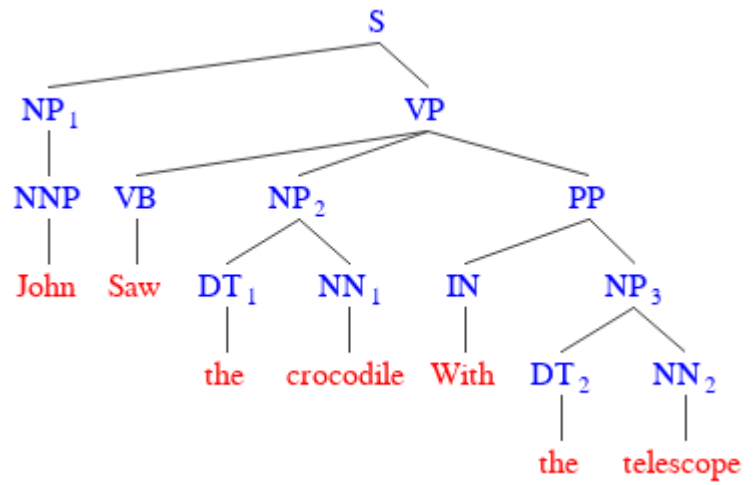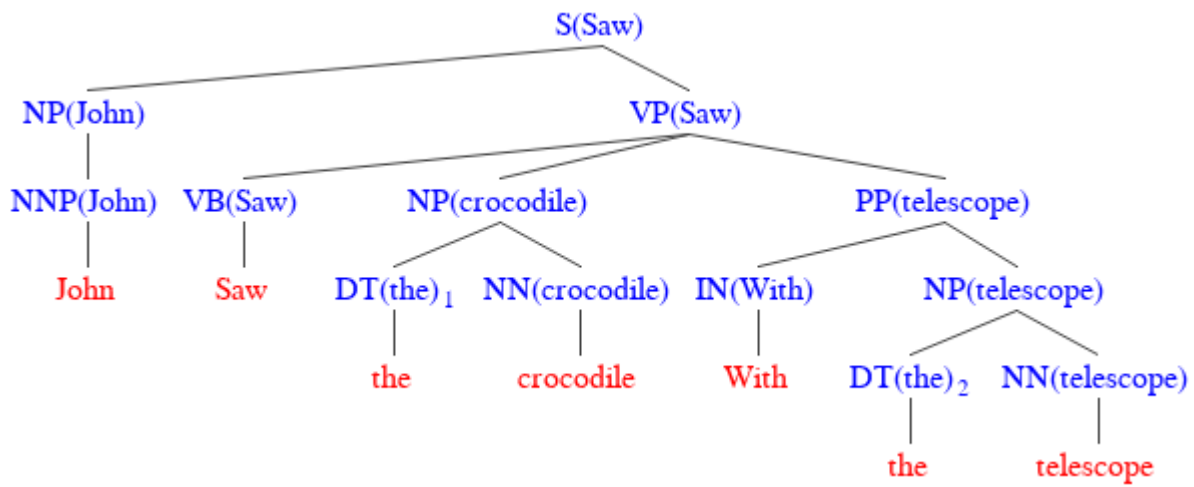**1**

1.1

1.2

there is only 1 option to derivate the sentence under the given CFG.

1.3

1.4

John saw the crocodile with the telescope

2

2.1

```
C:\Users\Omer\Anaconda3\python.exe C:/Users/Omer/PycharmProjects/untitled13/tets.py
running arc standart with the following actions  SHIFT , SHIFT , LEFT nsubj, SHIFT , SHIFT , SHIFT , LEFT mark, RIGHT acl, SHIFT , SHIFT , LEFT cc, R
stack: ['root'] buffer: ['John', 'likes', 'balloons', 'that', 'pop', 'and', 'eggs']
arcs: []
----- SHIFT ------
stack: ['root', 'John'] buffer: ['likes', 'balloons', 'that', 'pop', 'and', 'eggs']
arcs: []
----- SHIFT ------
stack: ['root', 'John', 'likes'] buffer: ['balloons', 'that', 'pop', 'and', 'eggs']
arcs: []
----- LEFT nsubj------
stack: ['root', 'likes'] buffer: ['balloons', 'that', 'pop', 'and', 'eggs']
arcs: [('likes', 'John')]
----- SHIFT ------
stack: ['root', 'likes', 'balloons'] buffer: ['that', 'pop', 'and', 'eggs']
arcs: [('likes', 'John')]
----- SHIFT ------
stack: ['root', 'likes', 'balloons', 'that'] buffer: ['pop', 'and', 'eggs']
arcs: [('likes', 'John')]
----- SHIFT ------
stack: ['root', 'likes', 'balloons', 'that', 'pop'] buffer: ['and', 'eggs']
arcs: [('likes', 'John')]
----- LEFT mark------
stack: ['root', 'likes', 'balloons', 'pop'] buffer: ['and', 'eggs']
arcs: [('likes', 'John'), ('pop', 'that')]
----- RIGHT acl------
stack: ['root', 'likes', 'balloons'] buffer: ['and', 'eggs']
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop')]
----- SHIFT ------
stack: ['root', 'likes', 'balloons', 'and'] buffer: ['eggs']
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop')]
----- SHIFT ------
stack: ['root', 'likes', 'balloons', 'and', 'eggs'] buffer: []
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop')]
----- LEFT cc------
stack: ['root', 'likes', 'balloons', 'eggs'] buffer: []
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and')]
----- RIGHT conj------
stack: ['root', 'likes', 'balloons'] buffer: []
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and'), ('balloons', 'eggs')]
----- RIGHT obj------
stack: ['root', 'likes'] buffer: []
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and'), ('balloons', 'eggs'), ('likes', 'balloons')]
----- RIGHT root------
stack: ['root'] buffer: []
arcs: [('likes', 'John'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and'), ('balloons', 'eggs'), ('likes', 'balloons'), ('root', 'likes')]
```

2.2

```
running arc eager with the following actions  SHIFT , LEFT nsubj, RIGHT root, RIGHT obj, SHIFT , LEFT mark, RIGHT acl, REDUCE , SHIFT , LEFT cc, RIGHT
stack:  ['root'] buffer:  ['John', 'likes', 'balloons', 'that', 'pop', 'and', 'eggs']
arcs:  []
--Shift--
stack:  ['root', 'John'] buffer:  ['likes', 'balloons', 'that', 'pop', 'and', 'eggs']
arcs:  []
--Left arc nsubj--
arcs:  [('likes', 'John')]
stack:  ['root'] buffer:  ['likes', 'balloons', 'that', 'pop', 'and', 'eggs']
arcs:  [('likes', 'John')]
--Right arc root--
arcs:  [('likes', 'John'), ('root', 'likes')]
stack:  ['root', 'likes'] buffer:  ['balloons', 'that', 'pop', 'and', 'eggs']
arcs:  [('likes', 'John'), ('root', 'likes')]
--Right arc obj--
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons')]
stack:  ['root', 'likes', 'balloons'] buffer:  ['that', 'pop', 'and', 'eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons')]
--Shift--
stack:  ['root', 'likes', 'balloons', 'that'] buffer:  ['pop', 'and', 'eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons')]
--Left arc mark--
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that')]
stack:  ['root', 'likes', 'balloons'] buffer:  ['pop', 'and', 'eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that')]
--Right arc acl--
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop')]
stack:  ['root', 'likes', 'balloons', 'pop'] buffer:  ['and', 'eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop')]
--Reduce--
stack:  ['root', 'likes', 'balloons'] buffer:  ['and', 'eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop')]
--Shift--
stack:  ['root', 'likes', 'balloons', 'and'] buffer:  ['eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop')]
--Left arc cc--
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and')]
stack:  ['root', 'likes', 'balloons'] buffer:  ['eggs']
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and')]
--Right arc conj--
arcs:  [('likes', 'John'), ('root', 'likes'), ('likes', 'balloons'), ('pop', 'that'), ('balloons', 'pop'), ('eggs', 'and'), ('balloons', 'eggs')]
stack:  ['root', 'likes', 'balloons', 'eggs'] buffer:  []
```