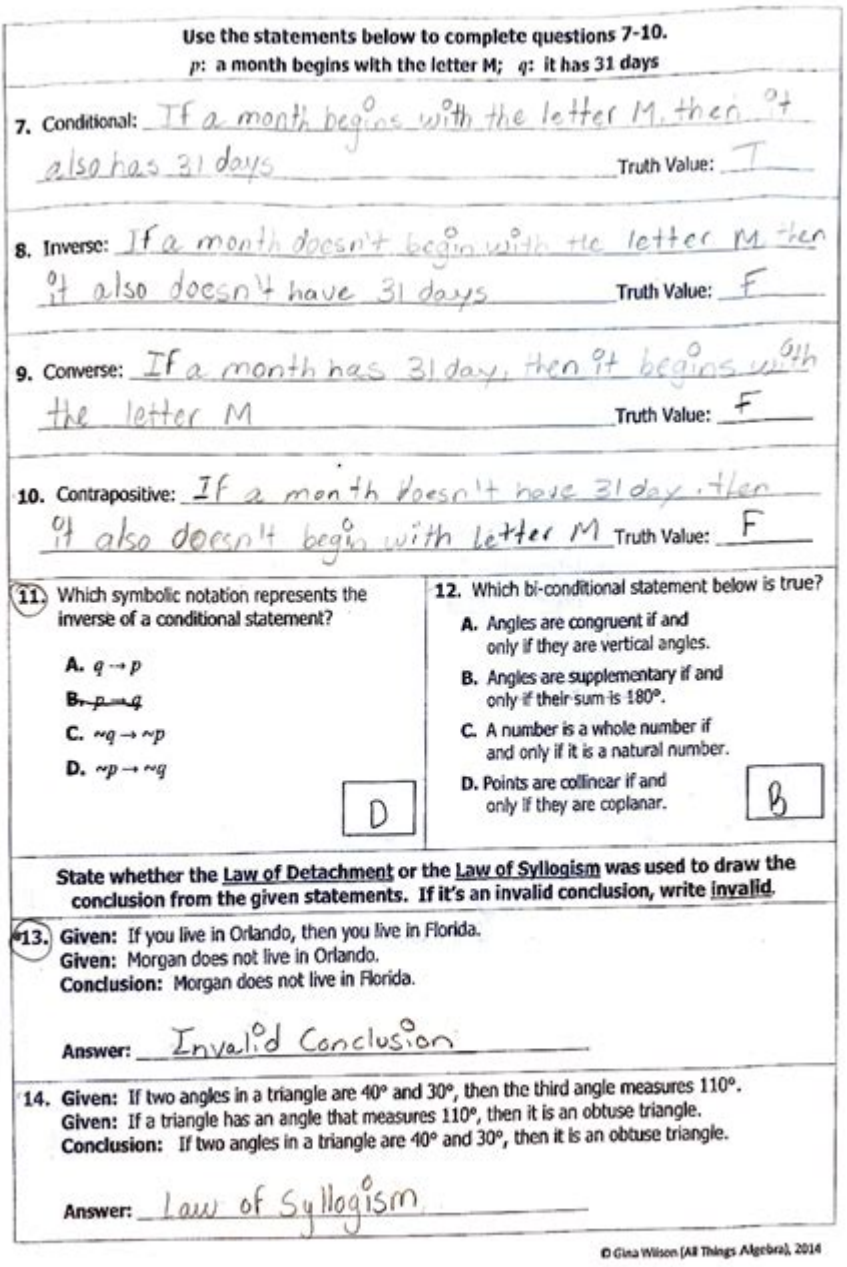
Unit 2 Logic And Proof



Use the statements below to complete questions 7-10.
p: a month begins with the letter M; *q*: it has 31 days

7. Conditional: If a month begins with the letter M, then it also has 31 days. Truth Value: T

8. Inverse: If a month doesn't begin with the letter M then it also doesn't have 31 days. Truth Value: F

9. Converse: If a month has 31 days, then it begins with the letter M. Truth Value: F

10. Contrapositive: If a month doesn't have 31 days, then it also doesn't begin with letter M. Truth Value: F

11. Which symbolic notation represents the inverse of a conditional statement?
A. $q \rightarrow p$
B. ~~$p \rightarrow q$~~
C. $\sim q \rightarrow \sim p$
D. $\sim p \rightarrow \sim q$
D

12. Which bi-conditional statement below is true?
A. Angles are congruent if and only if they are vertical angles.
B. Angles are supplementary if and only if their sum is 180°.
C. A number is a whole number if and only if it is a natural number.
D. Points are collinear if and only if they are coplanar.
B

State whether the Law of Detachment or the Law of Syllogism was used to draw the conclusion from the given statements. If it's an invalid conclusion, write invalid.

13. Given: If you live in Orlando, then you live in Florida.
Given: Morgan does not live in Orlando.
Conclusion: Morgan does not live in Florida.
Answer: Invalid Conclusion

14. Given: If two angles in a triangle are 40° and 30°, then the third angle measures 110°.
Given: If a triangle has an angle that measures 110°, then it is an obtuse triangle.
Conclusion: If two angles in a triangle are 40° and 30°, then it is an obtuse triangle.
Answer: Law of Syllogism

Unit 2: Logic and Proof: Mastering Deductive Reasoning and Mathematical Arguments

Unlocking the power of logical reasoning and rigorous proof is a cornerstone of mathematical understanding. This comprehensive guide dives deep into the intricacies of "Unit 2: Logic and Proof," equipping you with the tools and strategies to conquer this crucial area of mathematics. We'll explore fundamental concepts, dissect complex problems, and provide actionable tips to boost your

understanding and improve your problem-solving skills. Whether you're a high school student tackling geometry proofs or a university student grappling with abstract algebra, this post will serve as your comprehensive resource.

Understanding the Fundamentals of Logic (H2)

Before delving into proofs, a solid grasp of fundamental logic is essential. This section lays the groundwork for your success in "Unit 2: Logic and Proof."

Statements and their Truth Values (H3)

Mathematical logic revolves around statements – declarative sentences that are either true or false. It's crucial to distinguish between statements and non-statements (like questions or commands). Understanding truth values allows us to analyze the relationships between different statements.

Logical Connectives (H3)

Logical connectives, such as "and," "or," "not," "implies," and "if and only if," allow us to combine and modify statements to create more complex logical expressions. Mastering these connectives is paramount for constructing and interpreting proofs. Understanding their truth tables is key to recognizing valid arguments.

Truth Tables and Logical Equivalence (H3)

Truth tables provide a systematic way to evaluate the truth value of complex logical expressions for all possible combinations of truth values of their component statements. They are invaluable for determining logical equivalence – whether two different statements always have the same truth value.

Methods of Proof (H2)

This section explores the various techniques used to construct rigorous mathematical proofs within the context of "Unit 2: Logic and Proof."

Direct Proof (H3)

A direct proof starts with the given premises and, through a series of logical steps, directly arrives at the conclusion. This is often the most straightforward approach, but it requires careful structuring and a clear understanding of logical implications.

Indirect Proof (Proof by Contradiction) (H3)

In an indirect proof, you assume the negation of the conclusion and demonstrate that this assumption leads to a contradiction. Since a contradiction is impossible in a consistent logical system, the original conclusion must be true. This technique is particularly useful when a direct

proof is difficult or impossible to construct.

Proof by Cases (H3)

When dealing with a statement that can be broken down into several distinct cases, a proof by cases involves proving the statement separately for each case. This ensures comprehensive coverage and avoids overlooking potential exceptions.

Proof by Induction (H3)

Mathematical induction is a powerful technique used to prove statements about integers. It involves proving a base case and then demonstrating that if the statement is true for a particular integer, it's also true for the next integer. This recursive approach allows you to prove the statement for all integers greater than or equal to the base case.

Applying Logic and Proof in Geometry (H2)

Geometry provides a rich context for applying the principles of logic and proof. "Unit 2: Logic and Proof" often includes a significant focus on geometric proofs.

Two-Column Proofs (H3)

Two-column proofs are a structured format for presenting geometric arguments, listing each statement and its corresponding justification in separate columns. This method promotes clarity and helps organize the steps of a proof.

Working with postulates, theorems, and definitions (H3)

Geometric proofs rely on previously established truths (postulates and theorems) and precise definitions. Understanding and correctly applying these elements is crucial for constructing valid geometric arguments.

Strategies for Success in Unit 2: Logic and Proof (H2)

Mastering "Unit 2: Logic and Proof" requires consistent effort and strategic learning.

Practice, Practice, Practice (H3)

The key to success is consistent practice. Work through numerous examples, gradually increasing the complexity of the problems you tackle.

Seek Clarification (H3)

Don't hesitate to seek clarification from your teacher, tutor, or classmates if you encounter concepts

you don't fully understand.

Organize Your Work (H3)

A well-organized approach is vital, particularly for complex proofs. Use clear notation, label your steps, and systematically present your arguments.

Conclusion

Understanding "Unit 2: Logic and Proof" is not just about memorizing theorems; it's about developing a powerful analytical mindset. By mastering the fundamentals of logic, different proof techniques, and applying them consistently through practice, you'll build a strong foundation for further mathematical exploration. This unit lays the groundwork for more advanced mathematical topics, and your efforts here will pay significant dividends in the future.

FAQs

1. What is the difference between a theorem and a postulate? A postulate is a statement accepted as true without proof, while a theorem is a statement that has been proven to be true.

2. How can I improve my ability to construct proofs? Practice is key. Start with simpler proofs and gradually work your way up to more complex ones. Break down the problem into smaller, more manageable steps.

3. What are some common mistakes students make in logic and proof? Common mistakes include incorrectly applying logical connectives, making assumptions without justification, and failing to provide sufficient reasoning for each step in a proof.

4. Are there online resources to help me learn more about logic and proof? Yes, many online resources, including Khan Academy, YouTube channels dedicated to mathematics, and various university websites, offer valuable tutorials and practice problems.

5. How important is understanding "Unit 2: Logic and Proof" for future math courses? It's extremely important. The logical reasoning and proof-writing skills developed in this unit are fundamental to success in higher-level mathematics courses, including calculus, linear algebra, and abstract algebra.

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student who has had some calculus, there is really no prerequisite other than a measure of mathematical maturity.

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construct mathematical proofs.Uses elementary number theory and congruence arithmetic throughout. Focuses on writing in mathematics. Reviews prior mathematical work with “Preview Activities” at the start of each section. Includes “Activities” throughout that relate to the material contained in each section. Focuses on Congruence Notation and Elementary Number Theorythroughout.For professionals in the sciences or engineering who need to brush up on their advanced mathematics skills. Mathematical Reasoning: Writing and Proof, 2/E Theodore Sundstrom

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introduction is followed by discussions of classes and sets, functions, natural and cardinal numbers, the arithmetic of ordinal numbers, and related topics. 1971 edition with new material by the author--

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motivated by epistemological considerations; some papers originated in the critique of certain views that at one time dominated the discussions of the Vienna Cirele; others grew out of problems in teaching fundamental ideas of mathematics; sti II others were occasioned by personal relations with economists. Hence a wide range of subjects will be discussed: epistemology, logic, basic concepts of pure and applied mathematics, philosophical ideas resulting from geometric studies, mathematical didactics and, finally, economics. The papers also span a period of more than fifty years. What unifies the various parts of the book is the spirit of searching for the elarification of basic concepts and methods and of articulating hidden ideas and tacit procedures. Part 1 ineludes papers published about 1930 which expound an idea that Carnap, after a short period of opposition in the Cirele, fully adopted ; and, under the name Princip/e of To/erance, he eloquently formulated it in great generality in his book, Logica/ Syntax of Language (1934), through which it was widely disseminated. The New Logic in Chapter 1 furthermore ineludes the first report (I932) to a larger public of Godel's epochal discovery presented among the great logic results of ali time. Chapter 2 is a translation of an often quoted 1930 paper presenting a detailed exposition and critique of intuitionism.

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unit 2 logic and proof: Uncle Petros and Goldbach's Conjecture Apostolos Doxiadis, 2012-11-15 Uncle Petros is a family joke. An ageing recluse, he lives alone in a suburb of Athens, playing chess and tending to his garden. If you didn't know better, you'd surely think he was one of life's failures. But his young nephew suspects otherwise. For Uncle Petros, he discovers, was once a celebrated mathematician, brilliant and foolhardy enough to stake everything on solving a problem that had defied all attempts at proof for nearly three centuries - Goldbach's Conjecture. His quest brings him into contact with some of the century's greatest mathematicians, including the Indian prodigy Ramanujan and the young Alan Turing. But his struggle is lonely and single-minded, and by the end it has apparently destroyed his life. Until that is a final encounter with his nephew opens up to Petros, once more, the deep mysterious beauty of mathematics. Uncle Petros and Goldbach's Conjecture is an inspiring novel of intellectual adventure, proud genius, the exhilaration of pure mathematics - and the rivalry and antagonism which torment those who pursue impossible goals.

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insights acquired in the study of formal languages could be used fruitfully in solving old problems of conventional mathematics. (ii) Mathematics has been and is moving with growing acceleration from the set-theoretic language of structures to the language and intuition of (higher) categories, leaving behind old concerns about in?nities: a new view of foundations is now emerging. (iii) Computer science, a no-nonsense child of the abstract computability theory, has been creatively dealing with old challenges and providing new ones, such as the P/NP problem. Planning additional chapters for this second edition, I have decided to focus onmodeltheory,the conspicuousabsenceofwhichinthe ?rsteditionwasnoted in several reviews, and the theory of computation, including its categorical and quantum aspects. The whole Part IV: Model Theory, is new. I am very grateful to Boris I. Zilber, who kindly agreed to write it. It may be read directly after Chapter II. The contents of the ?rst edition are basically reproduced here as Chapters I–VIII. Section IV.7, on the cardinality of the continuum, is completed by Section IV.7.3, discussing H. Woodin's discovery.

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