3

Making Sense of Arguments

Chapter Objectives

Argument Basics

You will be able to
- distinguish between deductive and inductive arguments.
- understand the terms *valid*, *invalid*, and *sound*.
- understand the terms *strong*, *weak*, and *cogent*.

Judging Arguments

You will be able to
- follow the four-step procedure for determining whether an argument is deductive or inductive, good or bad.
- obtain a familiarity with indicator words that suggest that an argument is deductive or inductive.

Finding Missing Parts

You will be able to
- use the three-step procedure for uncovering implicit premises.

Argument Patterns

You will be able to
- memorize and be able to recognize the argument patterns know as *modus ponens*, *modus tollens*, *hypothetical syllogism*, *denying the antecedent*, *affirming the consequent*, and *disjunctive syllogism*.
- use the counterexample method for determining if a deductive argument is valid or invalid.

Diagramming Arguments

You will be able to
- understand the definition of *dependent* and *independent premises*.
- follow the three-step procedure to diagram arguments, both simple and complex ones, including those embedded in extraneous material.

You will be able to

- understand the challenges involved in assessing long arguments.
- follow the procedure for diagramming long arguments.

Chapter Summary

Arguments come in two forms: deductive and inductive. A **deductive argument** is intended to provide logically *conclusive* support for a conclusion; an **inductive argument** is intended to provide *probable*—not conclusive—support for a conclusion. Deductive arguments can be **valid** or **invalid**, while inductive arguments are **strong** or **weak**. A valid argument with true premises is said to be **sound**. A strong argument with true premises is said to be **cogent**.

Evaluating an argument is the most important skill of critical thinking. It involves finding the conclusion and premises, checking to see if the argument is deductive or inductive, determining its validity or strength, and discovering if the premises are true or false. Use the four-step process (see p. 71) to evaluate an argument.

Sometimes you also have to ferret out implicit, or unstated, premises or conclusions. When there are unstated premises or conclusions in an argument, we need to make them explicit in order to adequately evaluate an argument. In doing so, we should follow the "Principle of Charity," which states that we should try to supply premises or a conclusion that (a) is plausible and (b) is consistent with the author's intentions. Use the three-step process (pp. 79–80) to find missing premises or conclusions.

Arguments can come in certain common patterns or forms. There are four valid forms of reasoning that are discussed in the text: (1) *modus ponens*, or **affirming the antecedent**, (2) *modus tollens*, or **denying the consequent**, (3) **hypothetical syllogism**, and (4) **disjunctive syllogism**. Two common invalid forms are **denying the antecedent** and **affirming the consequent**.

Analyzing the structure of arguments is easier if you diagram them. Argument diagrams can help you visualize the function of premises and conclusions and the relationships among complex arguments with several sub-arguments.

Assessing very long arguments can be challenging because they may contain lots of verbiage but few or no arguments, and many of their premises can be implicit. Evaluating long arguments, though, requires the same basic steps as assessing short ones: (1) ensure that you understand the argument; (2) locate the conclusion; (3) find the premises; and (4) diagram the argument to clarify logical relationships.

Answers to Select Textbook Exercises

Please note: These answers are for some of the questions that were not answered in Appendix B of *The Power of Critical Thinking*, Fifth Canadian Edition.

Exercise 3.1
9. Cogent
11. At least one of the premises is false.

5. Step 1: Conclusion: People who have benefited from racist systems have low self-esteem.
    Premises: People with racist tendencies also have low self-esteem. Having benefited from racist
    systems is comparable to having racist tendencies.
    Step 2: Not deductively valid.
    Step 3: Inductively strong.
    Step 4: Does not apply.
12. Step 1: Conclusion: Someone must have burglarized the place.
    Premises: A vase was found broken on the floor, some money had been taken out of the safe,
    and there were strange scratches on the wall.
    Step 2: Not deductively valid.
    Step 3: Inductively strong.
    Step 4: Does not apply.

Exercise 3.3
1. Weak
6. Weak
20. Invalid

Exercise 3.4
I.
7. Implicit premise: If the Taliban regime fell because it was deeply sexist, then the government of
    Saudi Arabia is bound to fail.

II.
4. A recent poll shows that 71 per cent of the faculty and staff at Spadina College are New Democrats.
10. The typical Canadian eats way too many doughnuts.

Exercise 3.5
3. Valid; disjunctive syllogism
5. Invalid; denying the antecedent
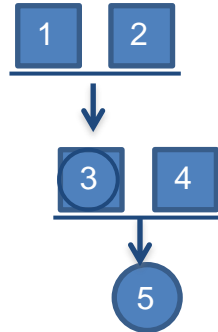
Exercise 3.6
4. *MP*: If the new vaccine prevents the spread of the virus, the researchers who developed the vaccine
    should get the Nobel Prize.
    It does prevent the spread of the virus.
    Therefore, the researchers who developed the vaccine should get the Nobel Prize.
    MT: If the new vaccine prevents the spread of the virus, the researchers who developed the vaccine
    should get the Nobel Prize.
    The researchers will not get the Nobel Prize.
    Therefore, the new vaccine does not prevent the spread of the virus.

Exercise 3.7
5. If Mickey Mouse were real, he would be famous all over the world. But he's not real. Therefore,
    he is not famous all over the world.
    If *a*, then *b*.
   not-*a*.
    ∴ not-*b*.

6. (1) If the experiment had succeeded, there would have been a massive explosion. (2) And there was such an explosion. (3) So we have a success. (4) If we have a success, we will win the Nobel Prize. (5) Therefore, we will win the Nobel Prize.
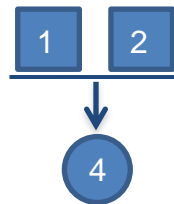
3. * (1) I think that university is overrated. (2) Their professors aren't very accomplished, and (3) their students are a bunch of rich brats. (4) They also try way too hard to get into the news by bragging about every minor success.
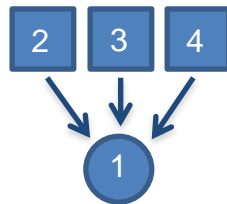
12. * (1) Cindy is a 15-year-old. (2) No 15-year-old has ever gained a PhD in nuclear physics. Therefore, (3) Cindy does not have a PhD in nuclear physics.


15. * (1)It's very easy to tell whether bread is freshly baked or not. (2)The aroma is unmistakable, and (3) the inside will be soft and moist. (4) Baker's Bakery says that their bread is freshly baked in their store everyday, (5) but they must be lying. (6) There is no aroma, and (7) the bread is hard and dry. (8) I also saw a delivery guy from the local grocery store carrying bread into the bakery.
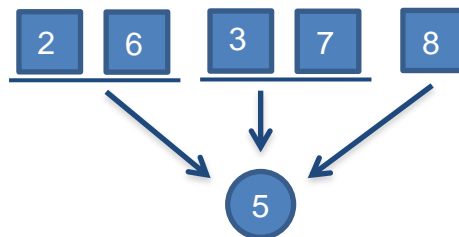
1. * Conclusion: (9) You should skip the supplements.
   Premises: (2) There's no persuasive evidence yet to suggest that collagen supplements help with joint pain. (3) Collagen is a specific thing (something unstated). (4) Collagen is absorbed in a certain (unstated) way. (5) Collagen is synthesized in the body in a certain (unstated) way. (6) It's implausible that a small supplement of amino acids consumed daily will have any meaningful therapeutic effects. (8) Genacol, like other collagen supplements, appears to be little more than an expensive protein supplement.
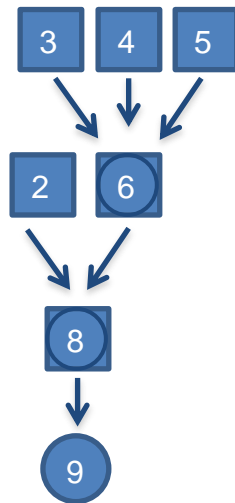
Study Questions

1. What is a deductive argument? What is an inductive argument?

2. What is a valid argument? What is an invalid argument?

3. What is a strong inductive argument? What is a weak one?

4. What does it mean to say that an argument is sound or cogent?

5. What are the four steps involved in determining whether an argument is deductive or inductive, sound or cogent?

6. What are four indicator words or phrases that suggest an argument is probably deductive?

7. What are four indicator words or phrases that suggest an argument is probably inductive?

8. What is an implicit premise?

9. Why is it often very important to make implicit premises explicit?

10. What is the procedure for uncovering implicit premises?

11. What is a conditional statement?

12. What is the argument pattern for each of *modus ponens*, *modus tollens*, hypothetical syllogism, denying the antecedent, affirming the consequent, and disjunctive syllogism?

13. How is the counterexample method used to evaluate validity?

14. How would you diagram the following argument?

"If the unemployment rate goes up, then the prime minister's popularity will go down. If the prime minister's popularity goes down, then he will lose the election. So if the unemployment rate goes up, the prime minister will lose the election."

15. What three obstacles are you usually faced with when you try to evaluate an argument in a very long passage?

16. How do sound arguments differ from both cogent arguments and valid arguments? Use examples to illustrate.

17. Provide examples of each of both a good and bad deductive argument, as well as of both a good and bad inductive argument.

18. What is the difference between a good and bad inductive argument? Use examples to illustrate.

19. What is the difference between a good and bad deductive argument? Use examples to illustrate.

20. How do valid arguments differ both from invalid arguments as well as sound arguments? Use examples to illustrate.

Self-Assessment Quiz

Scroll down for answers.

Missing Parts

For each of the following arguments, supply a premise or conclusion to complete the argument.

1. None of my friends smoke marijuana. Therefore, Rahul is not my friend.

2. The picnic will be held unless it rains heavily. So, the picnic won't be cancelled.

3. Either the liberals or the conservatives will win the provincial election, and it definitely won't be the liberals.

4. Some members of the NDP are in favour of lowering the voting age. So some left-leaning people are in favour of lowering the voting age.

5. Most geographers love to travel, so probably Juanita loves to travel too.

6. McDavid is better than Matthews, so I guess he's the best player in the NHL.

7. The Leafs will have to trade Marner or Nylander, and it won't be Marner, that's for sure.

8. If yesterday was Christmas Day, then today is Boxing Day. So, I guess today must be Boxing Day.

9. Any NHL All-Star must be a pretty good hockey player. So, I assume John Scott must be a pretty good hockey player.

10. If Michael Jordan won more championships, then he is better than LeBron James, period. And Michael Jordan won more championships; it's just a fact.

Argument Pattern Identification

For each of the following arguments, identify each of the component claims and assign these claims letters *p*, *q*, *r*, etc. Then, reconstruct the argument using the claim variables assigned. Finally, identify the pattern of the argument and state whether the argument is valid or invalid.

1. If Jones wins the election, then we will get lower taxes. Jones will win the election; therefore, taxes will be reduced.

2. Either Cathy or Alma committed the murder. It wasn't Cathy. Therefore, it must have been Alma.

3. If reincarnation really occurs, then there will be traces of past lives deep in our subconscious. There are traces of past lives deep in our subconscious. Therefore, reincarnation really occurs.

4. If the Jets get through the first round of the playoffs, then they will play the Kings in the second round. If the Jets play the Kings, then they will win the second round, too. So, if the Jets get through the first round, then they will also win the second round.

5. If you have the smell of rotten eggs in your home, then you have a natural gas leak. You do not smell rotten eggs, so you can conclude that you don't have a natural gas leak.

6. Either the Patriots will win the Super Bowl, or the Rams will win the Super Bowl. But, the Rams will not win the Super Bowl. So, the Patriots will.

7. If Wittgenstein refuted Russell, then Russell refuted Frege. If Russell refuted Frege, then Frege refuted Mill. Thus, if Wittgenstein refuted Russell, then Frege refuted Mill.

8. If it poured, then it rained. Given that it rained, however, it follows that it must have poured.

9. If Mars is larger than Jupiter, then it is larger than Saturn. But Mars is not larger than Saturn, so it is not larger than Jupiter.

10. If Jupiter orbits the Sun, then it is in our solar system. Given that Jupiter does orbit the Sun, it follows that it is in our solar system.

Argument Diagrams

Diagram the following arguments.

1. If the cutting of trees for lumber and fuel and the clearing of land for cultivation do not stop in the next five years, the rainforests of the world will disappear forever. Sadly, this devastation of the forests will probably not stop—not even when disaster looms. It's likely, then, that in a few short years, our children will never be able to see a real rainforest.

2. Either the Minister of Defence is incompetent or he is willful, determined to reshape the military in his own image. His record shows that he is far from incompetent. He is, in fact, probably the brightest minister in department history. We have to conclude, then, that he is willful. He has deliberately arranged things so that the military is exactly the way he wants it.

3. We should not buy Farhan a car. He is not working hard enough at school and we told him that we would buy him a car only if he worked hard at his studies. Moreover, his friends do not have cars, and it is possible for him to take the bus to get around.

4. It is driving me crazy! The zoo is treating its large cats poorly. It has been feeding them poor quality meat and the enclosures are too small. If the zoo cannot treat the animals properly, then it ought to be closed down. Therefore, it the zo ought to be closed down.

5. The Canadian Senate is unelected, and therefore is undemocratic. So, it ought to be abolished or be revised significantly. It is clear that we should not abolish the senate, so we must work to revise it.

Answers to Self-Assessment Quiz

Missing Parts

1. Missing premise: Rahul smokes marijuana.
2. Missing premise: It won't rain heavily.
3. Missing conclusion: The conservatives will win the election.
4. Missing premise: All members of the NDP are left-leaning.
5. Missing premise: Juanita is a geographer.
6. Missing premise: If McDavid is better than Matthews, then he is the best player in the NHL.
7. Missing conclusion: The Leafs will have to trade Marner.
8. Missing premise: Yesterday was Christmas day.
9. Missing premise: John Scott is an NHL All-Star.
10. Missing conclusion: Michael Jordan is better than LeBron James.

Argument Pattern Identification

1. p: Jones wins the election.
   q: We will get lower taxes.

   If p then q.
   p.
   Therefore, q.

   This is *modus ponens* and is valid.

2. p: Cathy committed the murder.
   q: Alma committed the murder.

   Either p or q.
   Not p.
   Therefore, q.

   This is a disjunctive syllogism and is valid.

3. p: Reincarnation really occurs.
   q: There will be traces of past lives deep in our subconscious.

   If p then q.
   q.
   Therefore, p.

   This is affirming the consequent and is invalid.

4. p: The Jets get through the first round of the playoffs.
   q: The Jets will play the Kings in the second round.
   r: The Jets will win the second round.

If p then q.
If q then r.
Therefore, if p then r.

This is a hypothetical syllogism and is valid.

5. p: You have the smell of rotten eggs in your home.
    q: You have a natural gas leak.

    If p then q.
    Not p.
    Therefore, not q.
    This is denying the antecedent and is invalid.

6. p: The Patriots will win the Super Bowl
    q: The Rams will win the Super Bowl

    Either p or q.
    Not q
    Therefore, r.

    This is a disjunctive syllogism and is valid.

7. p: Wittgenstein refuted Russell
    q: Russell refuted Frege
    r: Frege refuted Mill

    If p then q.
    If q then r.
    Therefore, if p then r.

    This is a chain argument and is valid.

8. p: it rained
    q: it poured

    If p then q.
    q.
    Therefore, p.

    This is affirming the consequent and invalid.

9. p: Mars is larger than Jupiter
    q: Mars is larger than Saturn

    If p then q.
    Not q.

Therefore, not *p*.

This is *modus tollens* and valid.

10. p: Jupiter orbits the Sun
   q: Jupiter is in our solar system

    If p then q.
    p.
    Therefore, q.

   This is *modus ponens* and valid.

Argument Diagrams

1. (1) If the cutting of trees for lumber and fuel and the clearing of land for cultivation do not stop in the next five years, the rainforests of the world will disappear forever. (2) Sadly, this devastation of the forests will probably not stop—not even when disaster looms. (3) It's likely, then, that in a few short years, our children will never be able to see a real rainforest.
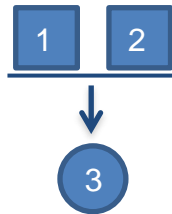

2. (1) Either the Minister of Defence is incompetent or he is willful, determined to reshape the military in his own image. (2) His record shows that he is far from incompetent. (3) He is, in fact, probably the brightest minister in department history. (4) <u>We have to conclude</u>, then, that he is willful. He has deliberately arranged things so that the military is exactly the way he wants it.
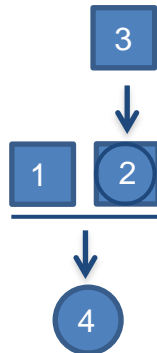
3. (1) We should not buy Farhan a car. (2) He is not working hard enough at school and (3) we told him that we would buy him a car only if he worked hard at his studies. Moreover, (4) his friends do not have cars, and (5) it is possible for him to take the bus to get around.

```
  [2]  [3]       [4]  [5]
  ─────────
          ＼      ↓   ↙
              (1)
```
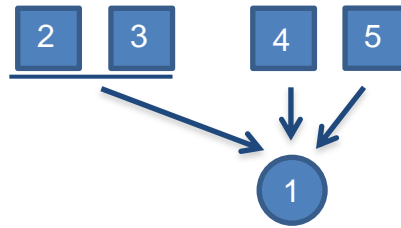
4. (1) ~~It is driving me crazy!~~ (2) The zoo is treating its large cats poorly. (3) It has been feeding them poor quality meat and (4) the enclosures are too small. (5) If the zoo cannot treat the animals properly, then it ought to be closed down. Therefore, (6) the zoo ought to be closed down.

```
  [3]  [4]
  ─────────
      ↓
   (2)  [5]
  ─────────
      ↓
     (6)
```
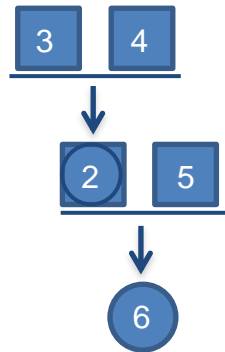
5. (1) The Canadian Senate is unelected, and therefore (2) is undemocratic. So, (3) it ought to be abolished or be revised significantly. (4) It is clear that we should not abolish the senate, so (5) we must work to revise it.

```
   [1]
    ↓
   (2)
  ─────
    ↓
   (3)  [4]
  ─────────
    ↓
   (5)
```