Practice answers

Assuming an intensional denotation, provide a full lambda computation of the following sentences. Ignore tense, *is*, *an*, and *did*.

1. Steve died
2. Steve celebrates Halloween
3. Steve is an American hero
4. Steve did not die

(1) INTENSIONAL PREDICATE MODIFICATION:
If α is a branching node, $\{\beta, \gamma\}$ is the set of α's daughters, and $[\![\beta]\!]$ and $[\![\gamma]\!]$ are both type $\langle e, \langle s, t\rangle\rangle$, then

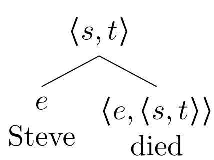
$$[\![\alpha]\!] = \lambda x[\lambda w[\ [\![\beta]\!](x, w) \wedge [\![\gamma]\!](x, w)\ ]]$$

★ $\wedge$ is the same thing as &!

★ Predicates are often bold faced (e.g., **celebrate**), but if you want to be old school you can do all caps too (e.g., CELEBRATE)!

★ Constants (e.g., **s** for Steve) are often boldfaced too, to distinguish them from variables (e.g., x).

1. Steve died



- $[\![\text{Steve}]\!] = \mathbf{s}$
- $[\![\text{die}]\!] = \lambda x[\lambda w[\mathbf{die}_w(x)]]$

$[\![\text{Steve died}]\!]$

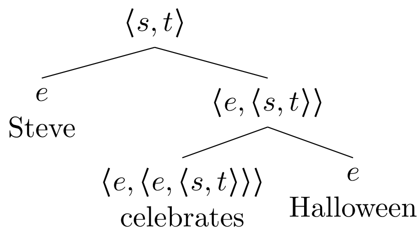
$= [\![\text{die}]\!]([\![\text{Steve}]\!])$

$= [\![\text{die}]\!](\mathbf{s})$

$= \lambda x[\lambda w[\mathbf{die}_w(x)]](\mathbf{s})$

$= \lambda w[\mathbf{die}_w(\mathbf{s})]$

2. Steve celebrates Halloween



- $[\![\text{Steve}]\!] = \mathbf{s}$
- $[\![\text{celebrate}]\!] = \lambda x[\lambda y[\lambda w[\mathbf{celebrate}_w(y, x)]]]$
- $[\![\text{Halloween}]\!] = \mathbf{h}$

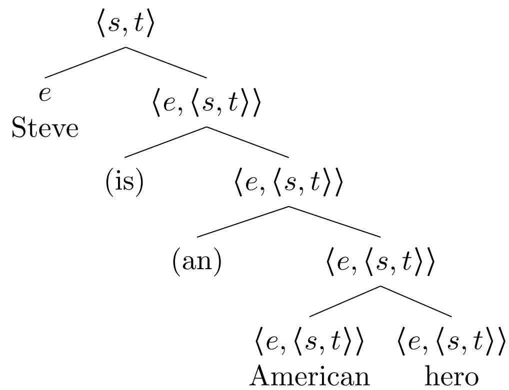
(a) $[\![\text{celebrates Halloween}]\!]$

$= [\![\text{celebrate}]\!]([\![\text{Halloween}]\!])$
$= [\![\text{celebrate}]\!](\mathbf{h})$
$= \lambda x[\lambda y[\lambda w[\mathbf{celebrate}_w(y, x)]]](\mathbf{h})$
$= \lambda y[\lambda w[\mathbf{celebrate}_w(y, \mathbf{h})]]$

(b) $[\![\text{Steve celebrates Halloween}]\!]$

$= [\![\text{celebrate Halloween}]\!]([\![\text{Steve}]\!])$
$= [\![\text{celebrate Halloween}]\!](\mathbf{s})$
$= \lambda y[\lambda w[\mathbf{celebrate}_w(y, \mathbf{h})]](\mathbf{s})$
$= \lambda w[\mathbf{celebrate}_w(\mathbf{s}, \mathbf{h})]$

3. Steve is an American hero



- $[\![\text{Steve}]\!] = \mathbf{s}$
- $[\![\text{American}]\!] = \lambda x[\lambda w[\mathbf{american}_w(x)]]$
- $[\![\text{hero}]\!] = \lambda y[\lambda w[\mathbf{hero}_w(y)]]$

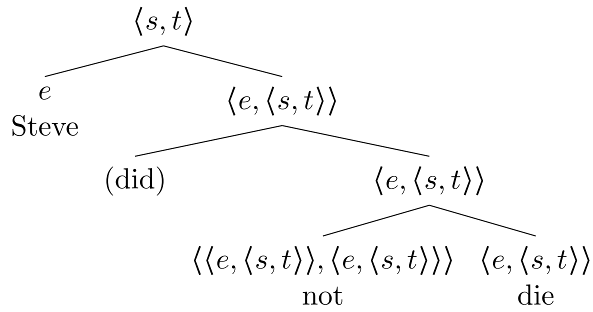
(a) $[\![\text{American hero}]\!]$

$= \lambda z[\lambda w'[[\![\text{American}]\!](z,w') \wedge [\![\text{hero}]\!](z,w')]]$ (via Predicate Modification)
$= \lambda z[\lambda w'[\lambda x[\lambda w[\mathbf{american}_w(x)]](z,w') \wedge [\![\text{hero}]\!](z,w')]]$
$= \lambda z[\lambda w'[\mathbf{american}_{w'}(z) \wedge [\![\text{hero}]\!](z,w')]]$
$= \lambda z[\lambda w'[\mathbf{american}_{w'}(z) \wedge \lambda y[\lambda w[\mathbf{hero}_w(y)]](z,w')]]$
$= \lambda z[\lambda w'[\mathbf{american}_{w'}(z) \wedge \mathbf{hero}_{w'}(z)]]$

(b) $[\![\text{Steve is an American hero}]\!]$

$= [\![\text{American hero}]\!]([\![\text{Steve}]\!])$
$= [\![\text{American hero}]\!](\mathbf{s})$
$= \lambda z[\lambda w'[\mathbf{american}_{w'}(z) \wedge \mathbf{hero}_{w'}(z)]](\mathbf{s})$
$= \lambda w'[\mathbf{american}_{w'}(\mathbf{s}) \wedge \mathbf{hero}_{w'}(\mathbf{s})]$

4. Steve did not die



- $\llbracket \text{Steve} \rrbracket = \mathbf{s}$
- $\llbracket \text{die} \rrbracket = \lambda x[\lambda w[\mathbf{die}_w(x)]]$
- $\llbracket \text{not} \rrbracket = \lambda f_{\langle e,\langle s,t\rangle\rangle}[\lambda y[\lambda w'[\neg f(y,w')]]]$

(a) $\llbracket \text{not die} \rrbracket$

$= \llbracket \text{not} \rrbracket(\llbracket \text{die} \rrbracket)$
$= \lambda f_{\langle e,\langle s,t\rangle\rangle}[\lambda y[\lambda w'[\neg f(y,w')]]](\llbracket \text{die} \rrbracket)$
$= \lambda y[\lambda w'[\neg \llbracket \text{die} \rrbracket(y,w')]]$
$= \lambda y[\lambda w'[\lambda x[\lambda w[\neg \mathbf{die}_w(x)]](y,w')]]$
$= \lambda y[\lambda w'[\neg \mathbf{die}_{w'}(y)]]$

(b) $\llbracket \text{Steve did not die} \rrbracket$

$= \llbracket \text{not die} \rrbracket(\llbracket \text{Steve} \rrbracket)$
$= \llbracket \text{not die} \rrbracket(\mathbf{s})$
$= \lambda y[\lambda w'[\neg \mathbf{die}_{w'}(y)]](\mathbf{s})$
$= \lambda w'[\neg \mathbf{die}_{w'}(\mathbf{s})]$