Pitt State Pathway

(Undergraduate Course Numbers through 699)

Please check only one:

🔴 Course is **<u>currently</u>** a "General Education" course

⊙ Course is listed in the current catalog, but is **<u>NOT</u>** a "General Education" course

⊙ New course that is **<u>NOT</u>** listed in the current catalog and has **<u>NOT</u>** been legislated through PSU Faculty Senate and/or KBOR

A. Submission date**: December 18, 2018**

B. Department**: HPSS**

C. College**: Arts and Sciences**
    If two or more Colleges, please indicate which Colleges will be involved in teaching the course:
    Click or tap here to enter text.

D. Name of faculty member on record for the course (may be Coordinating Professor or Chair):
    Bonnekessen
    (As faculty of record, I verify all sections agree to address the Core or Essential Studies Element and corresponding Learning Outcome as indicated below.)

E. Course prefix: **PHIL**

F. Course number: **208**

G. Credit hours: **3**

H. Title of course: **Logic**
    Is this a change in the title of the course? No
    (*If "Yes," a Revision to Course form will need to be completed and uploaded to the Preliminary Briefcase and will go through the legislation process.)*

I. Will this course require a new course description? No
    (If "Yes," please insert new course description here. A Revision of Course form will need to be completed and uploaded to the Preliminary Briefcase and will go through the legislation process)
    Click or tap here to enter text.

J. Does this course include a co-requisite laboratory course: No
    If "Yes", please provide the co-requisite course name and number:
    Click or tap here to enter text.

K. Will this course be available on–line: **No**
    If "Yes", please provide a detailed explanation: **Click or tap here to enter text.**

L. Semester(s) course will be offered (choose all that apply): **Fall and Spring**

M. Prerequisite(s): **none**

N. Co-requisite(s) —other than lab course named above: **none**

O. Select the *Pitt State Pathway* **Core Element** or **Essential Studies Element** based on the identified Learning Outcome to be covered in the course (choose only **one** set):
*(*Refer to definitions, hierarchy, and rubrics in the *Pitt State Pathway* document)

<u>Select **Only One** Element</u>

- o Communication

  - ▪ **Written Communication**... .... ○
    - Students will communicate effectively.

- o Communication

  - ▪ **Verbal Communication** .... ○
    - *Students will communicate effectively.*

- o Quantitative/Analytic Methods and Scientific Literacy

  - ▪ **Quantitative/Analytic Methods** ....🔴
    - *Students will analyze data logically.*

- o Global Understanding and Civic Engagement

  - ▪ **Human Experience within a Global Context** .... ○
    - *Students will explore global systems conscientiously.*

- o Global Understanding and Civic Engagement

  - ▪ **Human Systems within a Global Context** .... ○
    - *Students will explore global systems conscientiously.*

- o Global Understanding and Civic Engagement

  - ▪ **Natural World within a Global Context** .... ○
    - *Students will explore global systems conscientiously.*

- o Personal and Professional Behavior

  - ▪ **Wellness Strategies**... .... ○
    - *Students will model productive behaviors purposefully.*

P. Will the course address a **Companion Element**? No
(Refer to definitions, hierarchy, and rubrics in the Pitt State Pathway document.)

      If "Yes," please select one: **Choose an item.**

Q. What is the highest anticipated level of student achievement for the stated learning outcome(s) common across <u>all</u> sections of the course? Note: Sample assessment strategies will be submitted on the representative syllabus. Milestone I
(Refer to definitions, hierarchy, and rubrics in the Pitt State Pathway document.)

R. Please submit course syllabus as an attachment, highlighting the following items: course objectives related to Learning Outcome(s), assessment strategies (e.g. exams, course project, etc.), and assessment tool(s) to be used to measure student achievement.

Legislative Process
Authorization and Notification Signatures
(Electronic signatures accepted)

Department Chairperson ....Approved ☑   Not Approved ☐

13.Feb.'19

_____   _____
Department Chairperson Signature   Date

Faculty Senate General Education Committee ....Approved ☐   Not Approved ☐

_____   _____
Faculty Senate General Education Chairperson Signature   Date

Faculty Senate ....Approved ☐   Not Approved ☐

_____   _____
Faculty Senate Recording Secretary Signature   Date

Note: Each College curriculum representative will notify their respective College and Department(s) of the completion of the approval process.

*Originating Department: Please **complete** the entire form, acquire the Chairperson's signature, and save as **PSP.ABC123.Form**. Save the syllabus to be attached as **PSP.ABC123.Syll**. Email the completed form and attachments to psupathway@pittstate.edu.

> Naming convention: **PSP.ABC123.Form**
> PSP = Pitt State Pathway.
> ABC123 = Course abbreviation and number

Syllabus for *Logic*, PHIL 208
Pittsburg State University

Professor: Office hours:
Email: Office:

Course Description

   The most fundamental question of logic is this: Given any two statements, does the one *follow from* the other? Thus, the "follows from" or "entailment" relation is central to the study of logic. The course is not about how people actually reason—a subject more appropriate for psychology or sociology—but how one should and should not reason. At the very least, the object is to introduce students to some of the necessary features of sound reasoning through a study of both its formal and informal features. Hence, the course has a strong *normative component*. Thus, in addition to thinking of logic as the study of entailment, one could think of it as the study of the difference between good and poor reasoning, particularly as these are exemplified in arguments. Topics covered include, but are not limited to, the nature of arguments, deduction and induction, syllogistic logic, propositional logic, quantified predicate logic, fallacious reasoning, and scientific reasoning. Also to be stressed is the role of logic in thinking critically. Logic alone is not the same as critical thinking. On the other hand, thinking cannot be "critical" if it violates elementary logical norms. The discipline of logic brings one to awareness of logic's norms, and can thereby be one's best friend in the attempt to think critically.

Overall Course Objectives

   1. Students should come away from Logic with an appreciation of the fact that logic is both an object of study and an aid in thinking clearly. Thus, logic has both a theoretical and a practical side. The tool of logic has been refined through the centuries by making logic itself an object of study. This course touches on both aspects of logic.

   2. Students should be able to make distinctions among and identify (a) the truth or falsity of beliefs and the truth or falsity of statements (b) the truth or falsity of statements and the validity or invalidity arguments, (c) the emotional appeal of an argument and its logical force, (d) deduction and induction, (e) arguments and explanations, (f) decision procedures and proofs.

   3. Students should be able to (a) test the validity of arguments using Venn diagrams, truth tables, and truth trees and (b) construct formal proofs using rules of inference and rules of equivalence. In order to develop these skills it will be necessary to learn the fundamental principles of elementary term logic and elementary propositional (or sentential) logic.

   4. Students should appreciate the roles of both deduction and induction in science, including the ways in which these forms of reasoning are used and abused in pseudo-science. Particularly relevant to these questions is learning to mark the distinction between auxiliary and *ad hoc* hypotheses.

   5. Students should understand the differences between formal and informal logic and they should be able to identify the most common fallacious forms of reasoning in each form of logic. This aspect of the course sensitizes one to the varieties of ways that language is used in the process of reasoning well and reasoning poorly.

Required Textbook

Donald W. Viney, *Logic Crystallized: A New Introduction to Logic* (Deer Park, NY: Linus Pubilcations, 2011). [The author makes no royalties on the sale of this book.]

Because the textbook is a central element of the course students should take the time to familiarize themselves with its layout and features. Please note the following: (I) Every chapter contains numbered exercises; the first number indicates the chapter and the second number indicates the sequence of exercises

in the chapter—for example, 2.6 means second chapter, sixth set of exercises. (II) Answers to prime numbered exercises (with the exception of number 1) are given in the final section of the book beginning on page 251—thus, answers are given to each question 2, 3, 5, 7, 11 and so forth. (III) There is a glossary of terms and concepts used in the text, which are printed in bold face in the body of the text, beginning on page 233. (IV) On page v, just after Table of Contents, there is a list of charts, tables, and diagrams used in the text.

Course Requirements and Grading

Instructor's philosophy of grading: Grades are *not* given on the basis of the work done, the amount of work done, or the tuition paid. Grades are awarded by the instructor and earned by the student on the basis of *merit*. Students are neither clients nor customers and university degrees cannot legitimately be traded, sold, or purchased. A grade of A represents outstanding work; B means work of high quality; a grade of C is awarded when a student shows a basic grasp of the material; D is for work of substandard but passing quality; F means failure.

1. The final grade is figured as a percentage of the total points earned on quizzes and exams (90% and above = A; 80-89% = B; 70-79% = C; 60-69% = D; 59% and below = F). Students may examine their current standing in the course by checking their scores on Canvas.

2. There will be at least twelve quizzes and at least three exams, varying in point values between 20 and 80. The total point value in the course will likely reach into the 500s. Quiz and exam questions are often drawn directly from the book. All quizzes and exams will be announced ahead of time and notices placed on Canvas.

3. Make-up work and extra credit: There are no make-up quizzes or exams so it is imperative that you be in class on the days that quizzes and exams are given. There is one major extra credit assignment involving chapter 4 that will be discussed when the time comes. This extra credit opportunity should be enough to compensate anyone who, for whatever reason, misses a quiz or an exam.

4. Students should comport themselves in ways consistent with the learning environment of a university classroom. Examples of behaviors that are inconsistent with the learning environment include: reading extraneous material, talking on a cell phone, texting, playing computer games, speaking out of turn, persistent whispering, noisy interruptions, and low and mean personal attacks. The instructor reserves the right to penalize misbehavior by deducting points from quizzes or, in extreme cases, by dismissing the offending student(s) from class.

5. *Some Friendly, but hopefully not too patronizing, advice*: Logic is not the kind of subject for which most students find it easy to "cram." Waiting until the last minute to study or to do the assignments will almost certainly result in a less than satisfactory performance.

Schedule of Course Work

Although the instructor will refer to *all* parts of the textbook students will not be required to read and master all the material in the book. Here is an outline of the topics and skills to be covered.

Chapter 1

Be able to explain and give examples of the variety of things we do with language.
Be able to identify the difference between statements (propositions) and other sorts of sentences.
Be able to define "argument," "premise," and "conclusion"
Be able to identify the premises and conclusions of arguments
Be able to explain and identify the differences among (i) statements, (ii) beliefs about statements, (ii) the truth or falsity of statements (and beliefs), and (iv) justifications for holding beliefs about statements.
Define and be able to identify deductive and inductive arguments.
Define and be able to explain the difference between the validity and soundness of arguments.

Be able to explain why logic, as studied in this course, is a normative discipline.
Be able to explain why logic is not the same as psychology.
Be able to state the fundamental question of logic.

Chapter 2

Be able to explain in what sense Aristotle's logic is a formal logic.
Be able to explain Aristotle's theory of categorical propositions (statements)
Be able to identify the properties of a categorical proposition, that is, its quality and quantity
Be able to identify the parts of a categorical proposition—subject and predicate terms, quantifier, copula.
Be able to explain what a Venn diagram means both *with* and *without* Xs and zero-slashes.
Be able to draw Venn diagrams of the four types of categorical propositions.
Be able to identify the categorical propositions represented in a Venn diagram.
Be able to perform the operations of immediate inference—conversion, contraposition, obversion—on any categorical proposition and to explain whether the operation yields a valid or an invalid inference.
Be able to identify the valid and invalid inference relations on the square of opposition. The inference relations are contrary, contradictory, subcontrary, and subaltern.
Be able to explain Aristotle's oversight and the existential fallacy.
Be able to identify the elements of an Aristotelian syllogism, its three terms (major, minor, and middle), its three statements (major premise, minor premise, conclusion).
Be able to name the mood and figure of any Aristotelian syllogism.
Be able to use Venn diagrams to determine the validity or invalidity of any Aristotelian syllogism.
Be able to identify the various fallacies of invalid syllogisms.

Chapter 3 and part of chapter 4

Be able to explain how the formalism of modern logic differs from the formalism of Aristotle's logic, but how it is similar to ancient Stoic logic.
Be able to explain and identify the difference between simple and compound propositions.
Be able to identify the five basic truth-functions used in the text by their truth tables.
Be able to explain what a truth function is.
Be able to explain the principle used in the construction of each of the truth tables.
Be able to explain the difference between exclusive and inclusive disjunction.
Be able to distinguish between the antecedent and the consequent of a conditional statement and to distinguish sufficient and necessary conditions.
Be able to explain the difference between the expressions "if" and "if and only if."
Be able to explain the so-called paradox of material implication.
Be able to explain the difference between a conditional statement and an implication.
Be able to distribute a negation through a conjunction or a disjunction using De Morgan's rules.
Be able to construct a truth table for a proposition with any number of elementary variables.
Be able to explain the differences among tautologies, contradictions, and contingent statements.
Be able to classify propositions as belong to the same or different equivalence classes.
Be able to identify the sixteen basic truth-functions.
Be able to construct and correct truth tables for arguments.
Be able to identify the "top ten argument forms" (*modus ponens*, *modus tollens*, etc.)
In the case of constructive and destructive dilemmas, know the difference "escaping between the horns of a dilemma" and "grasping a dilemma by its horns."
Be able to identify the difference between theory confirmation and theory disconfirmation.
Be able to identify an auxiliary hypothesis and explain whether or not it should be classified as *ad hoc*.
Be able to explain how the difference between auxiliary and *ad hoc* hypotheses helps to clarify the difference between science and pseudo-science.
Be able to explain the variety of uses for contradictions.

Chapter 5 and Chapter 7

Be familiar with the rules of inference and the rules of equivalence.

Be able to identify substitution instances of the rules of inference and equivalence.
Be able to construct proofs using the rules of inference and equivalence.
Be able to construct proofs using the rules of conditional proof and indirect proof.
Know the difference between a proof of validity and the proof of a statement.
Know the difference between a decision procedure and a proof of validity.
Be able to explain the difference between a formal fallacy and an informal fallacy.
Be able to name and identify the major formal fallacies.
Be able to name and identify the major informal fallacies.
Be able to articulate the difference between raising a question and begging a question.
Be able to state the fundamental question of logic.

Academic Misconduct/Scholastic Dishonesty

Any act that violates the rights of another student in academic work, is disruptive of proper class order, or that involves the misrepresentation of your own work, will result in penalties up-to and including dismissal from the course with a failing grade. Scholastic dishonesty and academic misconduct include, but are not limited to, cheating on assignments or examinations; plagiarizing (which means presenting the work of another as one's own work); submitting the same or substantially the same paper to meet the requirements of more than one class without the consent of all of the instructors involved; depriving another student of necessary course materials; interfering with another student's work; or disruptive classroom behavior. For the full PSU Official policy on academic integrity see attached syllabus supplement.

Notice of Nondiscrimination

Pittsburg State University prohibits discrimination on the basis of race, color, religion, sex, national origin, sexual orientation, age, marital status, ancestry, genetic information, or disabilities. Address inquiries regarding the nondiscrimination policies to Director of Institutional Equity/Title IX Coordinator, 218 Russ Hall, 620-235-4189 or equity@pittstate.edu.

Logic and PSU Pathway

MISSION STATEMENT

The *Pitt State Pathway* curriculum serves as the heart of the university education by fostering interdisciplinary competencies that typify the educated person. It is designed to facilitate the development of key proficiencies including communication and information literacy. The *Pitt State Pathway* curriculum provides a transformational experience that challenges students to think creatively and critically, and to immerse themselves in the productive examination of humans in their global setting. By encouraging the development of skills that promote life-long learning, the *Pitt State Pathway* fosters a sense of personal responsibility, an appreciation of diversity, and an understanding of interconnectedness in our truly global society.

Learning Outcome: *Students will analyze data logically*.

PHIL 208: Logic is part of the PSU Pitt State Pathway. It fulfills the requirement for the element Quantitative/Analytic Methods.

Quantitative literacy and its methods refer to competency in working with numerical data. Students with strong quantitative skills possess the ability to reason and solve problems from a wide array of contexts and everyday life situations. They can create sophisticated arguments supported by objective evidence and can communicate those arguments in a variety of formats (e.g. text, tables, graphs, mathematical equations, etc.) as appropriate. Competency in this element means:
- *Applying* a set of formal tools to interpret, represent, calculate, and analyze quantitative data;
- *Explaining* assumptions and rationale for selecting a mathematical approach to solve a problem;
- *Explaining* assumptions and rationale for selecting a mathematical or formal logical approach to solve a problem;

Kansas Board of Regents Course Objectives

By its nature, Philosophy encourages diverse approaches to teaching, and so it is to be expected that different programs and different instructors will approach a Critical Thinking course in a variety of different ways. Consequently, a broad consensus on details of content is not to be expected. However, students will become familiar with the basic concepts and methods of philosophical reasoning and their application in correct reasoning.

Students will:
I. Recognize the difference between arguments and non-arguments.
   a. Students will distinguish between an argument and an explanation, report, or illustration.
   b. Students will identify the premises and the conclusion of arguments.
   c. Students will recognize components of language and language use relevant to reasoning such as meaning, definition, emotive force, denotation and connotation.
II. Identify and explain the components of informal reasoning
   a. The student will be able to recognize and define informal fallacies
   b. The student will be able to demonstrate an understanding of, and the ability to evaluate, inductive arguments such as analogical arguments, generalizations, arguments from authority, causal inferences etc.
   c. Students will evaluate the cogency of arguments in specialized areas such as legal, moral, or scientific reasoning.
III. Identify and apply the basic concepts of logical discourse.
   a. Students will distinguish formal from informal arguments.
   b. Students will distinguish deductive validity and soundness and be able to evaluate arguments for each.
   c. The student will be able to recognize basic argument forms such as modus ponens, modus tollens, disjunctive syllogism, chain, etc.
IV. Recognize the basic concepts of propositional logic.
   a. The student will be able to symbolize natural language arguments in propositional logic.
   b. The student will be able to use truth tables to evaluate the validity/invalidity of arguments in propositional logic.
   c. Students will demonstrate familiarity with and the ability to use logical operators.

p = He joins the resistance in Paris.
q = He violates his duty to his mother.

r = H stays at home to take care of his mother.
s = He violates his duty to his country.
t = He violates his duty.

1. $(p \rightarrow q) \wedge (r \rightarrow s)$
2. $(q \vee s) \rightarrow t$
3. $p \vee r$
4. $q \vee s$ 1, 3 CD
5. $\therefore t$ 2,4 MP

Escaping between the horns of the dilemma: To use this strategy one would try to show that the disjunctive premise, number 3, "$p \vee r$" is false. A disjunction is false only when both disjuncts are false. Thus, if p and r are both false then "$p \vee r$" is false. It is easy enough to construct other alternatives to p or r, for example, the man may flee to another country to seek help from a foreign government. Of course, in the man's case this may be an unrealistic option.

Grasping the horns of the dilemma: To use this strategy, one would try to show that one of the conditionals in the first premise is false. If either conditional is false, then the first premise as a whole is false. A conditional is false when the antecedent is true and the consequent is false. For example, "$r \rightarrow s$" would be false if the man could find a way to support the resistance in Paris while staying at home. Perhaps he could help fund the resistance or even serve as a spy in his own town.

2. Plato's *Symposium* gives a positive view of homosexual relations among men. If it is great literature then it should be read in the schools. If we decide that it should not be read in the schools then we are saying that our children should not be exposed to great literature, for if the *Symposium* is not great literature then nothing is. Either it is great literature or we decide that it should not be read in the schools. Therefore, either it should be read in the schools or we are saying that our children should not be exposed to great literature.

p = Plato's *Symposium* is great literature.

q = Plato's *Symposium* should be read in the schools.

r = We decide Plato's *Symposium* that should not be read in the schools.

s = We are saying that our children should not not be exposed to great literature.

1. $(p \rightarrow q) \wedge (r \rightarrow s)$
2. $p \vee r$
3. $\therefore q \vee s$

Escaping between the horns of the dilemma: To use this strategy one would try to show that the disjunctive premise, number 2, "$p \vee r$" is false. A disjunction is false only when both disjuncts are false. Thus, if p and r are both false then "$p \vee r$" is false. Since Plato's *Symposium* is generally regarded as great literature, escaping between the horns of this dilemma is not a promising strategy. However, one can certainly imagine some misguided soul arguing that it is not great literature. Of course, if it is not great literature, then a strong case could be made that it should not be read in the schools—the limited time in school should be spent study the classics.

Grasping the horns of the dilemma: To use this strategy, one would try to show that one of the conditionals in the first premise is false. If either conditional is false, then the first premise as a whole is false. A conditional is false when the antecedent is true and the consequent is false. There is a lot of great literature to choose from to read in the schools, not all of which can be studied. Thus, the conditional, "If x is great literature then x should be read in the schools" is not always true. For this reason, "$p \rightarrow q$" might be

false. Perhaps one thinks that there are other, more worthy, pieces of literature that should be read before the *Symposium* is read. In other words, perhaps *Symposium*, though great, is far down in the queue of literature one thinks should be read. The conditional "r → s" is dubious for the same reason. There can be other reasons for deciding that a piece of literature should not be read other than supposing that the literature is not great.

Logic Test — Natural Deduction

Part I: Fill in the justification for steps in the following derivations (2 points for each correct answer; 22 possible).

Example:
1. p → (q → r) premise
2. p ∧ q premise
3. p 2, SM
4. q 2, SM
5. q → r 1, 3 MP
6. r 4, 5 MP

(1)
1. p → (q → r) premise
2. p ∧ ~ r premise
3. p
4. ~ r
5. q → r
6. ~ q

(2)
1. (p → q) ∧ (r → s) premise
2. p premise
3. (q ∨ s) → t premise
4. p ∨ r
5. q ∨ s
6. t

(3)
1. p ∨ q premise
2. ~ p ∧ r premise
3. ~ p
4. q

(4)
1. (p ∧ q) → r premise
2. p → (q → r)
3. ~ p ∨ (q → r)

Part II: Circle the mistakes in the following derivations (2 points for each correct answer; 20 possible)

Example:
1. p → (q → r) premise
2. p ∧ q premise
3. p (1 SM)
4. q 2 SM
5. q → r (1, 3 MT)
6. r 4, 5 MP

(1)
1. p → (q ∨ r) premise
2. p ∧ ~ r premise
3. ~ r 2 SM
4. q 1, 3 DS
5. p 1 SM
6. q ∨ r 1, 5 MT
7. r 6 SM
8. p ∨ ~ (q ∨ r) 1 CE

(2)
1. (p → q) ∧ ~ (r ∧ ~ s) premise
2. p premise
3. q 1, 2 MP
4. ~ (r ∧ ~ s) 1 SM
5. ~ r ∨ ~ s 4 DM
6. ~ r ∨ s 5 DN
7. s 6 SM
8. q ∨ s 3, AD

Part II: Circle the mistakes in the following derivations (2 points for each correct answer; 20 possible)

Example: 1. p → (q → r)   premise
          2. p ∧ q   premise
          3. p   1 SM
          4. q   2 SM
          5. q → r   1, 3 MT
          6. r   4, 5 MP

(2)   (2)

1. p → (q ∨ r)   premise   1. (p → q) ∧ ~ (r ∧ ~ s)   premise
2. p ∧ ~ r   premise   2. p   premise
3. ~ r   2 SM   3. q   1, 2 MP
4. q   1, 3 DS   4. ~ (r ∧ ~ s)   1 SM
5. p   1 SM   5. ~ r ∨ ~ s   4 DM
6. q ∨ r   1, 5 MT   6. ~ r ∨ s   5 DN
7. r   6 SM   7. s   6 SM
8. p ∨ ~ (q ∨ r)   1 CE   8. q ∨ s   3, 7 AD

Part III: Derive the conclusion of each of the following using the rules of inference and/or the rules of replacement (5 points possible for each derivation; 10 possible)

Example: 1. p   premise
             2. ~ p   premise / ∴ ~ (q ∨ ~ r)
             3. p ∨ (q → r)   1, AD
             4. q → r   2, 3 DS
             5. ~ (q ∨ ~ r)   4, CE

(1)   (2)

1. p → (q ∧ r)   premise   1. p   premise
2. ~ s → ~ (q ∧ r)   premise / ∴ p → s   2. ~ p   premise / ∴ q

Instructions: Put the following arguments into symbolic form (using sentence variables, p, q, r, etc., and sentence functions, negation, conjunction, conditional, etc.). Be sure to clearly define each variable. Explain *in complete sentences* how one might criticize these arguments by (a) escaping between the horns of the dilemma and by (b) grasping the dilemma by its horns. (25 points each; 5 points for symbolizing the argument, 10 points each for the discussion of escaping the dilemma and grasping it by the horns)

1. If every aspect of our lives is governed by the laws of nature, then we are never responsible for anything that we do. But if we have free will, then our actions are the result of pure chance, and again we are not responsible for what we do. Either our lives are totally determined in accordance with the laws of nature or we have free will. Therefore, we are not responsible for what we do.

p = Every aspect of our lives is governed by laws of nature.
q = We are never responsible for anything we do.

r = We have free will
s = Our actions are the result of pure chance.

Alternative, but somewhat more cumbersome, formulation:

1. $(p \rightarrow q) \land [r \rightarrow (s \land q)]$
2. $p \lor r$
3. $\therefore q$

1. $(p \rightarrow q) \land (r \rightarrow s)$
2. $p \lor r$
3. $s \rightarrow q$
4. $\therefore q$

Escaping between the horns of the dilemma: To use this strategy one would try to show that the disjunctive premise, "$p \lor r$" is false. A disjunction is false only when both disjuncts are false. Thus, if p and r are both false then "$p \lor r$" is false. For example, suppose our lives were not totally governed by laws of nature but were instead the effects of an all-determining deity that caused our actions; this hypothesis would not only render "p" false but it might also render "r" false, which is to say that we would not have free will.

Grasping the horns of the dilemma: To use this strategy, one would try to show that one of the conditionals in the first premise is false. If either conditional is false, then the first premise as a whole is false. (If one used the alternative formulation, one might also try to show that its third premise is false.) A conditional is false when the antecedent is true and the consequent is false. For example, "$p \rightarrow q$" would be false if every aspect of our lives were governed by laws of nature and if we were responsible for acts that arose from our own desires and intentions. (This would require that "being governed by laws of nature" is not the same as "not being responsible for what one does.") The second conjunct of the first premise, "$r \rightarrow (s \land q)$," would be false if we have free will but our actions were the product of our own desires and intentions *but not the product of chance*.

2. No matter how one understands the matter, the second book of Thessalonians shows that there were almost certainly forgeries in Paul's name in circulation all the way back during the time of the New Testament writings. If scholars who think that 2 Thessalonians was not written by Paul are wrong—that is, if Paul really wrote it—then it shows that Paul himself knew of a forgery in his name that had come to the Thessalonian church. But if the other scholars are right, that Paul did not compose 2 Thessalonians, then this book *itself* is a forgery in Paul's name that was floating around in the church. Either way, there must have been Pauline forgeries already in the first century.

p = Paul wrote the second book of Thessalonians.
q = Paul knew of a forgery in his name that had come to the Thessalonian church.
r = The second book of Thessalonians is a forgery.
s = There were forgeries in Paul's time when the New Testament was written.

4. $(p \rightarrow q) \land (\sim p \rightarrow r)$
5. $(q \lor r) \rightarrow s$
6. $p \lor \sim p$

7.   ∴ s

Escaping between the horns of the dilemma: There is no way to escape between the horns of this dilemma, for this would require showing that the disjunctive premise—in this case, "p ∨ ~ p"—is false. This premise, however, is a tautology and thus cannot be false. In fact, premise 3 is not required for the validity of the argument; take away this premise and the argument remains valid.

Grasping the horns of the dilemma: In order to use this strategy one must show that one of the conditionals in the first premise is false. (The conditional of the second premise is arguably true by the definition of "forgery," for if X or Y is a forgery, then there is a forgery.) A conditional is false if the antecedent is true and the consequent is false. Note that in *this* argument, the conditionals cannot both be false since their antecedents (p, ~ p) contradict each other, which means that the antecedent of one of the conditionals is false, making *that* conditional true.

One might try to question either conditional of the first premise in the following way. "p → q" would be false if Paul indeed wrote II Thessalonians but if the passages that seem to indicate a knowledge of forgeries written in Paul's name (II Thess. 2:2 and 3:17) represent Paul being misinformed. This would be a difficult thing to establish based on the historical evidence currently available to scholars. "~ p → r" would be false if II Thessalonians were a forgery but if the passages in the letter where Paul's name appears were added after the time when the New Testament was written. Again, this would be a difficult thing to establish based on the historical evidence presently available to scholars. Each of the conditionals seems to be true, making this an argument that is both valid and sound.

Take-Home Exercise: The following quotes are from Michael W. Cueno's *American Exorcism: Expelling Demons in the Land of Plenty* (New York: Doubleday, 2001). To research exorcisms, Cueno, a sociologist, attended more than fifty exorcisms, both Catholic and Protestant, as well as the exorcisms of free-lance exorcists. In what follows he sums up what he saw and what he did not see. Analyze the argument of Cueno and the arguments of those with whom he spoke who believe in demon possession and exorcism. In your analysis, use the model I suggested in class (i.e. hypothesis or theory, predicted observations, actual observations, theory confirmation/disconfirmation, auxiliary and *ad hoc* hypotheses). Identify the auxiliary hypotheses used by both parties. Explain whether these auxiliary hypotheses are *ad hoc*. Is the theory of demon possession and the idea of exorcism scientific or not?

Over a two-year period, I personally sat in on about a dozen Catholic exorcisms. Unlike Father Nicola, I never personally witnessed levitation or any other spectacular effects—demonic or otherwise. I did, however, hear reports of such effects taking place at exorcisms I was unable to attend . . . I have no way of vouching for the historical truthfulness of [these] reports, which were relayed to me by people of considerable intelligence and integrity, if not exactly sterling impartiality. When I asked why these effects always seemed to occur at exorcisms I have just missed or was prevented from attending, but never at ones where I was present, my informants answered in one of two ways. Some said it was probably just the luck of the draw. Others suggested it was because Satan, knowing I was a writer and not wanting to blow his cover, was deliberately keeping me in the dark about his very real powers to possess people. (pp. 264-265)

I started out this research with an attitude I'd characterize as "open-minded Canadian skepticism." I wasn't expecting to encounter demons—especially not the ripsnorting, mind-blowing demons of popular imagination—but I was entirely open to being surprised. If something happened during an exorcism that defied rational explanation, that seemed to reek of supernatural evil, I was committed to reporting it. . . . But nothing happened—at least nothing startling, nothing that reached out and grabbed me by the throat. At the exorcisms I attended, there were no spinning heads, no levitating bodies, no voices from beyond the grave. (There was plenty of vomiting, no question about it, but nothing more impressive than what you'd probably catch most Saturday nights out behind your local bar.) I wasn't counting on demonic fireworks, but neither was I counting them out. After all was said and done, more than fifty exorcisms—no fireworks at all.

At least none that I could make out. Occasionally I found myself in a situation where I was the odd man out, the party pooper of all party poopers. Just about everyone else on hand would claim to see something extraordinary, and they'd be disappointed—confused and disappointed—that I hadn't seen it also.

"But you must have seen the body rising. The rest of us saw it. It clearly rose two, maybe three feet off the chair. How could you not have seen it?"

"I'm sorry, but I didn't see it. I was looking as hard as I could, and I didn't see it."

No, I didn't see it, and the reason I didn't? There was nothing to be seen. People tend to be so keyed up during an exorcism, so eager to sink their fingers into something preternatural, that they easily convince themselves they're seeing, hearing, or feeling things that simply aren't there—not *really* there—to be seen, heard, or felt. As for myself, open-mindedly skeptical, skeptically open-minded, I was ready for any kind of action, but I was determined not to fall into the trap of conjuring things up just to suit the mood of the occasion. What I saw (I'm quite sure) was actually there to be seen; what I didn't see . . . well, I'm afraid not. (pp. 274-275)

Possible answer to Exorcism Exercise

Cueno attended more than fifty exorcisms (some Catholic, some Protestant) but never saw anything that would lead him to believe that the victim was actually possessed by demons. He identifies the more dramatic sorts of effects that might have convinced him that demons were possessing people—things like spinning heads, levitating bodies, voices beyond the grave—but he was prepared to accept less spectacular effects. But he saw nothing. Cueno's basic argument runs like this:

p = Exorcists expel real demons from possessed people.

    [This is the hypothesis to be tested.]

$$p \rightarrow q$$
$$\sim q$$

q = During exorcisms, those who are supposedly
    possessed are observed to exhibit behaviors that
    are very difficult to explain without the hypothesis
    that they are actually possessed (e.g. spinning heads,
    levitating bodies, and the like).

$$\therefore \sim p$$

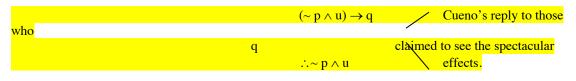Cueno's argument: the hypothesis of demon possession disconfirmed. Prediction of q failed.

Those who believe in demon possession offered two possible explanations for this predictive failure. One explanation is that Cueno just happened to miss the exorcisms with spectacular effects ("the luck of the draw"). The other explanation was that Satan, knowing Cueno is a writer and not wanting to "blow his cover," deliberately kept Cueno in the dark. These are auxiliary hypotheses designed to explain predictive failure.

$$[p \wedge (s \vee t)] \rightarrow \sim q$$
$$\sim q$$

s = Cueno just happened to miss the exorcisms
    that included spectacular effects.

$$\therefore p \wedge (s \vee t)$$

t = Satan deliberately kept Cueno in the dark.

The auxiliary hypotheses, added to p, yield the prediction of what Cueno saw (or failed to see).

Auxiliary hypothesis s is not *ad hoc*, but it seems merely to be false, for Cueno attended over fifty exorcisms, thus limiting the odds that he would, by chance, miss the spectacular effects. Auxiliary hypothesis t, on the other hand, seems to be *ad hoc*, for there seems no way to test whether Satan is deliberately doing something. This does not bode well for the claim that demon possession is scientific.

However, at some exorcisms, others besides Cueno saw the spectacular effects that Cueno did not see. This poses a possible disconfirmation of Cueno's own hypothesis. Thus, Cueno must introduce an auxiliary hypothesis to explain the apparent predictive failure.

Disconfirmation $\sim p \rightarrow \sim q$ Cueno's auxiliary hypothesis, call it u = People are so

of Cueno's views on   q [i.e. *we* saw it.]   inclined to believe in the preternatural that they tend to

demon possession $\therefore p$ see things that aren't really there.

$$(\sim p \wedge u) \rightarrow q$$

Cueno's reply to those who

$$q$$

claimed to see the spectacular

$$\therefore \sim p \wedge u$$

effects.

Cueno's auxiliary hypothesis, u, is not *ad hoc*. Psychologists have tested something like this hypothesis. People *do* have a tendency to see what they expect to see (and not to see what they do not expect to see). Anyone skeptical of Cueno's skepticism could test u to find out if is true; for example, cameras and other recording devices could be used at exorcisms; thus Cueno's auxiliary hypothesis is not *ad hoc*.