Study this list together with your notes, readings, graded and ungraded HW problems, and in-class handouts. Aim to master concepts and techniques for use in general; just memorizing familiar problems is unlikely to be successful. Many former students use these lists to make their own study guides that include solved examples and reminders/cautions.

Logic with STATEMENT FORMS: (using ONLY statement variables p, q, r, etc. and the symbols below)

1. Memorize and understand the symbols $\vee$, $\wedge$, $\sim$, $\rightarrow$, $\leftrightarrow$. Know and apply the logic order of operations.

2. Construct full truth tables or find isolated truth values for given statement forms.

3. Isolated values may be asked when certain truth values hold for other statement forms, as in p.48, #21.

4. Explain what logically equivalent, tautology, contradiction mean; use truth tables to confirm.

   (a) "Explain" in my courses always means to use words and sentences. Diagrams, chains of equations, truth tables, etc., are NOT explanations by themselves.

5. Remember the "constants" **t** and **c** for tautologies and contradictions. Be able to use them in truth tables.

6. MEMORIZE these key equivalences: de Morgan's Laws, iff (mid p.45); ctp, NOT converse (p.48 #24,27).

7. Convert between verbal statements and statement FORMS as in p.36 #6-8, #10, p.48 #18. Prepare for conditionals and biconditionals as well.

Logic with STATEMENTS and PREDICATES: (i.e., using words, algebra, and/or $P(x)$ predicate notation)

1. Understand and convert BETWEEN formal and informal, and FROM symbolic TO verbal, especially p.48 #18 and our Tarski's World problems.

2. Fill in blanks to complete a rephrasing of a given statement, as in Exercise Sets 1.1, 3.1, and 3.2.

3. Recognize conjunctions, disjunctions, including the many verbal synonyms (such as "neither...nor").

4. Recognize conditional or biconditional statements, including the many verbal synonyms.

5. Recognize universal or existential statements, including the many verbal synonyms.

6. Use, understand $\vee$, $\wedge$, $\sim$, $\rightarrow$, $\forall$, $\exists$, as well as basic symbols such as $=$, $<$, $\in$, etc.

7. Rewrite a biconditional statement as the conjunction of two conditionals.

8. Convert among universal conditional, strictly universal, strictly conditional phrasings.

9. Work with conditional rephrasings: if-then, only if, necessary, sufficient, implies, "trailing if":

   (a) Recognize hypothesis and conclusion in such statements; write each as a stand-alone sentence.
   (b) Rewrite a statement given using one of these synonyms so that it will use my choice of another.
   (c) Negate a statement that uses any of these synonyms.
   (d) Write the converse, inverse, or contrapositive of a statement that uses any of the synonyms.
   (e) Write converse, inverse, or contrapositive so that it too will use my choice of the synonyms.

10. Negate statements, including conditional, biconditional, universal, and existential statements.

11. You must simplify negations whenever possible:

   (a) Apply de Morgan's Laws: for instance, "not both" isn't allowed; "not a or b" $\neq$ "not (a or b)," etc.
   (b) Avoid double negatives: for instance, "not non-negative" isn't allowed. Negate inequalities correctly.
   (c) Don't "opposite" by mistake: "not positive" $\neq$ "negative," negating $>$ doesn't create $<$, etc.
   (d) Also take care with inequality *words*, such as "at least/most," "over/under," etc.
   (e) Incorporate "not" into stmts/predicates: "It's not the case that," "Not all" and "there isn't/doesn't exist" are not allowed. "No" and "none" are also not allowed.

12. Work with the truth values of quantified statements:

   (a) Find the entire truth set for a given quantified statement when you are told what domain to use.
   (b) Classify a given universal or existential statement as true or false, and justify:
      i. True $\exists$s and false $\forall$s need clear, complete examples/counterexamples
      ii. False $\exists$s and true $\forall$s need you to explain how you exhausted all the possibilities.
   (c) Settings may be Tarski's World, a chart/list like Example 3.3.3, or just familiar sets of numbers.

13. Be prepared for statements with more than one quantifier, for blended quantifiers such as "for all $x, y \in \mathbf{R}$."

Sets aren't on the exam, but you should be able to use set notation $\in$, $\mathbf{Z}$, $\mathbf{Z}^+$, $\mathbf{R}$, $\mathbf{R}^+$, etc., within the tasks above.

You will have the entire class period to take the exam. When you finish, you may hand it in and leave.

Please spread out around the entire classroom for the exam.
(This enhances integrity and gives me better access to come answer your questions.)

Students with SRU-approved accommodations should speak with me and process ODS requests ASAP.
ODS should proctor your exam since our classroom and my schedule are not automatically free.

Make-up Policy:

1. Notify me immediately if you'll miss the exam.

2. Documentation will be required: get a doctor's note, accident report, newspaper notice, etc.

3. If I excuse your absence, the Exam #1 content on our cumulative Final Exam in December will also be your make-up exam.

4. (D2L will show an artificial 0 for any excused absence until the end of the course.)