

Problem

Show that the string the girl touches the boy with the flower has two different leftmost derivations in grammar G_2 on page 103. Describe in English the two different meanings of this sentence.

Step-by-step solution

Step 1 of 2

Leftmost derivative is use for replacing the leftmost variable. Each and every variable is replaced on the consecutive step.

Given: the girl touches the boy with flower

Proof: The above given string has two leftmost derivative

$\langle \text{SENTENCE} \rangle \rightarrow \langle \text{NOUN-PHRASE} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \langle \text{CMPLX-NOUN} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \langle \text{ARTICLE} \rangle \langle \text{NOUN} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \text{the} \langle \text{NOUN} \rangle \langle \text{VERB-PHRASE} \rangle$

Grammars describing the fragment of English language are as follows:

$\rightarrow \text{the girl} \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \text{the girl} \langle \text{CMPLX-VERB} \rangle$
 $\rightarrow \text{the girl} \langle \text{VERB} \rangle \langle \text{NOUN-PHRASE} \rangle$
 $\rightarrow \text{the girl touches} \langle \text{NOUN-PHRASE} \rangle$
 $\rightarrow \text{the girl touches} \langle \text{CMPLX-NOUN} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches} \langle \text{ARTICLE} \rangle \langle \text{NOUN} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches the} \langle \text{NOUN} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches the boy} \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches the boy} \langle \text{PREP} \rangle \langle \text{CMPLX-NOUN} \rangle$
 $\rightarrow \text{the girl touches the boy with} \langle \text{CMPLX-NOUN} \rangle$
 $\rightarrow \text{the girl touches the boy with} \langle \text{ARTICLE} \rangle \langle \text{NOUN} \rangle$
 $\rightarrow \text{the girl touches the boy with the} \langle \text{NOUN} \rangle$
 $\rightarrow \text{the girl touches the boy with the flower}$

The above phrase is the first derivative of the leftmost derivation.

[Comment](#)

Step 2 of 2

Grammars describing the fragment of English language are as follows:

$\langle \text{SENTENCE} \rangle \rightarrow \langle \text{NOUN-PHRASE} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \langle \text{CMPLX-NOUN} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \langle \text{ARTICLE} \rangle \langle \text{NOUN} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \text{the} \langle \text{NOUN} \rangle \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \text{the girl} \langle \text{VERB-PHRASE} \rangle$
 $\rightarrow \text{the girl} \langle \text{CMPLX-VERB} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl} \langle \text{VERB} \rangle \langle \text{NOUN-PHRASE} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches} \langle \text{NOUN-PHRASE} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches} \langle \text{CMPLX-NOUN} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches} \langle \text{ARTICLE} \rangle \langle \text{NOUN} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches the} \langle \text{NOUN} \rangle \langle \text{PREP-PHRASE} \rangle$
 $\rightarrow \text{the girl touches the boy} \langle \text{PREP-PHRASE} \rangle$

→ the girl touches the boy ⟨PREP⟩⟨CMPLX-NOUN⟩

→ the girl touches the boy with ⟨CMPLX-NOUN⟩

→ the girl touches the boy with ⟨ARTICLE⟩⟨NOUN⟩

→ the girl touches the boy with the ⟨NOUN⟩

→ the girl touches the boy with the flower

The above phrase is the second derivative of the leftmost derivation.

[Comments \(1\)](#)