

6.1.xa. Exercise answers

1. a. Ann introduced Bill to Carol
 $[\lambda xyz (x \text{ introduced } y \text{ to } z)] \text{ Ann Bill Carol}$

Iabc
 I fits a, b, 'n c

[I: $\lambda xyz (x \text{ introduced } y \text{ to } z)$; a: *Ann*; b: *Bill*; c: *Carol*]

- b. Ann gave the book to either Bill or Carol
Ann gave the book to Bill \vee Ann gave the book to Carol
 $[\lambda xyz (x \text{ gave } y \text{ to } z)] \text{ Ann the book Bill } \vee [\lambda xyz (x \text{ gave } y \text{ to } z)] \text{ Ann the book Carol}$

Gakb \vee Gake
 either G fits a, k, 'n b or G fits a, k, 'n c

[G: $\lambda xyz (x \text{ gave } y \text{ to } z)$; a: *Ann*; b: *Bill*; c: *Carol*; k: *the book*]

- c. Ann gave the book to Bill and he gave it to Carol
Ann gave the book to Bill \wedge Bill gave the book to Carol
 $[\lambda xyz (x \text{ gave } y \text{ to } z)] \text{ Ann the book Bill } \wedge [\lambda xyz (x \text{ gave } y \text{ to } z)] \text{ Bill the book Carol}$

Gakb \wedge Gbkc
 both G fits a, k, 'n b and G fits b, k, 'n c

[G: $\lambda xyz (x \text{ gave } y \text{ to } z)$; a: *Ann*; b: *Bill*; c: *Carol*; k: *the book*]

- d. Tom had the package sent to Sue, but it was returned to him
Tom had the package sent to Sue \wedge the package was returned to Tom
 $[\lambda xyz (x \text{ had } y \text{ sent to } z)] \text{ Tom the package Sue } \wedge [\lambda xy (x \text{ was returned to } y)] \text{ the package Tom}$

Htps \wedge Rpt
 both H fits t, p, 'n s and R fits p 'n t

[H: $\lambda xyz (x \text{ had } y \text{ sent to } z)$; R: $\lambda xy (x \text{ was returned to } y)$; p: *the package*; s: *Sue*; t: *Tom*]

- e. Georgia will see Ed if she gets to Denver before Saturday
Georgia will see Ed \leftarrow Georgia will get to Denver before Saturday
 $[\lambda xy (x \text{ will see } y)] \text{ Georgia Ed } \leftarrow [\lambda xyz (x \text{ will get to } y \text{ before } z)] \text{ Georgia Denver Saturday}$

Sge \leftarrow Ggds
 Ggds \rightarrow Sge

if G fits g, d, 'n s then S fits g 'n e

[G: λxyz (x will get to y before z); S: λxy (x will see y); d: Denver; e: Ed; g: Georgia; s: Saturday]

- f. *If the murderer is either the butler or the nephew, then I'm Sherlock Holmes*
the murderer is either the butler or the nephew \rightarrow I'm Sherlock Holmes
(the murderer is the butler \vee the murderer is the nephew) \rightarrow I = Sherlock Holmes
(the murderer = the butler \vee the murderer = the nephew) \rightarrow i = s

(m = b \vee m = n) \rightarrow i = s

if either m is b or m is n then i is s

[b: the butler; i: I; m: the murderer; n: the nephew; s: Sherlock Holmes]

- g. *Neither Ann nor Bill saw Tom speak to either Mike or Nancy*
 \neg (Ann saw Tom speak to either Mike or Nancy \vee Bill saw Tom speak to either Mike or Nancy)
 \neg ((Ann saw Tom speak to Mike \vee Ann saw Tom speak to Nancy) \vee (Bill saw Tom speak to Mike \vee Bill saw Tom speak to Nancy))
 \neg (([λxyz (x saw y speak to z)] Ann Tom Mike \vee [λxyz (x saw y speak to z)] Ann Tom Nancy) \vee ([λxyz (x saw y speak to z)] Bill Tom Mike \vee [λxyz (x saw y speak to z)] Bill Tom Nancy))

\neg ((Satm \vee Satn) \vee (Sbtm \vee Sbtn))

not either either S fits a, t, 'n m or S fits a,t, 'n n
or either S fits b,t, 'n m or S fits b,t, 'n n

[S: λxyz (x saw y speak to z); a: Ann; b: Bill; m: Mike; n: Nancy; t: Tom]

- h. *Tom will agree if each of Ann, Bill, and Carol asks him*
Tom will agree \leftarrow *each of Ann, Bill, and Carol will ask Tom*
Tom will agree \leftarrow ((Ann will ask Tom \wedge Bill will ask Tom) \wedge Carol will ask Tom)
[λx (x will agree)] Tom \leftarrow (([λxy (x will ask y)] Ann Tom \wedge [λxy (x will ask y)] Bill Tom) \wedge [λxy (x will ask y)] Carol Tom)

Gt \leftarrow ((Aat \wedge Abt) \wedge Act)

((Aat \wedge Abt) \wedge Act) \rightarrow Gt

if both both A fits a 'n t and A fits b 'n t and A fits c 'n t then G fits t

[A: λxy (x will ask y); G: λx (x will agree); a: *Ann*; b: *Bill*; c: *Carol*; t: *Tom*]

The function of *each* here is to indicate a group of two-place predication rather than a single four-place predicate $\lambda xyzw$ (x, y, *and* z will ask w), which is what would be required in order to express instead the idea of Ann, Bill, and Carol making the request as a group.

2. a. [λxy (x is west of y)] Crawfordsville Indianapolis
 \wedge [λxy (x is south of y)] Crawfordsville Lafayette
Crawfordsville is west of Indianapolis \wedge Crawfordsville is south of Lafayette
Crawfordsville is west of Indianapolis and south of Lafayette
- b. [λxy (x has met y)] Ann Bill \rightarrow [λxy (x has met y)] Bill Ann
Ann has met Bill \rightarrow Bill has met Ann
If Ann has met Bill then he has met her
- c. [λxyz (x introduced y to z)] Alice Clarice Boris
 \wedge [λxyz (x introduced y to z)] Alice Doris Boris
Alice introduced Clarice to Boris \wedge Alice introduced Doris to Boris
Alice introduced Clarice and Doris to Boris
- d. [λxy (x wrote to y)] Alice Boris
 \wedge [$\lambda xyzw$ (x asked y to write z about w)] Alice Boris Alice Boris
Alice wrote to Boris \wedge Alice asked Boris to write Alice about Boris
Alice wrote to Boris \wedge Alice asked Boris to write her about himself
Alice wrote to Boris and asked him to write her about himself
- e. $g = c \rightarrow (f = s \wedge p = t)$
Green Bay = the city \rightarrow (football = the sport \wedge the Packers = the team)
Green Bay is the city \rightarrow (football is the sport \wedge the Packers are the team)
Green Bay is the city \rightarrow football is the sport and the Packers are the team
If Green Bay is the city, then football is the sport and the Packers are the team