

7.4E EXERCISES

1. Determine which of the following attempted symbolizations are appropriate. For those that are not, explain why not.

UD: The set of all living creatures
Bx: x is at the Bronx zoo
Gx: x is a giant
Lx: x believes there are vampires
Mx: x is a moose
Tx: x is a tufted titmouse
Vx: x is a vampire
Wx: x wants to see a vampire
Cxy: x wants to catch y
Rxy: x wants to ride y
Sxy: x wants to see y
j: Jeremy
s: Sue

- a. Jeremy wants to catch a vampire.

$(\exists x)(Vx \ \& \ Cjx)$

- *b. Sue wants to see a vampire.

Ws

- c. Sue believes there are vampires but doesn't want to catch one.

$Ls \ \& \ \sim (\exists y)(Vy \ \& \ Csy)$

- *d. Sue wants to see a moose and Jeremy wants to ride one.

$(\exists x)(Mx \ \& \ Ssx) \ \& \ (\exists x)(Mx \ \& \ Rjx)$

- e. There is a moose at the Bronx zoo that Sue wants to see and Jeremy wants to ride.

$(\exists z)[(Mz \ \& \ Bz) \ \& \ (Ssz \ \& \ Rjz)]$

- *f. There is a giant tufted titmouse at the Bronx Zoo.

$(\exists z)[(Tz \ \& \ Gz) \ \& \ Bz]$

2. Using the symbolization key

UD: The set of all people

Sx: x is a sales clerk
Wxy: x is waiting for y
h: Helen

give a context in which it would be appropriate to symbolize ‘Helen is waiting for a sales clerk’ as ‘ $(\exists z)(Sz \ \& \ Whz)$ ’ and one where this symbolization is not appropriate.

3. Symbolize the following sentences in *PL* using the given symbolization key.

UD: The set of all people
Cx: x is careless
Lx: x is lucky
Rx: x is a sailor
Wx: x is a Wilcox
Yx: x dies young
Dxy: x is a daughter of y
Sxy: x is a son of y
d: Daniel Wilcox
j: Jacob Wilcox
r: Rebecca Wilcox

- a. Some sailors are both careless and lucky.
- *b. Some careless sailors aren’t lucky.
- c. Not all lucky sailors are careless.
- *d. All careless sailors, except the lucky ones, die young.
- e. Not all sons of sailors are sailors.
- *f. Not all daughters of sailors are sailors.
- g. Not all sons and daughters of sailors are sailors.
- *h. Sailors who aren’t lucky and are careless have neither daughters nor sons.
- i. Sailors who have either sons or daughters are lucky.
- *j. Sailors who have both daughters and sons are lucky.
- k. Rebecca Wilcox is either a sailor or the daughter of a sailor.
- *l. Every Wilcox is either a sailor or the offspring of a sailor.
- m. Either Rebecca Wilcox and all her children are sailors or Jacob Wilcox and all his children are sailors.

4. Symbolize the following sentences in *PL* using the given symbolization key.

UD: The set of employees of Temple University

Ax: x is an administrator
Cx: x is a coach

Fx: x is a faculty member
Mx: x is an MD
Ox: x is a union officer
Px: x is paranoid
Rx: x should be fired
Ux: x is a union member
Dxy: x distrusts y
Exy: x earns more than y
p: the president
j: Jones

- a. Every administrator earns more than some faculty member, and every faculty member earns more than some administrator.
 - *b. If any administrator earns more than every faculty member, Jones does.
 - c. No faculty member earns more than the president.
 - *d. Any administrator who earns more than every faculty member should be fired.
 - e. No faculty member earns more than the president, but some coaches do.
 - *f. Not all faculty members are union members, but all union members are faculty members.
 - g. No administrator is a union member, but some are faculty members.
 - *h. Every faculty member who is an administrator earns more than some faculty members who are not administrators.
 - i. At least one administrator who is not a faculty member earns more than every faculty member who is an administrator.
 - *j. Every faculty member who is an MD earns more than every faculty member who is not an MD.
 - k. Some faculty members distrust every administrator, and some administrators distrust every faculty member.
 - *l. There is an administrator who is a faculty member and distrusts all administrators who are not faculty members.
 - m. Anyone who distrusts everyone is either paranoid or an administrator or a union officer.
 - *n. Everyone distrusts someone, but only administrators who are not faculty members distrust everyone.
5. Use the following symbolization key to translate sentences a–r into fluent English.
(*Note*: All of the following claims are true.)

UD: The set of positive integers
Dx: x is odd
Nx: x is even
Px: x is prime
Exy: x plus y is even

Lxy: x is larger than y
Oxy: x times y is odd
Rxy: x times y is prime
Sxy: x plus y is odd
Txy: x times y is even
a: 1
b: 2
c: 3

- a. $(\forall x)[Nx \supset (\forall y)Txy]$
- *b. $(\forall x)(\forall y)[(Dx \ \& \ Dy) \supset Oxy]$
- c. $(\forall x)(\forall y)[Exy \supset [(Nx \ \& \ Ny) \vee (Dx \ \& \ Dy)]]$
- *d. $(\forall x)[(Px \ \& \ (\exists y)(Py \ \& \ Lxy)) \supset Dx]$
- e. $\sim (\exists y)[Py \ \& \ (\forall x)(Px \supset Lyx)]$
- *f. $(\forall y)(\forall z)[(Py \ \& \ Pz) \ \& \ (Lyb \ \& \ Lzb)] \supset Oyz]$
- g. $\sim (\exists x)(\exists y)[(Px \ \& \ Py) \ \& \ Rxy]$
- *h. $(\exists x)(Px \ \& \ Nx)$
- i. $(\exists x)[Px \ \& \ (\forall y)Txy]$
- *j. $\sim (\forall x)(\exists y)Lxy \ \& \ (\forall x)(\exists y)Lyx]$
- k. $(\forall x)(\forall y)[Oxy \supset (Dx \ \& \ Dy)]$
- *l. $(\forall x)(\forall y)[Txy \supset (Nx \ \vee \ Ny)]$
- m. $(\forall x)(\forall y)[(Dx \ \& \ Dy) \supset (Oxy \ \& \ Exy)]$
- *n. $(\forall x)(\forall y)(Lxy \supset \sim Lyx)$
- o. $(\forall x)(\forall y)[(Dx \ \& \ Ny) \supset (Sxy \ \& \ Txy)]$
- *p. $(\forall x)(\forall y)[[(Px \ \& \ Py) \ \& \ Lcx] \supset Txy]$
- q. $(\exists y)[(Lya \ \& \ Lcy) \ \& \ (Py \ \& \ Ny)]$
- *r. $(\exists x)[(Px \ \& \ Nx) \ \& \ (\forall y)((Py \ \& \ Lyx) \supset Dy)]$