COR165
Thinking Critically

Study Guide

Centre for Continuing and Professional Education

SUSS
SINGAPORE UNIVERSITY OF SOCIAL SCIENCES

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Course Guide

Thinking Critically

1. Welcome

Presenter: Dr Sovan Patra

This streaming video requires Internet connection. Access it via Wi-Fi to avoid incurring data charges on your personal mobile plan.

Click here to watch the video. [i]

Welcome to the course *COR165 Thinking Critically,* a 2.5 credit unit (CU) course.

This Study Guide will be your personal learning resource to take you through the course learning journey. The guide is divided into two main sections – the Course Guide and Study Units.

The Course Guide describes the structure for the entire course and provides you with an overview of the Study Units. It serves as a roadmap of the different learning components within the course. This Course Guide contains important information regarding the course learning outcomes, learning materials and resources, assessment breakdown and additional course information.

[i] https://d2jifwt31jjehd.cloudfront.net/COR165/IntroVideo/COR165_Intro_Video.mp4

2. Course Description and Aims

The ability to reason soundly is prized across academic and vocational settings. Every worthwhile academic enterprise attempts, in its chosen area, to uncover truths that are the conclusions of good arguments. Similarly, the degree to which one is professionally successful is founded on one's capacity for judicious decision-making and powers of persuasion, which necessarily demand the skill to think correctly and critically. This natural selection argument aside, developing the faculty to reason well is an indispensable step towards fulfilling our uniquely human potential, given that it is the propensity for sophistication in reasoning that distinguishes us from other species.

In this context, this course attempts to equip students with a tool kit that enables them to distinguish between truths and falsehoods; justified and unjustified beliefs; coherent and incoherent claims; and good and bad decisions. In addition, this course provides students with the rigour, restraint and discipline required for a self-directed understanding of, and learning about, the world.

All the principles of reasoning presented in this course were developed keeping in mind how we speak, write and communicate with each other on an everyday basis. There are two primary advantages of this approach. Firstly, the reasoning skills acquired become transferable across our students' academic, professional and personal roles. In addition, it emphasises that the capacity for and the commitment to critical thought is an indispensable life skill. This is perhaps the central precept of this course.

Course Structure

This course is a 2.5-credit unit course presented over 6 weeks.

There are three Study Units in this course. The following provides an overview of each Study Unit.

Study Unit 1 – The Principles of Reasoning

This study unit introduces you to the conceptual nuts and bolts (the 'principles') of reasoning. It comprises two chapters. In the first, you learn that the act of reasoning is the act of giving reasons for a conclusion, where both the reasons (the premises) and the conclusion are 'statements'. Additionally, you learn about the various types of statements that function as premises or conclusions as well as how to distinguish between the truth conditions of statements (conditions under which, a given statement is true). Further, you are taught to distinguish between two broad categories of arguments, deductive and inductive. The chapter concludes by familiarising you with the criteria for a good argument; these are the benchmarks you should try to meet while providing an argument of your own and the benchmark to which you should subject every argument you encounter.

The second chapter instructs you on a very useful tool for representing arguments – arrow diagrams. It explains how these diagrams can be used to identify the structure of complex arguments as a first step towards evaluating them.

Study Unit 2 – Forms of Arguments

This study unit explores deductive and inductive arguments in greater detail. It comprises two chapters. The first considers a common type of deductive argument, known as a categorical syllogism, and instructs you on how to use Venn diagrams to establish the validity of any categorical syllogism. In addition, it introduces you to 'propositional logic': this is a system which structures any ordinary language argument into standard forms, based on the type of statements that feature in the argument. The aim is to explain to you which of these standard forms are valid, and why.

The second chapter focuses on inductive arguments. It discusses the general spirit of inductive reasoning before moving on to identify some commonly encountered forms of inductive arguments. Finally, this chapter considers conditions that make any argument, in any of these forms, strong.

Study Unit 3 – Additional Principles for Arguing Well

This study unit builds on the foundations laid in the previous study units, by introducing you to some further issues associated with good reasoning. It comprises three chapters. The first introduces you to informal fallacies – commonly committed errors in reasoning. Here, a discussion on the general nature of such errors is followed by identifying a fairly comprehensive number of fallacies and classifying these into broader categories, for ease of reference. The aim is to ensure that you are quick to spot informal fallacies when you encounter them, as well as prevent you from falling into 'fallacy-traps' in your own reasoning.

The second chapter concerns itself with definitions. It begins by emphasising the importance of providing definitions of terms of ambiguous meaning used in an argument, by highlighting their role in preventing us from talking at cross purposes to each other. It then looks at the characteristics of a good definition, before concluding by identifying a variety of approaches you can employ to provide a good definition.

The last chapter in this study unit has a more practical orientation. It recommends tips and steps that are generally helpful in writing evaluative essays (essays that assess the quality of a given argument) and argumentative essays (essays that present arguments for a chosen conclusion).

3. Learning Outcomes

Knowledge & Understanding (Theory Component)

By the end of this course, you should be able to:

- Identify the principles that underpin critical thinking and writing;
- Explain the rules of legitimate inference; and
- Demonstrate the universal applicability of critical thinking skills, across academic disciplines and across contexts.

Key Skills (Practical Component)

By the end of this course, you should be able to:

- Distinguish speech or writing that is 'argumentative' from that which is descriptive;
- Illustrate the structure of any given argument;
- Use established principles of inference to evaluate the quality of given arguments;
- Recognise, and therefore avoid, common forms of reasoning, which, in spite of their appeal and popularity, are ultimately fallacious;
- Critically develop their own positions on a wide range of issues; and
- Defend those positions through arguments of their own and at length.

4. Learning Materials

The following is a list of the required learning materials to complete this course.

Required Textbook(s)

Mooney, T. B., Williams, J. N., & Burik, S. (2016). *An Introduction to critical and creative thinking: Analysing and evaluating ordinary language reasoning*. Singapore: McGraw Hill Education (Asia).

5. Assessment Overview

The overall assessment weighting for this course is as follows:

Assessment	Description	Weight Allocation
Assignment 1	Pre-Class Quiz	20%
Assignment 2	TMA01	40%
Assignment 3	TMA02	40%
TOTAL		100%

The following section provides important information regarding Assessments.

Continuous Assessment:

Your performance in this course is assessed entirely via continuous assessment, which comprises the three assignments listed above. All assignments are compulsory; non-submission of any one of the assignments will constitute a 'withdraw' (W) grade for the entire course. These assignments will test conceptual understanding of both the fundamental and more advanced concepts and applications that underlie critical thinking. It is imperative that you read through your assignment questions and submission instructions before embarking on your assignment.

Examination:

There is no final examination for this course.

Passing Mark:

To pass the course, you must obtain a minimum mark of 40 percent for each of the two TMA components and also a minimum mark of 60 per cent for the online quiz. That is, students must obtain at least a mark of 40 percent for the combined assessments. For detailed information on the Course grading policy, please refer to The Student Handbook

('Award of Grades' section under Assessment and Examination Regulations). The Student Handbook is available from the Student Portal.

Non-graded Learning Activities:

Activities for the purpose of self-learning are present in each study unit. These learning activities are meant to enable you to assess your understanding and achievement of the learning outcomes. The activities are either in the form of formative quizzes, or exercises. You are expected to complete the suggested activities either independently and/or in groups.

6. Course Schedule

To help monitor your study progress, you should pay special attention to your Course Schedule. It contains study unit related activities including Assignments, Self-assessments, and Examinations. Please refer to the Course Timetable in the Student Portal for the updated Course Schedule.

Note: You should always make it a point to check the Student Portal for any announcements and latest updates.

7. Learning Mode

The learning process for this course is structured along the following lines of learning:

a. Self-study guided by the study guide units. Independent study will require ***at least 6 hours per week.***

b. Working on assignments, either individually or in groups.

c. Classroom Seminar sessions (3 hours each session, 2 sessions in total).

iStudyGuide

You may be viewing the iStudyGuide version, which is the mobile version of the Study Guide. The iStudyGuide is developed to enhance your learning experience with interactive learning activities and engaging multimedia. Depending on the reader you are using to view the iStudyGuide, you will be able to personalise your learning with digital bookmarks, note-taking and highlight sections of the guide.

Interaction with Instructor and Fellow Students

Although flexible learning – learning at your own pace, space and time – is a hallmark at SUSS, you are encouraged to engage your instructor and fellow students in online discussion forums. Sharing of ideas through meaningful debates will help broaden your learning and crystallise your thinking.

Academic Integrity

As a student of SUSS, it is expected that you adhere to the academic standards stipulated in The Student Handbook, which contains important information regarding academic policies, academic integrity and course administration. It is necessary that you read and understand the information stipulated in the Student Handbook, prior to embarking on the course.

Study Unit 1

The Principles of Reasoning

Learning Outcomes

By the end of this unit, you should be able to:

1. Describe the intended aims of the course.
2. Distinguish statements from sentences.
3. Identify types of compound statements, such as disjunctions, conjunctions and conditionals.
4. State the truth conditions for compound statements.
5. Identify the basic structure of an argument.
6. Categorise ordinary language passages as descriptive or argumentative.
7. Distinguish deductive from inductive arguments.
8. Distinguish between concepts such as validity, soundness, strength and cogency.
9. Distinguish between serial, convergent, linked and divergent reasoning.
10. Draw an arrow diagram to show the structure of an argument expressed in ordinary language.
11. Evaluate the strengths and weaknesses of an argument using an arrow diagram.

Overview

The ability to reason soundly is prized across academic and vocational settings. Every worthwhile academic enterprise attempts, in its chosen area, to uncover truths that are the conclusions of good arguments. Similarly, the degree to which one is professionally successful is founded on one's capacity for judicious decision-making and powers of persuasion, which necessarily demand the skill to think correctly and critically. This natural selection argument aside, developing the faculty to reason well is an indispensable step towards fulfilling our uniquely human potential, given that it is the propensity for sophistication in reasoning that distinguishes us from other species.

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All the principles of reasoning presented in this course are developed keeping in mind how we speak, write and communicate with each other on an everyday basis. There are two primary advantages of this approach. Firstly, the reasoning skills acquired become transferable across our students' academic, professional and personal roles. In addition, it emphasises that the capacity for and the commitment to critical thought is an indispensable life skill. This is perhaps the central precept of this course.

Chapter 1: Basic Concepts of Critical Thought

1.1 Course Overview

Read

You should now read: Mooney et al (2016), Chapter 1 (Section 1.1).

This course has a noble and ambitious goal. It intends, firstly, to teach you to reason. But, what does reasoning mean? As the opening line of the first chapter of your textbook suggests, reasoning is giving reasons for any claim (that you might wish to make). You could broaden the scope of this definition and consider reasoning as having reasons for any belief (that you might hold).

For example, if you believe that telling a lie is wrong, or that God exists, or that ministers in Singapore get paid too much, or that you deserve a pay rise or promotion at work, this course aims to teach you to have reasons for these beliefs. It emphasises the importance of only having beliefs that you have reasons for. And this is where many of you might object that this course is going to be a waste of your time, since you already do what I said this course teaches you to do – reason, that is. You might even claim that the structure of the ordinary, functional human brain is such as to make the lack of reasoning by an individual impossible.

If this were to be your objection, I would be happy, because then you would already be a step closer to achieving the other objective of this course. You see, even if I grant you that most, if not all, of us engage in reasoning, it does not follow that most of us reason well. In other words, even if we have reasons for our beliefs, they might not be good reasons. So, secondly, this course aims to teach you how to reason correctly. Note that whether you have good reasons for your beliefs is not a matter of interpretation; it is not a subjective

issue. Rather, there are clear, established and agreed upon criteria based on which, the 'soundness' of your reasons can be evaluated.

So, in order to turn you into a 'good reasoner', this course will teach you to identify the different 'types' of reasons one might have for one's beliefs or claims, and to subject such reasons to the scrutiny of the standards of good reasoning. And, if you are conscientious and diligent in your study and application of the material prepared for you, then, at the end of the course, you will be in the happy circumstance of coming as close as possible to:

i. having only true, or at least, justified beliefs;
ii. getting others to agree to your claims; and
iii. making the right decision in your personal and professional lives.

1.2 Statements: 'Simple' and 'Compound'

Read

You should now read: Mooney et al (2016), Chapter 1 (Section 1.2).

1.2.1 Statements versus Sentences

Having read Section 1.1 (Mooney et al, 2016), you should know that the act of reasoning is the act of giving an argument for a claim or belief. The basic ingredient in any argument is a statement. Just as a Lego model is constituted by Lego bricks, which are not divisible further, the indivisible components of an argument are statements. So, your ability to identify arguments and evaluate them hinges, first and foremost, on your ability to identify statements. The required reading from your textbook defines statements for you, and shows you how to distinguish them from sentences. Having familiarised yourself with that distinction, you should attempt the following exercise:

Activity 1.1

Mooney et al (2016), Exercise 1.1, pp.4.

1.2.2 Simple versus Compound Statements

Read

You should now read: Mooney et al (2016), Chapter 9 (Section 9.1).

Section 1.2 (Mooney et al, 2016) also, but very briefly, illustrates the distinction between simple and compound statements (Section 9.1 is a lot richer). It is easier to make this distinction by starting with a compound statement. For our purposes, compound statements take one of the following forms:

a. Negations

A negation takes the form: "Not [•]." Note that any statement can be substituted for the dot within the brackets to give us a negation. For example, the dot could stand for: "Jack will ask Jill out." Then, the negation would be: "Jack will not ask Jill out" or, to use a more contrived expression, "It is not the case that Jack will ask Jill out."

To use another example, the dot could represent: "If a dog wags its tail, it is either warning you off or being friendly." Then, the negation would be: "It is not the case that, if a dog wags its tail it is either warning you off or being friendly."

b. Disjunctions

A disjunction takes the form: "Either [•] or [•]." As before, the dots, which are called disjuncts, can stand for any statement. For example, the first dot could stand for: "Jack will ask Jill out" and the second dot could stand for "Jack will ask Jane out." Then, the disjunction would be: "Jack will ask Jill or Jane out," or to use a more contrived expression, "Either Jack will ask Jill out or Jack will ask Jane out."

To use another example, the first dot could represent: "If it rains, there will be no game" and the second dot could stand for: "Emma is not coming for the party tonight." Then, the disjunction would read: "Either if it rains, there will be no game, or Emma is not coming for the party tonight."

You will perhaps (and should) find the last disjunction strange. There appears to be no 'relation' between the disjuncts. However, I have used the example on purpose, to impress on you the idea that there need not be any 'relation' between the disjuncts in a disjunction. As you will see later, if there is no relation between the disjuncts, then the disjunction will probably turn out to be false; but it will still be a disjunct.

c. Conjunctions

A conjunction takes the form: "[•] and [•]." The dots, which can represent any statement, are now called conjuncts. For example, using the dots to represent the same statements in the first example in b) above, the conjunction would be: "Jack will ask Jill and Jane out," or to use a more contrived expression, "Jack will ask Jill out and Jack will ask Jane out."

I will leave you to form the conjunction for the second example in b) above. Also, note that the insight of the last paragraph in b) above applies to conjunctions as well.

d. Conditionals

A conditional takes the form: "If [•], then [•]." The first dot, which can represent any statement, is called the antecedent of the conditional, while the second dot, which can also stand for any statement, is called the consequent. You have already seen an example of a conditional statement in the examples I have given you thus far: can you identify it?

Here's another one though: suppose the first dot stands for: "Ministers in Singapore are not paid highly" and the second, for: "They will not be corrupt." Then, the conditional would read: "If ministers in Singapore are paid highly, then they will not be corrupt." Note that the antecedent and the consequent of the conditional could be either negations or disjunctions, or even conditionals themselves.

Now that you know what a compound statement is, defining a simple statement is a lot easier. A simple statement is a statement that does not contain a 'not,' or an 'and,' or an 'or,' or can't be expressed in the 'if …, then …' form. And from now on, throughout the remainder of your study units, I will refer to a simple statement as some capital letter of the alphabet (A to Z). Do note that letters of the alphabet can only be assigned to simple statements, in this context.

1.2.3 Sufficient versus Necessary Conditions

Read

You should now read: Mooney et al (2016), Chapter 5 (Section 5.8).

A conditional statement can also be thought of as the **antecedent** being a sufficient condition for the **consequent**. For example, the conditional in Section 1.2.2 d) claims that ministers being paid highly is sufficient for their not being corrupt.

However, I might, instead, want to claim that high ministerial pay is necessary for ministers' abstaining from corruption. Section 5.8 (Mooney et al 2016)[1] elaborates on how to amend the standard conditional statement (the one that expresses a sufficient condition) to express this idea. Having read this section, you must be familiar with the idea that the statement, 'High pay for ministers is necessary to stop them from being corrupt' in conditional form would read as: "**Only if** ministers are paid highly, they will not be corrupt". You should also be familiar with alternative ways of claiming 'Only if A, then B.'

Although Section 5.8 (Mooney et al, 2016) does not discuss the idea, it is important for you to be able to understand the relation between necessary and sufficient conditions and use that understanding to convert an "Only if …, then …" conditional into an "If …, then …" form. The idea is relatively straight-forward. Let me develop it though the following example.

Suppose I claim, "If John is wearing a blue shirt, then he is wearing a shirt." Intuitively, this statement is true.[2] The fact that John is wearing a blue shirt is sufficient for the fact that he is wearing a shirt. But if that is true, then the fact that John is wearing a shirt is necessary for the fact that he is wearing a blue shirt. If you get the drift of the example, you should be able to generalize: 'A is sufficient for B' is equivalent to 'B is necessary for A.' In other words, 'If A, then B' is equivalent to 'Only if B, then A.'

There is another more direct approach to developing the relations between 'Only if …, then…' and 'If …, then …' conditionals. Suppose I claim: 'Only if A, then B.' You already know this is equivalent to claiming: 'A is necessary for B.' Now ask yourself, intuitively, what does this claim mean? Hopefully, you'll arrive at my intuition: 'If A is not true [A doesn't happen], then B is not true [B wouldn't happen].' In conditional terms, this intuition is expressed as 'If not-A, then not-B.' There we have it: 'Only if A, then B' is equivalent to 'If not-A, then not-B.'

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[1] Ignore Example 5.8.9, you can return to it later.

[2] I will give you a more formal understanding of truth conditions in Section 1.2.4.

So, in summary, for reasons that will become obvious to you as the course progresses, whenever you see an 'Only if A, then B' conditional in the context of an argument, you should convert it to one of the equivalent 'standard' conditional forms: 'If not-A, then not-B' or 'If B, then A'.

1.2.4 Truth Conditions for Compound Statements

In this section, I am concerned with giving you an intuitive understanding of what makes negations, disjunctions, conjunctions and conditionals true. This is not discussed in either Section 9.1 or 5.8 in your textbook (Mooney et al, 2016).[3] I will summarise the conditions for you here; for an intuitive explanation, you must watch the linked video.

a. 'Not [•]' is true (false) if and only if '[•]' is false (true).
b. 'Either [•] or [•]' is true if at least one of the disjuncts is true; otherwise, it is false.
c. '[•] and [•]' is true if both conjuncts are true; otherwise, it is false.
d. 'If [•], then [•]' is false if the antecedent is true and the consequent is false; otherwise, it is true.

Lesson Recording

Truth Conditions for Compound Statements

[3] Although your textbook gives you the truth conditions for these statements, more formally, in the context of truth tables, truth tables are beyond the scope of this course.

1.3 Arguments: Basic Structure and Types

Read

You should now read: Mooney et al (2016), Chapter 1 (Section 1.3, 1.4, 1.5, 1.6, 1.9 and 1.10).

By now, you know that arguments are constituted by statements. Having read the material in Chapter 1 of your textbook (Mooney et al, 2016), you should be able to define an argument as a collection of statements where some of the statements in the collection operate as reasons for the other statements in the collection. Statements of the former type are called premises; the latter type are called conclusions.

You should also be able to use inference (premise and conclusion) indicators to identify an argument when you encounter one and use your judgement and the principle of charity to do so, when no explicit inference indicators are present.

You must also be able to distinguish between intermediate and final conclusions, and infer them, where they are not explicitly stated.

Finally, it is extremely important that you are able to distinguish between two types of arguments, deductive and inductive. Having done your reading, you should be able to identify a deductive argument as one where the arguer wants to claim his argument to be guaranteed by his reasons (premises). In addition, you should be able to classify an argument as inductive if the arguer merely wants to claim his conclusion to be highly likely, given his premises.

Activity 1.2

Mooney et al (2016), Exercise 1.3 (pp.8-9), 1.4 (pp.12-13) and 1.5 (pp.16-17).

1.4 The Quality of Arguments

Read

You should now read: Mooney et al (2016), Chapter 1 (Section 1.8, 1.9 and 1.10).

You are now in a position to consider the criteria by which the quality of an argument is judged. Having done the required reading, you should be able to see that, regardless of the type of argument, for one to accept its conclusion, it is necessary that the reasons given in support of the conclusion be true. In other words, a good argument must, at the very least, have true premises.

However, true premises are not sufficient for a good argument. It is also necessary that the premises provide 'good' support for the conclusion. What constitutes 'good' support? Your reading should have informed you that this depends on the type of argument being given. If the argument is deductive, then 'good' support is 'conclusive' or 'guaranteed' support. In other words, if the premises **are accepted to be true** (regardless of whether they are, in fact, true), then the conclusion **has to be** accepted to be true (regardless of whether it is, in fact, true). Such an (deductive) argument is called **valid**. Conversely, if a (deductive) argument is such that even if the premises are accepted as true, it is still possible that the conclusion is false, then it is an invalid argument.

On the other hand, if the argument is inductive, then 'good' support is 'highly probable' support. In other words, if the premises are accepted to be true (regardless of whether they

are, in fact, true), then the conclusion is accepted to be **highly likely** to be true (regardless of whether it is, in fact, true). Such an (inductive) argument is called **relatively strong**. Conversely, if the conclusion is not very likely to be true, even after accepting the premises to be true, we categorise the argument as relatively weak.

So, a good deductive argument is one that is **valid** and**has true premises**. Such an argument is called **sound**; if it is either invalid or has false premises, then it is **unsound**. Similarly, a good inductive argument is one that is **relatively strong**and**has true premises**. Such an argument is called **cogent**; if it is either weak or has false premises, then it is **uncogent**.

You should note that the discussion above has the following implications:

a. Validity and soundness are terms associated only with deductive arguments;
b. Strength and cogency are terms associated only with inductive arguments;
c. Validity and strength have nothing to do with whether the premises and conclusion of the argument are actually true;
d. The conclusion of a sound argument must be true; and
e. The conclusion of a cogent argument is highly likely to be true.

Lesson Recording

Quality of Arguments

Activity 1.3

Mooney et al (2016), Exercise 1.6 (pp.26) and 1.7 (pp.31-32).

Summary of Key Points

- Thinking implies reasoning, which is the act of giving an argument.

- Every argument consists of (and only of) statements; any statement is 'a collection of words' that can either be true or false, but not both.
- Statements are, usefully, distinguished into two types, simple and compound.
- A compound statement is one that contains an 'operator' (not, or, and, if) and is called a negation, disjunction, conjunction and conditional, respectively; a simple statement is one that is devoid of an operator.
- A conditional statement claims that the antecedent is sufficient for the consequent; however, to make the claim that the antecedent is necessary for the consequent, the 'if' in a conditional is prefixed by the word 'only'.
- The truth of a negation, disjunction, conjunction and a conditional is related to the truth of the negated statement, the truth of the disjuncts, the truth of the conjuncts and the truth of the antecedent and consequent, respectively.
- An argument is a collection of statements, some of which function as reasons (premises) for the truth of others in that collection (conclusions).
- Arguments can be classified either as deductive or inductive (but, not both); this classification depends on how strongly it wants to establish its conclusion.
- A deductive argument intends its conclusion to be certainly true, whereas an inductive argument intends its conclusion to only be highly likely to be true.
- A good (bad) deductive argument is called a sound (unsound) argument; an argument is sound if and only if it is valid and has true premises.
- A valid argument is such that the truth of its premises are sufficient for the truth of its conclusion.
- A good (bad) inductive argument is called a cogent (uncogent) argument; an argument is cogent if and only if it is strong and has true premises.
- A strong argument is such that the truth of its premises is sufficient for a high chance that its conclusion is true.
- Validity and strength are measures of how strongly a set of premises supports the conclusion; as such, the actual truth or falsity of the premises is irrelevant to whether an argument is valid/strong.

Chapter 2: Arrow Diagrams: Laying Bare the Structure of an Argument

2.1 The Basic Arrow Arrangements

Read

You should now read: Mooney et al (2016), Chapter 2 (Section 2.1, 2.2, 2.3, 2.4, 2.5 and 2.6).

An arrow diagram is an effective and instructive way of identifying the structure of an argument. This identification of structure is an essential first step towards determining what the strong and weak points of an argument are (i.e., what features of the argument make it 'good' and what features of the argument make it 'bad').

An arrow diagram represents arguments that consist of statements which generally play exactly one of three roles; a statement could be either an unsupported premise, or an intermediate conclusion, or a final conclusion. Arrows are drawn from **supporting** statements to**supported** statements (i.e., from premises to either intermediate or final conclusions, or, from intermediate to final conclusions).

Your readings should make it clear that there are four basic forms of arrow arrangements, each corresponding to a unique form of reasoning: serial, convergent, linked and divergent. You should be able to distinguish between arguments expressing these forms of reasoning and draw corresponding arrow diagrams.

Activity 1.4

Mooney et al (2016), Exercise 2.2 (pp.51-52), 2.3 (pp.52-53) and 2.4 (pp.55-56).

2.2 Combining Arrow Arrangements

Read

You should now read: Mooney et al (2016), Chapter 2 (Section 2.7).

Most arguments you will encounter on an everyday basis will combine the different basic forms of reasoning in a variety of ways. You should read the requisite section in your textbook to be familiar with how to represent an ordinary language argument in the form of an arrow diagram. Watch the video for additional guidance.

Lesson Recording

Drawing an Arrow Diagram

Activity 1.5

Mooney et al (2016), Exercise 2.5 (pp.62-63).

Summary of Key Points

- An arrow diagram is a useful way of representing any argument because it illustrates the structure of an argument.
- As the name suggests, an arrow diagram consists of arrows drawn to statements in the argument that are supported from the statements in the argument that support them; each arrow represents a mini argument within the larger argument.
- Every statement in an argument is represented in an arrow diagram in exactly one of three different ways: either it only has arrows drawn from it [in which case, it is an unsupported premise]; or, it only has arrows drawn to it [in which case, it is a final conclusion]; or, it has arrows drawn both from and to it [in which case, it is an intermediate conclusion].
- Arrow diagrams can represent four distinct argument structures: serial, convergent, linked and divergent.
- In a basic serial structure, one statement supports exactly one other statement; so, there is exactly one arrow drawn from the supporting statement to the supported statement.
- In a basic convergent structure, multiple statements independently support exactly one other statement; so, there is one arrow drawn from each supporting statement to the supported statement.
- In a basic linked structure, multiple statements jointly support exactly one other statement; so, there is exactly one arrow drawn from the set of supporting statements to the supported statement.
- In a basic divergent structure, exactly one statement supports multiple statements; so, there is one arrow drawn from the supporting statement to each of the supported statements.
- In general, arguments consist of a variety of combinations of these four basic structures.

Formative Assessment

1. 'If I wear a red shirt to the interview, I will get a job. This is _____.
    a. a statement
    b. an argument
    c. A) and B)
    d. None of the above

2. Suppose you believe that you have to study hard to do well in this course. Which of the following conditional statements expresses your belief?
    a. If I study hard, then I will do well in this course.
    b. If I don't do well in this course, I did not study hard.
    c. If I do well in this course, then I have studied hard.
    d. None of the above.

3. Suppose Emma is married to George. Suppose also that Emma has two children. Which of the following compound statements is false?
    a. Either Emma is married to George or she has two children.
    b. Either Emma is not married to George or she has two children.
    c. Either Emma is married to George or she does not have two children.
    d. Either Emma is not married to George or she does not have two children.

4. Suppose Emma is married to George. Suppose also that Emma has two children. Which of the following compound statements is false?
    a. If Emma is not married to George, she is childless.
    b. If Emma likes wearing red dresses, she has two children.
    c. If Emma has two children, then she is married to George.
    d. If Emma is married to George, then she is childless.

5. Consider the following argument: "Most of the times Roger plays Rafa, Rafa wins. So, the next time Roger and Rafa play, I think Rafa will win."
    a. This is best read as a deductive argument.
    b. This is best read as an inductive argument.
    c. Both A) and B) are true.
    d. None of the above

6. Consider the following argument: "All flowers are red in colour. A rose is a type of flower. So, a rose must be red in colour." Which of the following statements is true?
    a. This is a valid, but unsound argument.
    b. This is a valid and sound argument.
    c. This is an invalid, but sound argument.
    d. This is a valid, inductive argument.

7. Which of the following statements is true?
    a. A sound argument <u>can</u> have a false conclusion.
    b. A valid argument <u>must</u> have a true conclusion.
    c. A cogent argument <u>can</u> have a false conclusion.
    d. A strong argument <u>must</u> have true premises.

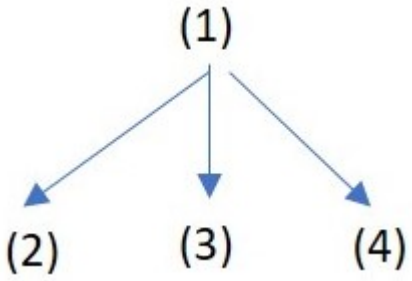
8. Consider the following argument: "Mr. Tan has been very active in political work at the grassroots-level and so he is well-suited to contest the general elections." Which of the following arrow diagrams represent this argument?
    a. "Mr. Tan has been very active in political work at the grassroots-level" → "He is well-suited to contest the general elections".
    b. "He is well-suited to contest the general elections" → "Mr. Tan has been very active in political work at the grassroots-level".
    c. "Mr. Tan has been very active in political work at the grassroots-level" ↔ "He is well-suited to contest the general elections".

d. All of the above.

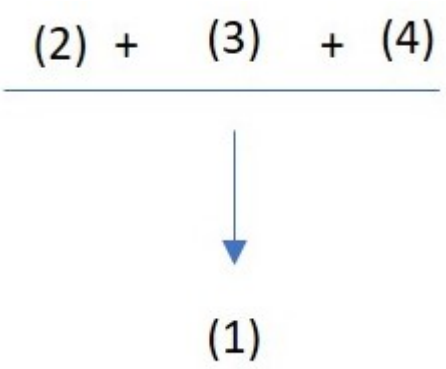
9. Consider the following argument, where the statements have been numbered: "(1) We should go to Hannah's party because (2) she serves really delicious food. If that isn't good enough a reason, remember that (3) she is never miserly with the wine. And don't forget, (4) the company is lovely too. Which of the following arrow diagrams best represent this argument?

a.

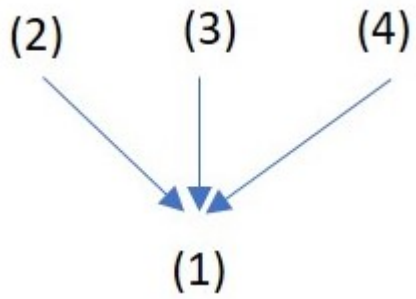
b.



c.



d.



Solutions or Suggested Answers

Formative Assessment

1. 'If I wear a red shirt to the interview, I will get a job. This is _____.

    a. a statement

    Correct! This is a compound statement, referred to as a conditional.

    b. an argument

    Incorrect. An argument must have at least two statements such that one of the two is a premise, and the other, a conclusion.

    c. A) and B)

    Incorrect. Nothing can be both a statement and an argument.

    d. None of the above

    Incorrect. You will know why, when you try again.

2. Suppose you believe that you <u>have</u> to study hard to do well in this course. Which of the following conditional statements expresses your belief?

    a. If I study hard, then I will do well in this course.

    Incorrect. The 'have to' in the statement indicates that you believe that studying hard is <u>necessary</u> for doing well in this course. But the conditional in A) claims that studying hard is <u>sufficient</u> for doing well in this course.

    b. If I <u>don't</u> do well in this course, I <u>did not</u> study hard.

    Incorrect. The 'have to' in the statement indicates that you believe that studying hard is <u>necessary</u> for doing well in this course. But the conditional in B) claims that studying hard is sufficient for doing well in this course.

    c. If I do well in this course, then I have studied hard.

Correct! The 'have to' in the statement indicates that you believe that studying hard is necessary for doing well in this course. This implies that the fact that you do well for this course is sufficient for the fact that you studied hard.

d. None of the above.
Incorrect. Only one of the options above is correct.

3. Suppose Emma is married to George. Suppose also that Emma has two children. Which of the following compound statements is false?

   a. Either Emma is married to George or she has two children.
   Incorrect. This disjunction is true. For a disjunction to be true, at least one disjunct must be true; in this case, both disjuncts are true.

   b. Either Emma is not married to George or she has two children.
   Incorrect. This disjunction is true. For a disjunction to be true, at least one disjunct must be true; in this case, the disjunct, 'Emma has two children' is true.

   c. Either Emma is married to George or she does not have two children.
   Incorrect. This disjunction is true. For a disjunction to be true, at least one disjunct must be true; in this case, the disjunct, 'Emma is married to George' is true.

   d. Either Emma is not married to George or she does not have two children.
   Correct! This disjunction is false. For a disjunction to be true, at least one disjunct must be true; in this case, both disjuncts are false.

4. Suppose Emma is married to George. Suppose also that Emma has two children. Which of the following compound statements is false?

   a. If Emma is not married to George, she is childless.

Incorrect. This conditional is true. A conditional is true if its antecedent is false; in this case, the antecedent is false.

b. If Emma likes wearing red dresses, she has two children.
Incorrect. This conditional is true. A conditional is true if its consequent is true; in this case, the consequent is true.

c. If Emma has two children, then she is married to George.
Incorrect. This conditional is true. A conditional is true if its consequent is true; in this case, the consequent is true.

d. If Emma is married to George, then she is childless.
Correct! This conditional is false. A conditional is false if its antecedent is true and its consequent is false; which is the case here.

5. Consider the following argument: "Most of the times Roger plays Rafa, Rafa wins. So, the next time Roger and Rafa play, I think Rafa will win."
   a. This is best read as a deductive argument.
   Incorrect. Charitably read, this does not appear to be an argument where the arguer is trying to claim his conclusion to be guaranteed to be true.

   b. This is best read as an inductive argument.
   Correct! Charitably read, this appears to be an argument where the arguer is trying to claim his conclusion to be highly likely to be true.

   c. Both A) and B) are true.
   Incorrect. An argument should be read either inductively or deductively, but not both.

   d. None of the above
   Incorrect. An argument has to be read either deductively or inductively.

6. Consider the following argument: "All flowers are red in colour. A rose is a type of flower. So, a rose must be red in colour." Which of the following statements is true?

    a. This is a valid, but unsound argument.
    Correct! The argument is valid because if you accept the premises to be true, you must accept the conclusion to be true; but the premise "All flowers are red in colour" is false; so, the argument is unsound.

    b. This is a valid and sound argument.
    Incorrect. The argument is valid because if you accept the premises to be true, you must accept the conclusion to be true; but the premise "All flowers are red in colour" is false; so, the argument is unsound.

    c. This is an invalid, but sound argument.
    Incorrect. No argument can be both invalid and sound.

    d. This is a valid, inductive argument.
    Incorrect. No argument can be both valid and inductive; validity and soundness are terms reserved for deductive arguments.

7. Which of the following statements is true?

    a. A sound argument <u>can</u> have a false conclusion.
    Incorrect. A sound argument is both valid (the conclusion is guaranteed by the premises) and has true premises. So, the conclusion must be true.

    b. A valid argument <u>must</u> have a true conclusion.
    Incorrect. The validity of an argument has no link with whether its premises or conclusion are actually true.

    c. A cogent argument <u>can</u> have a false conclusion.
    Correct! A cogent argument <u>must</u> have a conclusion that is highly likely to <u>be true,</u> but can be false.

    d. A strong argument <u>must</u> have true premises.

Incorrect. The strength of an argument has no link with whether its premises are actually true.

8. Consider the following argument: "Mr. Tan has been very active in political work at the grassroots-level and so he is well-suited to contest the general elections." Which of the following arrow diagrams represent this argument?

   a. "Mr. Tan has been very active in political work at the grassroots-level" → "He is well-suited to contest the general elections".
   Correct! The word 'so' indicates that "Mr. Tan has been very active in political work at the grassroots-level" is a premise for the conclusion, "He is well-suited to contest the general elections". Arrows are drawn from premises to the conclusion.

   b. "He is well-suited to contest the general elections" → "Mr. Tan has been very active in political work at the grassroots-level".
   Incorrect. The word 'so' indicates that "Mr. Tan has been very active in political work at the grassroots-level" is a premise for the conclusion, "He is well-suited to contest the general elections". Arrows are drawn <u>from</u> premises <u>to</u> the conclusion.

   c. "Mr. Tan has been very active in political work at the grassroots-level" ↔ "He is well-suited to contest the general elections".
   Incorrect. The word 'so' indicates that "Mr. Tan has been very active in political work at the grassroots-level" is a premise for the conclusion, "He is well-suited to contest the general elections". Arrows are drawn <u>from</u> premises <u>to</u> the conclusion.

   d. All of the above.
   Incorrect. There is a unique arrow diagram for every argument.

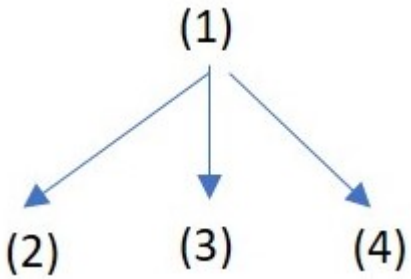
9. Consider the following argument, where the statements have been numbered: "(1) We should go to Hannah's party because (2) she serves really delicious food. If that

isn't good enough a reason, remember that (3) she is never miserly with the wine. And don't forget, (4) the company is lovely too. Which of the following arrow diagrams best represent this argument?

a.

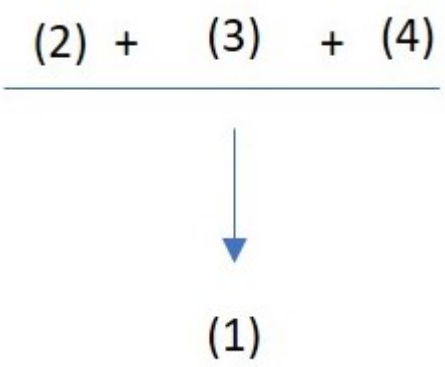
Incorrect. In the given argument, statements (2), (3) and (4) provide independent reasons for going to Hannah's party (1); thus, the structure of the argument is 'convergent'. A), however, describes a 'serial' structure.

b.



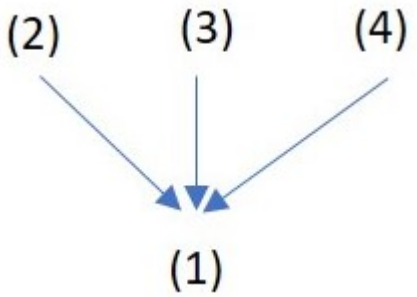
Incorrect. In the given argument, statements (2), (3) and (4) provide independent reasons for going to Hannah's party (1); thus, the structure of the argument is 'convergent'. B), however, describes a 'divergent' structure.

c.



Incorrect. In the given argument, statements (2), (3) and (4) provide independent reasons for going to Hannah's party (1); thus, the structure of the argument is 'convergent'. C), however, describes a 'linked' structure.

d.



Correct! In the given argument, statements (2), (3) and (4) provide independent reasons for going to Hannah's party (1); thus, the structure of the argument is 'convergent'.

Reference

Mooney, T. B., Williams, J. N., & Burik, S. (2016). *An Introduction to critical and creative thinking: Analysing and evaluating ordinary language reasoning*. Singapore: McGraw Hill Education (Asia).

Study Unit 2

Forms of Arguments

Learning Outcomes

By the end of this unit, you should be able to:

1. Identify the basic types of categorical statements.
2. Identify the types of categorical syllogisms.
3. Represent categorical statements using Venn diagrams.
4. Evaluate the validity and soundness of categorical syllogisms.
5. Identify the different valid deductive forms.
6. Identify the different invalid deductive forms.
7. Establish the validity of arguments by determining whether the conclusion is inferable from the premises via the above forms.
8. Identify the principles behind the inductive approach and appreciate its centrality in everyday reasoning.
9. Identify the four basic forms that an inductive argument might take – statistical syllogisms; inductive generalisations; arguments from analogy; and arguments appealing to authority.
10. Specify conditions under which an inductive argument is relatively strong or weak.
11. Evaluate the strength of an ordinary-language inductive argument.

Overview

The first study unit introduced you to the nature of reasoning. There, you learnt about the basic structure of an argument; a way of representing any given argument (arrow diagrams); the basic types of arguments (deductive and inductive); and, given the type, the basic criteria which a good argument must satisfy (soundness and cogency). You are now prepared for a more sophisticated enterprise: the task of determining which arguments meet those criteria, and why. Showing you how to do this is the primary focus of this study unit. We will begin by analysing deductive arguments and then move on to considering inductive arguments.

A caveat, though, is due here. You'll recall that the 'soundness' of an argument is constituted by its validity and the truth of its premises. Similarly, a cogent inductive argument is strong and has true premises. However, our focus will exclusively be on determining validity and strength; we will ignore considering whether the premises of an argument are true. The reason for this is because, in principle, determining the truth of a statement is relatively simple:

i. you can either appeal to your sensory perceptions (for example, 'Emma was wearing a red dress to the party' is true <u>because</u> I was at the party and I saw her wearing a red dress); or,
ii. appeal to your consciousness (for example, 'I am in pain' is true <u>because</u> I feel **pain**); or,
iii. appeal to legitimate authority (for example, 'Changi is in the east of Singapore <u>because</u> the **Atlas tells me so**).

Indeed, when controversies about truth arise, they do so because there are conflicts about sensory perceptions, or about how a particular term should be defined, or among authorities on a subject.

Chapter 1: Deductive Arguments

1.1 Categorical Syllogisms

1.1.1 Categorical Statements and Syllogisms

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 5 and 8 (Section 5.1, 5.2, 5.3, 8.1 and 8.2).

Having read the required material, you should be familiar with the general structure of a categorical statement. You should, for instance, know that a categorical statement expresses a relationship between sets or classes or categories of objects. In addition, you should know that every categorical statement must contain 3 'building blocks': a quantifier (**all, some,** or **none**); a subject category; and, a predicate category. Thus, more precisely, in a categorical statement, the quantifier tells you how many objects in the subject category also belong to the predicate category. In fact, your textbook (Mooney et al., 2016) helpfully classifies the types of categorical statements into A, E, I and O type statements, depending on the quantifier that is used.

Having familiarised yourself with categorical statements, you should move on to developing a good understanding of what a categorical syllogism is. Simply put, a categorical syllogism must have two essential properties: firstly, like all syllogisms, a categorical syllogism must consist of exactly 2 premises and 1 conclusion; secondly, the 2 premises and the conclusion must be categorical statements (either A, E, I or O type). Finally, you must acknowledge that a categorical syllogism, by its very nature, is a deductive argument. Anyone who puts forward a categorical syllogism is automatically

assumed to be claiming that his conclusion is guaranteed by the truth of his premises; as such, whether a categorical syllogism is sound depends on whether it is valid and whether its premises are true.

I want to conclude this subsection by reiterating an important point that is briefly alluded to in the 'preface' in Chapter 8 of your textbook (Mooney et al., 2016). There are two distinct approaches to understanding the content of any universal categorical statement (A or E type statements); on the 'Aristotelian' approach, a statement such as 'All As (for example, philosophers) are Bs (for example, whisky drinkers)', is taken to imply that there exists at least one A (philosopher). In other words, in the 'world as we know it', we can 'find' at least one A (philosopher). So, on this approach, it would be valid to infer from the premise, 'All (No) philosophers drink whisky, the conclusion that 'A philosopher exists' or 'Someone is a philosopher'.

The other approach, the 'Boolean' approach denies this claim. On this reading, a universal categorical statement is **silent** (or, says nothing) about whether we can 'find' at least one A in the world. So, you cannot validly infer from the premise 'All (No) philosophers drink whisky', the conclusion that 'Someone is a philosopher'. Although, on the first reading, you might sympathise with the Aristotelian approach (you might think: who, in his right mind, would want to claim 'All philosophers drink whisky', if there were no philosophers in the world?), the Boolean approach is not without its merits. Consider for example, the statements: 'All unidentified flying objects (UFOs) can fly' or 'No queen of Singapore is a male'. Both of the statements above are true, by the definitions of what 'UFOs' and 'queens' are. But, does it follow that UFOs exist? Or, that Singapore has a queen?

Now, whatever your persuasions are, in this course, we will read categorical statements in the 'Boolean' way. For us, universal categorical statements will make no existential claim. Note, finally, that when it comes to particular categorical statements (I or N type statements), there is no controversy between the Aristotelian and the Boolean approaches. On both readings, the statements, 'Some A's are Bs' or 'Some As are not Bs', imply that at least one A exists (we can 'find' at least one A in the world).

Activity 2.1

Mooney, Williams, & Burik (2016), Exercise 8.1, pp.229-230.

1.1.2 Venn Diagrams

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 8 (Section 8.7).

Our primary focus in this section is to assess whether a given categorical syllogism is valid. The fool-proof way of doing so is by using Venn diagrams. So, although Section 5.3 of your textbook (Mooney et al., 2016) gives you a summary of which categorical syllogisms are valid, when you are asked to determine validity, you must use Venn diagrams. You must read the required section in the textbook very carefully, and work through the numerous examples to master how A, E, I and O statements are represented using Venn diagrams.

Having done so, you must also be familiar with how to represent a categorical syllogism with Venn diagrams and determine its validity. Remember that the simple rule to follow in this context is to consider whether the conclusion of a categorical syllogism claims more than what the premises jointly claim. If yes, the syllogism is invalid; otherwise, it is valid.

Watch the video for additional guidance on this.

Lesson Recording

Venn Diagrams and Categorical Statements

Activity 2.2

Mooney, Williams, & Burik (2016), Exercise 8.4, pp.259.

1.2 Propositional Logic

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 5 (Section 5.4-5.6).

Section 5.4 in your textbook introduces you to a second type of deductive argument: arguments whose validity can be determined by appealing to established rules of inference. These are arguments in which the premises and the conclusion are either simple or compound statements, statements that are appended or conjoined by 'not', 'and', 'or' and 'if …, then …' (these are called propositional operators). This section also provides you with a list of 17 valid and invalid inferences in propositional logic. You must appreciate that the content (and, therefore, truth) of the statement/s is/are immaterial to the (in)validity of the argument. All that matters is whether the form of the argument takes one of the 17 forms identified here. Watch the video to strengthen your understanding of why certain inferences are valid, while others are not.

Lesson Recording

Forms of Deductive Arguments and Validity

Activity 2.3

Mooney, Williams, & Burik (2016), Exercise 5.2 (pp.134-136).

Section 5.6 of your textbook provides instruction on how to determine the validity of more complex arguments in propositional logic – arguments that might need you to employ a combination of the 17 forms identified in Section 5.4 (and summarised in Section 5.5) to determine validity. Work through the examples meticulously.

Summary of Key Points

- This chapter introduces you to two different types of deductive arguments as well as to techniques for determining their validity.
- The first type of deductive argument discussed is the categorical syllogism; this refers to arguments with two premises and one conclusion, where the premises and the conclusion are in the form of categorical statements.
- All categorical statements consist of exactly one qualifier ('all', 'none', or 'some'), exactly one subject category and exactly one predicate category.
- We take the Boolean approach to interpreting categorical statements, which states that universal categorical statements – those containing either the quantifier 'all' or 'non' – are silent about whether a member of the subject category actually exists.
- Venn diagrams can be used to represent categorical statements; you only need to be familiar with how universal categorical statements are represented.

- A statement such as "All As are Bs" is represented by identifying the area corresponding to the set of As that are not Bs and shading it; shading an area in a Venn diagram denotes that the shaded area is empty.
- A statement such as "No As are Bs" is represented by identifying a region corresponding to the set of As that are Bs, and shading it.
- Venn diagrams can also be used to evaluate whether a given categorical syllogism is valid by following these steps: firstly, each (universal) premise is represented; secondly, the (universal) conclusion is represented; and finally, the area shaded by the conclusion is compared to the area shaded by the two premises taken together.
- A categorical syllogism consisting only of universal statements is valid if the area shaded by the conclusion coincides with or, is contained within the area shaded by the two premises taken together; otherwise, it is invalid.
- A second type of deductive argument consists of those whose premises and conclusion are either in the form of simple or compound statements; the study of the validity of this type of argument is called propositional logic.
- Propositional logic attempts to represent any given argument in a standard argument form. Some standard argument forms are valid (including, but not limited to, Modus Ponens, Modus Tollens, Disjunctive Syllogism and Constructive Dilemma), while others (including, but not limited to, Denying the Antecedent) are invalid.
- In propositional logic, an argument is valid if it takes a valid standard argument form; and it is invalid if it follows an invalid standard argument form.
- Generally, arguments within the domain of propositional logic can consist of a combination of standard argument forms: such arguments are valid if all standard argument forms in the argument are valid; and they are invalid if at least one standard argument form is invalid.

Chapter 2: Inductive Arguments

2.1 The Nature of Induction

In much of your everyday conversation, you might make or come across claims such as these: 'It will rain today,' or 'Tom won't be late for the meeting,' or 'Let's not go to Holland Village; we won't find parking there.' These sorts of claims are **contingent** in nature; they are fundamentally distinct from absolute or necessary claims such as, 'Lying is wrong,' or 'Only one straight line can be drawn between any two fixed points,' or 'God exists.'

When you make a contingent claim, you allow some chance (in other words, a positive probability) for the claimed proposition to be false. Of course, you don't think that the statement you are claiming is **likely to be** (or has a high probability of being) false – otherwise, you wouldn't, in all sincerity, make the claim; you would, for instance, be surprised if it did rain, or if Tom was late, or that if you drove to Holland Village and happened to find ample parking space – but that would not change the fact that you had good reasons for claiming what you did, when you did. If your interlocutor were to ask you why you made a false claim, you would identify your reasons: 'It is the rainy season and it has been raining almost every day,' or 'Tom has never been late to a meeting before,' or 'generally, parking is hard to find in Holland Village on weekends and today is Saturday.' Indeed, if you were in a similar situation again, you would still be fairly comfortable (perhaps, a little less than before) in making the claims that you did.

Notice what is going on. You made a claim knowing that it was highly likely, but not guaranteed, to be true. Your claim was justified by your belief that there are certain **regularities** in the world (for instance, the world is such that it invariably rains during the rainy season), and the belief that these regularities will continue. If the 'regularity' is violated on any one instance, it might affect the confidence with which you make the same claim on a subsequent occasion; the degree to which your confidence is affected depends on how you explain away the violation. If you think of the violation merely as **random**, you would probably not hesitate in sticking to either your claim or your reasons for the

claim. For example, if Tom turned up late for the meeting and told you, truthfully, that a tree had fallen across the road on the way to work – a random occurrence – then you would still want to maintain that 'Tom won't be late for the next meeting.' Of course, if your claim starts turning out to be false more frequently, you would suspect that there is now a 'new regularity' in the world and revise your beliefs and claims accordingly.

The process described above is **induction**. You start with a (probably true, but possible false) claim that is justified by your knowledge about regularities that have been observed in the past (evidence); and, you continuously revise the **degree** of your belief in your claim in the light of new evidence (in other words, you **update** the degree of your belief in what you want to claim). How good the induction is – and that is what we are interested in determining – depends on the extent to which your evidence makes your claim likely. We will consider this issue in the next section, but before we do so, I would want you to appreciate that our day-to-day behaviour – going to the train station at a particular time, going to a favourite restaurant at lunch time, carrying an umbrella to work, etc. – is all justified by this process of induction.

2.2 Basic Forms of Inductive Arguments

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 5 (Section 5.9).

This section in your textbook familiarises you with the 4 basic forms that inductive arguments take: statistical syllogisms; inductive generalisations; arguments from inductive analogy; and, appeals to authority. You should carefully consider the general structure of each of these forms and appreciate how the particular examples follow that general structure. In addition, you must pay particularly close attention to the factors that make an inductive argument in each of the 3 forms relatively strong or weak (discussion

of the fourth form, appeals to authority, is postponed to Study Unit 3). These factors are specific to the form of the argument.

For example, you should know that the strength of an inductive generalisation depends on how large and how representative the sample used for the generalisation is. On the other hand, the strength of any argument from analogy depends on the number of relevant properties (or characteristics) shared between the objects being compared, and on whether there are any relevant dissimilarities. Finally, if you have been critically engaging with the examples in the textbook, then the following subtle point might have struck you: a statistical syllogism is nothing but an argument from analogy in different clothes. The former concludes that something or somebody is highly likely to have a particular property (for example, 'Sovan is highly likely to be an alcoholic') based on two premises: first, that thing/person is a member of a class (or, group) of things/persons (for example, 'Sovan is a philosopher' or more facetiously, 'Sovan belongs to the group of philosophers'); and second, every thing/one in that class is highly likely to have that particular property (for example, '90% of philosophers are alcoholics' or 'Any philosopher has a 90% chance of being an alcoholic').

You can easily rewrite the argument above as an argument from analogy:

P1: Steven, John, Bryan, etc. are philosophers.

P2: Sovan is (also) a philosopher.

P3: Steven, John, Bryan, etc. are highly likely to be alcoholics.

C: Sovan is highly likely to be an alcoholic.

There is a moral to this exercise; it is that the factors that determine the strength of an argument from analogy are also the factors that determine the strength of a statistical syllogism.

Watch the video for additional guidance.

Lesson Recording

Inductive Forms and Strength

Finally, note that a more complex inductive argument can be constructed using a combination of these forms. The strength of that argument will then depend on the strength of its constituent forms.

Summary of Key Points

- Induction is the act of making contingent claims based on our knowledge of contingent facts; such as, inductive reasoning is central to much of our everyday behaviour.
- There are four basic forms of inductive arguments, three of which are discussed in this chapter – inductive generalisation, statistical syllogism and argument from analogy.
- An inductive generalisation, as the name suggests, infers a claim about a population, based on what is known about a sample of the population; the generalisation is stronger if the sample is relatively large and relatively representative of the population.
- A statistical syllogism infers a claim about a member (or members) of the population, based on what is probabilistically known about the population; the induction is stronger if there are no relevant dissimilarities between the population at large, and the chosen member(s); what constitutes relevant is determined by what is claimed.
- An argument from analogy claims that two entities share some properties on the basis that they are known to share other properties (i.e., are analogous). The induction is stronger the larger the set of relevant properties the entities are known to share and the fewer the set of relevant dissimilarities between them.

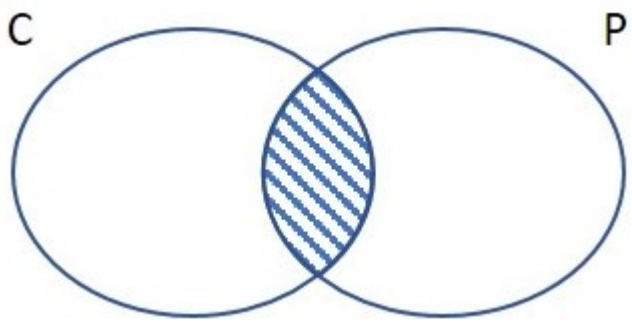
- In general, an inductive argument can consist of a variety of the basic inductive forms; then its strength would depend on the strength of its constituent forms.

Formative Assessment

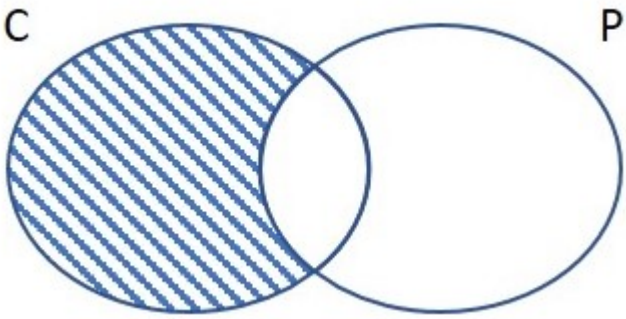
1. Under the 'Boolean' interpretation (our chosen interpretation in this course), which of the following claims are equivalent to claiming, "All elephants are mammals"?
    a. There is at least one elephant in the world.
    b. There is at least one mammal in the world.
    c. Nothing exists in this world that is an elephant, but not a mammal.
    d. All of the above.

2. Which of the following Venn diagrams correctly represents the claim, "All music composers (Cs) are accomplished players (Ps)"?

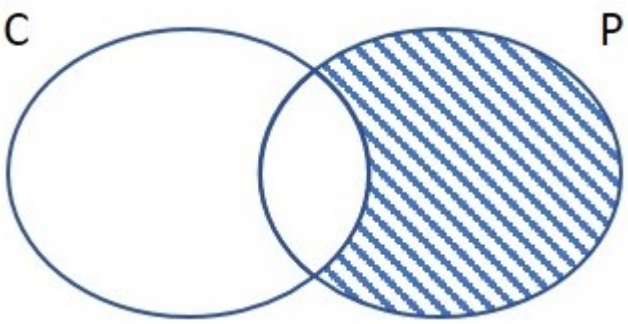
a.



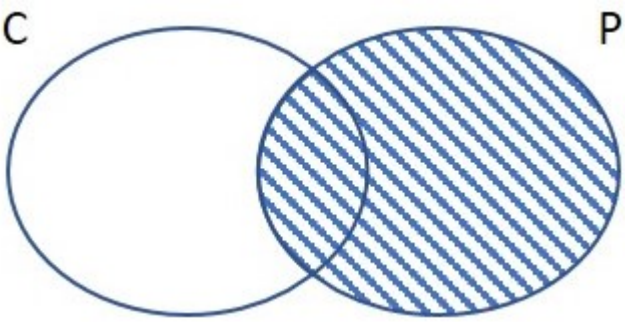
b.



c.

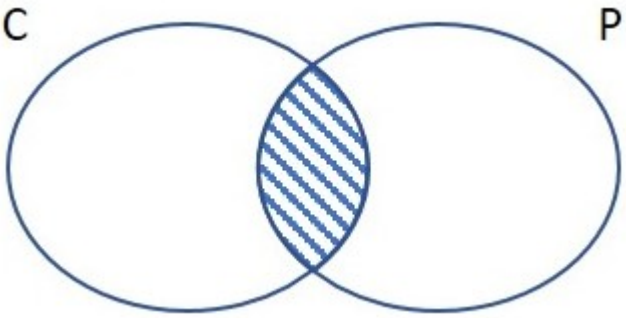


d.

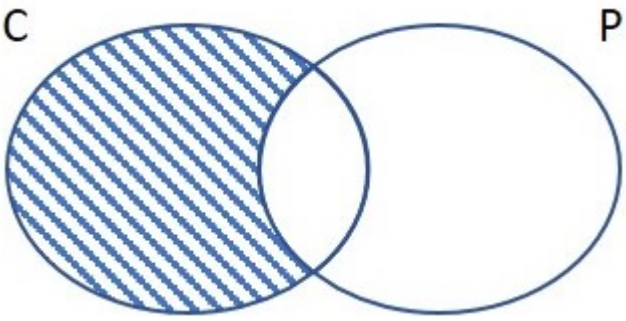


3. Which of the following Venn diagrams correctly represent the claim, "No music composers (Cs) are accomplished players (Ps)"?

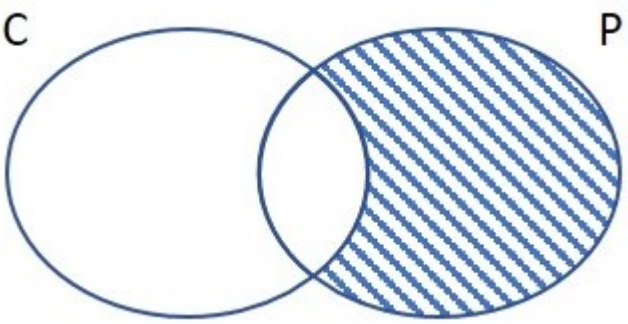
a.



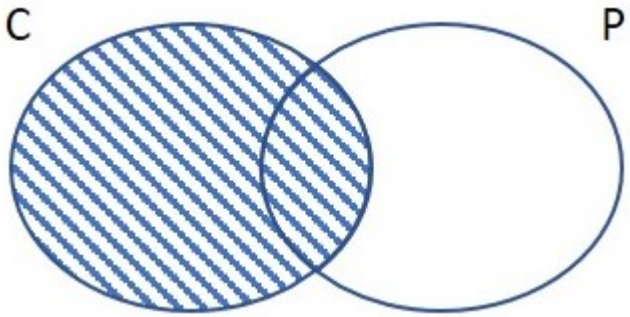
b.



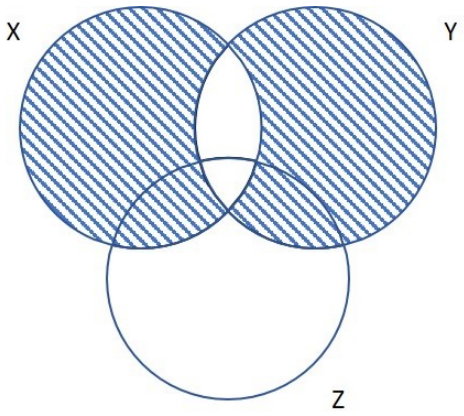
c.



d.

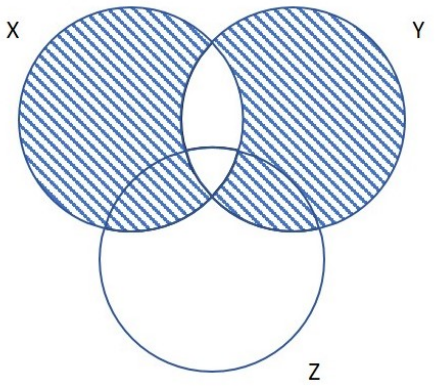


4. Suppose the premises of a categorical syllogism are represented as follows:

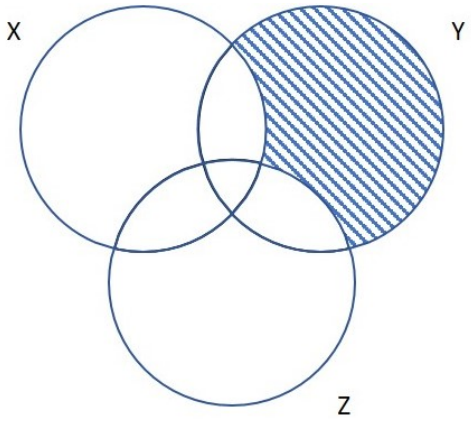


Under which of the following representations of the conclusion is the argument <u>invalid</u>?

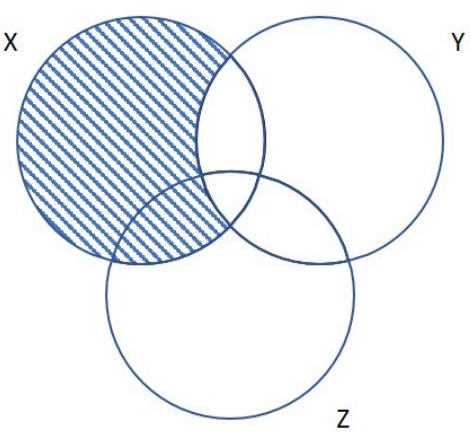
a.



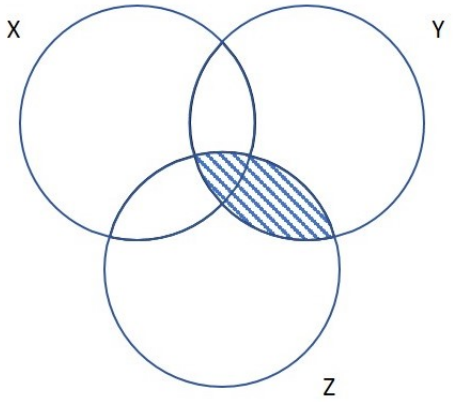
b.



c.



d.



5. Consider the following argument.

   If P, then not Q

   Q _____

   Therefore, not P

   This standard argument form is called _____.

   a. Modus Tollens
   b. False Dichotomy
   c. Hypothetical Syllogism
   d. Constructive Dilemma

6. Consider the following argument.

   "Either Modus Ponens is a valid argument form or Hypothetical Syllogism is a valid argument form. But Hypothetical Syllogism is not a valid argument form. So, Modus Ponens is a valid argument form." Which of the following statements is true?

   a. This argument is valid and sound.
   b. This argument is valid but unsound.
   c. This argument is invalid and unsound.
   d. This argument is invalid but sound.

7. Consider the following argument.

"85% of Singaporeans surveyed are against legalising gay marriage. So, Singaporeans are against gay marriage." Knowledge of which of the following would make you consider this argument to be relatively weak?

a. A thousand Singaporeans were surveyed; men and women were equally represented.
b. 90% of the Singaporeans surveyed belonged to some religious group and 90% of all Singaporeans are affiliated to some religious group.
c. All Singaporeans surveyed were above 45 years old.
d. None of the above.

8. Consider the following argument.

"80% of all unmarried men tend to develop symptoms of depression after they turn 50. Robert is unmarried. So, he will be depressed when he is older than 50." Knowledge of which of the following will make this argument weaker?

a. Like many other unmarried men, Robert has many casual relationships with women and is sad when they end.
b. Unlike many other unmarried men, Robert stays away from alcohol and is a fitness enthusiast.
c. Unlike many other unmarried men, Robert prefers driving sedans rather than convertibles.
d. None of the above

9. Consider the following argument.

"Jack and Jill both enjoyed their last trip to Singapore. Jack holidayed in Bangkok last year and enjoyed it. Jill is going there next month, so, I am sure she will love it." Which of the following statements will make this argument weaker?

a. Jack and Jill both love sampling the street food in their holiday destinations.
b. Jack loves staying in backpackers' lodges when on holiday whereas, Jill likes staying in 5-star hotels.

c. Jack went to Thailand on a golfing holiday, but Jill does not play golf.

d. None of the above.

Solutions or Suggested Answers

Formative Assessment

1. Under the 'Boolean' interpretation (our chosen interpretation in this course), which of the following claims are equivalent to claiming, "All elephants are mammals"?

    a. There is at least one elephant in the world.
    Incorrect. Under the Boolean interpretation, a universal categorical statement such as 'All As are Bs' is silent about whether an A exists and whether a B exists.

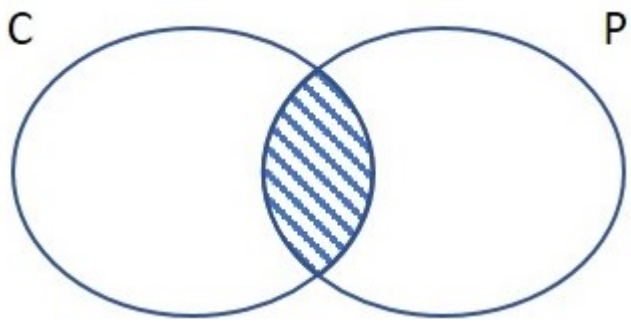
    b. There is at least one mammal in the world.
    Incorrect. Under the Boolean interpretation, a universal categorical statement such as 'All As are Bs' is silent about whether an A exists and whether a B exists.

    c. Nothing exists in this world that is an elephant, but not a mammal.
    Correct! "All As are Bs" is equivalent to claiming that we can't have an A that is not a B.

    d. All of the above.
    Incorrect. Under the Boolean interpretation, a universal categorical statement such as 'All As are Bs' is silent about whether an A exists and whether a B exists.

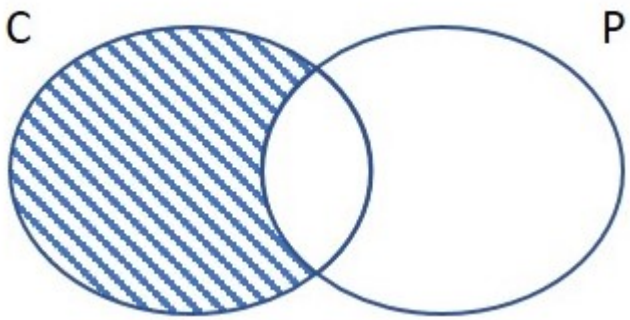
2. Which of the following Venn diagrams correctly represents the claim, "All music composers (Cs) are accomplished players (Ps)"?

a.



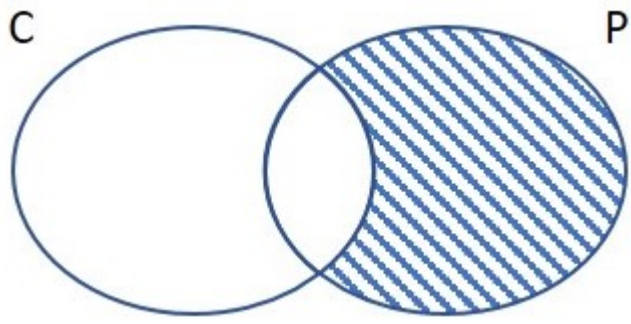
Incorrect. The area shaded in a Venn diagram represents an empty set. According to the statement, the set that is empty is the set of music composers who are not accomplished players. What is represented in (A), however, is that the set of all Cs that are Ps is empty or 'No Cs are Ps'.

b.



Correct! The area shaded in a Venn diagram represents an empty set. According to the statement, the set that is empty is the set of music composers who are <u>not</u> accomplished players.

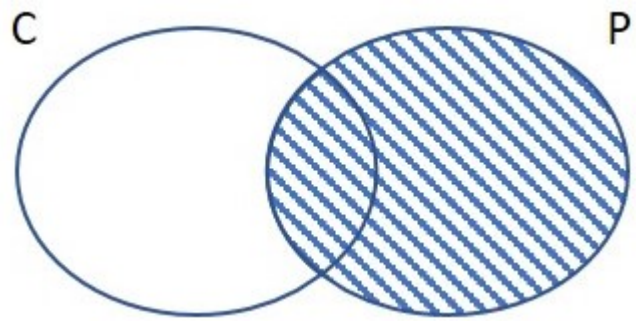
c.



Incorrect. The area shaded in a Venn diagram represents an empty set. According to the statement, the set that is empty is the set of music composers

who are not accomplished players. What is represented in (C), however, is that the set of all Ps that are not Cs is empty or 'All Ps are Cs'.

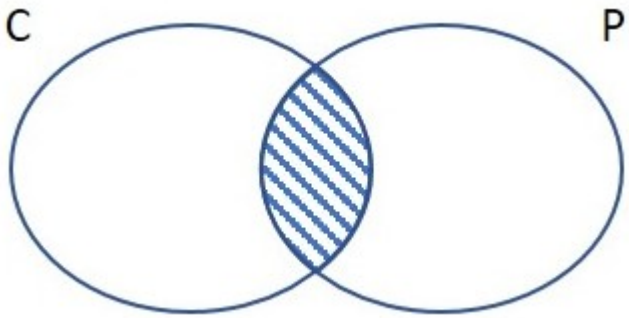
d.



Incorrect. The area shaded in a Venn diagram represents an empty set. According to the statement, the set that is empty is the set of music composers who are not accomplished players. What is represented in (D), however, is that the set of Ps is empty or 'There are no Ps'.

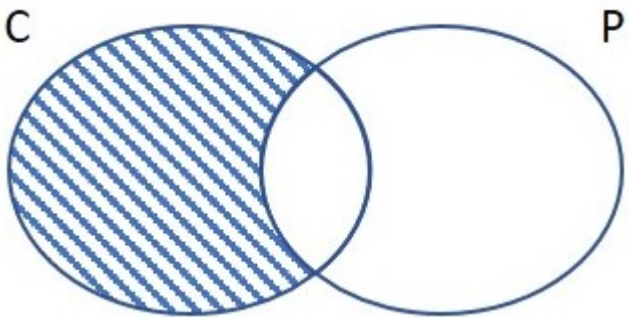
3. Which of the following Venn diagrams correctly represent the claim, "No music composers (Cs) are accomplished players (Ps)"?

a.



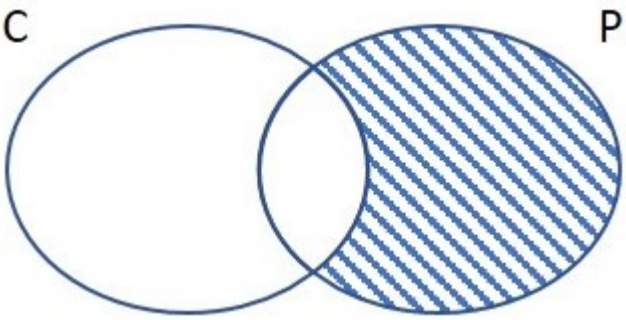
Correct. The area shaded in a Venn diagram represents an empty set. According to the statement, the set of all things that are both Cs and Ps is empty.

b.



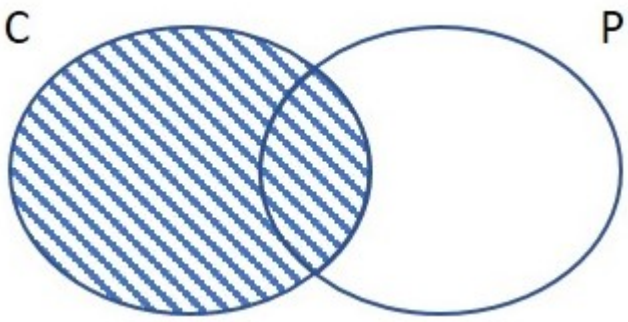
Incorrect. The area shaded in a Venn diagram represents an empty set. What is represented in (B), however, is that 'All Cs are Ps'.

c.



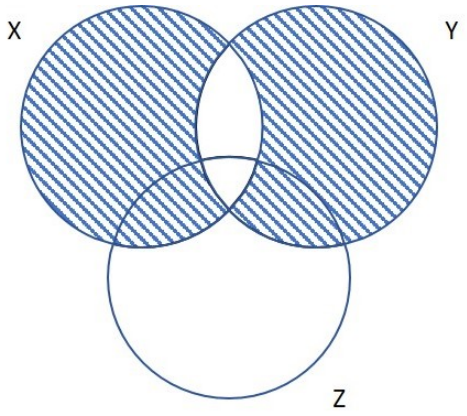
Incorrect. The area shaded in a Venn diagram represents an empty set. What is represented in (C), however, is that 'All Ps are Cs'.

d.



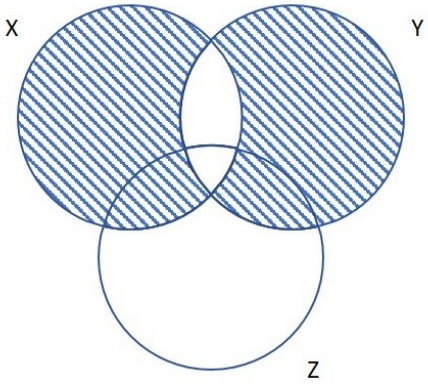
Incorrect. The area shaded in a Venn diagram represents an empty set. What is represented in (C), however, is that 'There are no Cs'.

4. Suppose the premises of a categorical syllogism are represented as follows:



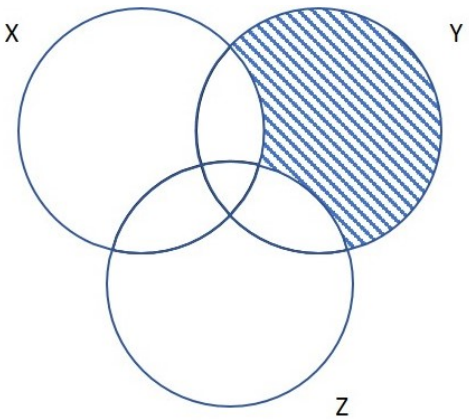
Under which of the following representations of the conclusion is the argument invalid?

a.



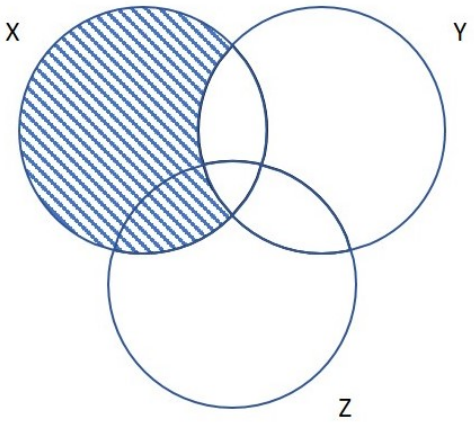
Incorrect. An argument represented through a Venn diagram is invalid if and only if the conclusion shades an area that is not shaded by premises; that is not the case here.

b.



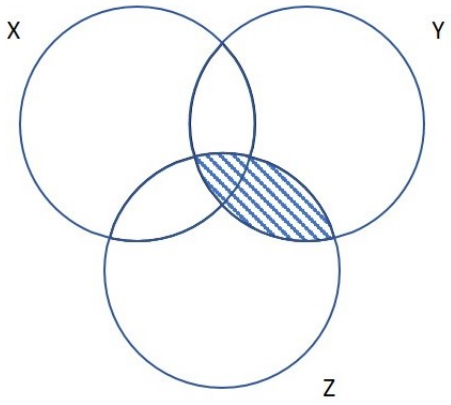
Incorrect. An argument represented through a Venn diagram is invalid if and only if the conclusion shades an area that is not shaded by premises; that is not the case here.

c.



Incorrect. An argument represented through a Venn diagram is invalid if and only if the conclusion shades an area that is not shaded by premises; that is not the case here.

d.



Correct! An argument represented through a Venn diagram is invalid if and only if the conclusion shades an area that is not shaded by premises; the shaded intersection of the three circles is such an area.

5. Consider the following argument.

If P, then not Q

Q _____

Therefore, not P

This standard argument form is called _____.

a. Modus Tollens

Correct! Modus Tollens is the name given to the argument form, which infers the denial of the antecedent from the conditional and the denial of its consequent.

b. False Dichotomy

Incorrect. This is not a false dichotomy; check argument form 7 (page 132 in your textbook).

c. Hypothetical Syllogism

Incorrect. This is not a hypothetical syllogism; check argument form 13 (page 133 in your textbook).

d. Constructive Dilemma

Incorrect. This is not a constructive dilemma; check argument form 16 (page 134 in your textbook)

6. Consider the following argument.

"Either Modus Ponens is a valid argument form or Hypothetical Syllogism is a valid argument form. But Hypothetical Syllogism is not a valid argument form. So, Modus Ponens is a valid argument form." Which of the following statements is true?

a. This argument is valid and sound.

Incorrect. The argument takes the form, 'Either P or Q; not Q, So, P'. This is a disjunctive syllogism, which is a valid standard argument form. However, the premise 'Hypothetical Syllogism is not a valid argument form' is false. So, the argument is unsound.

b. This argument is valid but unsound.

Correct! The argument takes the form, 'Either P or Q; not Q, So, P'. This is a disjunctive syllogism, which is a valid standard argument form. However, the premise 'Hypothetical Syllogism is not a valid argument form' is false. So, the argument is unsound.

c. This argument is invalid and unsound.
Incorrect. The argument takes the form, 'Either P or Q; not Q, So, P'. This is a disjunctive syllogism, which is a valid standard argument form.

d. This argument is invalid but sound.
Incorrect. No argument can be both invalid and sound

7. Consider the following argument.

"85% of Singaporeans surveyed are against legalising gay marriage. So, Singaporeans are against gay marriage." Knowledge of which of the following would make you consider this argument to be relatively weak?

a. A thousand Singaporeans were surveyed; men and women were equally represented.
Incorrect. A sample of 1,000 is a relatively large sample and the distribution of men and women in the sample is, largely, representative.

b. 90% of the Singaporeans surveyed belonged to some religious group and 90% of all Singaporeans are affiliated to some religious group.
Incorrect. Even though the sample is biased towards representing 'religious' people, it is still representative of how the population is.

c. All Singaporeans surveyed were above 45 years old.
Correct! The sample fails to be representative with respect to the age-distribution in the Singapore population.

d. None of the above.

Incorrect. One of the options above is correct.

8. Consider the following argument.

"80% of all unmarried men tend to develop symptoms of depression after they turn 50. Robert is unmarried. So, he will be depressed when he is older than 50." Knowledge of which of the following will make this argument weaker?

a. Like many other unmarried men, Robert has many casual relationships with women and is sad when they end.
Incorrect. A similarity between Robert and other unmarried men cannot make the argument weaker; if it is an irrelevant similarity, it has no effect on strength, and if it is relevant, it makes the argument stronger.

b. Unlike many other unmarried men, Robert stays away from alcohol and is a fitness enthusiast.
Correct! This is a relevant dissimilarity between Robert and other unmarried men; it is known that lifestyle factors have an influence on some's propensity to be depressive.

c. Unlike many other unmarried men, Robert prefers driving sedans rather than convertibles.
Incorrect. This is highly likely to be an irrelevant dissimilarity, which should have no impact on the strength of the argument.

d. None of the above
Incorrect. One of the options above is correct.

9. Consider the following argument.

"Jack and Jill both enjoyed their last trip to Singapore. Jack holidayed in Bangkok last year and enjoyed it. Jill is going there next month, so, I am sure she will love it." Which of the following statements will make this argument weaker?

a. Jack and Jill both love sampling the street food in their holiday destinations.
Incorrect. This is a relevant similarity which should make the argument stronger.

b. Jack loves staying in backpackers' lodges when on holiday whereas, Jill likes staying in 5-star hotels.
Incorrect. This is an irrelevant dissimilarity. Bangkok is known to have both backpackers' lodges and 5-star hotels.

c. Jack went to Thailand on a golfing holiday, but Jill does not play golf.
Correct! This is a relevant dissimilarity. Jack might have enjoyed his holiday purely on account of the good, cheap golf he gets to play, which Jill would derive no enjoyment from.

d. None of the above.
Incorrect. One of the above options is correct.

Reference

Mooney, T. B., Williams, J. N., & Burik, S. (2016). *An Introduction to critical and creative thinking: Analysing and evaluating ordinary language reasoning*. Singapore: McGraw Hill Education (Asia).

Study Unit 3

Additional Principles for Arguing Well

Learning Outcomes

By the end of this unit, you should be able to:

1. Describe the relationship between fallacious, invalid and weak arguments.
2. Identify the commonly committed fallacies and suggest ways of avoiding them.
3. Describe the role of definitions in achieving consensus over terms used in an argument.
4. Identify the criteria for a good definition, and use the criteria to provide definitions of terms.
5. Identify the structure of a complex argument.
6. Evaluate the strengths and weaknesses of a given argument.
7. Present good, ordinary language arguments for any given conclusion.

Overview

Study Unit 2 introduced you to some fundamental techniques for reasoning well. You now know how to determine the validity of a categorical syllogism; which forms of deductive arguments are valid; and, the criteria that inductive arguments must satisfy in order to be strong. Now, you are ready to learn how to apply that knowledge. So, the primary focus of Study Unit 3 is to instruct you how to press all the conceptual and technical resources studied thus far, to the task of writing a sustained argument for a conclusion. As a corollary, you will also learn how to evaluate the merits of relatively long arguments of the sort that routinely appear on the editorial pages of newspapers, as well as, in much of the academic writing in the social sciences.

To do this however, I will begin by introducing you to **certain** fallacies; as you will soon see, fallacies are erroneous ways of reasoning that are common because, at a superficial and uncritical level, arguments containing these fallacies appear to be good arguments. It is imperative that you take extra care in watching out for fallacious arguments and, indeed, avoid fallacies in your own argument.

I will then introduce you to the importance of defining any controversial term (a term, such that there is no consensus over its meaning) that you might use in your argument. In addition, we will consider what the criteria for a good definition are. Finally, we will wrap things up by considering how to critique complex arguments found in relatively long passages and how to write long argumentative passages that are coherent, internally consistent and free of fallacies.

Chapter 1: Informal Fallacies

1.1 The General Nature of Informal Fallacies

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 7 (Section 7.1).

Your textbook defines fallacies as "mistakes in reasoning," or "defective pieces of reasoning" (Mooney et al., 2016). It further distinguishes 'formal' fallacies from 'informal' ones based on whether the defect is in the structure of the argument, or in the substance (or "content") of the argument, while readily admitting that the distinction is slightly artificial. Given this, it might be better to rename the 'informal' fallacy as a 'popular' fallacy – a fallacy that is pervasive in everyday, ordinary language arguments and that goes routinely undetected or unchallenged by an interlocutor who, by the standards established in Study Unit 2, finds nothing wrong with the argument.

The above characterisation of an informal fallacy is instructive because it tells you that a fallacy might be lurking in an argument which:

a. is invalid, even though it does not follow the structure of any of the deductive forms listed in Section 5.5 of your textbook; or,
b. is invalid, because it follows the structure of any one of the invalid deductive forms listed in Section 5.5[1] ; or,
c. is unsound, even though it follows the structure of any one of the valid deductive forms listed in Section 5.5 [in this case, one of the premises has to be untrue]; or,

[1] If you commit this sort of a fallacy, or allow it to pass unchallenged, then you are just being careless about what you learnt in Study Unit 2.

d. is a bad argument, even though it is valid and, perhaps, even sound; or,

e. is a weak inductive argument.

Let us now look at an example of each of the kinds of fallacies identified above. Begin by considering Example 7.2.27 in your textbook (Mooney et al., 2016, pp.182) as an example of (a) above. Here, the argued-for conclusion is: 'We should not cut down on pesticides used in growing fruit and vegetables.' The reason given for the conclusion is that fruit and vegetables are essential for our health. Note that this argument, as it stands, does not follow any of the forms listed in Section 5.5. However, a little thought should be sufficient to convince you that the argument is invalid: accepting the health benefits of consuming fruit does not allow you to infer that the cultivation of fruit should not use pesticides. Indeed, there is no connection between the premise and the conclusion.

Next, consider Example 7.4.13 (Mooney et al., 2016, pp.209) as an example for (b) above. This argument follows the structure of argument 7 in Section 5.5, which is invalid. Therefore, Example 7.4.13 is straightforwardly fallacious although people routinely reason in this manner.

Now, look at Example 7.4.11 (Mooney et al., 2016, pp.208) as an example for (c) above. This argument takes the form of a disjunctive syllogism (argument 6 in Section 5.5), which is valid. However, Example 7.4.11 is an unsound argument; the disjunctive premise 'Either I should explore the tenets of Scientology or continue to lead a meaningless life' is false. It could very well be the case that I don't want to explore the tenets of Scientology and that I don't want to lead a meaningless life but that I want to take up the study of music, instead.

Move on to Example 7.4.5 (Mooney et al., 2016, pp.205) to see an instance of (d) above. The structure of the argument does not take after any of the valid forms identified in Section 5.5, but is clearly valid. If we accept the premise that we can't sell medication other than on a physician's prescription, then we must accept that we can't sell medication other than on a physician's prescription. Indeed, if any argument is valid, this certainly is. The greater travesty here is that the argument might also be sound. The pharmacist making the argument could be living in a legal jurisdiction where such sale is prohibited. Why

then is this argument 'bad' or fallacious? This is because it defeats the implicit purpose of argumentation: you argue to give independent reasons for a conclusion; in this case, the reason is not independent. You are only pretending to argue.

Let us now consider fallacies that are erroneous forms of induction. Example 7.3.6 (Mooney et al., 2016, pp.192) is a good example of (e) above. The argument takes the form of an inductive generalisation, but clearly, the small sample ("3 American men that I dated") provides weak evidence for the generalised conclusion (that American men are demanding). Another more innocuous (and so, more dangerous) form of weak induction is provided by Example 7.3.19 (Mooney et al, 2016, pp.199). Let us bolster the example by using some numbers: suppose 60% of the students (most of the students) will drink at the bar on campus; 60% of that lot (most of that lot) will have premarital sex; and 60% of those having premarital sex (most of those having premarital sex) will end up as single parents. This does not imply that most of the students will become single parents (the chance of a student becoming a single parent is only 22%).

I hope that this discussion has put you on firmer ground in terms of understanding what an informal fallacy is. However, one thing about these fallacies is yet unexplained. Why are they so frequently committed? I suspect that is, in part, because we are not, ordinarily, sufficiently scrupulous with our reasoning. Or, there could be a commonly distributed defect in our neural processes. Whatever the explanation is, it need not detain us any further; all I am concerned with is that you familiarise yourself with the different types of fallacies discussed below sufficiently thoroughly, so that you can avoid making them.

1.2 Types of Informal Fallacies

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 7 (Section 7.2 to 7.6).

Your textbook helpfully organises the different commonly occurring fallacies into four categories: fallacies of relevance; of weak induction; of presumption; and, miscellaneous fallacies. The basis of this organisation is, in part, structural (the fallacies in any of the first three categories share similarities in their structure, while the last category is a holding area for fallacies that cannot be accommodated into any of the other categories); the names chosen for the categories reflect the 'spirit', the underlying cause, of the fallacy. Each category is then subdivided into further groups according to even stronger structural similarities. I will briefly go over these categories here; it is imperative, however, that you work through the material and the examples in the textbook to understand what constitutes the fallacy and how it might be avoided.

1.2.1 Fallacies of Relevance

Fallacious arguments of this sort, invariable, fall into category (a) in Section 1.1 above. These arguments are such that the premises appear to, but do not, in fact, justify the conclusion. So, while these arguments are invalid, the misleading appearance of validity could be grounded in a variety of factors.

As your textbook explains, the conclusion of such arguments might be justified by appealing to the reason that:

i. There is something pitiable about a person's circumstance ('appeal to pity'); or,
ii. The conclusion is popularly believed to be true ('appeal to popularity'); or,

iii. A contrary conclusion is claimed by a person of objectionable character or a person who doesn't practice what he preaches ('argument against the man'); or,

iv. It is broadly related to the 'topic' of the conclusion without being directly related to the conclusion ('red herring'); or,

v. There is no known evidence against the conclusion ('appeal to ignorance'); or,

vi. The argument against the conclusion is unsound/uncogent ('rejecting the conclusion of a bad argument').

You should note that the fallacy of 'attacking a strawman' is closely related to the fallacy committed in (vi) above. Fallacy (vi) ('rejecting the conclusion of a bad argument') arises when, based on the fact that an argument is bad, you reject its conclusion: the strawman fallacy arises when you, carelessly or cunningly, provide a bad argument for a conclusion in order to reject it.

Finally, as you work through the examples in the textbook, be mindful that just because an argument takes one of the six forms identified above, it is not, by default, fallacious. Context plays an important role and you must be discerning about whether, in a given context, a fallacy has been committed.

Activity 3.1

Mooney, Williams, & Burik (2016), Exercise 7.1, pp.186-188.

1.2.2 Fallacies of Weak Induction

Fallacious arguments of this sort fall into category (e) in Section 1.1 above. In addition, note that the discussion here complements the discussion in Section 3.2 of Study Unit 2. You would be guilty of committing this sort of fallacy when you:

i. Provide a weak inductive generalisation ('hasty generalisation'); or,

ii. Provide a weak statistical syllogism ('suppressing information); or,

iii. Provide a weak argument from analogy ('weak analogy'); or,

iv. You claim a causal relation based on a correlation ('with this, so because of this').

Do note that the fallacy titled 'Exception proves the rule' falls under the broad category (i) above. Here, you are generalising from a small sample (indeed, a sample size of one). Further, the fallacy titled 'After this, so because of this' could either be an example of a weak generalisation (if your sample size is small), or it could be a fallacy that falls under category (iv) above. Thirdly, the fallacy titled 'Causal slippery slope' is really an example of a weak statistical syllogism. I discussed Example 7.3.19 in Section 1.1 of this Study Unit and showed you that as we build longer syllogistic chains, the strength of the syllogism diminishes.

Finally, take particular note of the fallacy titled, 'Appeal to unqualified authority.' This is a common enough fallacy for you to take extra care to avoid, although, in my opinion, it is hard to justify your textbook's claim that it is a fallacy of weak induction. I would have placed it under 'Miscellaneous Fallacies.'

Activity 3.2

Mooney, Williams, & Burik (2016), Exercise 7.2, pp.202-203.

1.2.3 Fallacies of Presumption

Although we really have a mixed bag of fallacies here, the common strand running through them is that the conclusion in these arguments is justified by a premise that is presumed to be true; however, that presumption is, itself, unjustified. The fallacy 'Begging the question' falls under category (d) in Section 1.1 above, while the fallacy titled 'False dichotomies' would fall under category (a) or category (c), depending on whether it is a case of "overlapping alternatives" or "overlooking alternatives" respectively.

1.2.4 Miscellaneous Fallacies

I will leave you to work through these fallacies on your own. As an exercise, for each type and example of fallacy that you encounter under this heading in the textbook, ask yourself which of the categories (category [a] to [e] in Section 1.1 above) it falls under.

Activity 3.3

Mooney, Williams, & Burik (2016), Exercise 7.3, pp.216-218.

Summary of Key Points

- Fallacies are especially pernicious arguments because the flaws in the argument (whether invalidity, weakness, false premises or others) are not immediately apparent.
- For ease of exposition, fallacies can be categorised as fallacies of relevance; fallacies of weak induction; fallacies of presumption and miscellaneous fallacies.
- Fallacies of relevance (such as, but not limited to, Ad Populum, Ad Hominem and Red Herring) are, in fact, invalid, but masquerade as valid arguments.
- Fallacies of weak induction (such as, but not limited to, Hasty Generalisation and Slippery Slope) are, in fact, weak arguments, which appear strong.
- Fallacies of presumption comprise Begging the Question and False Dichotomies. The former is an instance of bad (but, sound!) reasoning because the conclusion is assumed by the premises; the latter is an instance of unsound reasoning because the premises, even though they appear true, are actually false.
- Miscellaneous fallacies consist of fallacies (such as, but not limited to, Composition, Division and False Appeal to Authority) have no common diagnosis of why they are fallacious.

Chapter 2: Definitions

2.1 The Importance of Definitions

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 10 (Section 10.1 and 10.2).

Language makes communication between us possible precisely because the signs and sounds that comprise it have a shared meaning for the interlocutors. The 'codification' of this shared meaning is a 'definition.' Suppose, for instance, I was suggesting to Emma that we should have pasta for lunch at this new Italian restaurant. Emma would understand me perfectly well because she would know exactly what I meant by 'pasta' or 'lunch' or 'new Italian restaurant.'

However, there are terms (words or phrases, if you wish) in ordinary language that are vague; these are terms over whose meaning there is no consensus. Examples of such terms are: 'tall,' 'hot,' 'bald,' 'heap,' etc. The ambiguity in the meaning of these terms arises due to the fact that the meaning of such words depend also on the context in which they are used (I might be tall in a community of pygmies, but certainly not among professional basketball players). Another way of saying, more or less, the same thing is that the word 'tall' has no precise definition.[2]

In addition to vague terms, ordinary language also consists of words (let us call them 'licentious words'), where their meaning, even though not context dependent, has a

[2] In fact, while preparing this discussion for you, I checked up 'tall' in a dictionary and was told, 'tall' is 'something above average height'. Note that, 'average height' is context dependent.

'subjective' element to it. These words (or, phrases) such as, 'God,' 'love,' 'morally right,' provide their users the license to give a personal, private meaning to them. For example, when I claim, 'There's no good reason to believe in the existence of God,' I am really claiming that, 'There's no good reason to believe in the existence of what I consider to be God.' The trouble is, our everyday usage of licentious terms generally happens to be presumptuous: we presume, without warrant, that our meaning for the term is shared by the person(s) we are speaking to.

When conversation consists of vague or licentious terms, disagreements may result, which are of a superficial nature. For example, if during the course of our Italian lunch, I were to tell Emma that I love her, Emma might respond, "No, you don't. Because, if you did, you wouldn't have flings with all these other women." To which, I might respond, "Don't be ridiculous; what has that got to do with the fact that I love you?" Now, whichever further direction this conversation might take, note that Emma and I seem, here, to be talking, what your textbook calls, "past each other." We are not taking the word 'love' to mean the same thing. Our disagreement, thus, is a disagreement about the definition of 'love.'

In this case, rather than continuing the conversation in the same vein, it would be helpful if Emma and I were to try to define the term, first. And, if we can't agree on a definition, we must abandon the conversation. The moral of this story is that if your argument consists of a vague or licentious term, always begin by defining it: doing so will allow your audience to focus their criticism on your argument, rather than on your usage of the term; in addition, it will enable you to decide which conversation can be fruitfully continued and which ones are futile. That said, you don't have to define every term in an argument; those with ambiguous meaning can (and, should) be left alone.

2.2 Providing Definitions

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 10 (Section 10.3 – 10.10).

2.2.1 The Criteria for a Good Definition

Section 10.3 in your textbook lists six criteria that a good definition must satisfy. Three of these criteria are especially important. Firstly, a definition must be 'precise.' A few implications of satisfying this criterion follow: if you are defining a 'vague' term, provide the context on which the meaning depends; and, avoid having vague or licentious terms in the definition itself (for example, don't define a 'pygmy' as a 'short' person).

Secondly, a good definition must strike the right balance between narrowness (which can be thought of as another name for precision) and breadth. This is an important criterion, especially when it comes to defining licentious terms. A good definition must be able to include all cases which everyone agrees are examples of the term being defined and exclude all cases that everyone agrees are not examples of the term being defined.

Finally, a good definition must be non-circular (i.e., the definition must not contain the term being defined). It should be obvious why: a circular definition defeats the purpose of defining!

Sections 10.4 through to 10.9 justify the six criteria identified in Section 10.3 and provide you examples of definitions that meet these criteria and those that don't. You should work through each of the examples carefully.

Activity 3.4

Mooney, Williams, & Burik (2016), Exercise 10.2, pp.353.

2.2.2 Methods of Definition

Section 10.10 in your textbook introduces you to four different approaches to providing definitions. The approach you choose depends on the context in which you are providing the definition (and, therefore, on the purpose of your providing the definition). For example, if you are trying to explain to someone what a 'violin' is, you might just show them a picture of a violin or/and make them hear how it sounds like, as a way of defining it (the 'ostensive' definition). Each approach to defining may perform differentially well on each of the six criteria identified in Section 10.3; your purpose will determine the extent to which you are willing to tolerate your definition's poor performance on any given criterion to get a better performance on another criterion.

Pay particular attention to the approach titled 'Necessary and Sufficient' conditions. I am partial to this approach, as it is particularly useful for defining licentious terms. The requirement to provide necessary conditions ensures that the definition is not too broad, while the sufficient condition requirement ensures that the definition is not too narrow.

Work through the examples provided for each of the approaches carefully and then attempt the exercises. Watch the video for additional guidance.

Activity 3.5

Mooney, Williams, & Burik (2016), Exercises 10.3 – 10.6, pp.354-361.

Lesson Recording

Defining Love

Summary of Key Points

- Yet another crucial element of reasoning well involves defining 'contentious' terms that are used in an argument; doing so allows criticism of the argument to be focused on the quality of the argument, rather than on the meaning of the contentious term.
- A good definition must be non-circular (i.e., must not contain the defined term in the definition) and must neither be too narrow (since that would make the definition too exclusive), nor too broad (since that would make the definition too inclusive).
- There are, broadly speaking, four different approaches to providing a definition: the ostensive approach; an approach that involves specifying necessary and sufficient conditions for the definiendum to be true; an approach that involves specifying the genus, species and differences of the definiendum; and the stipulative approach.
- Regardless of the approach employed, it is important that the approach produces a definition that performs satisfactorily on the criteria for a good definition.

Chapter 3: Writing Evaluative and Argumentative Essays

3.1 Writing Evaluative Essays

Read

You should now read: Mooney, Williams, & Burik (2016), Chapter 6 (Section 6.1-6.3 and 6.7).

When you write an evaluative essay, the project is to critique a (relatively complex) argument that is presented to you. An essential first step in this enterprise is to 'reconstruct' the given argument. Sections 6.1 through to 6.3 in your textbook show you how you might go about accomplishing a correct reconstruction; you should go over the discussion and the examples presented therein meticulously. Please be mindful that you should be able to reconstruct a given argument, both using the standard argument forms (that were identified in Study Unit 2) and in ordinary language. Once you have managed to reconstruct the argument, you can proceed to evaluate how good the argument is. Section 6.7 provides a very good example of evaluating an extended argument that you should work through very carefully. For more practice with reconstructing and evaluating arguments, pick up opinion pieces from any English language magazine or broadsheet and try to follow the precepts of the textbook.

That said, let me give you a series of steps that I would follow in writing an evaluative essay:

1. Reconstruct the argument:
    a. Identify and state the final conclusion of the argument.
    b. Identify and state the explicit premises of the argument.

c. Identify and state any intermediate conclusions that can be (or have been) inferred from the premises identified in (b) above, using valid standard argument forms (VSAF).

d. Consider whether any of the premises in (b) can be combined with any of the intermediate conclusions in (c) to infer the final conclusion in (a) using a VSAF.

   i. If yes, the argument has been reconstructed.

   ii. If no, consider whether using an implicit premise to the premises in (b) and repeating Step (c) would allow you to infer the final conclusion using a VSAF; if yes, add the implicit premise.

2. Evaluate the argument:

   a. Comment on the validity of the argument.

      i. The argument is valid if and only if all intermediate conclusions have been inferred from the explicit and implicit premises via VSAFs, and the final conclusion can be inferred from the intermediate conclusions and the premises via VSAFs.

      ii. ii. Otherwise, it is invalid.

   b. Comment on the truth of the premises (if necessary, appeal to qualified authority in the form of external sources).

   c. Comment on whether any informal fallacies have been committed.

   d. Use the discussion in (a) to (c) above to determine whether a good deductive argument has been given.

   e. Finally, if the deductive argument is unsound (because it is invalid), consider if an inductive reading of the argument makes the argument stronger.

3.2 Writing Argumentative Essays

Read

You should now read: Mooney, Williams, & Burik (2016), Chapters 6 and 11 (Section 6.4-6.6 and 11.2).

In writing an argumentative essay, the project is to present your own argument for a conclusion. Sections 6.4 through 6.6 in your textbook show you how to construct arguments of your own. You should read Section 6.6 first (which gives you a guide to determining whether you want your argument to be deductive or inductive), before going through Section 6.5. Section 11.2 gives you more practical advice; it lists a series of steps you are recommended to undertake in the actual process of writing. These steps are a guide; use them if you find them helpful. Watch the video for additional guidance.

Activity 3.6

Mooney, Williams, & Burik (2016), Exercises 6.1, pp.158.

Summary of Key Points

- The concepts and techniques discussed in this course teach you to think critically; how well you are able to do so, is reflected in the quality of the evaluative and argumentative essays that you write.
- An evaluative essay is written with the intention of critiquing a given argument for a conclusion: it involves identifying the structure of an argument and looking

for weaknesses in the structure, for false premises and/or, for fallacious forms of inference used in the argument.

- An argumentative essay, on the other hand, is written to justify a given conclusion; the extent to which it succeeds, depends on how well it defines contentious terms, whether the arguments are sound/cogent, and whether it avoids committing fallacies.

Formative Assessment

1. Consider the following conversation.

   Jack: I can't think of one reason why gay marriage is still illegal in this day and age.
   John: I will give you a reason. Gay marriage is illegal because it is against the law.
   What fallacy, if any, has John committed?

   a. Begging the question
   b. Red Herring
   c. Ad populum
   d. None of the above

2. Consider the following conversation.

   "We don't know that Mr. Lim Chek Meng will be able to represent this constituency well if we elect him. So, he won't be able to represent this constituency well if we elect him. So, we should not elect him." What fallacy, if any, does this argument commit?

   a. Ad populum
   b. Ad ignorantiam
   c. Ad hominem
   d. None of the above

3. Consider the following conversation.

   "We don't know that Mr. Lim Chek Meng will be able to represent this constituency well if we elect him. We can't take the chance that he might be unable to do so. So, we should not elect him." What fallacy, if any, does this argument commit?

   a. Ad populum
   b. Ad ignorantiam
   c. Ad hominem
   d. None of the above

4. Consider the following definition.

   'A romantic person is a person who behaves in a romantic manner.'
   What's the biggest problem, if any, that this definition suffers from?

   a. The definition is circular.
   b. The definition is not precise.
   c. The definition is too narrow.
   d. The definition is too broad.

5. Consider the following definition.

   'An elephant is an herbivorous mammal.'
   What's the biggest problem, if any, that this definition suffers from?

   a. The definition is circular.
   b. The definition is not precise.
   c. The definition is too narrow.
   d. The definition is too broad.

6. Consider the following argument.

   'Whisky is a drink that is brewed from malt in Scotland with an alcohol content in excess of 40% by volume.'
   What's the biggest problem, if any, that this definition suffers from?

   a. The definition is circular.
   b. The definition is not precise.
   c. The definition is too narrow
   d. The definition is too broad.

Solutions or Suggested Answers

Formative Assessment

1. Consider the following conversation.

   Jack: I can't think of one reason why gay marriage is still illegal in this day and age.
   John: I will give you a reason. Gay marriage is illegal because it is against the law.
   What fallacy, if any, has John committed?

   a. Begging the question
      Correct! John's premise, 'gay marriage is against the law' is a restatement of his conclusion, 'gay marriage is illegal'.

   b. Red Herring
      Incorrect. In a 'red herring' fallacy, the premise is unrelated to the conclusion; here, the premise is the conclusion.

   c. Ad populum
      Incorrect. In an 'ad populum' fallacy, the conclusion is justified by appealing to the fact that it is popularly believed to be true; here, no such appeal is made.

   d. None of the above
      Incorrect. One of the above fallacies have been committed.

2. Consider the following conversation.

   "We don't know that Mr. Lim Chek Meng will be able to represent this constituency well if we elect him. So, he won't be able to represent this constituency well if we elect him. So, we should not elect him." What fallacy, if any, does this argument commit?

   a. Ad populum
      Incorrect. In an 'ad populum' fallacy, the conclusion is justified by appealing to the fact that it is popularly believed to be true; here, no such appeal is made.

b. Ad ignorantiam

Correct! The arguer appeals to his ignorance about Mr. Lim's ability to represent the constituency well to conclude that he won't be able to do so.

c. Ad hominem

Incorrect. In an 'ad hominem' fallacy, the conclusion is justified by appealing to something objectionable about a person who argues for a contrary conclusion; here, no such appeal is made.

d. None of the above

Incorrect. One of the above fallacies have been committed.

3. Consider the following conversation.

"We don't know that Mr. Lim Chek Meng will be able to represent this constituency well if we elect him. We can't take the chance that he might be unable to do so. So, we should not elect him." What fallacy, if any, does this argument commit?

a. Ad populum

Incorrect. In an 'ad populum' fallacy, the conclusion is justified by appealing to the fact that it is popularly believed to be true; here, no such appeal is made.

b. Ad ignorantiam

Incorrect. In an 'ad ignorantiam' fallacy, the conclusion is justified by an appeal to the fact that it is not known to be false; here, no such appeal is made.

c. Ad hominem

Incorrect. In an 'ad hominem' fallacy, the conclusion is justified by appealing to something objectionable about a person who argues for a contrary conclusion; here, no such appeal is made.

d. None of the above

Correct! The argument given above is not fallacious in any of the standard ways, although it might still be unsound.

4. Consider the following definition.

   'A romantic person is a person who behaves in a romantic manner.'
   What's the biggest problem, if any, that this definition suffers from?

   a. The definition is circular.
      Correct! The definition contains the term ("romantic") that it is trying to define.

   b. The definition is not precise.
      Incorrect. The definition is very precise, only if we understand what 'romantic' meant.

   c. The definition is too narrow.
      Incorrect. This definition would rightly exclude those persons who do not behave in a romantic manner.

   d. The definition is too broad.
      Incorrect. This definition would rightly only include those who behave in a romantic manner.

5. Consider the following definition.

   'An elephant is an herbivorous mammal.'
   What's the biggest problem, if any, that this definition suffers from?

   a. The definition is circular.
      Incorrect. 'Elephant' does not appear in the definition.

   b. The definition is not precise.
      Incorrect. The terms contained in the definition, 'herbivorous' and 'mammal' have very precise meanings.

c. The definition is too narrow.
Incorrect. This definition would rightly exclude those creatures, which are not herbivorous mammals.

d. The definition is too broad.
Correct! This definition would wrongly include animals such as giraffes or zebras under 'elephants'.

6. Consider the following argument.

'Whisky is a drink that is brewed from malt in Scotland with an alcohol content in excess of 40% by volume.'
What's the biggest problem, if any, that this definition suffers from?

a. The definition is circular.
Incorrect. 'Whisky' does not appear in the definition.

b. The definition is not precise.
Incorrect. All the terms contained in the definition have very precise meanings

c. The definition is too narrow
Correct! This definition wrongly excludes drinks containing the same ingredients, and satisfying the alcohol content requirements, that are brewed in places other than Scotland.

d. The definition is too broad.
Incorrect. This definition rightly includes only those drinks brewed from malt that satisfy a minimum alcohol content requirement.

Reference

Mooney, T. B., Williams, J. N., & Burik, S. (2016). *An Introduction to critical and creative thinking: Analysing and evaluating ordinary language reasoning*. Singapore: McGraw Hill Education (Asia).