Example: Shift-Reduce Parsing

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Consider the CFG G = <N, T, P, S> with N = {S, A, B, C, D}, T = {a, b, c, d} and

P = {S → aA
A → BCD
B → BS|b
C → c
D → d},

and the input w = ababcdcd.

1. Give the trace of the shift-reduce parsing without deduction rules for this input.

input position	id	stack	remaining input	operation
0	1	ε	ababcdcd	-
1	2	a	babcdcd	shift (1)
2	3	ab	abcdcd	shift (2)
2	4	aB	abcdcd	reduce (3), b → B
3	5	aBa	bcdcd	shift (4)
4	6	aBab	cdcd	Shift (5)
4	7	aBaB	cdcd	Reduce (6), b → B
5	8	aBaBc	dcd	Shift (7)
5	9	aBaBC	dcd	Reduce (8), c → C
6	10	aBaBCd	cd	Shift (9)
6	11	aBaBCD	cd	Reduce (10), d → D
6	12	aBaA	cd	Reduce (11), BCD → A
6	13	aBS	cd	Reduce (12), aA → S
6	14	aB	cd	Reduce (13), BS → B
7	15	aBc	d	Shift (14)
7	16	aBC	d	Reduce (15), c → C
8	17	aBCd	ε	Shift (16)
8	18	aBCD	ε	Reduce (17), d → D
8	19	aA	ε	Reduce (18), BCD → A
8	20	S	ε	Reduce (19), aA → S

2. If w ∈ L(G), read off the rightmost derivation for w.

S → aA → aBCD → aBCd → aBcd → aBScd → aBaAcd → aBaBCDcd → aBaBCdcd → aBaBcdcd → aBabcdcd → ababcdcd