbit but is cute.
- D. There is some rabbit who is cute in jungle J.

goclasses2024_wq9 goclasses mathematical-logic first-order-logic multiple-selects 1-mark

Answer key√

1.1.10 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 6տթ

Let p(x), q(x) denote the following open statements.



Let r(x) be the open statement "x > 0."

The universe comprises all integers.

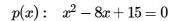
Determine the number of values of x for which $[p(x) \land q(x)] \land r(x)$ results in a true statement.

goclasses2024_wq9 numerical-answers goclasses mathematical-logic first-order-logic 1-mark

Answer key⊌

1.1.11 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 7top

Let p(x), q(x), and r(x) denote the following open statements.

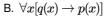


q(x): x is odd

 $r(x): \quad x>0$

For the universe of all integers, which of the following statements is/are false?

A. $\forall x[p(x) \rightarrow q(x)]$







1.1.12 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 8եօր

Let p(x), q(x), and r(x) denote the following open statements.

$$p(x): x^2 - 8x + 15 = 0$$

$$q(x)$$
: x is odd

$$r(x): \quad x>0$$

For the universe of all integers, which of the following statements is/are true?

A.
$$\exists x[r(x) \rightarrow p(x)]$$

B.
$$\forall x [\neg q(x) \rightarrow \neg p(x)]$$

C.
$$\exists x [p(x) \rightarrow (q(x) \land r(x))]$$

D.
$$\forall x[(p(x) \lor q(x)) \rightarrow r(x)]$$

goclasses2024_wq9 goclasses mathematical-logic first-order-logic multiple-selects 2-mark

Answer key

1.1.13 First Order Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 9top



Which of the following formulas is a formalization of the sentence "No dogs are intelligent"

- A. $\forall x (dog(x) \land \neg Intelligent(x))$
- B. $\forall x (Intelligent(x) \rightarrow \neg dog(x))$
- C. $\forall x (dog(x) \rightarrow \neg Intelligent(x))$
- D. $\neg \exists x (dog(x) \land Intelligent(x))$

goclasses2024_wq9 goclasses mathematical-logic first-order-logic multiple-selects 2-marks

Answer key⊌

1.2

1.3

Fuzzy Set (1) top

1.2.1 Fuzzy Set: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 4top



One approach to handling fuzzy logic data might be to design a computer using ternary (base-3) logic so that data could be stored as "true," "false," and "unknown." If each ternary logic element is called a flit, minimum how many flits are required to represent at least 256 different values?

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Answer key

Propositional Logic (1) top.

1.3.1 Propositional Logic: GO Classes 2024 | Weekly Quiz 9 | First Order Logic | Question: 3top:



A binary operator is defined as follows

$$P \mathop{\updownarrow} Q = \sim P \wedge Q$$

Which of the following statement is equivalent to P o Q

A.
$$\sim P \oplus Q$$

B.
$$\sim (P \uparrow Q)$$

C.
$$\sim$$
 (\sim $P \updownarrow Q$)

D.
$$\sim$$
 ($\sim P \updownarrow \sim Q$

goclasses2024_wq9 goclasses mathematical-logic propositional-logic 1-mark

Answer Keys

1.1.1	A;C
1.1.6	B;D

1.1.2	B;C
1.1.7	В

1.1.3	A;B;C
1.1.8	Α

1.1.4	A;B;C;D
1.1.9	A;B;D

1.1.5	C;D
1.1.10	1

1.1.11 B 1.1.12 A;B;C 1.1.13 B;C;D 1.2.1 6 1.3.1 D