

## CHAPTER 1

# Basic Concepts

The starred items are also contained in the Answer Key in the back of *The Power of Logic*.

### Exercise 1.1

#### Part A: Recognizing Statements

- \*1. Statement
2. Sentence only
3. Sentence only
- \*4. Statement
5. Statement
6. Statement
- \*7. Neither
8. Statement
9. Neither
- \*10. Statement
11. Statement
12. Sentence only
- \*13. Statement
14. Sentence only
15. Sentence only
- \*16. Sentence only
17. Statement
18. Neither
- \*19. Statement
20. Neither

#### Part B: True or False?

- \*1. False
2. True
3. False
- \*4. True
5. False
6. False
- \*7. False
8. True
9. True
- \*10. False
11. False
12. True
- \*13. True
14. False
15. True
- \*16. False

- 17. False
- 18. False
- \*19. True
- 20. True
- 21. False
- \*22. False
- 23. False
- 24. True
- \*25. False
- 26. False
- 27. True
- \*28. True
- 29. True
- 30. False

**Part C: Valid or Invalid?**

- \*1. Valid
- 2. Invalid
- 3. Invalid
- \*4. Valid
- 5. Valid
- 6. Valid
- \*7. Invalid
- 8. Valid
- 9. Invalid
- \*10. Invalid
- 11. Invalid
- 12. Valid
- \*13. Invalid
- 14. Valid
- 15. Valid

**Part D: Soundness**

- \*1. Sound
- 2. Sound
- 3. Unsound, because invalid; also, conclusion obviously false
- \*4. Unsound. The argument is invalid.
- 5. Sound
- 6. Unsound, because invalid
- \*7. Sound
- 8. Unsound, because has a false premise
- 9. Unsound, because invalid (has all true premises and a false conclusion)
- \*10. Unsound. Valid, but the first premise is false.
- 11. Unsound, because invalid
- 12. Unsound, because invalid
- \*13. Unsound. Valid, but the second premise is false.
- 14. Unsound, because invalid
- 15. Sound

## Exercise 1.2: Counterexamples

- \*1. *Form:* No A are B. Some C are not B. So, some C are A.  
*Counterexample:* No fish are cats. Some collies are not cats. So, some collies are fish.
2. *Form:* All D are H. All D are B. So, all B are H.  
*Counterexample:* All whales are water-dwellers. All whales are mammals. So, all mammals are water-dwellers.
3. *Form:* All S are N. Some S are not W. So, some W are not N.  
*Counterexample:* All dogs are animals. Some dogs are not collies. So, some collies are not animals.
- \*4. *Form:* No A are B. Some C are B. So, no C are A.  
*Counterexample:* No collies are cocker spaniels. Some dogs are cocker spaniels. So, no dogs are collies.
5. *Form:* All F are D. Some P are not F. So, some P are not D.  
*Counterexample:* All mammals are animals. Some snakes are not mammals. So, some snakes are not animals.
6. *Form:* All R are V. Some R are C. So, no V are C.  
*Counterexample:* All mammals are animals. Some mammals are land-dwellers. So, no animals are land-dwellers.
- \*7. *Form:* Some A are B. Some B are C. So, some C are not A.  
*Counterexample:* Some animals are collies. All collies are dogs. So, some dogs are not animals.
8. *Form:* No G are P. No P are C. So, no C are G.  
*Counterexample:* No dogs are reptiles. No reptiles have legs. So, no dogs have legs.
9. *Form:* All F are S. Some S are not C. So, some F are not C.  
*Counterexample:* All dogs are animals. Some animals are not mammals. So, some dogs are not mammals.
- \*10. *Form:* All A are B. Some A are not C. So, some C are not B.  
*Counterexample:* All dogs are animals. Some dogs are not collies. So, some collies are not animals.
11. *Form:* All O are P. Some Q are not O. So, some Q are not P.  
*Counterexample:* All cats are mammals. Some dogs are not cats. So, some dogs are not mammals.
12. *Form:* No W are D. Some B are not D. So, some B are not W.  
*Counterexample:* No mammals are reptiles. Some cats are not reptiles. So, some cats are not mammals.
- \*13. *Form:* All A are B. All C are B. So, all A are C.  
*Counterexample:* All dogs are animals. All cats are animals. So, all dogs are cats.
14. *Form:* All D are P. Some S are P. So, some S are D.  
*Counterexample:* All pines are trees. Some elms are trees. So, some elms are pines.
15. *Form:* All B are S. All B are T. So, all T are S.  
*Counterexample:* All cats are mammals. All cats are animals. So, all animals are mammals.
- \*16. *Form:* Every A is B. No C is A. So, no C is B.  
*Counterexample:* Every cat is an animal. No dog is a cat. So, no dog is an animal.
17. *Form:* All M are H. Some H are W. So, some W are M.  
*Counterexample:* All pines are trees. Some trees are elms. So, some elms are pines.
18. *Form:* No P are C. No N are C. So, some P are N.  
*Counterexample:* No mammals are reptiles. No fish are reptiles. So, some fish are mammals.
- \*19. *Form:* All A are B. No C is A. So, no C is B.  
*Counterexample:* All fish are animals. No dog is a fish. So, no dog is an animal.
20. *Form:* All D are E. Some W are E. So, all W are D.  
*Counterexample:* All mammals are animals. Some reptiles are animals. So, all reptiles are mammals.

### Exercise 1.3

#### Part A: Arguments to Evaluate

\*1. If the solution turns blue litmus paper red, then the solution contains acid. The solution turns blue litmus paper red. So, the solution contains acid.

1. If A, then B.  
2. A.  
So, 3. B. *modus ponens, valid*

2. If the solution turns blue litmus paper red, then the solution contains acid. The solution does not contain acid. So, the solution does not turn blue litmus paper red.

1. If A, then B.  
2. Not B.  
So, 3. Not A. *modus tollens, valid*

3. Lewis is a famous author only if he knows how to write. But Lewis is not a famous author. Hence, Lewis does not know how to write.

1. If A, then B.  
2. Not A.  
So, 3. Not B. *denying the antecedent, invalid*

\*4. If Susan is a famous author, then she knows how to write. Moreover, Susan knows how to write. So, she is a famous author.

1. If A, then B.  
2. B.  
So, 3. A. *affirming the consequent, invalid*

5. Souls transmigrate. But it is wrong to eat animals if souls transmigrate. Hence, it is wrong to eat animals.

1. A.  
2. If A, then B.  
So, 3. B. *modus ponens, valid*

6. Either Jones is an innocent bystander, or Jones fired a shot at the mayor. Jones is not an innocent bystander. Therefore, Jones fired a shot at the mayor.

1. Either A or B.  
2. Not A.  
So, 3. B. *disjunctive syllogism, valid*

\*7. Rilke is a dreamer if he is a poet. Therefore, Rilke is a poet.

1. If B, then A.  
So, 2. B.

Counterexample:

1. If the population of Nevada is more than 5 billion, then it is more than one thousand. [true]  
So, 2. The population of Nevada is more than 5 billion. [false]

8. Either you marry young, or you wait. If you marry young, you incur a high risk of divorce. If you wait, the field of available partners grows ever smaller. So, either you incur a high risk of divorce, or the field of available partners grows ever smaller.
- A                      B                      A                      C                      B
- D                      C                      D
1. Either A or B.
  2. If A, then C.
  3. If B, then D.
- So, 4. Either C or D.                      constructive dilemma, valid
9. It is not wrong to kill spiders. But if spiders have eternal souls, then it is wrong to kill them. Thus, it is false that spiders have eternal souls.
- not A                      B                      A
- not B
1. Not A.
  2. If B, then A.
- So, 3. Not B.                      *modus tollens*, valid
- \*10. If you study hard, you refine your communication skills. If you refine your communication skills, then your job opportunities increase. Hence, if you study hard, your job opportunities increase.
- A                      B                      B
- C                      A                      C
1. If A, then B.
  2. If B, then C.
- So, 3. If A, then C.                      hypothetical syllogism, valid
11. If Mubarak is from Egypt, then he is from Africa. Therefore, if Mubarak is not from Egypt, then he is not from Africa.
- A                      B                      not A
- not B
1. If A, then B.
- So, 2. If not A, then not B.
- Counterexample:
1. If lemons are red, then lemons have a color. [true]
  2. If lemons are not red, then lemons do not have a color. [false]
12. Ben is a rat. Ben is a rat only if Ben is a mammal. So, Ben is a mammal.
- A                      A                      B                      B
1. A.
  2. If A, then B.
- So, 3. B.                      *modus ponens*, valid
- \*13. Sam is wealthy if he has over a billion dollars. But Sam does not have over a billion dollars. Therefore, Sam is not wealthy.
- A                      B                      not B
- not A
1. If B, then A.
  2. Not B.
- So, 3. Not A.                      denying the antecedent, invalid
14. There is life on Mars given that there is life on Earth. Hence, there is life on Mars.
- A                      B                      A
1. If B, then A.
- So, 2. A.
- Counterexample:
1. If Abe Lincoln was over 10 feet tall, then he was over 8 feet tall. [true]
  2. Abe Lincoln was over 8 feet tall. [false]

15. It is true that corrupt institutions are hard to reform. It is false that individuals are totally depraved. Therefore, if corrupt institutions are hard to reform, then individuals are totally depraved.

A not B

A B

Counterexample:

1. A.	1. Bill Gates is rich. [true]
2. Not B.	2. Bill Gates is not poor. [true]
So, 3. If A, then B.	So, 3. If Bill Gates is rich, then Bill Gates is poor. [false]

### Part B: More Arguments to Evaluate

- \*1. The sky is blue. The sky is cobalt blue only if it is blue. Hence, the sky is cobalt blue.

A B A B

1. A.  
2. If B, then A.  
So, 3. B. affirming the consequent, invalid

2. Abortion in the case of ectopic pregnancy is not wrong. But if it is always wrong to kill an innocent human being, then abortion in the case of ectopic pregnancy is wrong. So, it is not always wrong to kill an innocent human.

not A B

A not B

1. Not A.  
2. If B, then A.  
So, 3. Not B. modus tollens, valid

3. Kidnapping is wrong if society disapproves of it. Kidnapping is wrong. So, society disapproves of kidnapping.

A B A B

1. If B, then A.  
2. A.  
So, 3. B. affirming the consequent, invalid

- \*4. Eating meat is unhealthy if meat contains a lot of cholesterol. Meat does contain a lot of cholesterol. Therefore, eating meat is unhealthy.

A B B

A

1. If B, then A.  
2. B.  
So, 3. A. modus ponens, valid

5. Either the "eye for an eye" principle is interpreted literally, or it is interpreted figuratively. If it is interpreted literally, then the state should torture torturers, maim maimers, and rape rapists. If the "eye for an eye" principle is interpreted figuratively, then it does not necessarily demand death for murderers. So, either the state should torture torturers, maim maimers, and rape rapists, or the "eye for an eye" principle does not necessarily demand death for murderers.

A B A

C B D

C D

1. Either A or B.  
2. If A, then C.  
3. If B, then D.  
So, 4. Either C or D. constructive dilemma, valid

6. Affirmative action is preferential treatment of disadvantaged groups, and preferential treatment of disadvantaged groups is reverse discrimination. If affirmative action is preferential treatment of disadvantaged groups and preferential treatment of disadvantaged groups is reverse discrimination, then affirmative action is wrong. Hence, affirmative action is wrong.

1. A.  
 2. If A, then B.  
 So, 3. B. *modus ponens, valid*

\*7. If the zygote lacks a brain, then the zygote lacks a soul. If the zygote lacks a soul, then killing the zygote is permissible. So, if the zygote lacks a brain, then killing the zygote is permissible.

1. If A, then B.  
 2. If B, then C.  
 So, 3. If A, then C. *hypothetical syllogism, valid*

8. If Mary is a psychiatrist, then she is a physician. Mary is not a physician. Therefore, Mary is a psychiatrist.

1. If A, then B.  
 2. Not B.  
 So, 3. A.

Counterexample:

1. If Jennifer Lopez is less than 2 feet tall, then she is less than 3 feet tall. [true]  
 2. Jennifer Lopez is not less than 3 feet tall. [true]  
 So, 3. Jennifer Lopez is less than 2 feet tall. [false]

9. If you want to ruin your life, you should take hard drugs. But you don't want to ruin your life. So, you should not take hard drugs.

1. If A, then B.  
 2. Not A.  
 So, 3. Not B. *denying the antecedent, invalid*

\*10. Lying causes social discord. Hence, lying is wrong.

- Counterexample:  
 1. A. 1. Trees exist. [true]  
 So, 2. B. So, 2. Unicorns exist. [false]

11. It is not true that acts are right because God approves them. But either acts are right because God approves them, or God approves of acts because they are right. Therefore, God approves of acts because they are right.

1. Not A.  
 2. Either A or B.  
 So, 3. B. *disjunctive syllogism, valid*

12. If Dracula is a vampire, then he is dangerous. But Dracula is not a vampire. Hence, he is dangerous.

Counterexample:

- |                  |   |       |   |
|------------------|---|-------|---|
| A                | B   | not A | B |
| 1. If A, then B. | 1. If Clint Eastwood is over 200 years old, then he is over 100 years old. [true] |       |   |
| 2. Not A.        | 2. Clint Eastwood is not over 200 years old. [true]                               |       |   |
| So, 3. B.        | So, 3. Clint Eastwood is over 100 years old. [false]                              |       |   |

\*13. Either the animals used in research are a lot like humans, or they are not a lot like humans. If the animals are a lot like humans, then experimenting on them is morally questionable. If the animals are not a lot like humans, then experimenting on them is pointless. So, either experimenting on animals is morally questionable, or it is pointless.

- |                       |                             |
|-----------------------|-----------------------------|
| A                     | B                           |
| 1. Either A or B.     |                             |
| 2. If A, then C.      |                             |
| 3. If B, then D.      |                             |
| So, 4. Either C or D. | constructive dilemma, valid |

14. The state cannot uphold the value of life by taking it. And if the state cannot uphold the value of life by taking it, then the death penalty should be abolished. Therefore, the death penalty should be abolished.

- |                  |                           |
|------------------|---------------------------|
| A                | A                         |
| 1. A.            |                           |
| 2. If A, then B. |                           |
| So, 3. B.        | <i>modus ponens</i> valid |

15. If my society approves of genetic engineering, then genetic engineering is right. But my society does not approve of genetic engineering. Hence, genetic engineering is not right.

- |                  |                                 |       |
|------------------|---------------------------------|-------|
| A                | B                               | not A |
| 1. If A, then B. |                                 |       |
| 2. Not A.        |                                 |       |
| So, 3. Not B.    | denying the antecedent, invalid |       |

### Part C: Still More Arguments to Evaluate

\*1. Overeating is foolish only if it causes disease. Overeating does not cause disease. So, overeating is not foolish.

- |                  |                              |       |       |
|------------------|------------------------------|-------|-------|
| A                | B                            | not B | not A |
| 1. If A, then B. |                              |       |       |
| 2. Not B.        |                              |       |       |
| So, 3. Not A.    | <i>modus tollens</i> , valid |       |       |

2. Either films depicting graphic violence have caused the increase in violent crime or bad parenting has caused it (or both). Movies depicting graphic violence have caused the increase in violent crime. Therefore, bad parenting has not caused the rise in violent crime.

- |                             |   |
|-----------------------------|---|
| A                           | B |
| 1. Either A or B (or both). |   |
| 2. A.                       |   |
| So, 3. Not B.               |   |

Counterexample:

- |  |
|--|
| 1. Either Bill Gates has over \$1 million or he has over \$2 million (or both). [true] |
| 2. Bill Gates has over \$1 million. [true]   |
| So, 3. Bill Gates does not have over \$2 million. [false]                              |



3. Corporations contribute huge sums of money to political campaigns. If that is so, then corporations exert undue influence on elections. So, corporations exert undue influence on elections.
- A A B
- B
1. A.
  2. If A, then B.
- So, 3. B. *modus ponens*, valid
- \*4. You will win the chess tournament if you are very good at chess. Unfortunately, you are not very good at chess. Hence, you will not win the chess tournament.
- A B not B
- not A
1. If B, then A.
  2. Not B.
- So, 3. Not A. denying the antecedent, invalid
5. Either virtue is good for its own sake, or it is good as a means to an end. It is not the case that virtue is good for its own sake. So, virtue is good as a means to an end.
- A B not A
- B
1. Either A or B.
  2. Not A.
- So, 3. B. disjunctive syllogism, valid
6. You should be an optimist if pessimists are less likely to succeed than optimists. And it is a fact that pessimists are less likely to succeed than optimists. Therefore, you should be an optimist.
- A B
- B A
1. If B, then A.
  2. B.
- So, 3. A. *modus ponens*, valid
- \*7. If God can arbitrarily decide what is morally right, then God can make cruelty right. And if God cannot arbitrarily decide what is morally right, then morality is not entirely in God's control. But either God can arbitrarily decide what is morally right, or God cannot arbitrarily decide what is morally right. Therefore, either God can make cruelty right, or morality is not entirely in God's control.
- A B
- C D
- A C
- B D
1. If A, then B.
  2. If C, then D.
  3. Either A or C.
- So, 4. Either B or D. constructive dilemma, valid
8. The dinosaurs vanished due to a sudden, extreme drop in temperature. The earth must have suffered some sort of cataclysm millions of years ago, assuming that the dinosaurs vanished due to a sudden, extreme drop in temperature. So, the earth must have suffered some sort of cataclysm millions of years ago.
- A B
- A
1. A.
  2. If A, then B.
- So, 3. B. *modus ponens*, valid

9. Assuming that you treat like cases alike, you are fair. Hence, you are fair only if you treat like cases alike.

Counterexample:

- |                      |   |   |   |
|----------------------|---|---|---|
| A                    | B   | B | A |
| 1. If A, then B.     | 1. If Lincoln was over 8 feet tall, then he was over 3 feet tall. [true]      |   |   |
| So, 2. If B, then A. | So, 2. If Lincoln was over 3 feet tall, then he was over 8 feet tall. [false] |   |   |

- \*10. The death penalty is inequitably applied to the poor and minorities. And given that the death penalty is inequitably applied to the poor and to minorities, it is unjust. Therefore, the death penalty is unjust.

- |                  |                            |
|------------------|----------------------------|
| A                | A                          |
| 1. A.            |                            |
| 2. If A, then B. |                            |
| So, 3. B.        | <i>modus ponens, valid</i> |

11. Philosophy is important if ideas are important. And assuming that ideas change lives, ideas are important. Hence, if philosophy is important, then ideas change lives.

Counterexample:

- |                      |   |   |   |
|----------------------|---|---|---|
| A                    | B   | C | B |
| 1. If B, then A.     | 1. If Michael Jordan is over 8 feet tall, then he is over 5 feet tall. [true]       |   |   |
| 2. If C, then B.     | 2. If Michael Jordan is over 10 feet tall, then he is over 8 feet tall. [true]      |   |   |
| So, 3. If A, then C. | So, 3. If Michael Jordan is over 5 feet tall, then he is over 10 feet tall. [false] |   |   |

12. If you join the military, you give up a lot of freedom. If you go to college, you incur enormous debts. However, you either join the military, or you go to college. Therefore, you either give up a lot of freedom, or you incur enormous debts.

- |                       |                                    |   |   |
|-----------------------|------------------------------------|---|---|
| A                     | B                                  | C | D |
| 1. If A, then B.      |                                    |   |   |
| 2. If C, then D.      |                                    |   |   |
| 3. Either A or C.     |                                    |   |   |
| So, 4. Either B or D. | <i>constructive dilemma, valid</i> |   |   |

- \*13. Mercy killing is morally permissible only if it promotes a greater amount of happiness for everyone affected than the alternatives do. And mercy killing does promote a greater amount of happiness for everyone affected than the alternatives do. Therefore, mercy killing is morally permissible.

- |                  |  |
|------------------|--|
| A                | B  |
| 1. If A, then B. |  |
| 2. B.            |  |
| So, 3. A.        | <i>affirming the consequent, invalid</i> |

14. You must either love or hate. If you love, then you suffer when your loved ones suffer. If you hate, then you suffer when your enemies flourish. Hence, either you suffer when your loved ones suffer, or you suffer when your enemies flourish.

- |                       |                                    |   |   |   |
|-----------------------|------------------------------------|---|---|---|
| A                     | B                                  | A | C | B |
| 1. Either A or B.     |                                    |   |   |   |
| 2. If A, then C.      |                                    |   |   |   |
| 3. If B, then D.      |                                    |   |   |   |
| So, 4. Either C or D. | <i>constructive dilemma, valid</i> |   |   |   |



- 8. Valid (therefore neither strong nor weak)
- 9. Invalid but strong
- \*10. Valid (therefore neither strong nor weak)
- 11. Invalid but strong
- 12. Valid (therefore neither strong nor weak)
- \*13. Invalid but strong
- 14. Invalid but strong
- 15. Valid (therefore neither strong nor weak)
- \*16. Invalid and weak
- 17. Invalid but strong
- 18. Invalid but strong (assuming the sample of tin cans examined by the inspectors is large enough)
- \*19. Invalid and weak
- 20. Invalid but strong

#### **Part D: Cogency**

- \*1. Cogent.
- 2. Weak, and therefore uncogent.
- 3. Valid, and hence neither cogent nor uncogent.
- \*4. Uncogent. Strong, but the premise is false (e.g., penguins and ostriches cannot fly).
- 5. Weak, therefore uncogent.
- 6. Strong, but not cogent (the first premise is false).
- \*7. Valid, and hence neither cogent nor uncogent.
- 8. Strong, but uncogent (the second premise is false).
- 9. Strong, but uncogent (the first premise is false).
- \*10. The argument is weak and hence uncogent.