The Elements of Reasoning (Sixth Edition)

Solutions to Exercises

Chapter 1

A. *(p. 10)*

1.   Not an argument. No claim here is intended to provide support for any other.

2.   A simple argument. Although there are no indicator terms, the conclusion - "we were wise when we ceased the routine vaccination of children" – is evidently intended to follow from the other two claims.

3.   A complex argument. In the first sentence, the word *so* indicates that what follows is a conclusion drawn from the previous claim. This conclusion in turn is a premise for "the job will go to Herbert", as indicated by the conclusion indicator word *thus*.

4.   Not an argument. This is a description of a series of procedures and observations.

5.   A simple argument. Although there are no indicator words, the first three claims are each independent evidence for the last claim.

6.   A complex argument. The second claim is intended to follow from the first, as indicated by the word *thus*; and the last sentence contains the conclusion indicating phrase *"that makes it obvious that"* introducing the final conclusion "computers think".

7.   Not an argument.

8.   A simple argument. No indicator words, but the conclusion is "the Taipei study doesn't establish its conclusion at all".

9.   Not an argument.

10. A simple argument. The conclusion is "you should stop killing every spider you see".

11. A simple argument. The first two sentences are claims intended to provide support for the last sentence.

12. A simple argument. The conclusion here is a claim disguised as a command.

13. A simple argument. The quoted passage constitutes the man's support for the conclusion that his wife had the right to commit suicide.

14. Not an argument.

15. A simple argument. The conclusion is "we should not have a constitutional amendment banning flag burning." The following claims are all in support of this conclusion.

16. Not an argument, but a description of a series of events. In the last sentence, *thus* means "in this way".

17. A simple argument. We should regard "ritual or habitual cannibalism is either rare or non-existent" as the conclusion. What follows this claim is the support for it.

18. Not an argument.

19. There appear to be two distinct arguments here, one complex and one simple. The conclusion is the same in each case: there should be copyright laws. The complex argument goes like this: compensating people encourages more creative works and our society benefits form these works; *therefore* people have a right to compensation for their creative work; *therefore* there should be copyright laws. The simple argument is a little harder to see, but try this: if there were no copyright laws then the only creative works would be those arising from the support of government and rich patrons; but there should be creative work arising other than from the support of government and rich patrons; *therefore* there should be copyright laws.

20. A simple argument. "It forms a strong presumption" operates as a kind of conclusion indicator. Here the conclusion is "there are no miracles."

B. *(p. 12)*

1. Unstated premise: anything that deliberately leads us to see an ordinary object in a new and interesting way is a genuine work of art.

2. Unstated premise: Tuesday is the day of the test.

3. Unstated conclusion: Lopez ought to resign.

4. Unstated premise: Tiny is a pit bull.

5. Unstated conclusion: there is no justification for allowing Hovey to compete.

6. Unstated premise: taking a life is murder.

7. Unstated premise: any case of taking the life of a living human being is murder.

8. Unstated premise: any war (or perhaps anything at all) that causes the suffering of innocent people is unjust.

9. Unstated conclusion: I should not completely trust my senses.

10. Unstated premise: to count as a sport, an activity requires foot speed, stamina, or quick reflexes.

11. Unstated conclusion: there is no god.

12. Unstated premise: all forms of expression are constitutionally protected.

13. Unstated premise: anything that is offensive to a lot of us should be outlawed.

14. Unstated premise: anyone who takes a life should lose their life.

15. Unstated premise: if at one time there was nothing in existence, then now there would be nothing in existence (nothing comes from nothing).

16. An atheist is someone who denies theistic claims.

17. Unstated premise: the table itself does not change as I change my perspective.

18. Unstated conclusion: animals do not reason.

19. Unstated conclusion: the killer was Colonel Sebastian Moran.

20. Anything desired by everyone is desirable.

Chapter 2

A. *(p. 24)*

1. An explanation.

2. An argument.

3. An explanation.

4. Neither.

5. An explanation.

6. An argument.

7. Neither.

8. An argument.

9. Neither.

10. An explanation.

11. An argument.

12. An explanation.

13. Neither.

14. Neither.

15. An explanation.

16. An argument.

17. Neither.

18. An argument.

19. An explanation. It is unlikely(though not impossible) that anyone would *argue* for the conclusion that Allen is very ill on the grounds that he was bitten by a rattlesnake. More likely, is illness is already a recognized fact and the snake bite is the explanation of that fact.

20. An explanation. Again, it is likely that the deaths of thousands would be a fact known prior to the claim about farming methods; that claim constitutes an explanation of the deaths.

B. *(p. 25)*
1. No matter what the fast drivers think, [higher speed limits will result in more needless deaths on the highway][1]. (So) [the speed limits should not be raised][2].

       Diagram

          <u>1</u>
          ↓
          2

       Standard Form

1. Higher speed limits will result in more needless deaths on the highway

∴

2. The speed limits should not be raised.

2.

[The Cat90 is the best lawn mower you can buy][1]. (Since) [you want the best][2], [you should buy the Cat90][3].

Diagram

$\underline{1 + 2}$
$\downarrow$
3

Standard Form
1. The Cat90 is the best lawn mower you can buy.
2. You want the best (lawn mower you can buy).

∴

3. You should buy the Cat90.

3.

[Without a tax increase there will soon be runaway inflation][1]. But [Congress refuses to raise taxes][2]. (Thus), [before long there will be runaway inflation][3]. (That means that) [you should borrow all the money you can right now][4].

Diagram

$\underline{1 + 2}$
$\downarrow$
$\underline{3}$
$\downarrow$
4

Standard Form
1. Without a tax increase there will soon be runaway inflation
2. Congress refuses to raise taxes.

∴

3. Before long there will be runaway inflation. (1,2)

∴

4. You should borrow all the money you can right now.(3)

4.

Because [Henry has started on a weight-lifting program][1] and [weight lifters are very strong][2], (it follows that) [Henry will soon be very strong][3]. And [anyone who is unusually strong can make the football team][4]. (So) [Henry will make the team this year][5].

Diagram

$\underline{1 + 2}$
$\downarrow$
$\underline{3 + 4}$
$\downarrow$
5
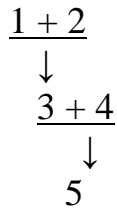
Standard Form
1. Henry has started on a weight-lifting program.
2. Weight lifters are very strong

∴

3.. Henry will soon be very strong
4. Anyone who is unusually strong can make the football team.

∴

5. Henry will make the team this year.

5. [People who study history are wiser than those who do not][1]. [Studying history makes a person less likely to repeat the mistakes of the past][2], and [not repeating past mistakes is a sign of wisdom][3]. And (because) [the primary aim of education is producing wisdom][4], [all universities should require the study of history][5].

Diagram

$\underline{2 + 3}$
$\downarrow$
$\underline{1 + 4}$
$\downarrow$
5
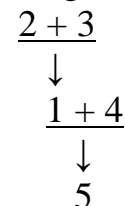
Standard Form
1. Studying history makes a person less likely to repeat the mistakes of the past.
2. Not repeating past mistakes is a sign of wisdom.
∴
3. People who study history are wiser than those who do not. (1,2)
4. The prime aim of education is producing wisdom.
∴
5. All universities should require the study of history. (3,4)

6. [Never, never pass up a four-leaf clover]^1! [They are very rare]^2 (because) [a clover normally has three leaves]^3, and [the four-leaved ones bring good luck]^4.

Diagram

<u>3</u>
↓
<u>2 + 4</u>
  ↓
  1

Standard Form
1. A clover normally has three leaves.
∴
2. (Four-leaf clovers) are very rare. (1)
3. The four-leaved ones bring good luck.
∴
4. Never, never pass up a four-leaf clover. (2, 3)

7. [Anything worth recording has been entered in the ship's log]^1, (so) [I can be sure I've never met a mermaid]^2. [A mermaid would be worth recording]^3, and [there's nothing about meeting a mermaid in my ship's log]^4.

Diagram
<u>1 2+3</u>
   ↓
   4

Standard Form
1. Anything worth recording is in the ship's log.
2. A mermaid would be worth recording
3. There is nothing about meeting a mermaid in the ship's log.
   ∴
4. I can be sure I've never seen a mermaid.

8. [AIDS may be the most horrible disease in the world's history][1]. [It is always lethal][2]. [There is no cure][3]. And [it is most often transmitted through pleasure][4].

Diagram

2 3 4
↓
1
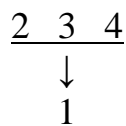
Standard Form
1. [AIDS] is always lethal.
2. There is no cure [for AIDS].
3. [AIDS] is most often transmitted through pleasure.
   ∴
4. AIDS may be the most horrible disease in the world's history.

9. [Higher education should increase our ability to think critically and to appreciate a greater variety of experiences][1]. (Thus), [it is good to take courses in the humanities, science, and social science][2]. (So), [students who take the advanced-level course in twentieth-century American poetry have made a wise choice][3].

Diagram
1
↓
2
↓
3

Standard Form
1. Higher education should increase our ability to think critically and to appreciate a greater variety of experiences.
   ∴
2. It is good to take courses in the humanities, science, and social science. (1)
   ∴
3. Students who take the advanced-level course in twentieth-century American poetry have made a wise choice.(2)

10. [We should go for a hike in the canyon this weekend][1]. [The air is crisp][2], and [the leaves are turning to lovely reds and yellows][3]. And [the exercise will be good for us][4], (since) [we haven't been out all week][5]. (So), [let's take the hike][6].

Diagram

1+2
↓
3   4+5
     ↓
     6

Standard Form
1. The air is crisp.
2. The leaves are turning to lovely reds and yellows.
   ∴
3. We should go for a hike in the canyon this weekend. (1,2)
4. We haven't been out all week.
5. The exercise will be good for us.
   ∴
6. Let's take a hike.(3, 4, 5)

11. The hike has been nice, but [we must be pretty far from civilization][1], (because) [the only people we have seen in the last three hours have been toting big backpacks][2]. (So) [we better turn around before we get lost in the middle of nowhere][3].

Diagram

$$\frac{2}{1}$$
$$\frac{1}{3}$$

Standard Form
1. The only people we have seen in the last three hours have been toting big backpacks.
   ∴
2. We must be pretty far from civilization. 1
   ∴
3. We had better turn around before we get lost in the middle of nowhere. 2

12. [The fate of the hikers will forever be a mystery][1]. [The *Weekly World News* said they were devoured by army ants][2], but [not much in *WWN* is true][3], (so) [probably they weren't][4]. [If they weren't, we just don't know what happened to them][5]. (So), [we will always be wondering][1].

Diagram
$$\underline{2 + 3}$$
$$\downarrow$$
$$\underline{4 + 5}$$
$$\downarrow$$
$$1$$

Standard Form
1. The *Weekly World News* said [the hikers] were devoured by army ants.
2. Not much in *WWN* is true.
   ∴
3. Probably [the hikers] weren't [devoured by army ants]. (1,2)
4. If they weren't, we just don't know what happened to them.
   ∴
5. The fate of the hikers will forever be a mystery.(3,4)

13. (It is obvious that) [the judge committed the murder][1], (given that) [either the butler or the judge did it][2]. (Since) [the butler was

passionately in love with the victim]³, [it was not she who committed the murder]⁴.

Diagram
```
  3  .
   ↓
  4 + 2
     ↓
     1
```
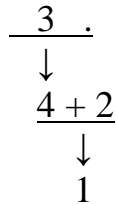
Standard Form
1. The butler was passionately in love with the victim.
   ∴
2. [The butler] did not commit the murder. 1
3. Either the butler or the judge [committed the murder].
   ∴
4. The judge committed the murder. 2, 3

14. [The detective is unlikely to be a convincing witness]¹ (because) [he has the reputation of being a racist]². (Probably, then), [the defendant will be acquitted]³.

    Diagram
    ```
    2
    ↓
    1
    ↓
    3
    ```
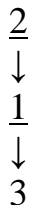
    Standard Form
    1. [The detective] has the reputation of being a racist.
       ∴
    2. The detective is unlikely to be a convincing witness.
       ∴
    3. The defendant will be acquitted.

15. [If the detective really is a racist]¹—(which) [he is]²—[then he never should have been allowed to testify at all]¹, (since) [white racists are especially unreliable witnesses when the accused is a person of

color]³. (So), [the detective should not have been allowed to testify at all]⁴.

Diagram

<u>3</u>
↓
<u>1 + 2</u>
  ↓
  4

Standard Form
1. White racists are especially unreliable witnesses when the accused is a person of color.
    ∴
2. If the detective is really a racist he should not have been allowed to testify. 1
3. The detective is a racist.
    ∴
4. The detective should not have been allowed to testify. 2, 3

16. [The eighteenth-century philosopher David Hume (was undoubtedly) a finer thinker than his even more celebrated successor Immanuel Kant]¹. [Hume was by far the more lucid writer]². [His contributions were more diverse than Kant's]³, (for) [he was a first-rate historian as well as a philosopher]⁴. (Further), [Hume's ethical thought did not suffer from the rigidity of Kant's]⁵. [Hume, unlike Kant, would never have said the duty not to lie is so absolute that we should answer truthfully even when a would-be murderer asks where his intended victim is hiding]⁶. (Thus), [there can be little doubt that, of the two, Hume was the superior thinker]⁷.

Diagram

<u>4</u> <u>6</u>
↓ ↓
<u>3 + 5 +   2</u>
    ↓
    1

Standard Form
1. [Hume] was a first-rate historian as well as a philosopher.

∴
2. [Hume's] contributions were more diverse than Kant's. (1)

1'. Hume would never have said the duty not to lie is so absolute that we should answer truthfully even when a would-be murderer asks where his intended victim is hiding.
∴
2'. Hume's ethical thought did not suffer from the rigidity of Kant's. (1')

1*. [Hume's] contributions were more diverse than Kant's. (1)
2*. Hume's ethical thought did not suffer from the rigidity of Kant's. (1')
3*. Hume was by far the more lucid writer.
∴
4*. David Hume was undoubtedly a finer thinker than his even more celebrated successor Immanuel Kant.

17. [Either the market has bottomed out or we're in for several more months of rocky times for investors][1]. [If this is the market's lowest point, then the Fed will not be thinking of lowering interest rates further][2], but [the latest report from the chairman of the Fed tells us that interest rates will go down further][3]. (So clearly) [this isn't the bottom of the market][4], (and consequently) [it's a bleak time ahead for investors][5].

Diagram
1   2+3
    ↓
    4   1
     ↓
     5

Standard Form
1. Either this is the bottom of the market or it is a bad time for investors.
2. If this is the bottom of the market, then the Fed will not lower rates.

3. The Fed will lower rates.

∴

4. This is not the bottom of the market. 2, 3

∴

5. This is a bad time for investors. 1, 4

18. [Dozens of people have claimed to have seen Elvis Presley since he was supposed to have died in 1978][1], (so) [he must still be alive][2], (since) [that many people wouldn't be wrong][3]. (On account of the fact that) Elvis is alive, ["Hound Dog" will soon again be a best-selling single.][4]

Diagram
$\underline{1 + 3}$
↓
$\underline{2}$
↓
4

Standard Form
1. Dozens of people have claimed to have seen Elvis Presley since he was supposed to have died in 1978.
2. That many people wouldn't be wrong.

∴

3. He must still be alive.

∴

4. "Hound Dog" will soon again be a best-selling single.

19. [The liquid is either acidic or alkaline][1]. [If it's acidic the paper will turn red][2], and [if it's alkaline the paper will turn blue][3]. (So) [the paper will turn either red or blue][4]. (But since) [I'm color-blind][5], (that means) [I won't be able to tell whether the liquid is acidic or alkaline][6].

Diagram
$\underline{1 + 2 + 3}$
↓
$\underline{4 + 5}$
↓
6

Standard Form

1. The liquid is either acidic or alkaline.
2. If the liquid is acidic, the paper will turn red.
3. If the liquid is alkaline, the paper will turn blue.
   ∴
4. The paper will either turn red or blue. 1, 2, 3
5. I am colorblind.
   ∴
6. I will not be able to tell if the liquid is acidic or alkaline. 4, 5

20. (Here are some reasons why) [you should stop sniffing cocaine][1]: [Cocaine is addictive][2]; [it is likely to lead to the use of even harder drugs][3], (because) [the user will always be looking for an even greater high][4]; rightly or wrongly,[it is illegal][5]; and [it is actually quite bad for your nose][6].

Diagram
2 3+4 5 6
      ↓
       1

Standard Form
1. Cocaine is addictive
2. Cocaine is likely to lead to the use of even harder drugs
3. Cocaine users will always be looking for an even greater high.
4. It is illegal.
   It is actually quite bad for your nose.
   ∴
5. You should stop sniffing cocaine,

Chapter 3

A. *(p. 33)*

1.   Invalid. Genevieve might deserve punishment for some other infraction.

2. Invalid. There may be some special feature that the speaker's friends have in common.

3. Valid.

4. Valid.

5. Invalid. Obviously, this argument has two true premises and a false conclusion.

6. Valid. If the dose is genuinely *unfailingly* lethal, then Henrietta must be dead.

7. Valid. Although the premises are both false, if they *were* true then the conclusion would have to be true too.

8. Invalid. If the premises were true, the conclusion would be false.

9. Valid.

10. Invalid. Although the laws of nature make the conclusion almost certain, it is remotely possible that no injury occurred.

11. Valid. If the premises *were* true, the conclusion would have to be true too.

12. Invalid. Some superstitious people may still choose to stay on the thirteenth floor.

13. Valid.

14. Valid.

15. Valid.

16. Invalid. The hard-working students may get bad grades and the good grades may go to the idle.

17. Invalid. It is possible that you might not take the medicine according to the directions.

18.   Invalid. Those undernourished who need vitamin supplements might not be vegetarians. Perhaps, vegetarians are undernourished in some way other than lacking vitamins.

19.   Valid (if you take the broad view that squash and beans are vegetables).

20.   Valid.

B. *(p. 42)*

1.   Valid.

2.   Non-deductively successful. Five hundred is a large enough sample to be representative.

3.   Non-deductively successful, though there are many ways she might fail to do very well.

4.   Non-deductively successful. Allen might be one of the two-percent, but it's highly unlikely.

5.   Non-deductively successful. Again, although this is not a particularly strong argument, the premise does make the conclusion somewhat likely.

6.   Non-deductively successful, though not a particularly strong argument. Some simple information would go a long way to showing the likelihood of the conclusion.

7.   Unsuccessful. Students in the algebra class are not the best sample by which to determine whether a literature class is boring or interesting.

8.   Unsuccessful. The premises contribute to the probability of the conclusion, but they alone do not make it more likely than not.

9. Non-deductively successful. Although the premise does not guarantee the conclusion, if the statistical claim in the premise is true then the conclusion is quite likely.

10. Non-deductively successful. It's not clear what relevance their being brothers has so this is a simple statistical induction.

11. Perhaps non-deductively successful. However, since the sample is limited and biased towards zoo-dwelling animals, it's hard to see that the premise makes the general conclusion more than barely likely.

12. Unsuccessful. The evidence suggests not giant rats, but something quite small.

13. Unsuccessful. Only one First Lady has ever gone on to be a U. S. Senator and even she may yet become President.

14. The argument for conclusion 1 is unsuccessful, for conclusion 2 is borderline successful, and for conclusion 3 is deductively valid.

15. Non-deductively successful.

16. Unsuccessful. The number of those who die of lung cancer may be much smaller than the number of smokers.

17. Unsuccessful. In order to be successful, this argument needs a premise linking the factual claims in the premises to the value claim in the conclusion.

18. Non-deductively successful. Such evidence as this, when not controverted, is commonly regarded as sufficient to establish guilt.

19. Non-deductively successful. Most of the inferences in this complex argument are deductively valid. However, the last inference is non-deductively successful, and this characterizes the whole argument.

20. Non-deductively successful.

C. *(p. 46)*

1. The premise about the nature of good literature seems questionably true.

2. The premise, though vaguely relevant to the conclusion, is not nearly sufficient evidence even to make it likely.

3. A case of relevant information not being taken into account. A calculus professor is much more likely than other intellectuals to know about a mathematical proposition.

4. The premise does not adequately support the conclusion. There is an equally good chance that King is a woman.

5. The premise is irrelevant. The best debater may not be the best manager.

6. Relevant information is not taken into account. Does Jameson want to play basketball?

7. Again, a problem of relevance. The premises do not establish the evaluative conclusion.

8. Since most dogs are not terriers, the premise alone fails to make it probable that this was a terrier.

9. The premise is almost certainly false.

10. The premise, though relevant, is not adequate to support the conclusion. All it takes is one Vermont resident to become president.

11. An odd argument in which the premise is entirely irrelevant to the conclusion.

12. Irrelevance again. The muse may not be an artist herself.

13. Unless Bailey's Gym is the only option, the premises do not lead to the conclusion that it is this particular gym you should attend.

14. Relevant information is not taken into account. A premed student has to take organic chemistry.

15. The premise is debatable at best.

16. The premises do not make the conclusion likely. It is equally if not more likely that the office-holders were chosen because they were very well qualified.

17. The premise presents a false dichotomy, and is thus false. A third possibility is that there were no weapons of mass destruction, but the administration believed there were and thus was not lying.

18. Plenty of recent disasters suggest that the premise is false.

19. The premise, while perhaps true, is insufficient to establish the conclusion. Other teams may have even better players.

20. A problem of relevance. The economic benefits cited in the premise do not bear on the ecological claim of the conclusion.

Chapter 4

A. *(p. 52)*

1. $(Q \bullet R) \rightarrow (W \vee F)$

2. $(P \bullet {\sim}E) \vee {\sim}P$

3. $E \rightarrow (A \rightarrow B)$
   $\underline{A \bullet E}$
   B

4. $N \vee (O \bullet A)$
   $\underline{{\sim}O}$
   N

5. $(M \bullet C) \rightarrow B$
   $\underline{{\sim}B}$
   ${\sim}M \vee {\sim}C$

B. *(p. 57)*

1. *Modus ponens*. Valid.

2. *Modus tollens*. Valid.

3. Denying the antecedent. Invalid.

4. *Modus ponens*. Valid.

5. Affirming the consequent. Invalid.

6. *Modus tollens*. Valid.

7. *Modus tollens*. Valid.

8. Affirming the consequent. Invalid.

9. *Modus ponens*. Valid.

10. Denying the antecedent. Invalid.

11. Affirming the consequent. Invalid.

12. Denying the antecedent. Invalid.

13. Hypothetical syllogism. Valid.

14. Disjunctive syllogism. Valid.

15. *Modus ponens*. Valid.

16. Hypothetical syllogism. Valid.

17. Hypothetical syllogism. Valid.

18. Disjunctive syllogism. Valid.

19. Addition. Valid.

20. Constructive dilemma. Valid.

21. Conjunction. Valid.

22. Simplification. Valid.

23. Constructive dilemma. Valid.

24. *Modus tollens*. Valid.

25. Affirming the consequent. Invalid.

C. *(p. 70)*

1. ~F → ~G
   G
   ———————
   F

   Modus tollens. Invalid.

2. S → G
   G → T
   ———————
   S → T

   Hypothetical Syllogism. Valid.

3. S
   ———————
   S ∨ P

   Addition. Valid.

4. H → ~B
   ~H
   ———————
   B

   Denying the antecedent. Invalid.

5. G ∨ C
   ~G
   ———————

C

Disjunctive syllogism. Valid.

6. $K \lor O$
$K \rightarrow R$
$O \rightarrow M$

$R \lor M$

Constructive dilemma. Valid.

7. $A \rightarrow {\sim}P$
A

${\sim}P$

Modus ponens. Valid.

8. C
V

$C \,\&\, V$

Conjunction. Valid.

9. $S \lor D$
${\sim}D$

S

Addition. Valid.

10. $D \rightarrow I$
${\sim}I$

${\sim}D$

Modus tollens. Valid.

D. *(p. 61)*

1. 1. ~H → (B ∨ L)
   2. ~H
   3. B ∨ L   1,2 MP
   4. ~L
   5. B   3,4 DS

2. 1. P → ~E
   2. ~E → ~D
   3. P → ~D   1,2 HS
   4. D
   5. ~P   3,4 MT
   6. ~P → ~C
   7. ~C   5,6 MP
   8. C ∨ G
   9. G   7,8 DS

E. *(p.62)*

1. 1. E → (A → B)
   2. A • E
   3. A   2 Simp
   4. E   2 Simp
   5. A → B   1,4 MP
   6. B   3,5 MP

2. 1. M → C
   2. C → B
   3. ~B
   4. M → B   1,2 HS
   5. ~M   3,4 MT

3. 1. S → P
   2. P → L
   3. S
   4. P   1,3 MP
   5. L   2,4 MP

4. 1. ~G → (S ∨ F)
   2. ~S • ~G
   3. ~G   2 Simp
   4. S ∨ F   1,3 MP

| | 5. | ~S | | 2 Simp |
| | 6. | F | | 4,5 DS |

5. | 1. | $K \rightarrow W$ | |
2.	$W \rightarrow H$	
3.	~H	
4.	~W	2,3 MT
5.	~K	1,4 MT

6. | 1. | $P \lor \sim M$ | |
2.	$P \rightarrow K$	
3.	$\sim M \rightarrow D$	
4.	~K	
5.	~P	2,4 MT
6.	~M	1,5 DS
7.	D	3,6 MP

7. | 1. | $V \lor E$ | |
2.	$M \rightarrow \sim V$	
3.	M	
4.	~V	2,3 MP
5.	E	1,4 DS
6.	$E \rightarrow \sim P$	
7.	~P	5,6 MP

8. | 1. | $\sim P \rightarrow \sim Q$ | |
2.	Q	
3.	$P \rightarrow S$	
4.	P	1,2 MT
5.	S	3,4 MP

9. | 1. | $P \rightarrow Q$ | |
2.	$P \lor R$	
3.	S	
4.	$S \rightarrow \sim Q$	
5.	~Q	3,4 MP
6.	~P	1,5 MT
7.	R	2,6 DS

10.   1. $P \rightarrow Q$
       2. $\sim Q \vee R$
       3. $\sim R$
       4. $\sim Q$ 2,3 DS
       5. $\sim P$ 1,4 MP

11.   1. $P \rightarrow (Q \vee R)$
       2. $\sim Q \bullet P$
       3. $\sim Q$ 2 Simp
       4. P 2 Simp
       5. $Q \vee R$ 1,4 MP
       6. R 3,5 DS

12.   1. $P \rightarrow \sim Q$
       2. $P \vee S$
       3. $\sim Q \rightarrow R$
       4. $S \rightarrow T$
       5. $P \rightarrow R$ 1,3 HS
       6. $R \vee T$ 2,4,5 CD

13.   1. Q
       2. $Q \rightarrow \sim R$
       3. P
       4. $\sim R \rightarrow S$
       5. $\sim R$ 1,2 MP
       6. S 4,5 MP
       7. $P \bullet S$ 3,6 Conj

F. *(p. 67)*

1.   a, d and e.

2.   b and d.

G. *(p. 67)*

1.   1. $P \rightarrow T$
       2. $T \rightarrow C$
       3. $P \rightarrow C$ 1,2 HS

2. 1. *~E → L*
    2. *~L → E*   1 Contra

3. 1. *T → ~K*
    2. *K → ~T*   1 Contra

4. 1. *~(A • D)*
    2. *~A ∨ ~D*   1 DM

5. 1. *C → (E → S)*
    2. *(C • E) → S*   1 Exp

6. 1. *~S → O*
    2. *S ∨ O*   1 Imp

7. 1. *~(V ∨ W)*
    2. *~V • ~W*   1 DM

8. 1. *C → ~H*
    2. *~~H*
    3. *~C*   1,2 MT

9. 1. *B ∨ I*
    2. *~B → I*   1 Imp

10. 1. *~G ∨ ~P*
    2. *~(G • P)*   1 DM

H. *(p. 70)*

1. 1. *B → L*
    2. *L → P*
    3. *B → P*   1,2 HS
    4. *~P*
    5. *~B*   3,4 MT
    6. *~B → I*
    7. *I*   5,6 MP

2. 1. *C → (R ∨ B)*
    2. *~R • ~B*

	3.	~(R ∨ B)	2 DM
	4.	~C	1,3 MT

3.
1. F → (T → ~L)
2. L
3. (F • T) → ~L   1 Exp
4. ~(F • T)   2,3 MT
5. ~F ∨ ~T   4 DM

4.
1. ~(H • L) → S
2. ~H ∨ ~L
3. ~(H • L)   2 DM
4. S   1,3 MP

5.
1. L → (~P → ~B)
2. L • ~P
3. L   2 Simp
4. ~P → ~B   1,3 MP
5. ~P   2 Simp
6. ~B   4,5 MP

6.
1. (P • J) → D
2. P • ~D
3. ~D   2 Simp
4. ~(P • J)   1,3 MT
5. ~P ∨ ~J   4 DM
6. P   2 Simp
7. ~J   5,6 DS

7.
1. G → (L → F)
2. G • ~F
3. G   2 Simp
4. L → F   1,3 MP
5. ~F   2 Simp
6. ~L   4,5 MT

8.
1. (G • H) → S
2. ~S
3. ~(G • H)   1,2 MT
4. ~G ∨ ~H   2 DM
5. G → ~H   4 Imp

9.
1. (~P ∨ Q) → ~(R • ~S)
2. R
3. ~P

4. ~P ∨ Q   3 Add
5. ~(R • ~S)   1,4 MP
6. ~R ∨ S   5 DM
7. S   2,6 DS

10. 1. ~(P • Q) → (R → S)
     2. ~P ∨ ~Q
     3. ~S
     4. ~(P • Q)   2 DM
     5. R → S   1,4 MP
     6. ~R   3,5 MT

11. 1. Q ∨ (R • S)
     2. ~Q
     3. S → (T ∨ U)
     4. R • S   1,2 DS
     5. S   4 Simp
     6. T ∨ U   3,5 MP
     7. ~T → U   6 Imp

12. 1. ~(P • Q) → ~R
     2. ~S
     3. ~R → S
     4. R   2,3 MT
     5. P • Q   1,4 MT
     6. Q   5 Simp
     7. Q ∨ T   6 Add

13. 1. ~(~P • ~Q) → R
     2. P
     3. ~~P   2 DN
     4. ~~P ∨ ~~Q   3 Add
     5. ~(~P • ~Q)   4 DM
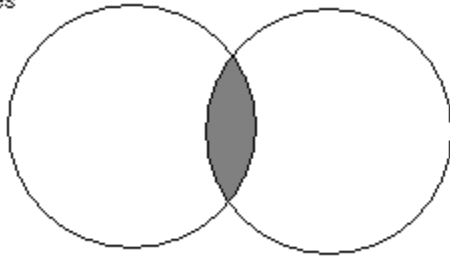   6. R   1,5 MP
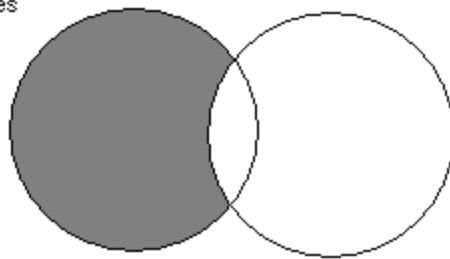
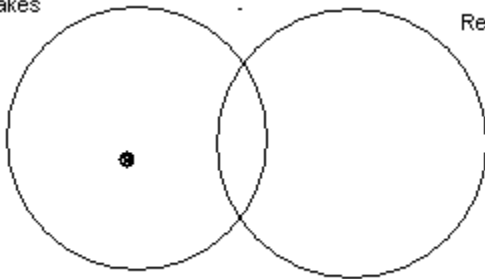# Chapter 5

A. *(p.81)*

1.
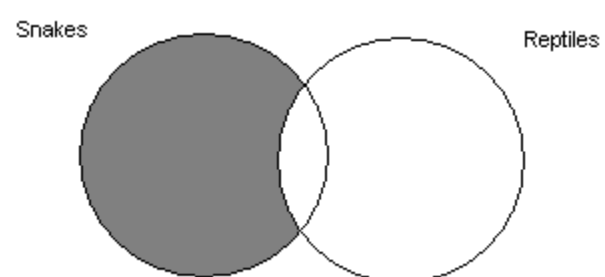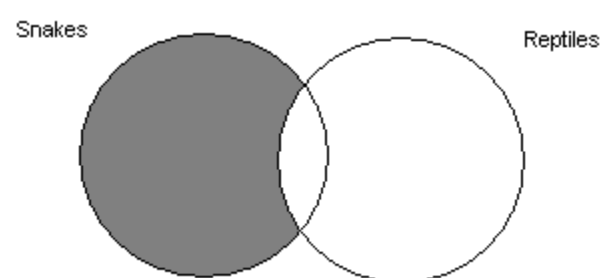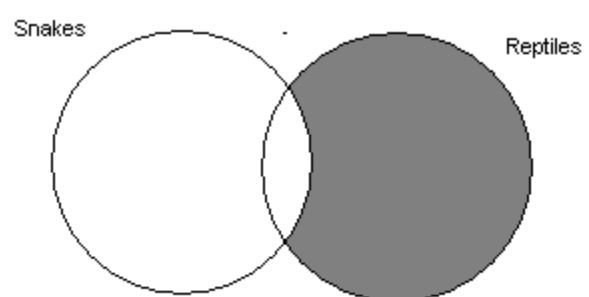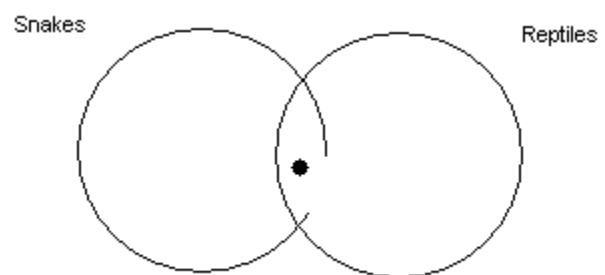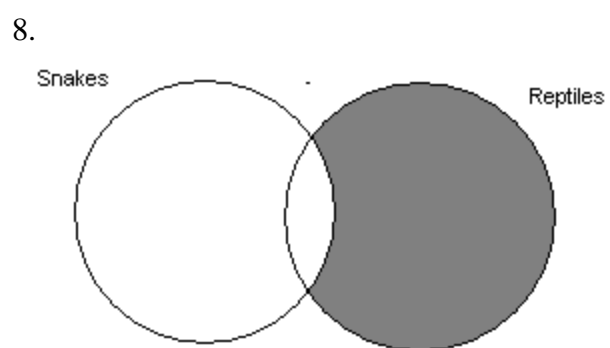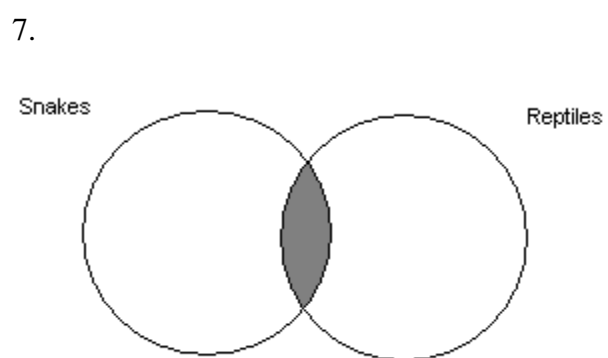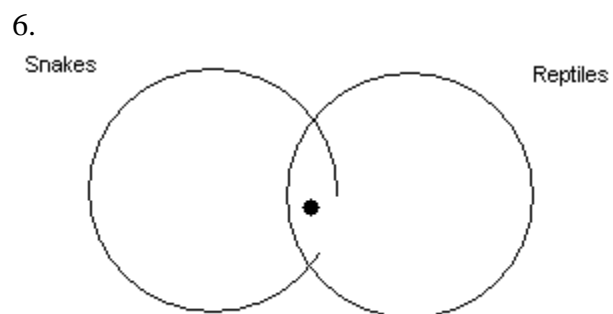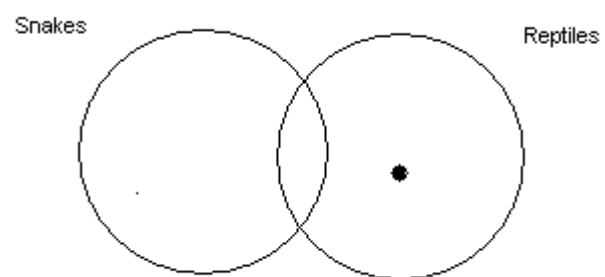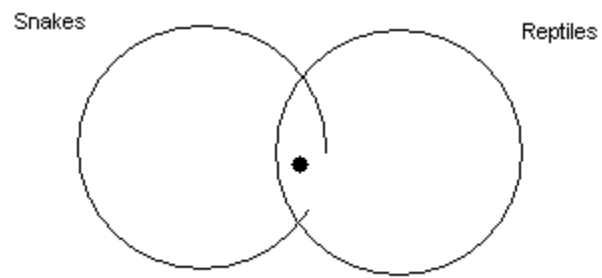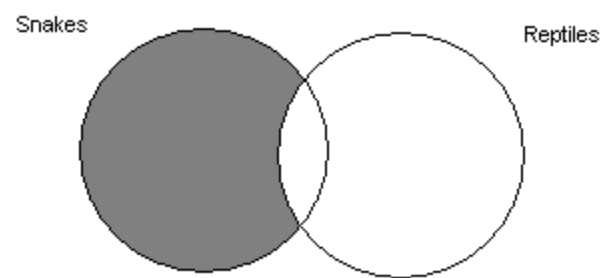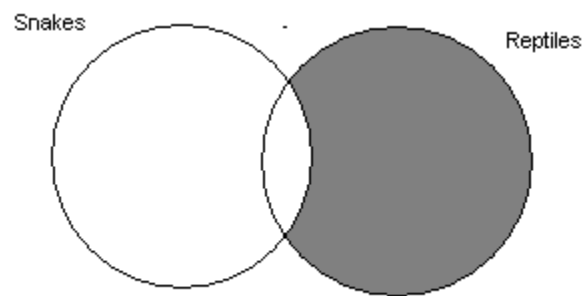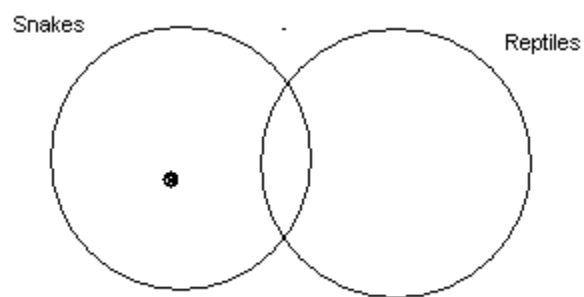
Snakes   Reptiles

2.

Snakes   Reptiles

3.

Snakes   Reptiles

4.

Snakes   Reptiles

5.

6.
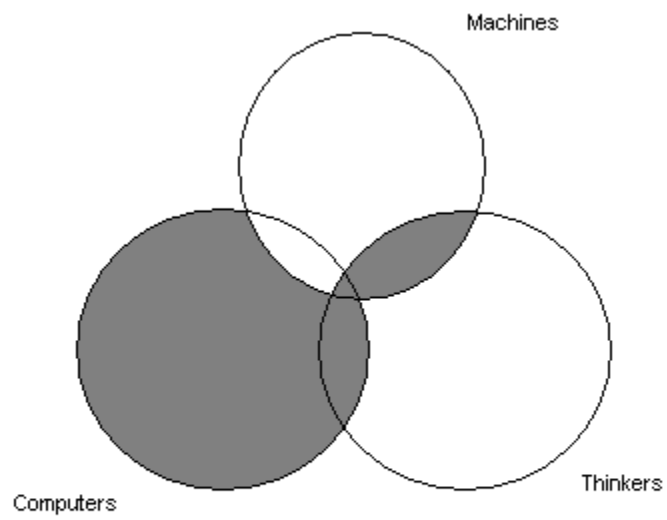

7.

8.
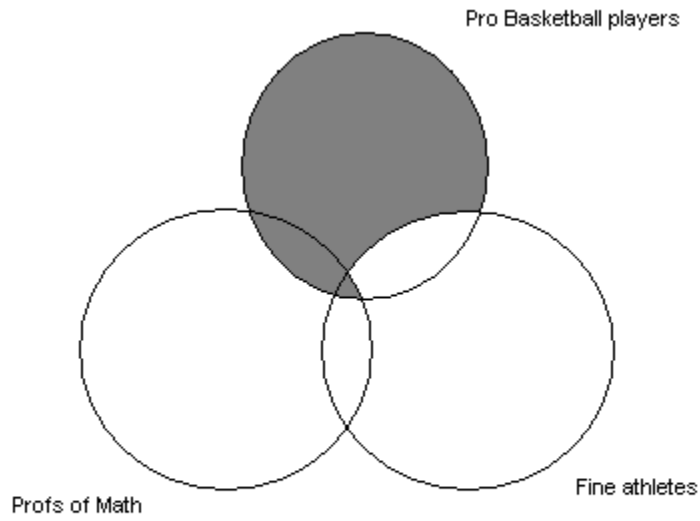
9.

10.

11.

12.

13.

14.

15.

16.
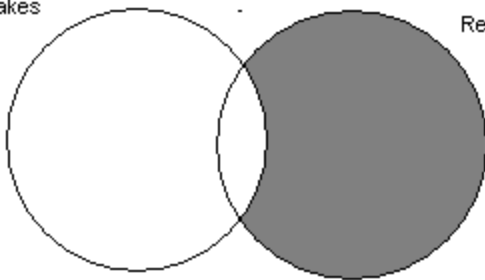
B. *(p.87)*

1.
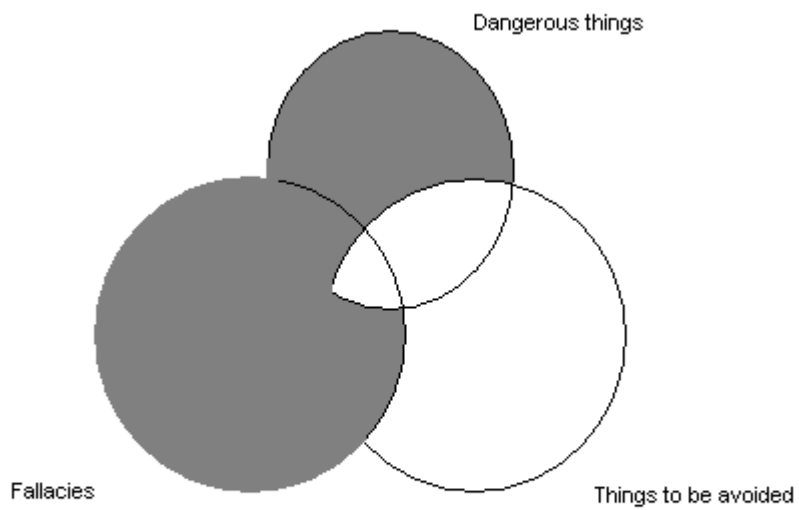

Regions 3 and 4 are shaded, so there is nothing in the intersection between machines and thinkers. The argument is valid.

2.

Pro Basketball players

Profs of Math

Fine athletes

3.

Dangerous things

Fallacies

Things to be avoided

Regions 2 and 5 are shaded, thus nothing in the set of fallacies is outside the
set of things to be avoided. The syllogism is valid.

4.   Valid

5.   Valid

6.   Valid

7.   Valid

8.   Valid

9.   Invalid

10.   Invalid

11.   Valid

12.   Invalid

13.   Invalid

14.   Invalid

15.   Valid

16.   Valid

17.   Invalid

18.   Invalid

19.   Valid

20.   Invalid