## ICS 661 Quiz 8

You are given the following unification grammar and lexicon:

1. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1} \mathrm{X}_{2}$
$<\mathrm{X}_{0} \mathrm{CAT}>=\mathrm{S},<\mathrm{X}_{1} \mathrm{CAT}>=\mathrm{NP},<\mathrm{X}_{2} \mathrm{CAT}>=\mathrm{VP}$
$<\mathrm{X}_{0}$ INV $>=-$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{2}$ HEAD $>$
$<\mathrm{X}_{1}$ HEAD AGR $>=<\mathrm{X}_{2}$ HEAD AGR $>$
$<\mathrm{X}_{2}$ HEAD VFORM $>=$ \{pres past $\}$
2. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1} \mathrm{X}_{2}$
$<\mathrm{X}_{0}$ CAT $>=\mathrm{NP},<\mathrm{X}_{1}$ CAT $>=$ Det,$<\mathrm{X}_{2} \mathrm{CAT}>=\mathrm{N}$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{2}$ HEAD $>$
$<\mathrm{X}_{1}$ HEAD AGR $>=<\mathrm{X}_{2}$ HEAD AGR $>$
3. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1}$
$<\mathrm{X}_{0} \mathrm{CAT}>=\mathrm{NP},<\mathrm{X}_{0} \mathrm{CAT}>=$ Name
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{1}$ HEAD $>$
4. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1} \mathrm{X}_{2} \mathrm{X}_{3}$
$\left.\left.\left.\left.<\mathrm{X}_{0} \mathrm{CAT}\right\rangle=\mathrm{VP},<\mathrm{X}_{1} \mathrm{CAT}\right\rangle=\mathrm{V},<\mathrm{X}_{2} \mathrm{CAT}\right\rangle=\mathrm{NP},<\mathrm{X}_{3} \mathrm{CAT}\right\rangle=\mathrm{WhP}$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{1}$ HEAD $>$
$<\mathrm{X}_{1}$ HEAD SUBCAT $>=$ _np_whp
5. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1} \mathrm{X}_{2} \mathrm{X}_{3}$
$<\mathrm{X}_{0}$ CAT $\left.\left.\left.>=\mathrm{VP},<\mathrm{X}_{1} \mathrm{CAT}\right\rangle=\mathrm{V},<\mathrm{X}_{2} \mathrm{CAT}\right\rangle=\mathrm{NP},<\mathrm{X}_{3} \mathrm{CAT}\right\rangle=\mathrm{NP}$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{1}$ HEAD $>$
$<\mathrm{X}_{1}$ HEAD SUBCAT $>=$ _np_np
6. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1} \mathrm{X}_{2}$
$<\mathrm{X}_{0}$ CAT $>=\mathrm{WhP},<\mathrm{X}_{1}$ CAT $\left.>=\mathrm{Adv},<\mathrm{X}_{2} \mathrm{CAT}\right\rangle=\mathrm{VP}$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{2}$ HEAD $>$
$<\mathrm{X}_{1}$ WH $>=+$
$<\mathrm{X}_{2}$ HEAD VFORM $>=\mathrm{inf}$
7. $\mathrm{X}_{0} \rightarrow$ to $\mathrm{X}_{1}$
$<\mathrm{X}_{0}$ CAT $>=\mathrm{VP},<\mathrm{X}_{1}$ CAT $>=\mathrm{VP}$
$<\mathrm{X}_{0}$ HEAD ROOT $>=<\mathrm{X}_{1}$ HEAD ROOT $>$
$<\mathrm{X}_{0}$ HEAD SUBCAT $>=<\mathrm{X}_{1}$ HEAD SUBCAT $>$
$<\mathrm{X}_{2}$ HEAD VFORM $>=$ base
$<\mathrm{X}_{0}$ HEAD VFORM $>=$ inf
8. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1} \mathrm{X}_{2}$
$<\mathrm{X}_{0} \mathrm{CAT}>=\mathrm{VP},<\mathrm{X}_{1} \mathrm{CAT}>=\mathrm{V},<\mathrm{X}_{2} \mathrm{CAT}>=\mathrm{NP}$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{1}$ HEAD $>$
< $\mathrm{X}_{1}$ HEAD SUBCAT> = np
9. $\mathrm{X}_{0} \rightarrow \mathrm{X}_{1}$
$<\mathrm{X}_{0}$ CAT $>=\mathrm{VP},<\mathrm{X}_{1}$ CAT $>=\mathrm{V}$
$<\mathrm{X}_{0}$ HEAD $>=<\mathrm{X}_{1}$ HEAD $>$
$<\mathrm{X}_{1}$ HEAD SUBCAT> = _none

## lexicon:

10. $\mathrm{X}_{0} \rightarrow$ showed
$<\mathrm{X}_{0}$ CAT $>=\mathrm{V},<\mathrm{X}_{0}$ HEAD ROOT $>=$ show, $<\mathrm{X}_{0}$ HEAD VFORM $>=$ past,
$<\mathrm{X}_{0}$ HEAD SUBCAT $>=\{$ np _np_np _np_whp $\},<\mathrm{X}_{0}$ HEAD AGR $>=\{1 \mathrm{~s} 2 \mathrm{~s} 3 \mathrm{~s} 1 \mathrm{p} 2 \mathrm{p} 3 \mathrm{p}\}$
11. $\mathrm{X}_{0} \rightarrow \mathrm{Jim}$
$<\mathrm{X}_{0}$ CAT $>=$ Name, $<\mathrm{X}_{0}$ HEAD ROOT $>=$ Jim, $<\mathrm{X}_{0}$ HEAD AGR $>=3 \mathrm{~s}$
12. $\mathrm{X}_{0} \rightarrow$ Sue
$<\mathrm{X}_{0}$ CAT $>=$ Name, $<\mathrm{X}_{0}$ HEAD ROOT $>=$ Sue, $<\mathrm{X}_{0}$ HEAD AGR $>=3 \mathrm{~s}$
13. $\mathrm{X}_{0} \rightarrow$ how
$<\mathrm{X}_{0}$ CAT $>=\mathrm{Adv},<\mathrm{X}_{0}$ HEAD ROOT $>=$ how, $<\mathrm{X}_{0} \mathrm{WH}>=+$
14. $\mathrm{X}_{0} \rightarrow$ the
$<\mathrm{X}_{0}$ CAT $>=$ Det, $<\mathrm{X}_{0}$ HEAD ROOT $>=$ the, $<\mathrm{X}_{0}$ HEAD AGR $>=\{3 \mathrm{~s} 3 \mathrm{p}\}$
15. $\mathrm{X}_{0} \rightarrow \mathrm{a}$
$<\mathrm{X}_{0}$ CAT $>=$ Det, $<\mathrm{X}_{0}$ HEAD ROOT $>=\mathrm{a},<\mathrm{X}_{0}$ HEAD AGR $>=\{3 \mathrm{~s}\}$
16. $\mathrm{X}_{0} \rightarrow$ bake
$<\mathrm{X}_{0}$ CAT $>=\mathrm{V},<\mathrm{X}_{0}$ HEAD ROOT $>=$ bake, $<\mathrm{X}_{0}$ HEAD VFORM $>=$ base,
$<\mathrm{X}_{0}$ HEAD SUBCAT $>=\{$ none np $\}$
17. $\mathrm{X}_{0} \rightarrow$ bake
$<\mathrm{X}_{0}$ CAT $>=\mathrm{V},<\mathrm{X}_{0}$ HEAD ROOT $>=$ bake, $<\mathrm{X}_{0}$ HEAD VFORM $>=$ pres, $<\mathrm{X}_{0}$ HEAD SUBCAT $>=\{$ none np $\},<\mathrm{X}_{0}$ HEAD AGR $>=\{1 \mathrm{~s} 2 \mathrm{~s} 1 \mathrm{p} 2 \mathrm{p} 3 \mathrm{p}\}$
18. $\mathrm{X}_{0} \rightarrow$ baked
$<\mathrm{X}_{0}$ CAT $>=\mathrm{V},<\mathrm{X}_{0}$ HEAD ROOT $>=$ bake,$<\mathrm{X}_{0}$ HEAD VFORM $>=$ past, $<\mathrm{X}_{0}$ HEAD SUBCAT $>=\{$ none _np $\},<\mathrm{X}_{0}$ HEAD AGR $>=\{1 \mathrm{~s} 2 \mathrm{~s} 3 \mathrm{~s} 1 \mathrm{p} 2 \mathrm{p} 3 \mathrm{p}\}$
19. $\mathrm{X}_{0} \rightarrow$ cake
$<\mathrm{X}_{0}$ CAT $>=\mathrm{N},<\mathrm{X}_{0}$ HEAD ROOT $>=$ cake,$<\mathrm{X}_{0}$ HEAD AGR $>=3 \mathrm{~s}$

## Show the parse trees for the following sentences:

Jim baked the cake.
Sue showed Jim.
Jim showed Sue how to bake.
Sue showed Jim how to bake a cake.

