4. Write a program to implement a top-down and bottom-up parser using an appropriate context-free grammar.

import nltk

from nltk import CFG

from nltk.parse import RecursiveDescentParser, ShiftReduceParser

# Define a Context-Free Grammar (CFG)

grammar = CFG.fromstring("""

S -> NP VP | S NP

NP -> Det N | N

VP -> V NP | V

Det -> 'the' | 'a'

N -> 'cat' | 'dog' | 'rat'

V -> 'chases' | 'eats'

""")

# Sample sentence

tokens = ['the', 'cat', 'chases', 'a', 'rat']

# Top-Down Parsing using Recursive Descent Parser

rd\_parser = RecursiveDescentParser(grammar)

print("\nTop-Down Parsing (Recursive Descent):")

for tree in rd\_parser.parse(tokens):

print(tree)

tree.pretty\_print()

# Bottom-Up Parsing using Shift-Reduce Parser

sr\_parser = ShiftReduceParser(grammar)

print("\nBottom-Up Parsing (Shift-Reduce):")

for tree in sr\_parser.parse(tokens):

print(tree)

tree.pretty\_print()

OUTPUT:

