

# 1 Syntactic categories

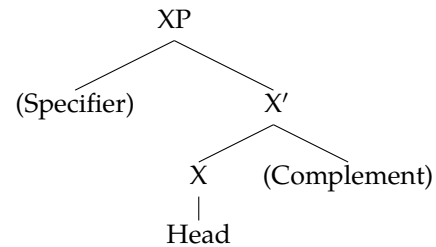
Lexical categories	Penn Treebank POS tags	Examples
Noun		
singular or mass	NN	<i>apple, cheese</i>
plural	NNS	<i>bananas</i>
singular proper noun	NNP	<i>Roger</i>
plural proper noun	NNPS	<i>BMWs</i>
personal pronoun	PRP	<i>we, him, herself</i>
wh-pronoun	WP	<i>what, which, who</i>
Verb		
base form	VB	<i>(to) eat</i>
past tense	VBD	<i>ate</i>
past participle	VBN	<i>eaten</i>
gerund/present pple	VBG	<i>eating</i>
non-3rd ps. sg. present	VBP	<i>(I) eat, (they) eat</i>
3rd ps. sg. present	VBZ	<i>(she) eats</i>
Adjective		
base form	JJ	<i>tasty, good</i>
comparative	JJR	<i>tastier, better</i>
superlative	JJS	<i>tastiest, best</i>
Adverb		
base form	RB	<i>(to run) fast</i>
comparative	RBR	<i>(to run) faster</i>
superlative	RBS	<i>(to run) fastest</i>
wh-adverb	WRB	<i>how, when, where, why</i>
Preposition	IN	<i>at, in, of</i>
Functional categories	Penn Treebank POS tags	Examples
Determiner	DT	<i>the, a</i>
wh-determiner	WDT	<i>which (fruit), what (flavor)</i>
Modal	MD	<i>will, can, could, should</i>
Conjunction	CC	<i>and, or, but</i>
Cardinal number	CD	<i>535, one (dollar)</i>
Existential <i>there</i>	EX	<i>there (is light)</i>
Possessive pronoun	PR\$	<i>our, his, hers</i>
possessive wh-pronoun	WP\$	<i>whose</i>
<i>to</i>	TO	<i>to (eat)</i>
possessive 's	POS	<i>(Roger)'s</i>

## 1.1 English regular inflection

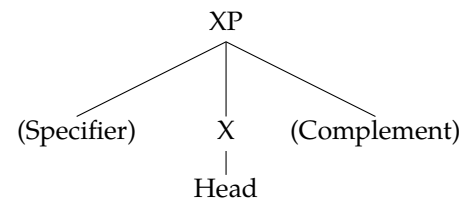
Category	Inflectional affix	Examples
Noun	plural <i>-s/-es</i>	pears, churches
	possessive <i>-’s</i>	Roger’s, courses’
Verb	past tense/past participle <i>-ed</i>	tested
	present participle (progressive) <i>-ing</i>	crying
	3rd person singular <i>-s/-es</i>	works, washes
Adjective/adverb	comparative <i>-er</i>	taller
	superlative <i>-est</i>	tallest

## 2 Phrase structure

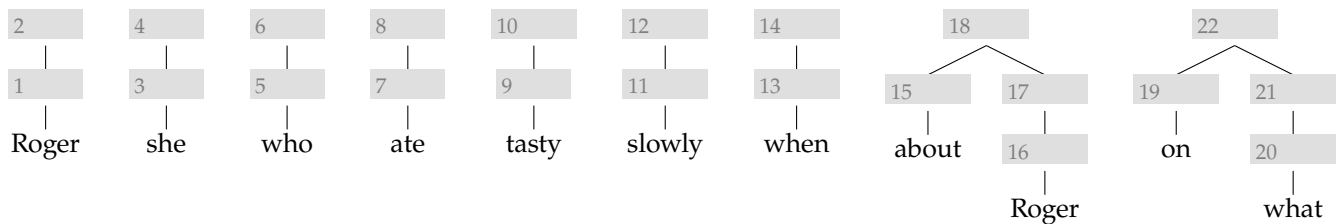
- In linguistics: the X' schema



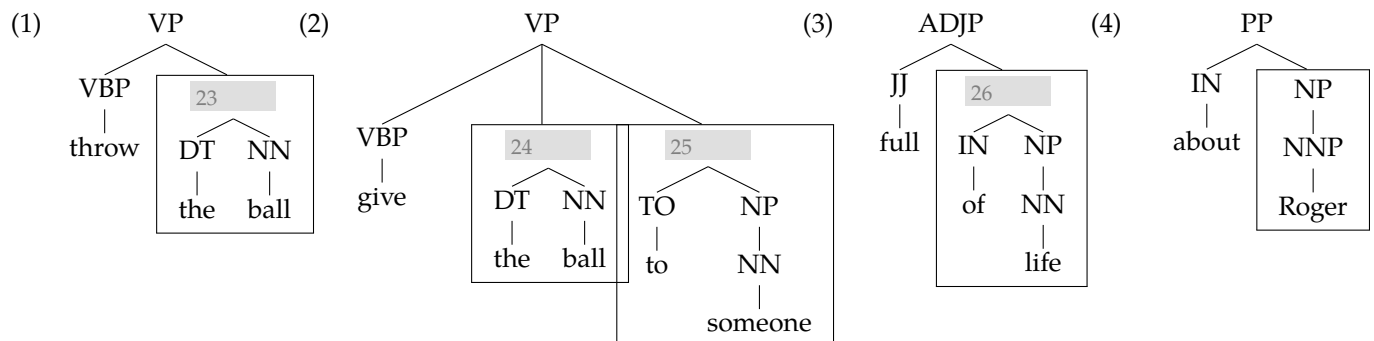
- In computation linguistics: the X' schema is simplified



- Only lexical categories can project a phrase (XP)

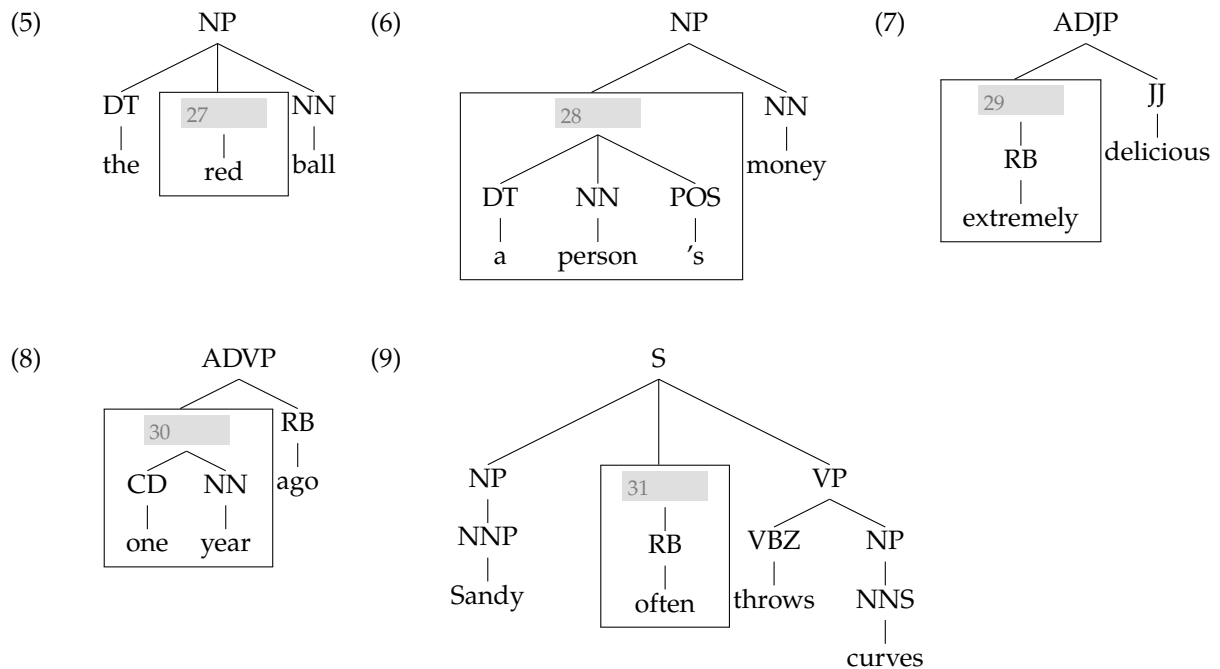


- Complement (has to be another XP): obligatory in some cases, and optional in others (but this can be ambiguous)

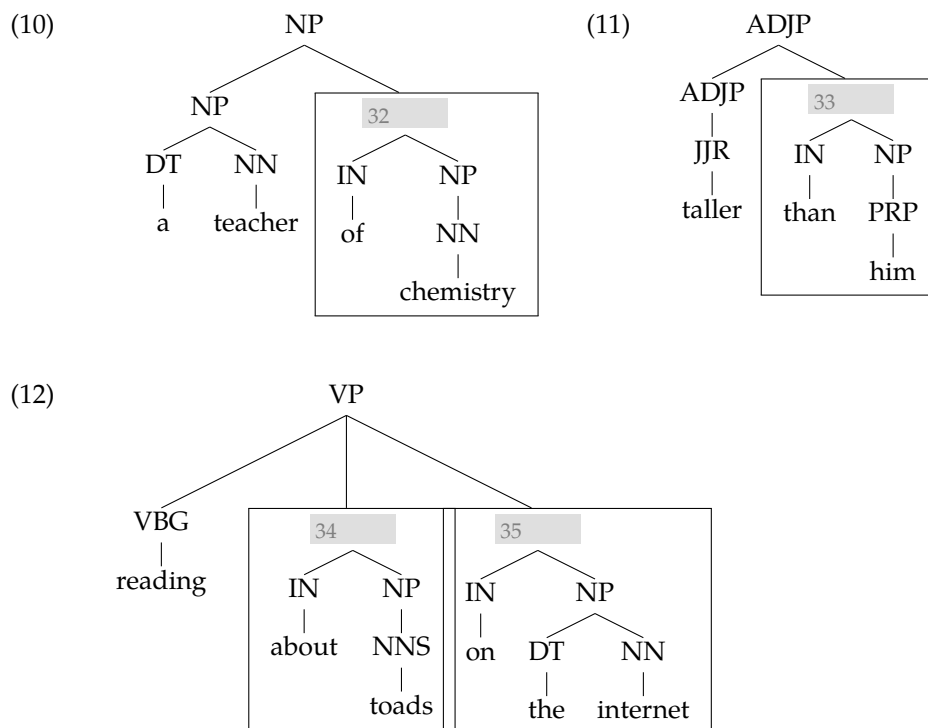


– Modification (always optional):

1. Premodifiers: generally are placed inside the phrase they are associated with, with the exception of some VP premodifiers (attached at S-level)



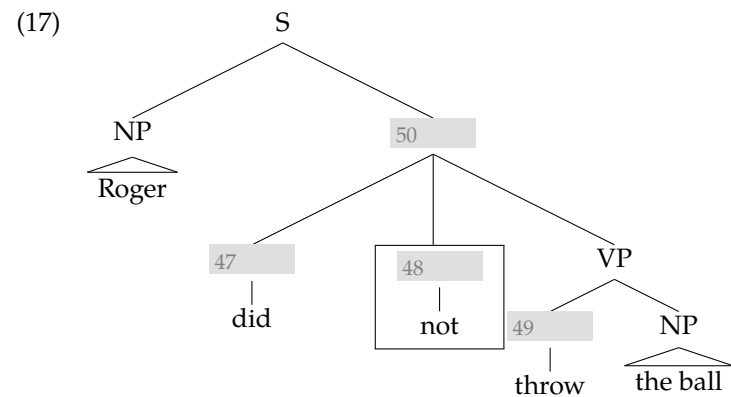
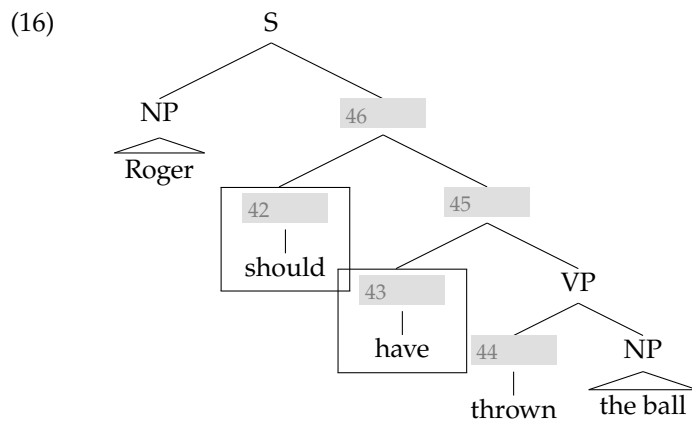
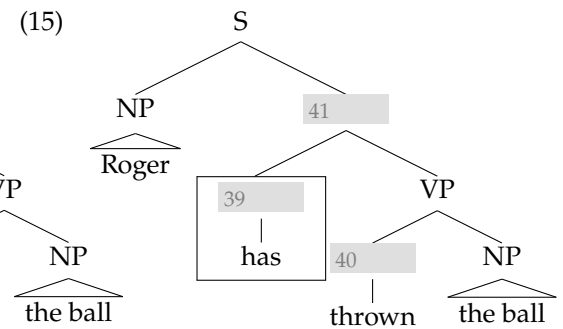
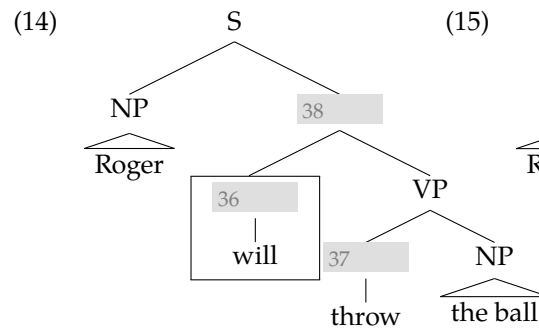
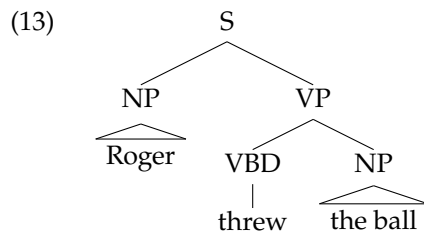
2. Postmodifiers



### 3 Clause types

#### 3.1 S

- Simple declarative sentences<sup>1</sup>

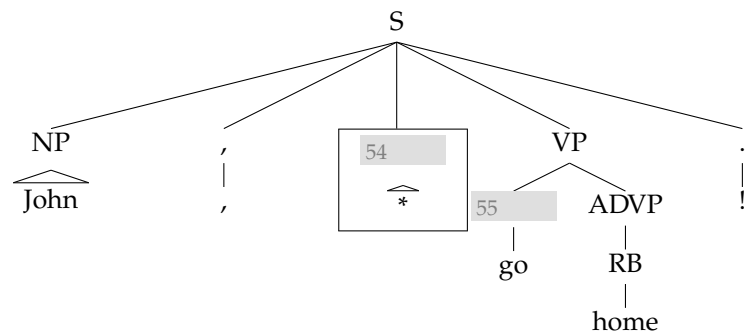
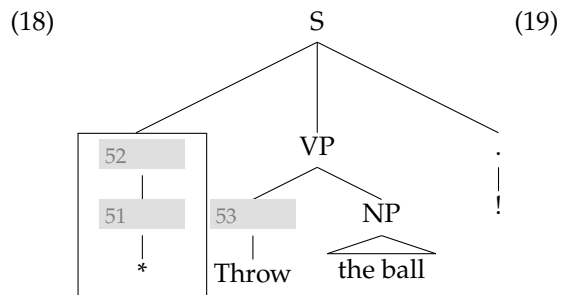


(Your turn) A friend of mine has been studying computer science

<sup>1</sup>Notational simplification:

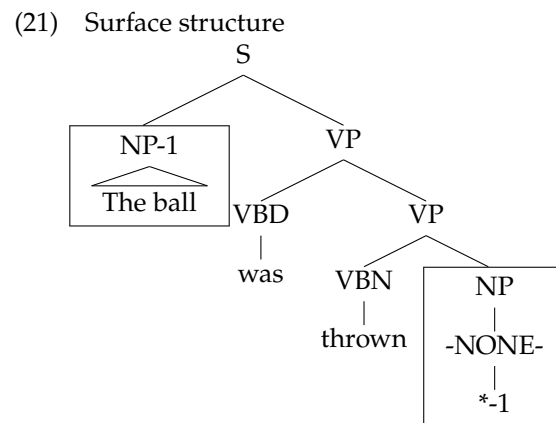
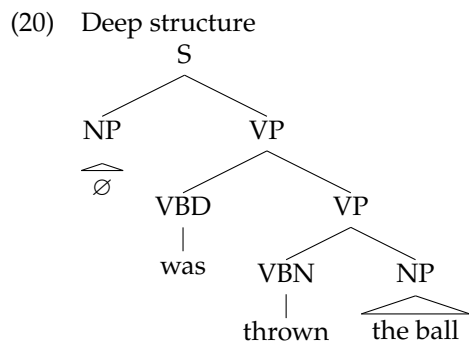


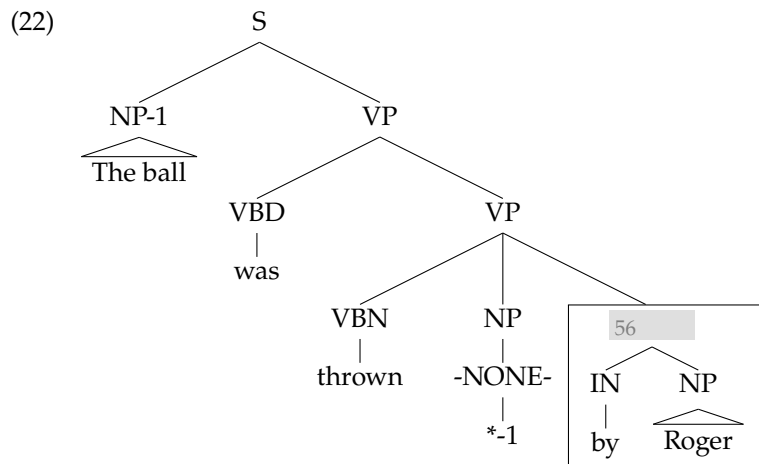
- Imperatives



(Your turn) Don't put the book on the table!

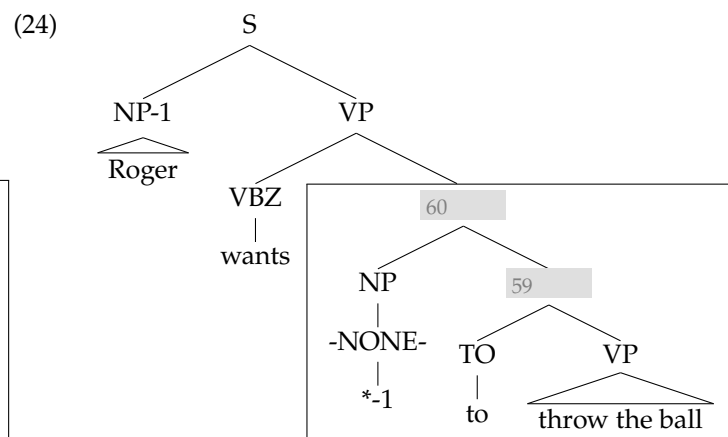
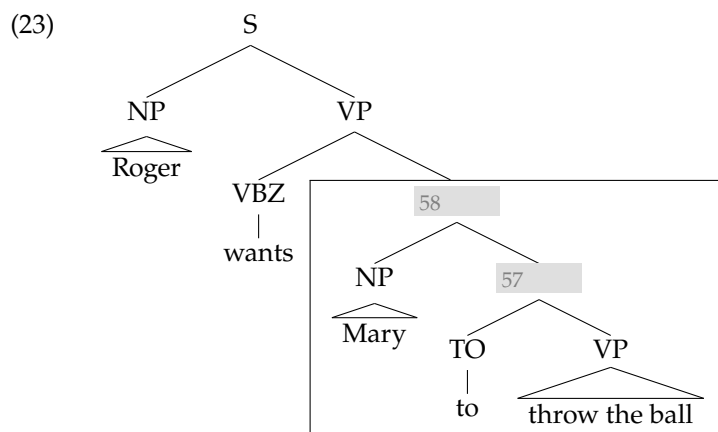
- Passives: *Roger threw the ball* → *The ball was thrown (by Roger)*.





(Your turn) The book was given to me by a friend

- Infinitives

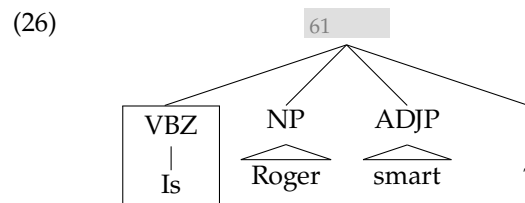
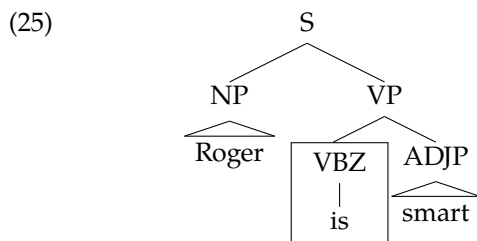


(Your turn) You cannot expect him to come here

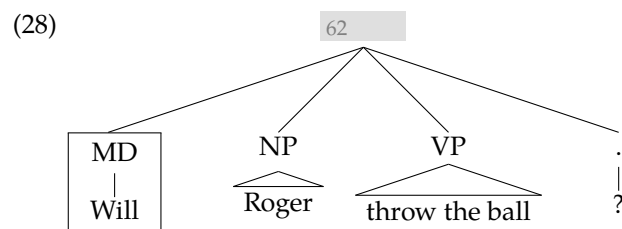
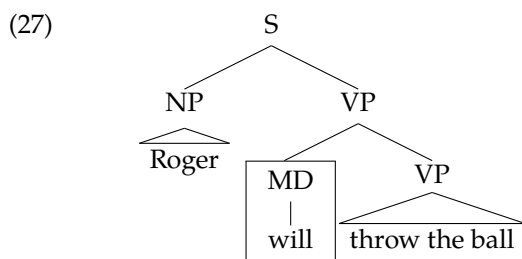
### 3.2 SQ

- Yes/No questions

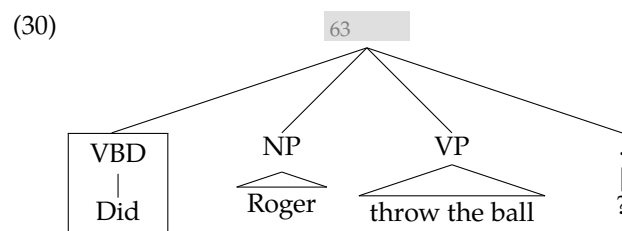
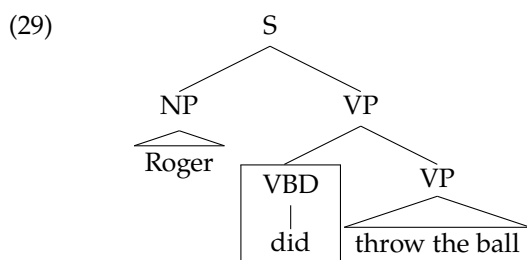
- *Roger is<sub>i</sub> smart.* → *Is<sub>i</sub> Roger t<sub>i</sub> smart?* (this is called the *head-movement*, but we don't mark it in the Treebank parse)



- *Roger will<sub>i</sub> throw the ball.* → *Will<sub>i</sub> Roger t<sub>i</sub> throw the ball?*



- *Roger threw the ball.* → *Roger did<sub>i</sub> throw the ball.* (this step is called *do-support*) → *Did<sub>i</sub> Roger t<sub>i</sub> throw the ball?*

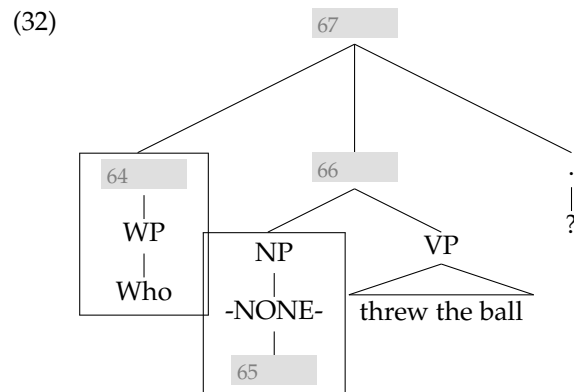
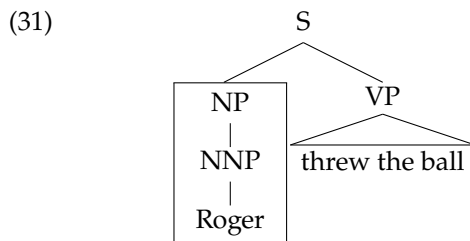


(Your turn) Was the course taught by the same person?

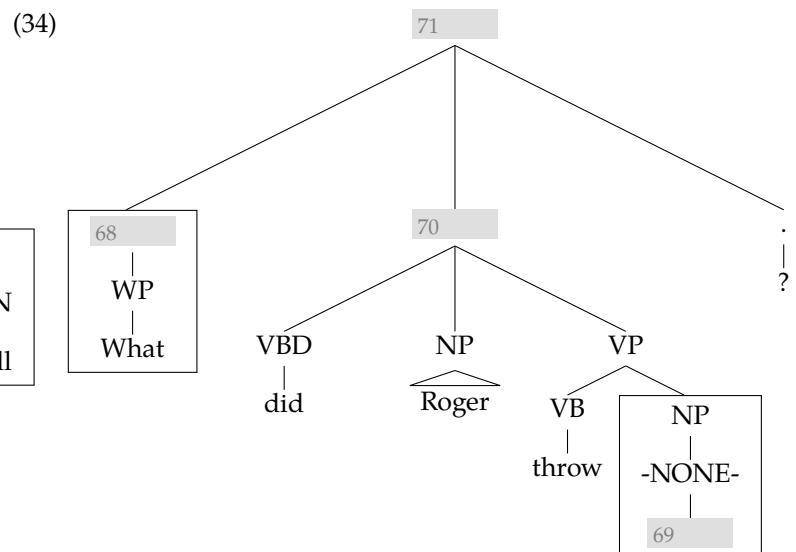
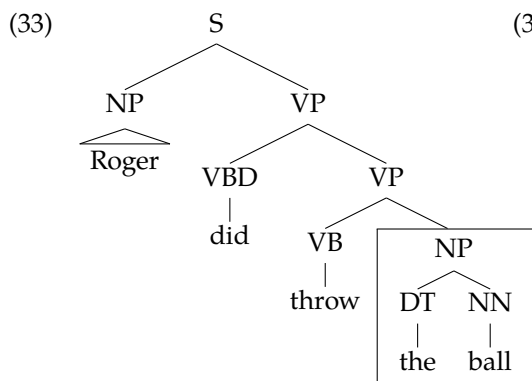
### 3.3 SBARQ

- Wh-questions (contain a gap and require a trace)

– *Roger threw the ball.* → *Who<sub>i</sub> threw the ball.* → *Who<sub>i</sub> t<sub>i</sub> threw the ball?* (this is called *wh-movement*, and we mark it here)

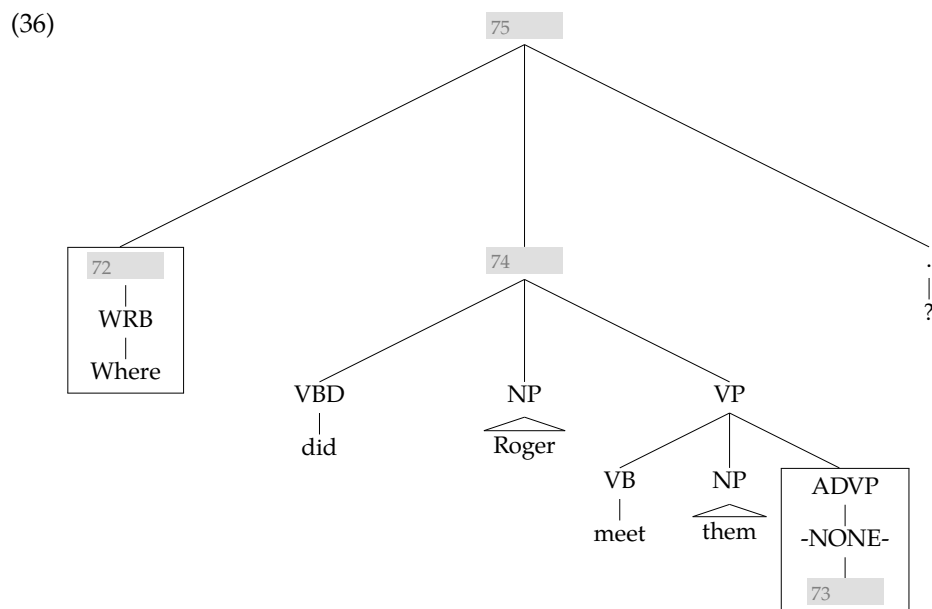
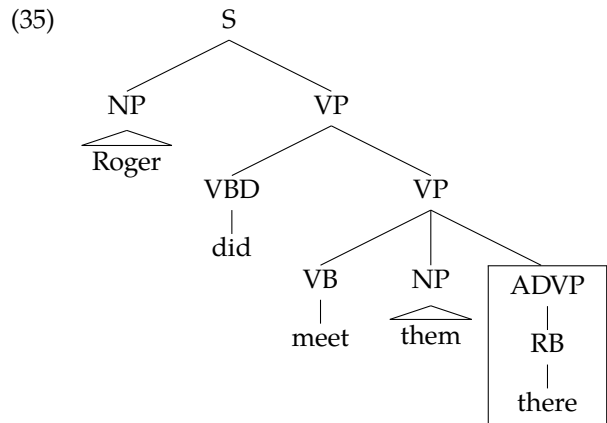


– *Roger threw the ball.* → *Roger did throw the ball* → *Roger did<sub>i</sub> throw what<sub>j</sub>?* → *What<sub>j</sub> did<sub>i</sub> Roger t<sub>i</sub> throw t<sub>j</sub>?*

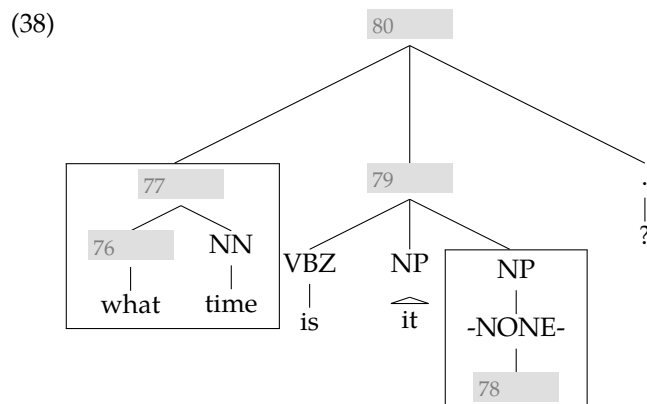
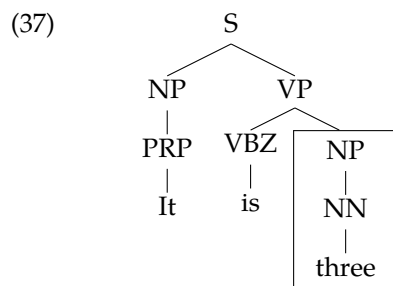




- *Roger met them there.* → *Roger did meet them there.* → *Roger did<sub>i</sub> meet them where<sub>j</sub>?* → *Where<sub>j</sub> did<sub>i</sub> Roger t<sub>i</sub> meet them t<sub>j</sub>?*



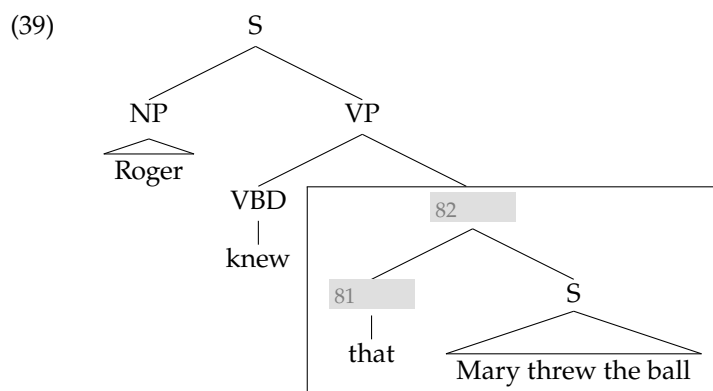
- *It is three.* → *It is<sub>i</sub> [what time]<sub>j</sub>.* → *[What time]<sub>j</sub> is<sub>i</sub> it t<sub>i</sub> t<sub>j</sub>?*



(Your turn) On what did you sit?

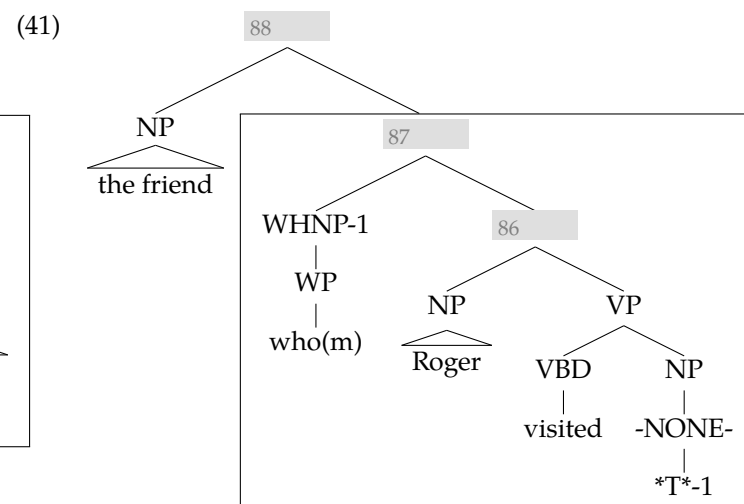
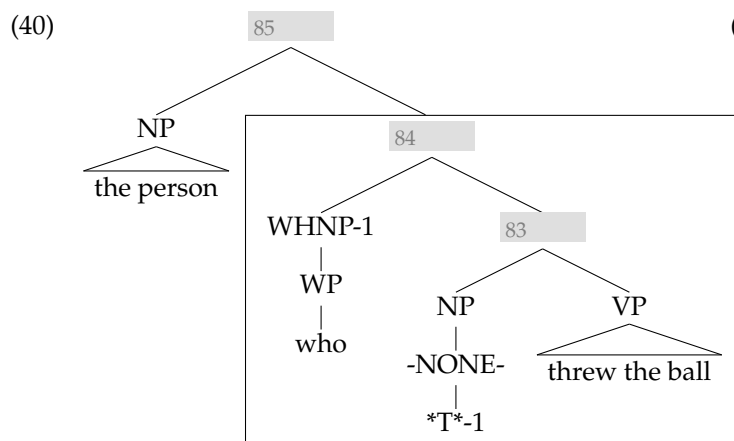
### 3.4 SBAR

- Subordinate clauses



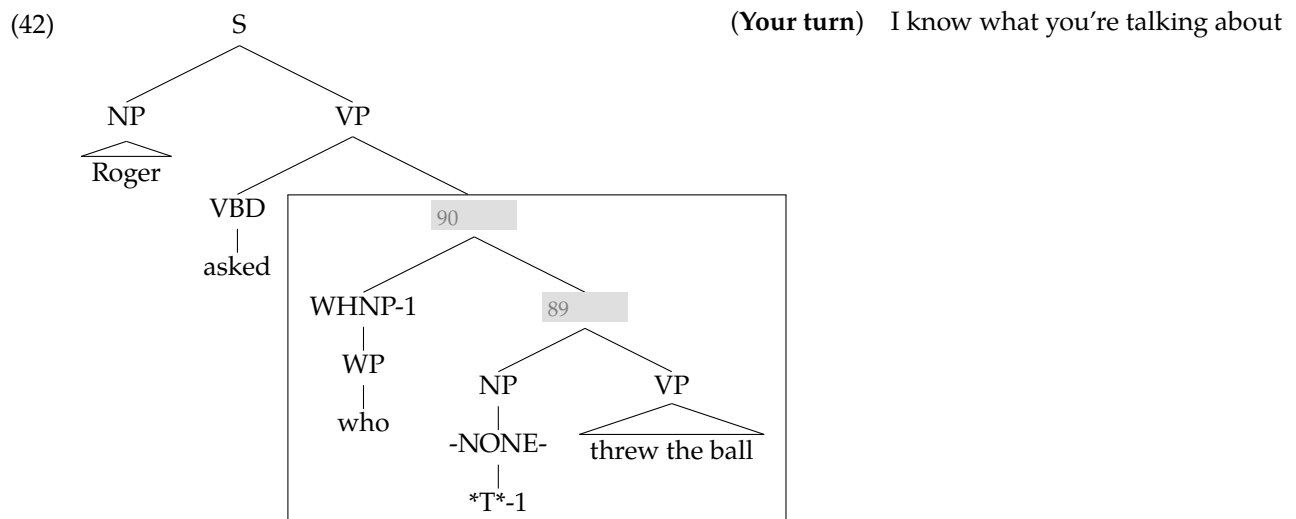
(Your turn) He is curious whether she knew him

- Relative clauses



(Your turn) The friend who I bought flowers for is sweet

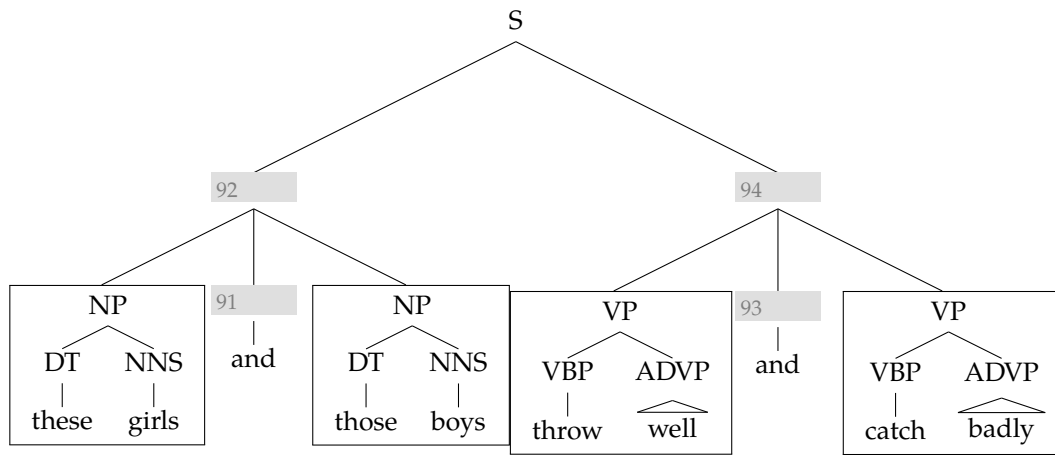
- Indirect questions



## 4 Coordination

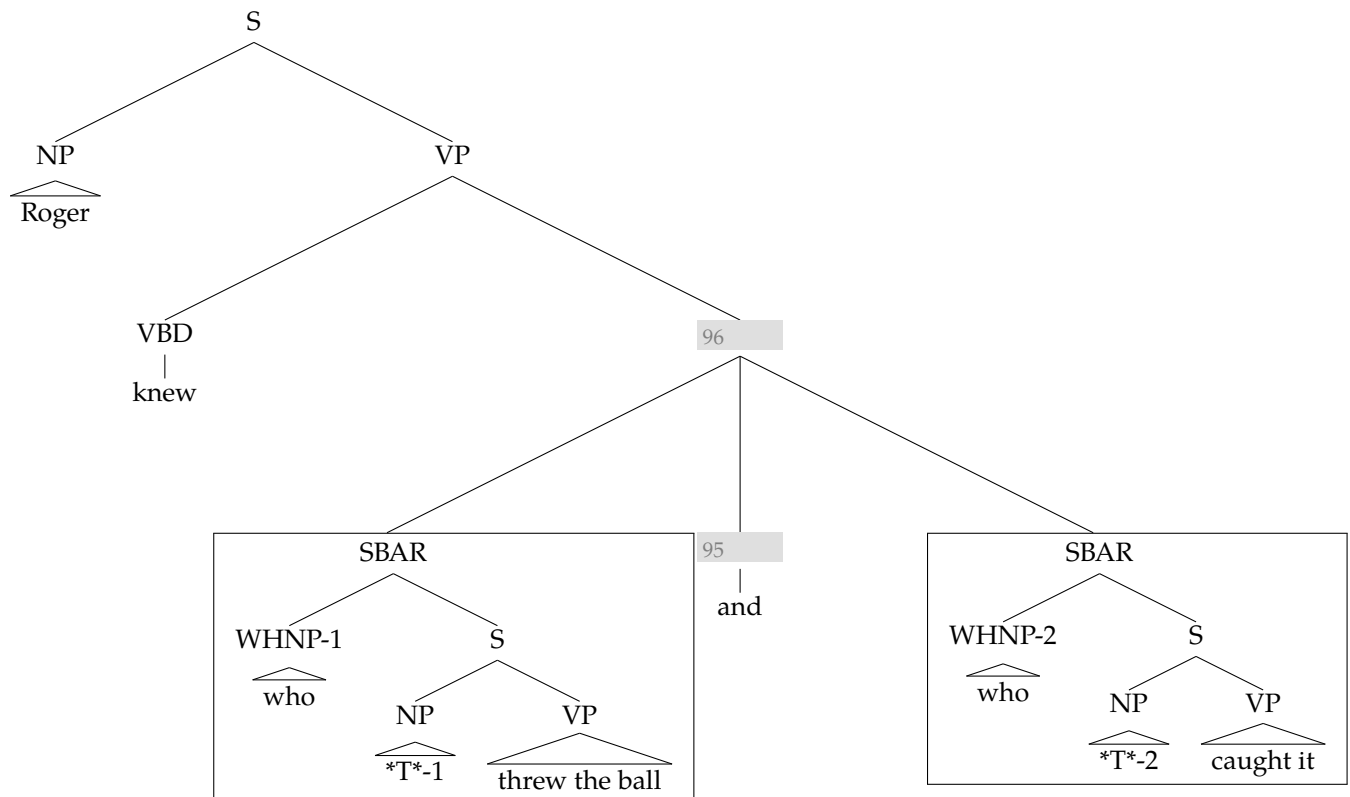
- Phrase coordination

(43)



- Clause coordination

(44)



## 5 Combining everything

(Your turn) Students have not been informed by the authority of the news that the strike which the company called was canceled and banned