

3.1.xa. Exercise answers

1. a. *The soup was hot but not too hot* \wedge *the soup was thick but not too thick*
(*the soup was hot* \wedge *the soup was not too hot*) \wedge (*the soup was thick* \wedge *the soup was not too thick*)
(*the soup was hot* \wedge \neg *the soup was too hot*) \wedge (*the soup was thick* \wedge \neg *the soup was too thick*)

$$(H \wedge \neg T) \wedge (K \wedge \neg O)$$

both both H and not T and both K and not O

[H: *the soup was hot*; K: *the soup was thick*; O: *the soup was too thick*; T: *the soup was too hot*]

- b. *The equipment isn't here* \wedge *the equipment is unlikely to arrive soon*
 \neg *the equipment is here* \wedge \neg *the equipment is likely to arrive soon*

$$\neg H \wedge \neg S$$

both not H and not S

[H: *the equipment is here*; S: *the equipment is likely to arrive soon*]

- c. *No one answered the phone* \wedge *the phone rang 10 times*
 \neg *someone answered the phone* \wedge *the phone rang 10 times*

$$\neg A \wedge R$$

both not A and R

[A: *someone answered the phone*; R: *the phone rang 10 times*]

- d. *The alarm must have gone off* \wedge *Ted didn't hear anything*
The alarm must have gone off \wedge \neg *Ted heard something*

$$A \wedge \neg H$$

both A and not H

[A: *the alarm must have gone off*; H: *Ted heard something*]

- e. \neg *they will both meet the deadline and stay within the budget*
 \neg (*they will meet the deadline* \wedge *they will stay within the budget*)

$$\neg (D \wedge B)$$

not both D and B

[B: *they will stay within the budget*; D: *they will meet the*

deadline]

- f. *They won't meet the deadline* \wedge *they will stay within the budget*
 \neg *they will meet the deadline* \wedge *they will stay within the budget*

$$\neg D \wedge B$$

both not D and B

[B: *they will stay within the budget*; D: *they will meet the deadline*]

- g. *They won't meet the deadline* \wedge *they won't stay within the budget*
 \neg *they will meet the deadline* \wedge \neg *they will stay within the budget*

$$\neg D \wedge \neg B$$

both not D and not B

[B: *they will stay within the budget*; D: *they will meet the deadline*]

- h. *Tod shut off the alarm* \wedge \neg *Tod woke up*

$$A \wedge \neg W$$

both A and not W

[A: *Tod shut off the alarm*; W: *Tod woke up*]

- i. \neg *they will meet the deadline without going over the budget*
 \neg (*they will meet the deadline* \wedge \neg *they will go over the budget*)

$$\neg (D \wedge \neg G)$$

not both D and not G

[D: *they will meet the deadline*; G: *they will go over the budget*]

- j. *Larry joined in* \wedge *Larry did not join in without being coaxed*
Larry joined in \wedge \neg *Larry joined in without being coaxed*
Larry joined in \wedge \neg (*Larry joined in* \wedge \neg *Larry was coaxed*)

$$J \wedge \neg (J \wedge \neg C)$$

both J and not both J and not C

[C: *Larry was coaxed*; J: *Larry joined in*]

This is equivalent to $J \wedge \neg \neg C$ and also to $J \wedge C$, but the analysis shown is closer to the form of the English.

- k. *Ann liked the movie* \wedge *neither Bill nor Carol liked the movie*

Ann liked the movie \wedge (\neg *Bill liked the movie* \wedge \neg *Carol liked the movie*)

$$A \wedge (\neg B \wedge \neg C)$$

both A and both not B and not C

[A: *Ann liked the movie*; B: *Bill liked the movie*; C: *Carol liked the movie*]

The alternative analysis as $A \wedge \neg E$ [E: *either Bill or Carol liked the movie*] is closer to the English but it is less satisfactory because it displays less structure. The next chapter will give us the means carry this sort of analysis further by analyzing E as a compound of B and C.

2. a. not not both A and B

b. not both not A and B

c. $\neg A \wedge (\neg B \wedge C)$

d. $\neg (A \wedge B) \wedge \neg C$

3. a. *It was cold* \wedge \neg *there was frost*

It was cold \wedge *there was no frost*

It was cold, but there was no frost

b. \neg *someone saw the accident* \wedge (*Sue heard a crash* \wedge *Sue went to investigate*)

No one saw the accident \wedge *Sue heard a crash and went to investigate*

No one saw the accident, but Sue heard a crash and went to investigate

c. (*it was a design* \wedge *it was new*) \wedge \neg *it pleased someone*

It was a new design \wedge *it pleased no one*

It was a new design, and it pleased no one

d. \neg (*we'll win in Iowa* \wedge *we'll win in New York*)

\neg (*we'll win in both Iowa and New York*)

We won't win in both Iowa and New York

e. \neg *we'll win in Iowa* \wedge *we'll win in New York*

We won't win in Iowa \wedge *we'll win in New York*

We won't win in Iowa, but we'll win in New York

f. \neg (*we'll win in Iowa* \wedge \neg *we'll lose in New York*)

\neg (*we'll win in Iowa without losing in New York*)

We won't win in Iowa without losing in New York

4. Numbers below the tables indicate the order in which values were computed.

a.
$$\frac{A \ B \ C}{T \ F \ F} \mid \frac{A \wedge \neg(B \wedge C)}{\textcircled{T} \ T \ F}$$

3 2 1

b.
$$\frac{A \ B \ C}{T \ F \ F} \mid \frac{A \wedge (\neg B \wedge C)}{\textcircled{F} \ T \ F}$$

3 1 2

[Note that, while in **a**, it is the value under the \neg that is used in calculating the value of the main conjunction, in **b** it is the value under the second \wedge ; this is due to the change in relative scope of these two connectives.]

c.
$$\frac{A \ B \ C \ D}{F \ T \ T \ T} \mid \frac{(\neg A \wedge \neg B) \wedge (\neg(A \wedge C) \wedge D)}{T \ F \ F \ \textcircled{F} \ T \ F \ T}$$

1 2 1 4 2 1 3