

TEXAS A&M UNIVERSITY (TAMU) PHIL 240 INTRODUCTION TO LOGIC EXAM 1 PRACTICE (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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THE FULL VERSION STUDY GUIDE

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

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1. Which is the correct general rule for discharging assumptions inside nested scopes?
 - A. In the order introduced
 - B. All at once
 - C. In reverse order
 - D. They cannot be discharged
2. Which inference is valid by Modus Ponens?
 - A. The ground is wet
 - B. It did not rain
 - C. If the ground is wet, it rains
 - D. It rains
3. Which statements characterize one-variable predicate logic?
 - A. It uses individual terms to represent single objects and quantifiers such as all or some.
 - B. It uses only propositional variables with no predicates.
 - C. It has no quantifiers.
 - D. It can express only categorical syllogisms.
4. Provide a counterexample to show that $\forall x \exists y P(x,y)$ does not imply $\exists y \forall x P(x,y)$.
 - A. Let domain be $\{a,b\}$ with $P(a,b)$ and $P(b,a)$ true, but $P(a,a)$ and $P(b,b)$ false; $\forall x \exists y P(x,y)$ holds, but no single y works for all x .
 - B. Domain $\{a\}$ with $P(a,a)$ true.
 - C. Domain $\{a,b\}$ with $P(a,a)$ true, $P(b,b)$ true.
 - D. Domain $\{a,b\}$ with $P(a,b)$ true and $P(b,a)$ false.
5. Double negation elimination: Not Not P can be replaced by P . Which option states this correctly?
 - A. Not Not P is equivalent to P .
 - B. Not Not P is equivalent to Not P .
 - C. Not Not P is equivalent to P and Not P .
 - D. Not Not P is equivalent to P or Not P .

6. Which statement best describes Conditional Proof (CP)?

- A. If, given the assumption p , we are able to derive q , then we may infer (if p , then q), citing all the steps from p to q inclusive.
- B. If p , then q only if p leads to q .
- C. We can infer q directly from p .
- D. We can infer p if q .

7. Which formula is a tautology?

- A. $\forall x P(x)$
- B. $\forall x (P(x) \rightarrow \neg P(x))$
- C. $\forall x P(x)$
- D. $\forall x \forall y (P(y) \rightarrow \neg P(y))$

8. Apply De Morgan's law to $\neg(p \wedge q)$.

- A. $\neg p \wedge \neg q$
- B. $p \wedge q$
- C. $\neg p \vee q$
- D. $\neg p \vee \neg q$

9. Negate $\forall x \forall y P(x,y)$. Which of the following is equivalent?

- A. $\forall x \forall y \neg P(x,y)$
- B. $\forall x \forall y P(x,y)$
- C. $\exists x \exists y \neg P(x,y)$
- D. $\neg \forall x \forall y P(x,y)$

10. Which feature best distinguishes a statement variable from a statement constant?

- A. A capital letter used as an abbreviation for a sentence
- B. A lowercase letter from the middle of the alphabet
- C. An English sentence that is always true
- D. A punctuation mark

Answers

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1. C
2. A
3. A
4. A
5. A
6. A
7. B
8. A
9. A
10. B

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Explanations

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1. Which is the correct general rule for discharging assumptions inside nested scopes?

- A. In the order introduced
- B. All at once
- C. In reverse order**
- D. They cannot be discharged

Discharging assumptions inside nested scopes is done from the inside out. Each subproof adds a temporary assumption that only holds within that block. To turn that assumption into a conditional, you close the subproof and discharge that assumption, but you must finish the inner subproof first. So, when there are multiple layers, you discharge the innermost assumption first, then the next outer one, and so on. This aligns with how the scope works: you can only remove an assumption as you exit its block, which naturally produces the conditional outcomes in reverse order of introduction. For example, suppose you assume A, and inside that you assume B, and from A and B you derive C. Ending the inner subproof lets you discharge B to get $B \rightarrow C$ under A. Then ending the outer subproof lets you discharge A to obtain $A \rightarrow (B \rightarrow C)$. This illustrates why the innermost assumption is discharged first, followed by the outer ones.

2. Which inference is valid by Modus Ponens?

- A. The ground is wet**
- B. It did not rain
- C. If the ground is wet, it rains
- D. It rains

Modus ponens is the rule: from a conditional $P \rightarrow Q$ and the statement P, you may infer Q. Here, "If the ground is wet, it rains" is $P \rightarrow Q$, and "The ground is wet" is P. Therefore, you may conclude "It rains," which is Q. That's why the valid inference is that it rains. The other options don't follow from these two statements by Modus ponens: the ground is wet is one of the premises, not a conclusion derived from the conditional, and the negation or the conditional itself aren't what MP yields from these premises.

3. Which statements characterize one-variable predicate logic?

- A. It uses individual terms to represent single objects and quantifiers such as all or some.**
- B. It uses only propositional variables with no predicates.
- C. It has no quantifiers.
- D. It can express only categorical syllogisms.

One-variable predicate logic expresses statements about individual objects by using predicates that apply to a single argument and quantifiers to talk about all or some objects in the domain. You can refer to a specific object with a term (like a constant) and then say things like $P(a)$ for a has property P, or use universal and existential quantifiers to make general or existential claims, such as $\forall x P(x)$ or $\exists x P(x)$. This combination—terms for individual objects and quantifiers such as all or some—is what characterizes one-variable predicate logic. The other options describe propositional logic (no predicates or quantifiers), a logic with no quantifiers, or a framework limited to categorical syllogisms, none of which capture the essence of one-variable predicate logic.

4. Provide a counterexample to show that $\forall x \exists y P(x,y)$ does not imply $\exists y \forall x P(x,y)$.

A. Let domain be {a,b} with $P(a,b)$ and $P(b,a)$ true, but $P(a,a)$ and $P(b,b)$ false; $\forall x \exists y P(x,y)$ holds, but no single y works for all x .

B. Domain {a} with $P(a,a)$ true.

C. Domain {a,b} with $P(a,a)$ true, $P(b,b)$ true.

D. Domain {a,b} with $P(a,b)$ true and $P(b,a)$ false.

The order of quantifiers matters: from $\forall x \exists y P(x,y)$ we allow the chosen y to depend on x , but $\exists y \forall x P(x,y)$ requires a single y that works for every x . Take a domain with two elements, a and b , and define P so that $P(a,b)$ and $P(b,a)$ are true, while $P(a,a)$ and $P(b,b)$ are false. Then for each x there is some y with $P(x,y)$ true: for $x = a$, take $y = b$; for $x = b$, take $y = a$. So $\forall x \exists y P(x,y)$ holds. But there is no single y that makes $P(x,y)$ true for all x : if $y = a$, $P(a,a)$ is false; if $y = b$, $P(b,b)$ is false. Hence $\exists y \forall x P(x,y)$ fails. This shows why the given statement does not follow from the first quantifier pattern.

5. Double negation elimination: Not Not P can be replaced by P . Which option states this correctly?

A. Not Not P is equivalent to P .

B. Not Not P is equivalent to Not P .

C. Not Not P is equivalent to P and Not P .

D. Not Not P is equivalent to P or Not P .

Double negation elimination is the idea that applying negation twice brings you back to the original truth value. For any proposition P , saying "not not P " effectively cancels the two negations and leaves P . Think it through: if P is true, then not P is false, and not not P is true — matching P . If P is false, then not P is true, and not not P is false — again matching P . So $\neg\neg P$ and P always share the same truth value, making them equivalent. That's why the correct statement is that not not P is equivalent to P . The other options would force relationships that don't hold universally: for example, equating $\neg\neg P$ with $\neg P$ would imply P and $\neg P$ have the same truth value for all cases (which never happens), while equating $\neg\neg P$ with " P and $\neg P$ " would be always false, and equating $\neg\neg P$ with " P or $\neg P$ " would be always true (since $P \vee \neg P$ is a tautology), neither of which matches the actual truth pattern of $\neg\neg P$.

6. Which statement best describes Conditional Proof (CP)?

A. If, given the assumption p , we are able to derive q , then we may infer (if p , then q), citing all the steps from p to q inclusive.

B. If p , then q only if p leads to q .

C. We can infer q directly from p .

D. We can infer p if q .

Conditional Proof is a way to establish a conditional by temporarily assuming the antecedent and showing that the consequent follows from that assumption. To prove "If p then q ," you open a subproof by assuming p , derive q from that assumption (using p and any previously established premises), and then discharge the assumption to conclude $p \rightarrow q$. The justification for the conditional is precisely the chain of steps from p to q , shown in that subproof. This description matches the idea that if, under the assumption p , we can derive q , then we may infer $p \rightarrow q$, with the steps from p to q recorded to justify the move. It highlights the discharging of the temporary assumption: the subproof structure is what lets you turn a local derivation into a global conditional. The other statements don't capture this method. Simply deriving q from p corresponds more to modus ponens at a single step, not to forming a new conditional by discharging an assumption. Saying " p only if q " or " p if q " confuses the direction of the conditional or its rationale.

7. Which formula is a tautology?

- A. $\exists x P(x)$
- B. $\forall x (P(x) \rightarrow \neg P(x))$
- C. $\exists x P(x)$
- D. $\exists x \forall y (P(y) \rightarrow \neg P(y))$

A tautology is a formula that is true in every interpretation, no matter what the predicate P means or what the domain is. The key here is the law of the excluded middle: for any object x , either $P(x)$ is true or its negation $\neg P(x)$ is true. So the inner part $P(x) \rightarrow \neg P(x)$ is true for every individual x . When you universalize that over all x , you get $\forall x (P(x) \rightarrow \neg P(x))$, which must hold in every interpretation. That makes it a tautology. The other formulas fail to be tautologies because they assert something about P that isn't guaranteed across all interpretations. $\exists x P(x)$ merely says there is some x for which P holds, which could be false if P is never true. $\forall x P(x)$ says P holds for every x , which could be false if some x makes P false. The last option asserts there exists some x such that a statement that is always true (for all y , $P(y) \rightarrow \neg P(y)$) holds; this depends on the domain having at least one element, which isn't guaranteed in all interpretations, so it isn't a tautology in the same sense.

8. Apply De Morgan's law to $\neg(p \wedge q)$.

- A. $\neg p \vee \neg q$
- B. $p \vee q$
- C. $\neg p \wedge q$
- D. $\neg p \vee \neg q$

De Morgan's law shows how negation interacts with conjunction: $\neg(p \wedge q)$ is equivalent to $\neg p \vee \neg q$. The idea is that it isn't the case that both p and q are true, so at least one of them must be false. If p is true and q is true, the original statement is false, and $\neg p \vee \neg q$ is also false. If either p or q is false (or both), the original becomes true, and at least one of $\neg p$ or $\neg q$ is true, making $\neg p \vee \neg q$ true as well. This captures precisely the idea that not (both true) is the same as (not p) or (not q). The other forms fail because they don't align with that intuition: $p \vee q$ would be true when at least one is true, which can be true even when both p and q are true, contradicting $\neg(p \wedge q)$.

9. Negate $\exists x \forall y P(x,y)$. Which of the following is equivalent?

- A. $\forall x \exists y \neg P(x,y)$
- B. $\exists x \forall y \neg P(x,y)$
- C. $\forall x \exists y \neg P(x,y)$
- D. $\neg \exists x \forall y P(x,y)$

Negating a quantified statement involves flipping the quantifiers and moving the negation inward step by step. Start with $\neg \exists x \forall y P(x,y)$. Move the negation across the universal quantifier to obtain $\forall x \neg \forall y P(x,y)$. Now push the negation through the existential quantifier: $\neg \forall y P(x,y)$ is equivalent to $\exists y \neg P(x,y)$. Put it all together and you get $\forall x \exists y \neg P(x,y)$. So the expression is true exactly when there exists some x for which $P(x,y)$ is false for every y . This matches the form with $\forall x \exists y \neg P(x,y)$. The other options describe different patterns (e.g., P false for all x and y , or there exists some x and y with P false, or a different negation structure), which do not capture the same meaning.

10. Which feature best distinguishes a statement variable from a statement constant?

- A. A capital letter used as an abbreviation for a sentence
- B. A lowercase letter from the middle of the alphabet**
- C. An English sentence that is always true
- D. A punctuation mark

In this area of logic, how we denote things signals their role. A statement variable is a placeholder that can be assigned different truth values depending on the interpretation. The way we usually mark these is with lowercase letters taken from the middle of the alphabet, which is a clear cue that the symbol is a variable to be filled in by a specific proposition later. A statement constant, by contrast, is a fixed proposition with a definite truth value in the discussion, and is typically represented differently (often with uppercase letters or by a particular sentence that is treated as given). So the use of a lowercase middle-of-the-alphabet letter is the best tell that you're dealing with a variable, since it's the standard notation that signals variability in truth value. For example, p can be true or false depending on what proposition you assign to it, while a constant would stay fixed within the context of the analysis.

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Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

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We wish you the very best on your exam journey. You've got this!

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