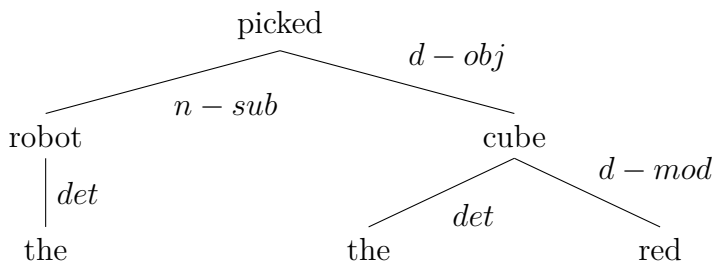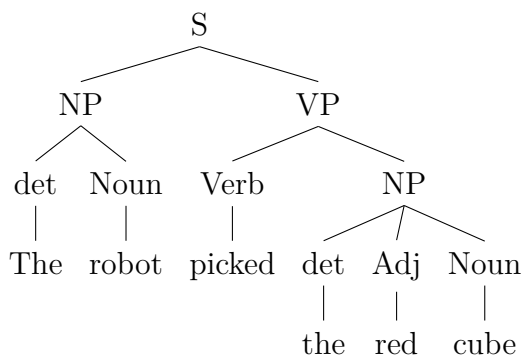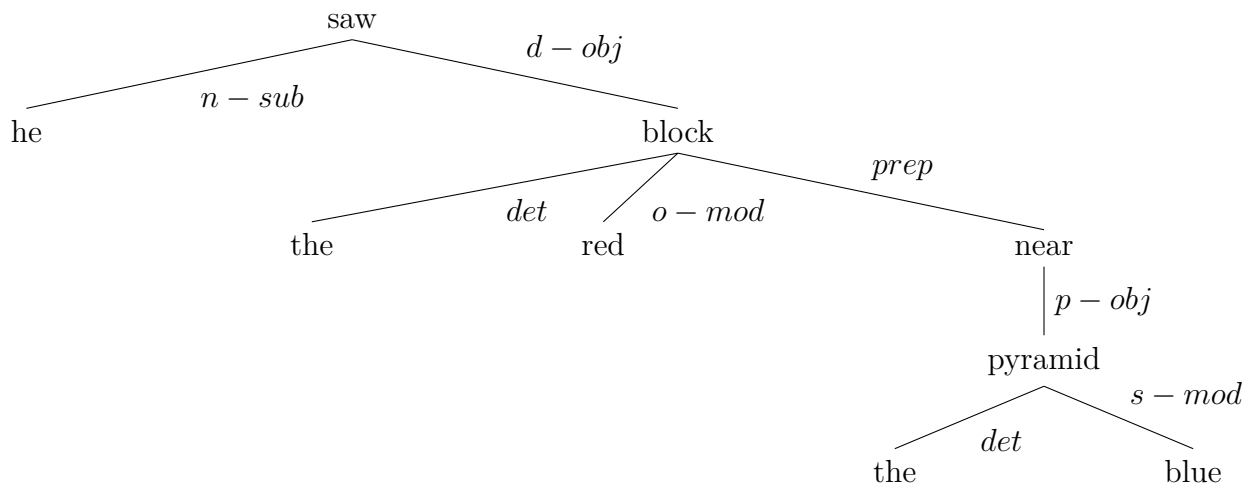# NLP, Assignment 1

Zubair Abid, 20171076

1 Phase Structure and Modifier-Modified Trees for English Sentences

1. The robot picked the red cube.

2. He saw the red block near the blue pyramid.

S
NP VP
pronoun V NP
He saw NP PP
det NP prep NP
the adj N near det NP
red block the adj N
blue pyramid

saw
$n-sub$ $d-obj$
he block
det $o-mod$ $prep$
the red near
$p-obj$
pyramid
det $s-mod$
the blue
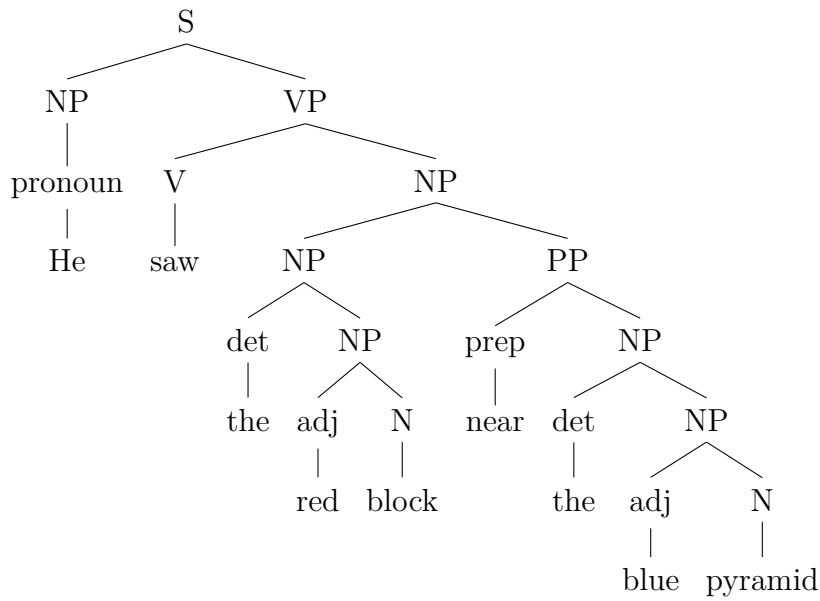
3. Put the red block near the blue pyramid on the green cylinder.

S
VP NP PP
V NP PP prep NP
Put det NP prep NP on det NP
the adj Noun near det NP the adj Noun
red block the adj Noun green cylinder
blue pyramid

Dependency tree (item 3, continued)

```
                              put
                    d − obj          prep
            block                          on
      det   o − mod                          p − obj
   the   red         prep                  cylinder
                    near                 det    s − mod
              det   s − mod          the      green
        p − obj
   pyramid   the   blue
```
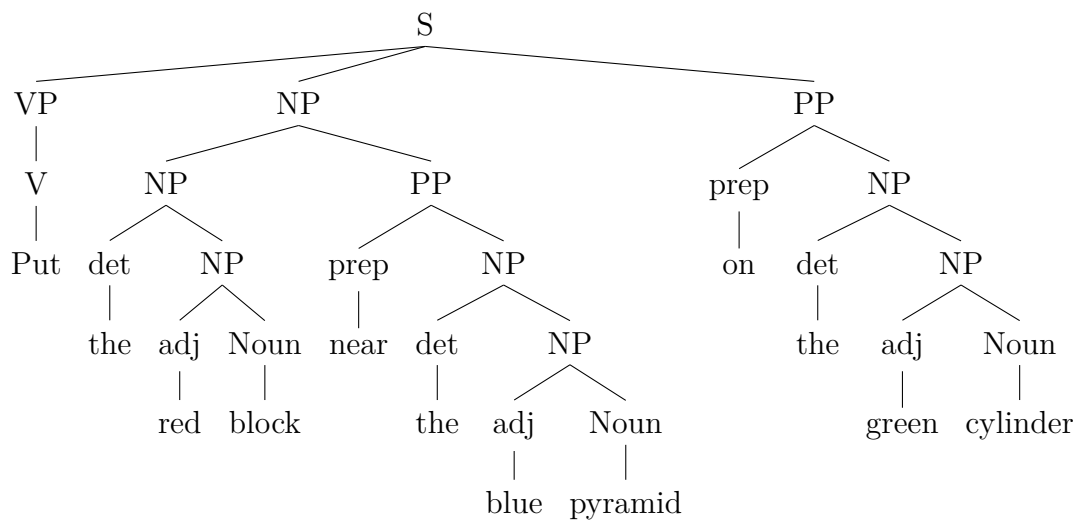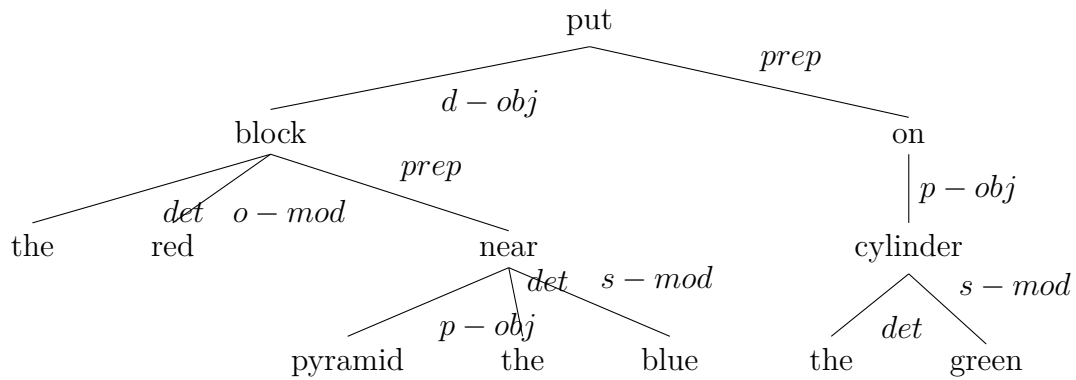
4. The robot placed the red block near the blue pyramid.

```
                    S
        NP                    VP
   det  Noun   Verb    NP              PP
   the  robot  placed det    NP    Prep    NP
                     the  adj  Noun  near  det    NP
                         red  block       the  adj    Noun
                                              blue   pyramid
```

```
                        placed
        n − sub        d − obj          prep
   robot            block                    near
     det          det    o − mod          p − obj
    the         the        red           pyramid
                                       det    o − mod
                                     the        blue
```
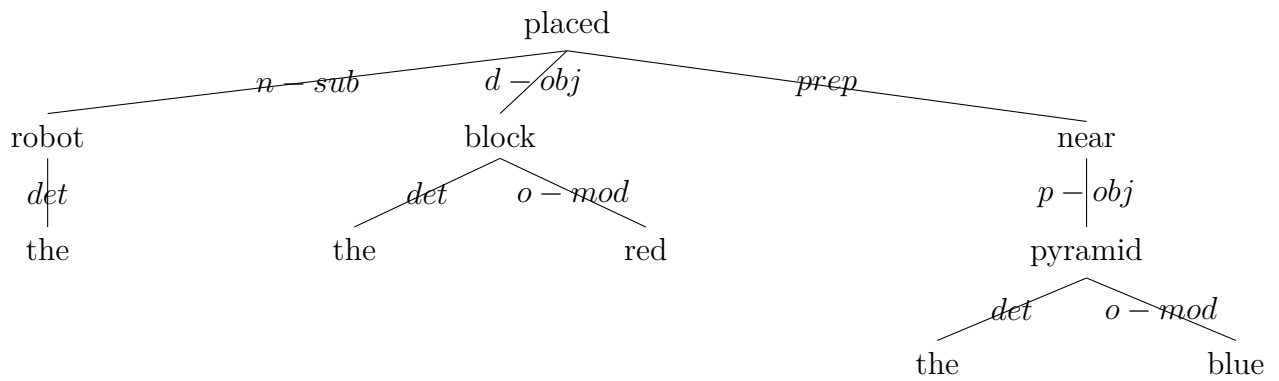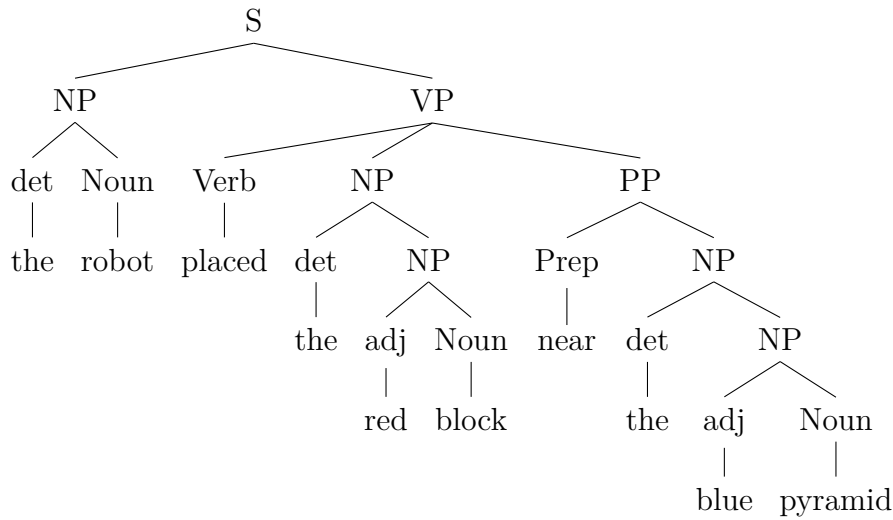
5. He lifted a yellow cylinder balanced on a green cylinder.

S
├─ NP
│ └─ pronoun
│   └─ he
└─ VP
   ├─ V
   │ └─ lifted
   └─ S'
      ├─ NP
      │ ├─ det
      │ │ └─ a
      │ └─ NP
      │   ├─ adj
      │   │ └─ yellow
      │   └─ N
      │   └─ cylinder
      └─ VP
         ├─ V
         │ └─ balanced
         └─ PP
            ├─ prep
            │ └─ on
            └─ N
               ├─ det
               │ └─ a
               └─ NP
                  ├─ adj
                  │ └─ green
                  └─ N
                     └─ cylinder

balanced
├─ $v-mod$ — cylinder
│   ├─ det — a
│   ├─ $o-mod$ — yellow
│   └─ $d-obj$ — lifted
│   └─ $n-sub$ — he
└─ prep — on
          └─ $p-obj$ — cylinder
                       ├─ det — a
                       └─ $o-mod$ — green
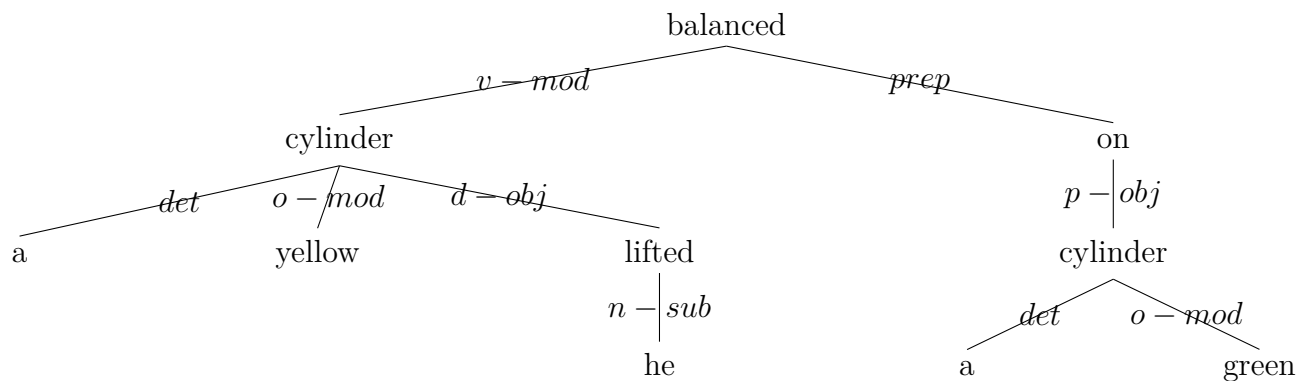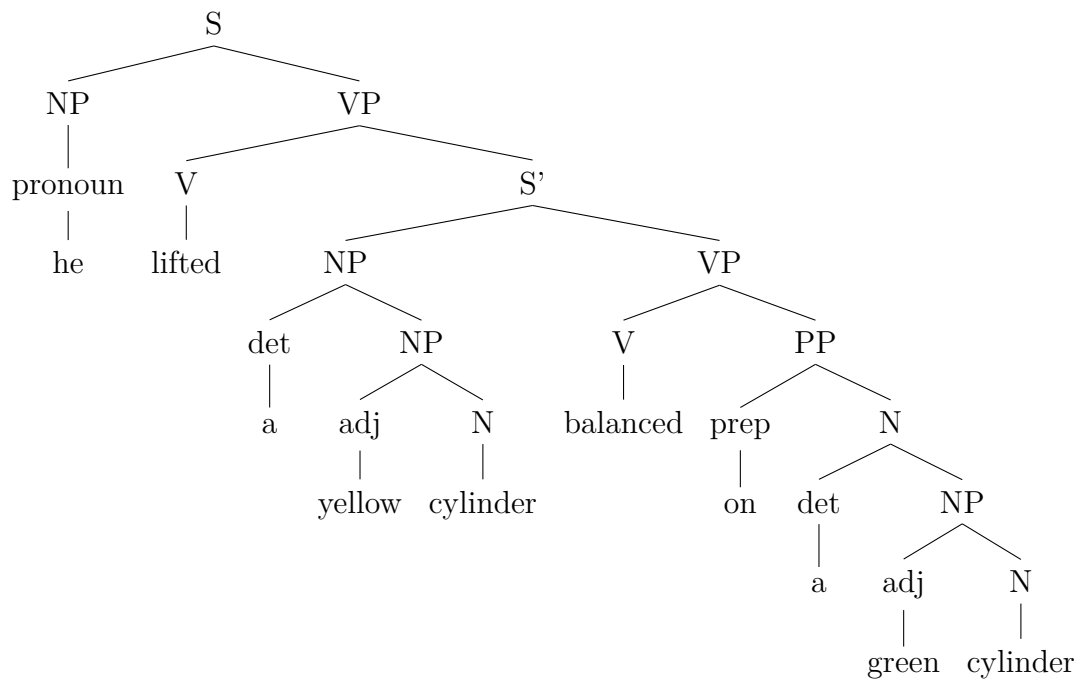
2 Syntactic Parse Trees and Modifier-Modified Trees for English Sentences

1. Ram called Mohan after eating a mango.

S
NP VP
N V NP AdvP
Ram called N adverb VP
Mohan after V NP
eating det N
a mango

called
$n - sub$ $d - obj$ $adv - mod$
Ram Mohan after
$v - mod$
eating
$d - obj$
mango
det
a
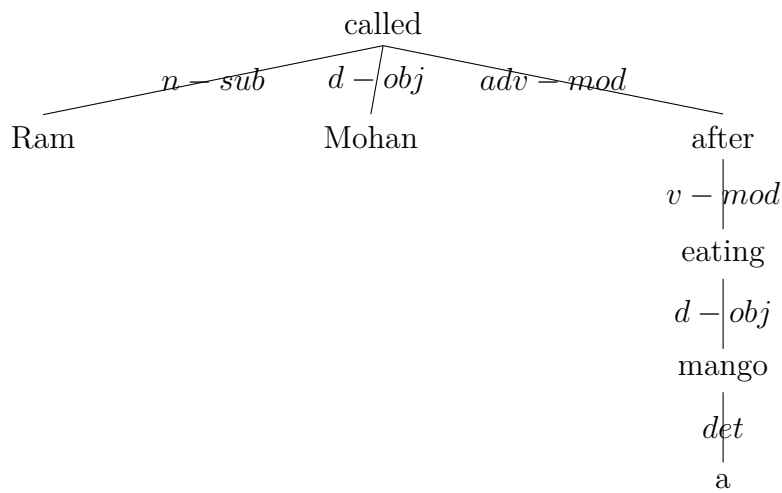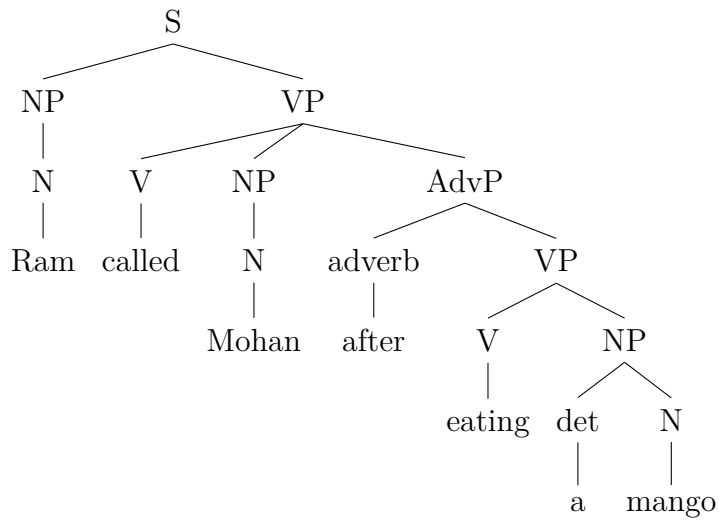
2. Ram called Mohan to eat a mango.

S
NP VP
N V NP VP
Ram called N VP NP
Mohan VAux V det N
to eat a mango

Dependency tree (top):

- called
  - n − sub: Ram
  - d − obj: Mohan
  - v − mod: eat
    - v − aux: to
    - d − obj: mango
      - det: a

3. Ram asked Mohan for a knife to cut the mango.

```
                         S
              ┌──────────┴──────────┐
             NP                     VP
              │            ┌────────┼──────────────┐
              N            V        NP           Comp'
              │            │        │        ┌─────┴──────────┐
             Ram         asked      N       Comp              S'
                                    │        │         ┌──────┴──────┐
                                  Mohan      for       NP            VP
                                                    ┌──┴──┐      ┌────┴────┐
                                                   det  Noun    VP        NP
                                                    │    │    ┌──┴──┐    ┌──┴──┐
                                                    a  knife VAux Verb  det   N
                                                              │    │     │    │
                                                              to  cut   the  mango
```
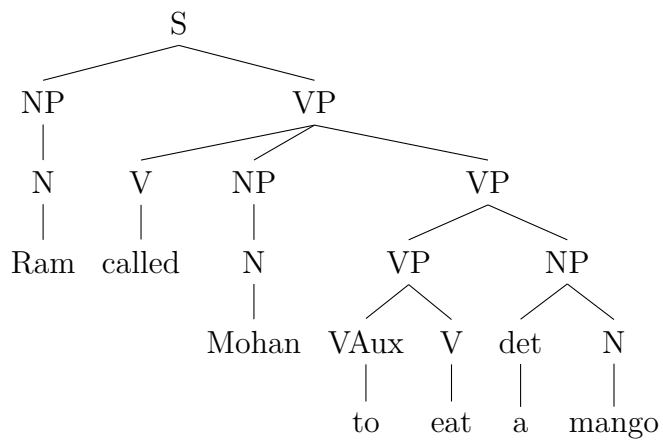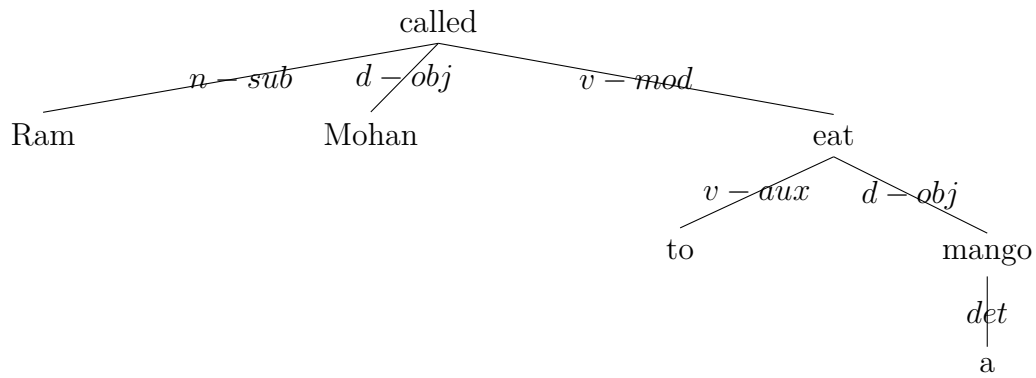
Dependency tree (bottom):

- asked
  - n − sub: Ram
  - d − obj: Mohan
  - comp: for
    - v − mod: cut
      - n − sub: knife
        - det: a
      - d − obj: mango
        - det: the
      - v − aux: to
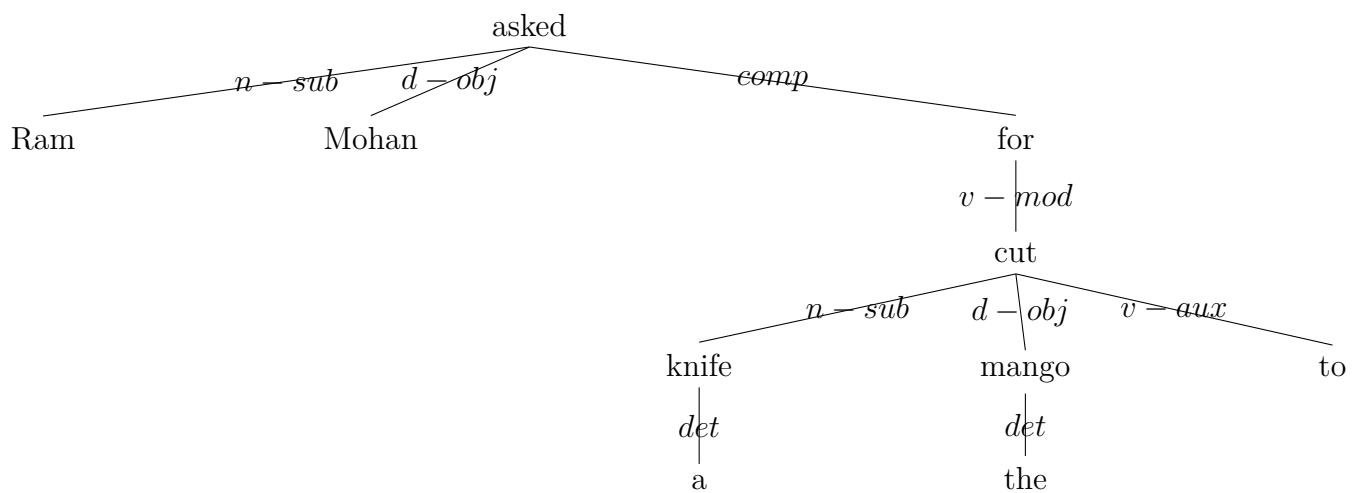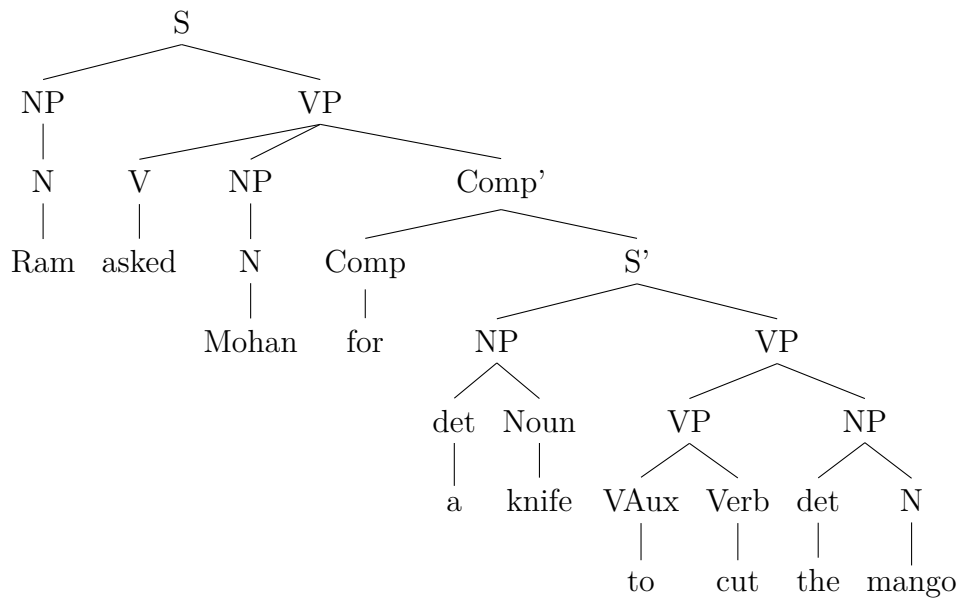
4. The hunter saw a running lion.

6

Tree 1

```
                    S
          ┌─────────┴─────────┐
          NP                   VP
       ┌───┴───┐         ┌──────┴──────┐
      det      N         V             NP
       │       │         │        ┌────┴────┐
      The   hunter      saw      det        NP
                         │        │      ┌───┴───┐
                         a       Adj    Noun
                                  │       │
                               running   lion
```

Tree 2

```
                    saw
          ┌──n − sub──┴──d − obj──┐
        hunter                   lion
          │det              ┌─det──┴──v − mod─┐
         the               a               running
```
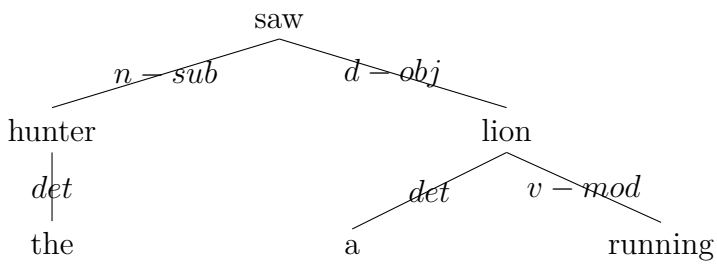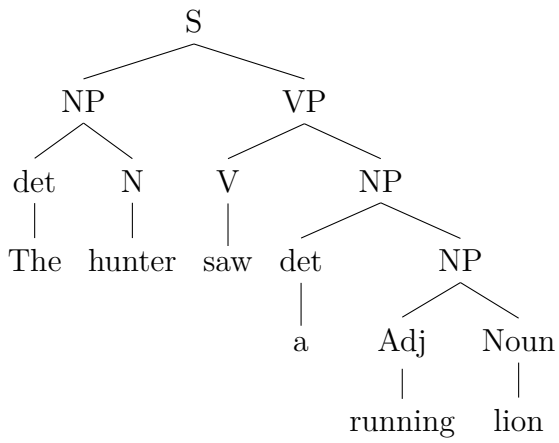
5. The hunter saw a lion running towards him.

```
                       S
             ┌─────────┴─────────┐
             NP                   VP
         ┌───┴───┐         ┌──────┴──────┐
        det      N         V             S'
         │       │         │        ┌────┴────┐
        The   hunter      saw      NP         VP
                                ┌───┴───┐  ┌───┴───┐
                               det   Noun  V       PP
                                │      │    │    ┌──┴──┐
                                a     lion running prep  NP
                                              │      │
                                           towards pronoun
                                                     │
                                                    him
```

saw

$n-sub$ $d-obj$ $v-mod$

hunter   lion   running

det det $prep$

the   a   towards

$p-obj$

him