Chapter 2
2.1 Introduction

A noun phrase is either a noun, pronoun, a noun preceded by one or more modifiers or a sequence of these noun phrases with the last two joined by a coordinating conjunction. A modifier is either an adjective phrase, an indicative pronoun, a count, a participle, a noun (or pronoun) in genitive case or a permissible sequence of these modifiers[17]. In a permissible sequence a noun (or pronoun) in genitive case may be followed by an indicative which may be followed by a count and may be followed by an adjective. A participle may occur anywhere in the sequence, but precedes adjective.

An adjective phrase is either an adjective, an adjective preceded by (or followed by) an affix denoting degree, an adjective preceded by a noun in genitive case or a sequence of these adjective phrases.

Indicative pronouns are divided into five categories: demonstrative, reflexive, relative, indefinite and interrogative [19].

A count modifier is divided into seven categories: cardinal, ordinal, approximate, multiplicative, fractional, collective and measure.

A participle form is a perfect or imperfect form of a verb optionally followed by a form of suffix *huua*.

A noun in genitive case represents either possession, composition, worth, measure, source, origin, cause, class membership, part-of relationship, purpose, or characteristic. A pronoun in genitive case either denotes possession, relationship, source, or characteristic.
In working out the present formalism, the above mentioned phrasal properties play a
central role. Hindi NP-agreement rules have been described in section 1.5 of the first
chapter.

2.2 Noun Phrase

This section describes rules for noun phrase with associated f-equations. The
f-equations implement the agreement rules for Noun Phrases. In the rules that follow,
symbols ADJ, DGRE1, MOD, NP, N, and P stands for adjective, degree modifier,
modifier, noun phrase, noun, and pronoun, respectively. Symbols NP1, NP2, NP3,
NP4, NP5, and NP6 stand for different types of noun phrases. Symbols
CORD_{CONJ1} and CORD_{CONJ2} denote coordinating conjunctions. Rules are
explained through examples. The Examples are full sentences. The noun phrases in
examples are underlined [29].

The rules proposed to describe the structure of noun phrase are:

1. \( NP \rightarrow NP1(\mod = 1) \mid NP2(\mod = 1) \mid NP3(\mod = 1) \mid NP4(\mod = 1) \mid NP5(\mod = 1) \mid NP6(\mod = 1) \mid NP7(\mod = 1) \)

   This rule states that a noun phrase may either be a phrase of type NP1 or type NP2
   etc. These phrases are described in rules 2-15.

2. \( NP1 \rightarrow MOD(\mod = 1) \mid N(\mod = 1) \mid NP1(\mod gen = 1) \mid NP2(\mod gen = 1) \mid NP3(\mod gen = 1) \mid NP4(\mod gen = 1) \mid NP5(\mod gen = 1) \mid NP6(\mod gen = 1) \mid NP7(\mod gen = 1) \)

   This rule states that a noun phrase is a noun preceded by modifier phrase. The
   constraint equations in the rule account for number, gender and case agreement
   between modifier phrase and the noun. The examples adhering to this rule are:

   (i) \textit{pyaaraa bachchaa khel rahaai hai}. 
(ii)  *raam ke deewar par baithe chaar kaale kabootar daanaa chug rahe hain.*

3. NP1 -> ADVP(\(^= !\)) ADJ (!noundrop \(= \_a +\)) (\(^= !\))
   
   \(\text{(^ noun_phrase = simple)}\)

This states that a noun phrase is an adjective preceded by an adverb phrase. Adjectives occurring here can drop the noun following it. This condition is satisfied by the constraint equation testing the value of "noundrop". In f-equations, attribute "noun_phrase" has a value simple. This attribute "noun phrase" is then used in determining the type of a noun phrase (simple, disjunctive or conjunctive) at semantic level. The examples adhering to this rule are :

   (i)  *sabhee baRon ko ijjat do.*
   (ii)  *beemaaree ko Theek se samajho.*

4. NP1 -> NP9(\(^= !\)) (\(^\text{noun_phrase = simple}\))

5. NP9 -> N(\(^ = !\)) \| ADJ(! noundrop = +) (\(^= !\)) \| P(\(^= !\)) (! type = \(= \_a \text{ personal}\))

These two rules state that a noun phrase is either a noun, a pronoun or an adjective (adjectival noun). Pronouns can only be of personal type. Adjectives occurring here can drop the noun following it. This condition is satisfied by the constraint equation testing the value of "noundrop". The examples adhering to this rule are :

   (i)  *raam khel rahaa hai.*
   (ii)  *vah so rahaa hai.*
   (iii)  *baRon ko ijjat denee chaahie.*

6. NP2 -> NP1 (\(^np1 = !\)) CORD_CONJ1(\(^\text{conj = !}\)) NP1 (\(^np2 = !\))

   \(\text{(^ np1 gen }= \_a \text{ ! gen)}\)
   \(\text{(^ num = plural)}\)
   \(\text{(^ gen }= \! \text{ gen)}\)
   \(\text{(^ per }= \! \text{ per)}\)
   \(\text{(^ case }= \! \text{ case)}\)
   
   \(\text{(^ noun_phrase = conjunctive)}\)

This rule accounts for a compound noun phrase. The noun phrase consists of two
simple noun phrases joined by a conjunctive coordinating conjunction. The conjunctive coordinating conjunctions are *aur*, *evam*, and *tathaa*. Both the noun phrases must agree in gender. This is shown by the constraint equation in the rule. The compound noun phrase is plural noun phrase whereas the gender and person of the compound noun phrase are same as the gender and person of the noun phrase following the conjunctive coordinating conjunction. The examples adhering to this rule are:

(i)  *raam aur shyaam achchhe dost hain.*

(ii) *raam kaa bhaaee mohan aur yah laRakaa achchhe mitra hain.*

7. NP2 -> NP1  (^ np1 = !) NP2(^ = !)  
   (^ gen = ! gen)  
   i = 3..n

This rule works in conjunction with previous rule (i.e. rule 6). The two rules accounts for a noun phrase with two or more than two simple noun phrases joined by a conjunctive coordinating conjunction. The rule is applicable only when the gender information of all the simple noun phrases are identical. This condition is taken care of at the time of unification. All these simple noun phrases are indexed as np1, np2, .. npn to differentiate them inside the f-structure of the compound noun phrase formed by them. For this rule index varies from 3 to the number of noun phrases forming the compound noun phrase. Index 1 and 2 are used in the previous rule which terminates this rule. Starting of index from 3 helps in making the index variable local to this rule only, otherwise the track of the index has to be made known to the previous rule. The examples adhering to this rule are:

(i)  *raam shyaam aur mohan ek hee skool men parhate hain.*

(ii) *main mera dost aur mere dost kaa bhaaee kal piknik par gaye the.*

8. NP3 -> NP1  (^ np1 = !) CORD_CONJ1(^ conj = !) NP1  (^ np2 = !)  
   (!type =a~proper)  
   (!type =a~personal)  
   (^ noun_phrase = conjunctive)  
   (!type =a~proper)  
   (!type =a~personal)  
   (^ gen =a~(!gen))  
   (^ num = ! num)  
   (^ gen = ! gen)
This rule accounts for a compound noun phrase consisting of two simple noun phrases in different genders joined by a conjunctive coordinating conjunction. The number, gender, and person of the compound noun phrase are same as the number, gender, and person of the noun phrase following the conjunctive coordinating conjunction. A noun forming these noun phrases should not be a proper noun. The rule does not permit a noun phrase to be a pronoun. The equations testing the value of "genm" and "genf" satisfy the requirement that there should be at least one noun phrase which differs in gender. The value of "genm" is set to 1 when the gender of a noun phrase is masculine and value of "genf" set to 1 when the gender of a noun phrase is feminine. Value '1' of both "genm" and "genf" at the end gives the information that there is at least one noun phrase which differs in gender from others. The value for genf and genm is set when rule number is executed. The absence of either of the genf or genm in an f-structure indicates that all the noun phrases are in same gender. The examples adhering to this rule are:

(i) kal skool men do laRake aur kuchh laRakiyaan aayeen thee.

(ii) kal skool men kuchh laRakiyaan aur laRake aaye the.

9. NP3 -> NP1  (^ np1 = !)      NP3(^ = !)
   (!type =ci ~proper)
   (!type =ci ~personal)
This rule works in conjunction with the previous rule (i.e. rule no. 8) The two rules account for a noun phrase with two or more than two simple noun phrases joined by a conjunctive coordinating conjunction. A noun or a pronoun forming this simple noun phrases should not be of a proper noun or a personal pronoun types, respectively. All these simple noun phrases are indexed as np1, np2, .. npn to differentiate them inside the f-structure of the compound noun phrase formed by them. For this, the rule index varies from 3 to the number of noun phrases forming the compound noun phrase. Index 1 and 2 are used in the previous rule which terminates this rule. Starting of index from 3 helps in making the index variable local to this rule only, otherwise the track of the index has to be made known to the previous rule. The equation setting the value of "genm" and "genf" is used to satisfy the requirement that there should be at least one noun phrase which differs in gender. The value of "genm" is set to 1 when the gender of a noun phrase is masculine and value of "genf" set to 1 when the gender of a noun phrase is feminine. Value '1' for both "genm" and "genf" at the end gives, the information that there is at least one noun phrase which differs in gender from others. The absence of either of the two at f-structure level indicates that all the noun phrases are in same gender. The examples adhering to this rule are:

(i)  kal·mere gharr kuchh purush, striyaan aur ek bachcha aayaa thaa.
(ii)  meraa baRaa bhaaee meree bahan aur pitaa ji baajaar gaye hai.

10.NP4  ->  NP1  (^ np1 = !)  CORD_CONJ1(^(conj = !) NP1  (^ np2 = !)
(^(type =a personal)  (^(type =a personal)
(^(prper = 1)  (^(num = plural)
This rule accounts for a compound noun phrase consisting of two simple noun phrases in different genders joined by a conjunctive coordinating conjunction. This rule requires that at least one of the noun phrases should be formed by a proper noun or personal pronoun. The number and gender of compound noun phrase will be plural and masculine respectively. The person of the compound noun phrase will be the same as the person of the noun phrase following conjunctive coordinating conjunction. The equation setting or testing the value of "prper" is used to satisfy the requirement that there should be at least one noun phrase of type proper or personal. The value of "prper" is set to 1 if the noun phrase is either a proper type or a personal type. The absence of "prper" indicates that the resulting noun phrase has neither a proper type noun phrase nor a personal type noun phrase as its constituent. The examples adhering to this rule are:
11. NP4 \rightarrow NP1 (\wedge \text{np}_i = 1) \quad \text{NP4}(\wedge = 1)

(!\text{type} =_c \text{personal})

(\wedge \text{prper} = 1)

\text{OR}

(\wedge \text{np}_i = 1)

(!\text{type} =_c \text{proper})

(\wedge \text{prper} = 1)

\text{OR}

(\wedge \text{np}_i = 1)

i = 3..n

This rule works in conjunction with the previous rule (i.e. rule no. 10). The rule accounts for a noun phrase with more than two simple noun phrases with last two noun phrases joined by conjunctive coordinating conjunctions. All the noun phrases should not be in same gender. At least one of the noun phrases should be formed by proper noun or by a personal pronoun. All these simple noun phrases are indexed as np₁, np₂, .. npₙ to differentiate them inside the f-structure of the compound noun phrase formed by them. For this rule index varies from 3 to the number of noun phrases forming the compound noun phrase. Index 1 and 2 are used in the previous rule which must executes to terminate this rule. Starting of index from 3 helps in making the index variable local to this rule only, otherwise the track of the index has to be made known to the previous rule. The equation setting or testing the value of "prper" is used to satisfy the requirement that there should be at least one noun phrase of proper type or personal type. The value of "prper" is set to 1 if the noun phrase is either a proper type or a personal type. The absence of "prper" indicates that the noun phrase is neither proper type nor personal type. The examples adhering to this rule are:

(i) \textit{ramesh mohan aur seetaa kal chale jaayenge}.

(ii) \textit{raadhikaa raahul aur raakesh baRe achchhe mitra hain}.
This rule accounts for a compound noun phrase consisting of two simple abstract noun phrases joined by conjunctive coordinating conjunction. The number of the compound noun phrase is singular whereas its gender and person are the same as the gender and person of the simple noun phrase following the conjunctive coordinating conjunction (The compound noun phrase may also be plural noun phrase which is taken care of by rules 6-11). The examples adhering to this rule are :

(i) *aanand aur sukh sabako nahin milataa.*

(ii) *aanand aur tripti sabako nahin milatee.*

This rule works in conjunction with the previous rule (i.e.rule no. 12). This rule states that a compound noun phrase consists of more than two simple abstract type noun phrases only with last two noun phrases joined by conjunctive coordinating conjunction. All these phrases The examples adhering to this rule are :

(i) *aanand sukh aur shaanti sabako nahin milatee.*

(ii) *aanand tripti aur sukh sabako nahin milataa.*

This rule states that a noun phrase is either NP1 type, NP2 type, NP3 type, NP4 type or NP5 type. The rule is used in formation of disjunctive noun phrase as described below.
15. NP6 -> NP8 (^ np1 = !) CORD_CONJ2 (^ conj = !) NP8 (^ np2 = !)
            (^ gen = ! gen)
            (^ num = ! num)
            (^ per = ! per)
            (^ case = ! case)
            (^ noun_phrase = disjunctive)

This rule accounts for a compound noun phrase consisting of two noun phrases joined by a disjunctive coordinating conjunction. The disjunctive coordinating conjunctions are yaa, va, and athavaa. The number, gender and person of the resulting noun phrase are same as the number, gender and person of the noun phrase following the disjunctive coordinating conjunction. The examples adhering to this rule are:

(i)  mohan kee gaayen aur raakesh ke bail vaa seeetaa kee bhainsen aur raadhaa kee bakaree saraa nuksaan pahuchayee hain.

(ii) raadhaa ke bahan vaa sohan ke bhaaee ne ye khabar dee.

(iii) ramesh vaa raadhikaa aur aashutosh baajaar jaayenge.

(iv) raadhikaa aur aashutosh vaa ramesh baajaar jaayegaa.

16. NP7 -> NP6 (^ = !)

This rule accounts for a compound noun phrase consisting of two noun phrases joined by disjunctive coordinating conjunction. This rule has been introduced to assure the termination of rule no. 17 which is described below.

17. NP7 -> NP6 (^ np1 = !) CORD_CONJ2 (^ conj = !) NP7 (^ = !)

This rule works in conjunction with previous rule (i.e. rule no. 16). The rule states that a compound noun phrase consists of more than two noun phrases. All these noun phrases are joined by disjunctive coordinating conjunction. The examples adhering to this rule are:

(i)  raadhikaa aur aashutosh vaa ravi aur prakaash vaa suresh aur suneeta baajaar jaayenge.

(ii) neeti aur ramesh vaa ravi aur prakaash vaa sohan ye kaam kar dengaa.
2.3 Modifier Phrase

The following rules describe modifier phrase of Hindi. The symbols ADJP, COUNT, INDICTV, K_AD, MPP, SP, V and V_AD denote adjective phrase, count (numerals) phrase, indicative pronoun phrase, noun in genitive case phrase, primary aspect suffix (moolpaksh pratyay), auxiliary aspect suffix (sahaayakpaksh pratyay), verb and participle phrase respectively [29]. All the phrases present in a noun phrase agree in number gender, and case (direct or oblique). But count phrase agrees with other phrases only in number. In the following rule, the defining equations for number (num), gender (gen) and case (dir_obl) help later testing of agreement between modifier phrase and the noun following it. This section contains 49 rules to describe modifier phrase. These rules are described in the following paragraphs:

1. MOD -> KA_AD(^ ka_ad = !) (^ num = !num) (^ gen = !gen) (^ dir_obl = ! dir_obl)
   
   This rule states that a modifier phrase consists of a noun in genitive case. As we will see later the rule allows one or more than one noun in genitive case phrase. Rules for noun in genitive case phrase (KA_AD) are given in section 2.3.3. The examples adhering to this rule are:
   
   (i) raam kaa betaa buddhimaan hai.
   (ii) meri buaa kee laRakee kee laRakee pahalee men paRhatee hai

2. MOD -> INDCTV(^ indctv = !) (^ num = !num) (^ gen = !gen) (^ dir_obl = ! dir_obl)

   This rule states that a modifier phrase consists of an indicative pronoun phrase. Rules for Indicative (INDCTV) phrase are given in section 2.3.4. The examples adhering to this rule are:

   (i) yah laRaka seedhaa hai.
   (ii) ve laRakiyaan meree ristedaar hain.
3. MOD -> COUNT(\(^\text{count} = !\))(\(^\text{num} = !\text{num}\))
This rule states that a modifier phrase consists of a count (numeral) phrase. A count phrase agrees in number with the noun following it. Rules for count (COUNT) phrase are given in section 2.3.1. The examples adhering to this rule are :
   (i) \text{seetaa ne ek pustak likhee thee.}
   (ii) \text{aanand ne das laakh gaayen paalee theen.}

4. MOD -> ADJP(\(^\text{adj} = !\))(\(^\text{num} = !\text{num}\))(\(^\text{gen} = !\text{gen}\))(\(^\text{dir\_obl} = !\text{dir\_obl}\))
This rule states that a modifier phrase consists of an adjective phrase. Rules for adjective phrase (ADJP) are given in section 2.3.2. The examples adhering to this rule are :
   (i) \text{haree saaRee sudhaa ko bahut pasand hai.}
   (ii) \text{saadhu gerue kapaRe pahante hain.}

5. MOD -> V\_AD(\(^\text{v\_ad} = !\))(\(^\text{num} = !\text{num}\))(\(^\text{gen} = !\text{gen}\))(\(^\text{dir\_obl} = !\text{dir\_obl}\))
This rule states that a modifier phrase consists of a participle phrase. Rules for participle (V\_AD) phrase are given in section 2.3.5. The examples adhering to this rule are :
   (i) \text{bhaagataa huaa laRakaa haanph rahaa thaa.}
   (ii) \text{khelatee huee bachchiyaan raheem kee theen.}

6. MOD -> KA\_AD\_COUNT(\(^\text{ka\_ad} = !\))(\(^\text{count} = !\))
   (\(^\text{num} = !\text{num}\))(\(^\text{ka\_ad num} = ed !\text{num}\))(\(^\text{gen} = !\text{gen}\))(\(^\text{dir\_obl} = !\text{dir\_obl}\))
This rule states that a modifier phrase consists of a sequence of noun (pronoun) in genitive case phrase followed by a count phrase. In the rule, the constraint equation tests agreement between nouns (pronouns) in genitive case phrase and count phrase. The examples adhering to this rule are :
   (i) \text{raam kee chaaron bahanen ghar gayee hain.}
   (ii) \text{mohan ke teenon kabootar uRane lage hain.}
7. MOD -> KA_AD  (^ ka_ad = !)  ADJP  (^ adj = !)  
               (^ num = !num)  (^ ka_ad gen = cd ! gen)  
               (^ gen = !gen)  (^ ka_ad num = cd ! num)  
               (^ dir_obl = !dir_obl)  (^ ka_ad dir_obl = cd !dir_obl)  

This rule states that a modifier phrase consists of a sequence of nouns (pronouns) in genitive case phrase followed by an adjective phrase. In the rule, the constraint equations test agreement between nouns (pronouns) in genitive case phrase and adjective phrase. The examples adhering to this rule are:

(i) raakesh kaa choTaa laRakaa beemaar hai.
(ii) rohit kee kaalee bakariyaan ghaas char rahee hain.

8. MOD -> INDCTV  (^ indctv = !)  COUNT  (^ count = !)  
                   (^ num = !num)  (^ indctv num = cd ! num)  
                   (^ gen = !gen)  (^ dir_obl = !dir_obl)  

This rule states that a modifier phrase consists of an indicative pronoun phrase followed by a count phrase. In the rule, the constraint equation tests agreement between indicative pronoun phrase and count phrase. The examples adhering to this rule are:

(i) vah ek bachchaa khel rahaa hai.
(ii) ve chaaron laRake gaa rahe hain.

9. MOD -> INDCTV  (^ indctv = !)  ADJP  (^ adj = !)  
                   (^ num = !num)  (^ indctv gen = cd ! gen)  
                   (^ gen = !gen)  (^ indctv num = cd ! num)  
                   (^ dir_obl = !dir_obl)  (^ indctv dir_obl = cd !dir_obl)  

This rule states that a modifier phrase consists of an indicative pronoun phrase followed by an adjective phrase. In the rule, the constraint equations test agreement between indicative pronoun phrase and adjective phrase. The examples adhering to this rule are:

(i) ye choTee bachchiyaan ro rahee hain.
(ii) vah lambaa laRakaa ghoom raahaa hai.
10. MOD -> COUNT (^count = !)   ADJP(^adj = !)
    (^count num =_{cd} ! num)
    (^num = !num)
    (^gen = !gen)
    (^dir_obl = !dir_obl)

This rule states that a modifier phrase consists of a count phrase followed by an adjective phrase. In the rule, the constraint equation tests agreement between count phrase and adjective phrase. The examples adhering to this rule are:

(i)  *das kaalee bakariyaan char rahee theen.*

(ii) *panjaab men paanch pavitra nadiyaan bahatee hain.*

11. MOD -> MOD2 (^ = !) | MOD21(^ = !) | MOD22(^ = !) | MOD23(^ = !) | MOD24(^ = !)

This rule is an intermediate rule introduced to reduce the number of rules for the modifier phrase. The description of the nonterminals occurring in the right hand side of this rule are given in rules 40-49. These phrases on the right hand side of the rule are internal to grammar.

12. MOD -> KA_AD (^ka_ad = !)   COUNT (^count = !)
    (^num = !num)                 (^ka_ad num =_{cd} ! num)
    (^gen = !gen)
    (^dir_obl = !dir_obl)

   ADJP(^adj = !) (^ka_ad gen =_{cd} ! gen) (^ka_ad num =_{cd} ! num)
   (^ka_ad dir_obl =_{cd} ! dir_obl)

This rule states that a modifier phrase is a sequence of a nouns (pronouns) in genitive case phrase, a count phrase and an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:

(i)  *bahool kaa ek chhotaa per TooT gayaa.*

(ii) *raadhaa kee chaaron haree saariya phaT gayeen.*

13. MOD -> INDCTV (^indctv = !)   COUNT(^count =!)
    (^indctv num =_{cd} ! num)
    (^num = !num)
This rule states that a modifier phrase is a sequence of an indicative pronoun phrase, a count phrase and an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:

(i) \textit{vah ek neeelee patang bik gayee.}

(ii) \textit{ye teenon laal kitaaben andar rakh do.}

This rule states that a modifier phrase is a sequence of a nouns (pronouns) in genitive case phrase, a count phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rules are:

(i) \textit{raakesh kee ek sotaa huaa bail behosh ho gayaa.}

(ii) \textit{sohan ke chaaron uRate hue kabootar maar diye gaye.}
This rule states that a modifier phrase is a sequence of nouns (pronouns) in genitive case phrase, an adjective phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:

(i) *usakaa laal dupaTTaa laharaa raha hai.*

(ii) *meree kaalee bakariyaan kho gayeen.*

16. MOD -> INDCTV (^ indctv = !) COUNT(^ count = !) (^ ka_ad num = cd !num) (^ num = !num) (^ gen = !gen) (^ dir_obl = !dir_obl) V_AD (^ v_ad = !) (^ indctv gen = cd ! gen) (^ indctv num = cd ! num) (^ indctv dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a sequence of an indicative pronoun phrase, a count phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:

(i) *yah ek bhaagataa huaa bachchaa khelane jaa raha hai.*

(ii) *ve paachon khelatee huee bachchiyaan thak gayeen.*

17. MOD -> INDCTV (^ indctv = !) ADJP (^ adj = !) (^ num = !num) (^ indctv gen = cd !gen) (^ gen = !gen) (^ indctv num = cd !num) (^ dir_obl = !dir_obl) (^ indctv dir_obl = cd !dir_obl) V_AD (^ v_ad = !) (^ indctv gen = cd ! gen) (^ indctv num = cd ! num) (^ indctv dir_obl = cd !dir_obl)

This rule states that a modifier phrase is a sequence of an indicative pronoun phrase, an adjective and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:
18. MOD -> COUNT(^ count = !) ADJP (^ adj = !) (^ count num = cd ! num)
   (^ num = !num) (^ gen = !gen) (^ dir_obl = !dir_obl)
   V_AD (^ v_ad = !) (^ adj gen = cd ! gen)
   (^ adj num = cd ! num) (^ adj dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a sequence of a count phrase, an adjective phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:

(i) yah laal khilataa huaa phool murjhaa gayaa.
(ii) ve saphed uRate huee patangen door chalee gayeen.

19. MOD -> MOD2(^ = !) COUNT(^ count = !) (^ ka_ad num = cd ! num)

In this rule MOD2 stands for a modifier phrase consists of either an indicative pronoun phrase followed by a noun (pronoun) in genitive case phrase, or nouns (pronouns) in genitive case phrase followed by an indicative pronoun phrase. This rule states that a modifier phrase is either a sequence of nouns (pronouns) in genitive case phrase, an indicative pronoun phrase, and a count phrase, or a sequence of an indicative pronoun phrase, nouns (pronouns) in genitive case phrase and count. In the rule, the constraint equation tests agreement between nouns in genitive case phrase and count phrase. The defining equations which will later establish agreement between modifier phrase and the noun following it, have been attached with the rule describing the structure of MOD2. The examples adhering to this rule are:

(i) teenon kaale baunkate hue kutte khatarnak hain.
(ii) beech men ek laal khilaa huaa gulaab achchaa lag rahaa hai.

20. MOD -> MOD2(^ = !) ADJP (^ adj = !) (^ ka_ad gen = cd ! gen)
   (^ ka_ad num = cd ! num)
   (^ ka_ad dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a sequence of a count phrase, an adjective phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The examples adhering to this rule are:

(i) romilaak kaa yah ek kuttaa raat bhar bhaunkataa hai.
(ii) ve raahul kee donon kameejen phat gayeen.
This rule states that a modifier phrase is either a sequence of nouns (pronouns) in genitive case phrase, an indicative pronoun phrase, and an adjective phrase, or a sequence of an indicative pronoun phrase, nouns (pronouns) in genitive case phrase, and an adjective phrase. In the rule, the constraint equations test agreement between noun in genitive case phrase and adjective phrase. The examples adhering to this rule are:

(i)  *raam kaa yah kaalaa kuttaa khatarnaak hai.*

(ii)  *ye raam ke kaale kabootar daanaa chug rahe hain.*

21. \[ \text{MOD} \rightarrow \text{MOD2}(\land = !) \quad \text{V}_\text{AD} \quad (\land \text{v}_\text{ad} = !) \quad (\land \text{ka}_\text{ad} \text{gen} = \text{cd} \land ! \text{gen}) \]
\[ (\land \text{ka}_\text{ad} \text{num} = \text{cd} \land ! \text{num}) \]
\[ (\land \text{ka}_\text{ad} \text{dir}_\text{obl} = \text{cd} \land ! \text{dir}_\text{obl}) \]

This rule states that a modifier phrase is either a sequence of nouns (pronouns) in genitive case phrase, an indicative pronoun phrase, and a participle phrase, or a sequence of an indicative pronoun phrase, a nouns (pronouns) in genitive case phrase, and a participle. In the rule, the constraint equations test agreement between noun in genitive case phrase and participle phrase. The examples adhering to this rule are:

(i)  *raam kaa yah bhaagataa huaa ghoRaa tej hai.*

(ii)  *ye raam ke sote hue kutte jarman hain.*

22. \[ \text{MOD} \rightarrow \text{MOD21}(\land = !) \quad \text{INDCTV}(\land \text{indctv} = !) \quad (\land \text{ka}_\text{ad} \text{gen} = \text{cd} \land ! \text{gen}) \]
\[ (\land \text{ka}_\text{ad} \text{num} = \text{cd} \land ! \text{num}) \quad (\land \text{ka}_\text{ad} \text{dir}_\text{obl} = \text{cd} \land ! \text{dir}_\text{obl}) \]

In this rule MOD21 stands for a modifier phrase which consists of either nouns (pronouns) in genitive case phrase followed by a participle phrase, or a participle phrase followed by nouns (pronouns) in genitive case phrase. This rule states that a modifier phrase is either a sequence of a nouns (pronouns) in genitive case phrase, a participle phrase, and an indicative phrase, or a sequence of participle phrase, nouns (pronouns) in genitive case phrase, and an indicative pronoun phrase. In the rule, the constraint equations test agreement between noun in genitive case phrase and indicative phrase. The defining equations which will later establish agreement between modifier phrase and the noun following it, have been attached with the rule describing the structure of MOD21. The examples adhering to this rule are:

(i)  *raam kaa yah bhaagataa huua ghoRaa tej hai.*

(ii)  *ve raam ke sote hue kutte jarman hain.*

32
23. MOD -> MOD21(= !) COUNT(\(^{\text{count}} = !\) (\(^{\text{ka_ad num}} =_{\text{ed}} ! \text{num}\))

This rule states that a modifier phrase is either a sequence of nouns (pronouns) in genitive case phrase, a participle phrase, and a count phrase, or a sequence of participle phrase, nouns (pronouns) in genitive case phrase, and a count phrase. In the rule, the constraint equations test agreement between noun in genitive case phrase and count phrase. The examples adhering to this rule are:

(i) \textit{mohan kee charatee huee chaaron gaayen sindhee hain.}

(ii) \textit{bandar kaa nachataa huaa ek bachcha bhaag gayaa.}

24. MOD -> MOD21(= !) ADJP (\(^{\text{adj}} = !\) \(^{\text{ka_ad gen}} =_{\text{ed}} ! \text{gen}\))

\(^{\text{ka_ad num}} =_{\text{ed}} ! \text{num}\))

\(^{\text{ka_ad dir_obl}} =_{\text{ed}} ! \text{dir_obl}\)

This rule states that a modifier phrase is either a sequence of nouns (pronouns) in genitive case phrase, a participle phrase, and an adjective phrase, or a sequence of a participle phrase, nouns (pronouns) in genitive case phrase and an adjective phrase. In the rule, the constraint equations test agreement between noun in genitive case modifier and adjective phrase. The examples adhering to this rule are:

(i) \textit{gulaab ke khilate hue laal phool murjhaa gaye.}

(ii) \textit{nadee kaa bahataa huaa swachchh paanee piyo.}

25. MOD -> MOD22(= !) COUNT(\(^{\text{count}} = !\) (\(^{\text{indctv num}} =_{\text{ed}} ! \text{num}\))

In this rule MOD22 stands for a modifier phrase consisting of either an indicative pronoun phrase followed by a participle phrase, or a participle phrase followed by an indicative pronoun phrase. This rule states that a modifier phrase is either a sequence of an indicative pronoun phrase, a participle phrase, and a count phrase, or a sequence of a participle phrase, an indicative pronoun phrase and a count phrase. In the rule, the constraint equations test agreement between indicative pronoun phrase and count phrase. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule describing the structure of
MOD22. The examples adhering to this rule are:

(i) *yah rotaa huaa ek bachchaa maan se alag ho paRaa hai.*
(ii) *Tangee huee ye chaaron saariya khaddar kee hain.*

26. MOD -> MOD22(\(^ = ! \)) ADJP (\(^ \text{adj} = ! \)) (\(^ \text{indctv gen} =_{cd} ! \text{gen} \))
\(^ \text{indctv num} =_{cd} ! \text{num} \))
\(^ \text{indctv dir obl} =_{cd} ! \text{dir obl} \))

This rule states that a modifier phrase is either a sequence of an indicative pronoun phrase, a participle phrase, and an adjective phrase, or a sequence of participle phrase, an indicative pronoun phrase and an adjective phrase. In the rule, the constraint equations test agreement between indicative pronoun phrase and adjective phrase. The examples adhering to this rule are:

(i) *yah rotaa huua chhoTaa bachchaa baRaa pyaaraa hai.*
(ii) *Tangee huee ye haree kameej achchhee hain.*

27. MOD -> MOD23(\(^ = ! \)) ADJP (\(^ \text{adj} = ! \)) (\(^ v_{-ad} \text{num} =_{cd} ! \text{num} \))
\(^ v_{-ad} \text{gen} =_{cd} ! \text{gen} \))
\(^ v_{-ad} \text{dir obl} =_{cd} ! \text{dir obl} \))

In this rule MOD23 stands for a modifier phrase consisting of either a count phrase followed by a participle phrase, or a participle phrase followed by a count phrase. This rule states that a modifier phrase is either a sequence of a count phrase, a participle phrase, and an adjective phrase, or a sequence of a participle phrase, a count phrase, and an adjective phrase. In the rule, the constraint equations test agreement between participle phrase and adjective phrase. The examples adhering to this rule are:

(i) *uRate hue chaar kaale kabootar achchhe lag rahe the.*
(ii) *piyaa huua ek badmaash aadamee naach raaha thaa.*

28. MOD -> KA_AD(\(^ \text{ka}_{-ad} = ! \)) COUNT(\(^ \text{count} = ! \)) (\(^ \text{ka}_{-ad} \text{num} =_{cd} ! \text{num} \))
MOD24 (\(^ = ! \)) (\(^ \text{ka}_{-ad} \text{gen} =_{cd} ! \text{adj gen} \))
\(^ \text{ka}_{-ad} \text{num} =_{cd} ! \text{adj num} \))
\(^ \text{ka}_{-ad} \text{dir obl} =_{cd} ! \text{adj dir obl} \))

In this rule MOD24 stands for a modifier phrase consisting of either an adjective
phrase followed by a participle phrase, or a participle phrase followed by an adjective phrase. This rule states that a modifier phrase is either a sequence of nouns (or pronouns) in genitive case phrase, a count phrase, an indicative pronoun phrase, a count phrase, and an adjective phrase, or a sequence of nouns (pronouns) in genitive case phrase, a count phrase, a participle phrase, and an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule describing the structure of MOD2. The examples adhering to this rule are:

(i) *mohan ke donon khelate hue haThee bachche jhagaR gaye.*

(ii) *ahmad kee teenon jhagaRatee huee naalaayak patniya ghar chhoR kar chalee gayeen.*

29. MOD -> MOD2(\(\wedge = !\)) COUNT(\(^\wedge \) count = !) (\(^\wedge \) ka_ad num = cd ! num)
   \(\wedge \) ADJP (\(^\wedge \) adj = !) (\(^\wedge \) ka_ad gen = cd ! gen)
   (\(^\wedge \) ka_ad num = cd ! num)
   (\(^\wedge \) ka_ad dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is either a sequence of nouns (pronouns) in genitive case phrase, an indicative pronoun phrase, a count phrase and an adjective phrase, or an indicative pronoun phrase, nouns (pronouns) in genitive case phrase, a count phrase and an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule describing the structure of MOD2. The examples adhering to this rule are:

(i) *sudhaa kee ye chaar haree saaRiyaan resham kee hain.*

(ii) *yah mere bhaaee kaa ek ghanishTh dost sharaari tee hain.*

30. MOD -> MOD2(\(\wedge = !\)) MOD23 (\(\wedge = !\)) (\(^\wedge \) ka_ad gen = cd ! v_ad gen)
   (\(^\wedge \) ka_ad num = cd ! v_ad num)
   (\(^\wedge \) ka_ad dir_obl = cd ! v_ad dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and an indicative pronoun phrase, followed by a combination of a count phrase and a participle phrase. In the rule, the constraint equations test agreement among
these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the above combinations. The examples adhering to this rule are:

(i) \textit{raam ke ye chaaron charate hue ghoRe achchhe hain.}
(ii) \textit{usake ve donon khelate hue bachche jhagaR paRe.}

31. MOD $\rightarrow$ MOD2($^\neg$ !) MOD24 ($^!$) ($^\neg$ ka_ad gen $\equiv_d$ ! adj gen)
($^\neg$ ka_ad num $\equiv_d$ ! adj num)
($^\neg$ ka_ad dir_obl $\equiv_d$ ! adj dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and an indicative pronoun phrase, followed by a combination of an adjective phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the above combinations. The examples adhering to this rule are:

(i) \textit{raam kee ye phatee huee haree kameej naee hai.}
(ii) \textit{ashok kaa ye likhaa huaa sundar patra paRo.}

32. MOD $\rightarrow$ MOD21($^!$) INDCTV ($^!$ indctv) ($^\neg$ ka_ad gen $\equiv_d$ ! gen)
($^\neg$ ka_ad num $\equiv_d$ ! num)
($^\neg$ ka_ad dir_obl $\equiv_d$ ! dir_obl)
COUNT($^\neg$ count) ($^\neg$ ka_ad num $\equiv_d$ ! num)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and a participle phrase, followed by an indicative pronoun phrase followed by a count phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of noun in genitive case phrase and participle (MOD21). The examples adhering to this rule are:

(i) \textit{usakee khelate hue ye donon bachche baRe achchhe hain.}
(ii) \textit{mohan ke phaTee huee ye teenon paint puraane hain.}
33. MOD -> MOD21(\(^=!\)) INDCTV (\(^\text{indctv} =!\) (\(^\text{ka_ad gen} =_d!\) gen)
(\(^\text{ka_ad num} =_d!\) num)
(\(^\text{ka_ad dir_obl} =_d!\) dir_obl)
ADJP (\(^\text{adj} =!\) (\(^\text{ka_ad gen} =_d!\) gen)
(\(^\text{ka_ad num} =_d!\) num)
(\(^\text{ka_ad dir_obl} =_d!\) dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and a participle phrase, followed by an indicative pronoun phrase followed by an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of noun in genitive case phrase and participle (MOD21). The examples adhering to this rule are:

(i)  sudhaa kaa piyaa huaa yah naalaayak pati bekaar hai.
(ii) bhaaee kaa likhaa huaa yah bhaavuk patr mujhe aaj hee milaa.

34. MOD -> MOD21(\(^=!\)) COUNT(\(^\text{count} =!\) (\(^\text{ka_ad num} =_d!\) num)
ADJP (\(^\text{adj} =!\) (\(^\text{ka_ad gen} =_d!\) gen)
(\(^\text{ka_ad num} =_d!\) num)
(\(^\text{ka_ad dir_obl} =_d!\) dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and a participle phrase, followed by a count phrase followed by an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of noun in genitive case phrase and participle (MOD21). The examples adhering to this rule are:

(i)  raahul ke charatee hue teenon kaalee gaayen doodh detee hain.
(ii) raam ke gaate hue donon ghanishth mitra jhoom rahe hain.

35. MOD -> MOD22(\(^=!\)) COUNT(\(^\text{indctv num} =_d!\) num)
ADJP(\(^\text{adj} =!\) (\(^\text{indctv gen} =_d!\) gen) (\(^\text{indctv num} =_d!\) num)
This rule states that a modifier phrase is a combination of an indicative pronoun phrase and a participle phrase, followed by a count followed by an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of indicative pronoun phrase and participle phrase (MOD22). The examples adhering to this rule are:

(i) *ye uRate hue donon hare tote videshee hain.*
(ii) *ye dauRate hue chaaron bachche khush hain.*

36. MOD -> MOD2(^ = !)  COUNT(^ count = !)  (^ ka_ad num = cd ! num)
   ADJP ( ^ adj = !)  ^ ka_ad gen = cd ! gen) ( ^ ka_ad num = cd ! num)
   ( ^ ka_ad dir_obl = cd ! dir_obl)
   V_AD  ( ^ v_ad = !) ( ^ ka_ad gen = cd ! gen) ( ^ ka_ad num = cd ! num)
   ( ^ ka_ad dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and an indicative pronoun phrase followed by a sequence of a count phrase, an adjective phrase and a participle phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of indicative pronoun phrase and noun in genitive case phrase (MOD2). The examples adhering to this rule are:

(i) *suresh kee ve donon saphed charatee huee gaayen doodh detee hain.*
(ii) *mere bhaaee ke ve donon chhoTe ghoomate hue saale abhee parhate hain.*

37. MOD -> MOD2(^ = !)  MOD23  (^ = !)  (^ ka_ad gen = cd ! v_ad gen)
   ( ^ ka_ad num = cd ! v_ad num)
   ( ^ ka_ad dir_obl = cd ! v_ad dir_obl)
   ADJP ( ^ adj = !) ( ^ ka_ad gen = cd ! gen) ( ^ ka_ad num = cd ! num)
   ( ^ ka_ad dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and an indicative pronoun phrase followed by a combination of a count phrase...
and a participle, followed by an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of indicative pronoun phrase and noun in genitive case phrase (MOD2). The examples adhering to this rule are:

(i) suresh kee ve donon charatee huee saphed gaayen doodh detee hain.
(ii) mere bhaaee ke ve donon ghoomate hue chhoTe saale abhee paRRate hain.

38. MOD -> MOD21(^ = !)  INDCTV (^ indctv = !) (^ ka_ad gen = cd ! gen)  
(^ ka_ad num = cd ! num)  
(^ ka_ad dir_obl = cd ! dir_obl)  
COUNT (^ count = !) (^ ka_ad num = cd ! num)  
ADJP (^ adj = !) (^ ka_ad gen = cd ! gen) (^ ka_ad num = cd ! num)  
(^ ka_ad dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a combination of a noun in genitive case phrase and a participle phrase followed by a sequence of an indicative pronoun phrase, a count phrase and, an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of indicative pronoun phrase and noun in genitive case phrase (MOD21). The examples adhering to this rule are:

(i) suresh kee charatee huee ve do saphed gaayen doodh detee hain.
(ii) mere bhaaee ke ghoomate hue ve donon chhoTe saale abhee paRRate hain.

39. MOD -> MOD22(^ = !)  KA_AD  (^ ka_ad = !) (^ indctv gen = cd ! gen)  
(^ indctv num = cd ! num)  
(^ indctv dir_obl = cd ! dir_obl)  
COUNT(^ count = !) (^ indctv num = cd ! num)  
ADJP (^ adj = !) (^ indctv gen = cd ! gen) (^ indctv num = cd ! num)  
(^ indctv dir_obl = cd ! dir_obl)

This rule states that a modifier phrase is a combination of an indicative pronoun phrase and a participle phrase, followed by a sequence of a noun in genitive case
phrase, a count phrase, an adjective phrase. In the rule, the constraint equations test agreement among these phrases. The defining equations which will later establish agreement between modifier phrase and the noun have been attached with the rule forming the combination of indicative pronoun phrase and participle phrase (MOD22). The examples adhering to this rule are:

(i) *ve charatee huee suresh kee do saphed gaayen doodh detee hain.*

(ii) *ghoomatee huee ve mere bhaaee ke donon chhoTe saale abhee paRhate hain.*

40. MOD2 -> KA_AD  \( (\wedge \text{ka\_ad} = !) \) INDCTV  \( (\wedge \text{indctv} = !) \)

\[
\begin{align*}
\wedge \text{num} &= ! \ \text{num} \\
\wedge \text{gen} &= ! \ \text{gen} \\
\wedge \text{dir\_obl} &= ! \ \text{dir\_obl}
\end{align*}
\]

\[
\begin{align*}
\wedge \text{ka\_ad\ gen} &= \text{cd} ! \ \text{gen} \\
\wedge \text{ka\_ad\ num} &= \text{cd} ! \ \text{num} \\
\wedge \text{ka\_ad\ dir\_obl} &= \text{cd} ! \ \text{dir\_obl}
\end{align*}
\]

This rule states that a modifier phrase consists of a noun in genitive case phrase followed by an indicative pronoun phrase. In the rule, the constraint equations test agreement between noun in genitive case phrase and indicative pronoun phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) *raam ke ye kabootar daanaa chug rahe hain.*

(ii) *seetaa ke ye dost kriket achchhaa khelate hain.*

41. MOD2 -> INDCTV  \( (\wedge \text{indctv} = !) \) KA_AD  \( (\wedge \text{ka\_ad} = !) \)

\[
\begin{align*}
\wedge \text{num} &= ! \ \text{num} \\
\wedge \text{gen} &= ! \ \text{gen} \\
\wedge \text{dir\_obl} &= ! \ \text{dir\_obl}
\end{align*}
\]

\[
\begin{align*}
\wedge \text{indctv\ gen} &= \text{cd} ! \ \text{gen} \\
\wedge \text{indctv\ num} &= \text{cd} ! \ \text{num} \\
\wedge \text{indctv\ dir\_obl} &= \text{cd} ! \ \text{dir\_obl}
\end{align*}
\]

This rule states that a modifier phrase consists of an indicative pronoun phrase followed by a noun in genitive case phrase. In the rule, the constraint equations test agreement between noun in genitive case phrase and indicative pronoun phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) *ye seetaa ke ye dost kriket khelate achchhaa hain.*
(ii) *ve raam ke kabootar daanaa chug rahe hain.*

42. MOD21 -> KA_AD ($^\text{ka_ad} = !$) V_AD ($^\text{v_ad} = !$)
   ($^\text{num} = ! \text{num}$) ($^\text{ka_ad gen} = \text{cd} ! \text{gen}$)
   ($^\text{gen} = ! \text{gen}$) ($^\text{ka_ad num} = \text{cd} ! \text{num}$)
   ($^\text{dir_obl} = ! \text{dir_obl}$) ($^\text{ka_ad dir_obl} = \text{cd} ! \text{dir_obl}$)

This rule states that a modifier phrase consists of a noun in genitive case phrase
followed by a participle phrase. In the rule, the constraint equations test agreement
between noun in genitive case phrase and participle phrase. The defining equations for
number, gender and case help later in testing the agreement between modifier phrase
and the noun following it. The examples adhering to this rule are:

(i) *sudhaa kaa khelataa huaa bachchaa achaanak rone lagaa.*

(ii) *raam kaa bhaagataa huaa ghoRaa gir paRaa.*

43. MOD21 -> V_AD ($^\text{v_ad} = !$) KA_AD ($^\text{ka_ad} = !$)
   ($^\text{num} = ! \text{num}$) ($^\text{v_ad gen} = \text{cd} ! \text{gen}$)
   ($^\text{gen} = ! \text{gen}$) ($^\text{v_ad num} = \text{cd} ! \text{num}$)
   ($^\text{dir_obl} = ! \text{dir_obl}$) ($^\text{v_ad dir_obl} = \text{cd} ! \text{dir_obl}$)

This rule states that a modifier phrase consists of a participle phrase followed by a
noun in genitive case phrase. In the rule, the constraint equations test agreement
between noun in genitive case phrase and participle phrase. The defining equations for
number, gender and case help later in testing the agreement between modifier phrase
and the noun following it. The examples adhering to this rule are:

(i) *khelataa huaa sudhaa kaa bachchaa achaanak rone lagaa.*

(ii) *bhaagataa huaa raam kaa ghoRaa gir paRaa.*

44. MOD22 -> INDCTV ($^\text{indctv} = !$) V_AD ($^\text{v_ad} = !$)
   ($^\text{num} = ! \text{num}$) ($^\text{indctv gen} = \text{cd} ! \text{gen}$)
   ($^\text{gen} = ! \text{gen}$) ($^\text{indctv num} = \text{cd} ! \text{num}$)
   ($^\text{dir_obl} = ! \text{dir_obl}$) ($^\text{indctv dir_obl} = \text{cd} ! \text{dir_obl}$)

This rule states that a modifier phrase consists of an indicative pronoun phrase
followed by a participle phrase. In the rule, the constraint equations test agreement
between indicative pronoun phrase and participle phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) \textit{vah khelataa huaa bachchaa raahul kaa hai}.

(ii) \textit{vah khulee huee kitaab raakesh kee hai}.

45. MOD22 -> V\_AD (\(^{\land} v_{\_ad} = ! \)) INDCTV (\(^{\land} \text{indctv} = ! \))

\[
\begin{align*}
&(^{\land} \text{num} = ! \text{num}) & (^{\land} v_{\_ad} \text{ gen} =_{cd} ! \text{gen}) \\
&(^{\land} \text{gen} = ! \text{gen}) & (^{\land} v_{\_ad} \text{ num} =_{cd} ! \text{num}) \\
&(^{\land} \text{dir\_obl} = ! \text{dir\_obl}) & (^{\land} v_{\_ad} \text{ dir\_obl} =_{cd} ! \text{dir\_obl})
\end{align*}
\]

This rule states that a modifier phrase consists of a participle followed by an indicative pronoun phrase. In the rule, the constraint equation tests agreement between participle phrase and indicative pronoun phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) \textit{khulee huee yah kitaab raakesh kee hai}.

(ii) \textit{khelataa huaa vah bachchaa raahul kaa hai}.

46. MOD23 -> COUNT (\(^{\land} \text{count} = ! \)) V\_AD (\(^{\land} v_{\_ad} = ! \))

\[
\begin{align*}
&(^{\land} \text{count num} =_{cd} ! \text{num}) & (^{\land} \text{num} = ! \text{num}) \\
&(^{\land} \text{gen} = ! \text{gen}) \\
&(^{\land} \text{dir\_obl} = ! \text{dir\_obl})
\end{align*}
\]

This rule states that a modifier phrase consists of a count phrase followed by a participle phrase. In the rule, the constraint equation tests agreement between count phrase and participle phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) \textit{maine chaar bhaagate hue choron\'ko dekhaa}.

(ii) \textit{maine teen garajate hue sheron ko dekhaa}.

47. MOD23 -> V\_AD (\(^{\land} v_{\_ad} = ! \)) COUNT (\(^{\land} \text{count} = ! \))

\[
\begin{align*}
&(^{\land} \text{num} = ! \text{num}) & (^{\land} v_{\_ad} \text{ num} =_{cd} ! \text{num})
\end{align*}
\]

42
This rule states that a modifier phrase consists of a participle phrase followed by a count phrase. In the rule, the constraint equation tests agreement between participle phrase and count phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) *maine bhaagte hue chaar chor ko dekhaa.*
(ii) *maine garajte hue teen sheron ko dekhaa.*

48. MOD24 -> V_AD (^v_ad = !) ADJP (^adj = !)

  (^num = ! num)  (^v_ad gen = cd ! gen)
  (^gen = ! gen)  (^v_ad num = cd ! num)
  (^dir obl = ! dir obl)  (^v_ad dir obl = cd ! dir obl)

This rule states that a modifier phrase consists of a participle phrase followed by an adjective phrase. In the rule, the constraint equations test agreement between participle phrase and adjective phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) *bahataa huaa swachcha paane piyo.*
(ii) *uRatee huee haree patang kat gayee.*

49. MOD24 -> ADJP (^adj = !) V_AD (^v_ad = !)

  (^num = ! num)  (^adj gen = cd ! gen)
  (^gen = ! gen)  (^adj num = cd ! num)
  (^dir obl = ! dir obl)  (^adj dir obl = cd ! dir obl)

This rule states that a modifier phrase consists of an adjective phrase followed by a participle phrase. In the rule, the constraint equations test agreement between adjective phrase and participle phrase. The defining equations for number, gender and case help later in testing the agreement between modifier phrase and the noun following it. The examples adhering to this rule are:

(i) *haree uRatee huee patang raahul kee hai.*
2.3.1 Count Phrase

The following rules describe different types of count (numeral) phrase. Symbols APPROX, CARDNL, COLLCT, FRACT, MEASR, MULTP, and ORDN denote approximate, cardinal, collective, fractional, measure, multiplicative and ordinal numerals respectively. This section contains 42 rules to describe count phrase.

The rules proposed to describe the structure of a count phrase are:

1. COUNT -> APPROX(^ = !)
   This rule states that a count phrase is an approximate type. The examples adhering to this rule are:
   (i)  *lagbhag sabhee log chale gaye the.*
   (ii)  *kareeb sabhee log rukenge.*

2. COUNT -> ORDN(^ = !)
   This rule states that a count phrase is an ordinal type. The examples adhering to this rule are:
   (i)  *tum pahalee pankti men khaRe ho jaao.*
   (ii)  *raashtrapati desh kaa pahalaa vyakti hotaa hai.*

3. COUNT -> CARDNL(^ card = ! set)
   This rule states that a count phrase is a cardinal type. The examples adhering to this rule are:
   (i)  *das hajaar logon ne snaan kiyaa.*
   (ii)  *teen sau vidvaanon ne is sabhaa men bhaag liyaa.*

4. COUNT -> MULTP(^ = !)
   This rule states that a count phrase is a multiplicative type. The examples adhering to this rule are:
   (i)  *saaree cheejon ke  paanch gune daam baRh gaye.*
5. COUNT -> FRACT(^ = !)
This rule states that a count phrase is a fractional type. The examples adhering to this rule are:
   (i) isamen aadhee jameen raam kee hai.
   (ii) taalaab kaa do teehaaee paanee sookh gayaa.

6. COUNT -> COLLECT(^ = !)
This rule states that a count phrase is a collective type. The examples adhering to this rule are:
   (i) darjanon bachhon ne khel men bhaag liyaa.
   (ii) yah tote kaa jORa bikaao hai.

7. COUNT -> MEASR(^ = !)
This rule states that a count phrase is a measure type. The examples adhering to this rule are:
   (i) vah roj mutThee bhar chane chabaataa hai.
   (ii) kilo bhar cheenee raate men gir paRee.

8. COUNT -> APPROX(^ = !) MULTP(^ = !)
This rule states that a count phrase is an approximate type followed by a multiplicative type. The examples adhering to this rule are:
   (i) isaka lagbhag duguna bhaaRaa lagegaa.
   (ii) kareeb paanch gune daam baR gaye.

9. COUNT -> APPROX(^ = !) COLLECT(^ = !) bhar
This rule states that a count phrase is an approximate type followed by a collective type. The examples adhering to this rule are:
   (i) lagbhag darzan bhar sev raaste men gir paRe.
   (ii) kareeb kilo bhar aam saR gaye
10. COUNT -> APPROX(\(^=!\)) MEASR(\(^=!\)) _bhar_
This rule states that a count phrase is an approximate type followed by a measure type.
The examples adhering to this rule are:
(i) _lagbhag muTThee bhar cheenee chaahiye._
(ii) _isamen kareeb gaj bhar kapaRaa lagegaa._

11. COUNT -> ORDN(\(^=!\)) COLLECT(\(^=!\))
This rule states that a count phrase is an ordinal type followed by a collective type.
The examples adhering to this rule are:
(i) _chauthee joRee achchhee lag rahee hai._
(ii) _pahalaa darian aam raam ke hai._

12. COUNT -> ORDN(\(^=!\)) MEASR(\(^=!\))
This rule states that a count phrase is an ordinal type followed by a measure type. The
textual examples adhering to this rule are:
(i) _pahalee pyaalee chaay suresh ne pee thee._
(ii) _dusaree Tokaree aam kee maine khareedee thee._

13. COUNT -> CARDNL(\(^\text{card}=!\)) COLLECT(\(^=!\))
This rule states that a count phrase is a cardinal type followed by a collective type.
The examples adhering to this rule are:
(i) _raam ke do joRee chappal kho gaye._
(ii) _teen darian kele saR gaye._

14. COUNT -> CARDNL(\(^=!\)) MEASR(\(^=!\))
This rule states that a count phrase is a cardinal type followed by a measure type. The
textual examples adhering to this rule are:
(i) _chaar pyaalee chaay banaao._
(ii) _usane teen gilaas paanee piyaa._

15. COUNT -> FRACT(\(^=!\)) COLLECT(\(^=!\))
This rule states that a count phrase is a fractional type followed by a collective type.
The examples adhering to this rule are:

(i) *aadhe darjan* bachche bhaag gaye.
(ii) *savaa darjan* santare bandar khaa gaye.

16. COUNT -> FRACT($\wedge = !$) MEASR($\wedge = !$)
This rule states that a count phrase is a fractional type followed by a measure type. The examples adhering to this rule are:

(i) *aadhee pyaalee chaay gir paRee.*
(ii) *aadhaa kilo* cheenee khareed laanaa.

17. COUNT -> AP_CD($\wedge = !$)
This rule states that a count phrase is an approximate type followed by a cardinal type. The examples adhering to this rule are:

(i) *kareeb bees hajaar* logon ne melaa dekhaa.
(ii) *lagbhag tees* aasamiyon ne gangaa snaan kiya.

18. COUNT -> AP_FRAC($\wedge = !$)
This rule states that a count phrase is an approximate type followed by a fractional type. The examples adhering to this rule are:

(i) *lagbhag aadhaa* kaam ho gayaa.
(ii) *kareeb tihaaee* khet jut gayaa.

19. COUNT -> OR_CD($\wedge = !$)
This rule states that a count phrase is an ordinal type followed by a cardinal type. The examples adhering to this rule are:

(i) *pahale paanch* aadamee chun liye gaye.
(ii) *dusare teen* bachche kelanaa jaanate hain.

20. COUNT -> OR_FRAC($\wedge = !$)
This rule states that a count phrase is an ordinal type followed by a fractional type. The examples adhering to this rule are:

(i) *pahalaa chauthaaee* maine le liyaa.
(ii) *dusaraa tihaaee usako de diyaa.*

21. **COUNT -> AP_CD(\(\wedge = 1\)) \ COLLECT(\(\wedge = 1\))**

This rule states that a count phrase is a sequence of an approximate type, a cardinal type followed by a collective type numeral. The examples adhering to this rule are:

(i) *kareeb bees darjan anDe TooT gaye.*

(ii) *lagbhag das joRee saRiyaa daan deen.*

22. **COUNT -> AP_CD(\(\wedge = 1\)) MEASR(\(\wedge = 1\))**

This rule states that a count phrase is a sequence of an approximate type, cardinal type followed by a measure type numeral. The examples adhering to this rule are:

(i) *lagbhag do pyaalee chaay gir paRee.*

(ii) *kareeb teen kilo aam saRe nikale.*

23. **COUNT -> AP_FRACT(\(\wedge = 1\)) COLLECT(\(\wedge = 1\))**

This rule states that a count phrase is a sequence of an approximate type, fractional type followed by a collective type numeral. The examples adhering to this rule are:

(i) *lagbhag aadha darjan sev saR gaye.*

(ii) *jangal ke kareeb aadhe darjan sher mar gaye.*

24. **COUNT -> AP_FRACT(\(\wedge = 1\)) MEASR(\(\wedge = 1\))**

This rule states that a count phrase is sequence of an approximate type, fractional type followed by a measure type numeral. The examples adhering to this rule are:

(i) *sahjee men kareeb paunaa kilo TamaaTar lagegaa.*

(ii) *lagbhag aadhaa Tokaree aam bik paaye.*

25. **COUNT -> OR_CD(\(\wedge = 1\)) COLLECT(\(\wedge = 1\))**

This rule states that a count phrase is a sequence of an ordinal type, cardinal type followed by a collective type numeral. The examples adhering to this rule are:

(i) *pahalee paanch joRee joote das nambar ke hain.*

(ii) *pahale das darjan kambal gareebon ko haanT do.*
26. COUNT -> OR_CD(\(^= !\)) MEASR(\(^= !\))
This rules states that a count phrase is a sequence of an ordinal type, cardinal type
followed by a measure type numeral. The examples adhering to this rule are:
   (i) *pahale das gaj men bagheecha hanaa lo.*
   (ii) *pahalee das pyaalee chay khatam ho gayee hai.*

27. COUNT -> OR_FRAC(\(^= !\)) COLLCT(\(^= !\))
This rule states that a count phrase is a sequence of an ordinal type, fractional type
followed by a collective type numeral. The examples adhering to this rule are:
   (i) *pahale aadhaa darjan sev pak gaye.*

28. COUNT -> OR_FRAC(\(^= !\)) MEASR(\(^= !\))
This rule states that a count phrase is a sequence of an ordinal type, fractional type,
followed by a measure type numeral. The examples adhering to this rule are:
   (i) *pahalaa tihaaee pyaalee chaay maine pee.*
   (ii) *doosaraa tihaaee pyaalee chaay usane pee.*

29. AP_FRAC -> APPROX(\(^= !\)) FRACT(\(^= !\))
This rule states that a count phrase is an approximate type followed by a fractional
type. The examples adhering to this rule are:
   (i) *lagbhag tihaaee botal tel giraa.*
   (ii) *kareeb aadhaa baaltee paanee hai.*

30. OR_CD -> ORDN(\(^= !\)) CARDNL(\(^= !\) set)
This rule states that a count phrase is an ordinal type followed by a cardinal type. The
text adhering to this rule are:
   (i) *pahale paanch aadamee chun liye gaye.*
   (ii) *dusare teen bachche kelanaa jaanate hain.*

31. OR_FRAC -> ORDN(\(^= !\)) FRACT(\(^= !\))
This rule states that a count phrase is an ordinal type followed by a fractional type.
The examples adhering to this rule are:
(i)  *pahalaa chauthaaee* maine le liyaa.
(ii) *dusaraa thihaee* usako de diyaa.

32. MULTP -> CARDNL(\(\wedge = !\))  MULTMK(\(\wedge = !\))
This rule states that a multiplicative type phrase is a cardinal type followed by a
multiplicative marker (i.e., gunaa). The examples adhering to this rule are:
(i)  *maine aaf paanch gunaa kaam kiyaa.*
(ii)  *vah roj teen gunaa jyaadaa kaam karataa hai.*

33. MEASR -> N(\!measure = ci +)  (\(^ = !\))
34. CARDNL -> CARDN(\!card \in set) \sqcup
   CARDN(\!card \in ^set)  CARDNI(\!card \in ^set)  CARDNL(\!set \in ^set)
This rule accounts for different permissible sequences of cardinals.
The symbol CARDN may take any numeral value from one to ninety nine. The
symbol CARDNI takes any value like sau, hajaar, laakh etc. The examples
adhering to this rule are:
(i)  *ek hajaar teen sau chaar aadamee the.*
(ii)  *ek laakh log the.*

2.3.2 Adjective phrase
The following rules describe structure of an adjective phrase. Symbols ADJ, ADJP,
and CMP_MRK denote adjective, adjective phrase, and comparative marker,
respectively. Symbols DGRE1 and DGRE2 denote degree marker. This section
contains 8 rules to describe adjective phrase.

The rules proposed to describe the structure of a adjective phrase are:

1. ADJP -> ADJP1 (\(^ ad_i = !\))  ADJP(\(^ = !\))
   (\(^ gen = ! gen\))
   (\(^ num = ! num\))
   \(i = 2..n\)
This rule works in conjunction with rule number two. The rule states that an adjective phrase consists of more than one adjectives. This rule is applicable only when the gender information of all adjectives is identical. This condition is taken care of at the time of unification. All these adjectives are indexed as $ad_1, ad_2, \ldots, ad_n$ to differentiate them inside the f-structure of the adjective phrase formed by them. For this rule index varies from 2 to the maximum number of adjectives forming the adjective phrase. Index 1 is used in the rule number two which terminates this rule. Starting of index from 2 helps in making the index variable local to this rule only, otherwise the track of the index has to be made known to the rule number two. The examples adhering to this rule are:

(i) $hare, peele, neele gubbaare uR rahe the.$

(ii) $usakee bhee seeetaa kee see kaalee bhuree aakhen hain.$

2. $ADJP \rightarrow ADJP1(^{ad1} = !) (^{gen} = ! gen) (^{num} = ! num)$

3. $ADJP1 \rightarrow ADJ(^{ad} = !) \mid NP(^{noun} = !) CMP_{MRK}(^{num} = !) ADJ(^{ad} = !) \mid \quad DGRE1(^{ad} = !) \quad ADJ(^{ad} = !) \mid \quad ADJ(^{ad} = !) \quad DGRE2(^{ad} = !)$

This rule states that an adjective is either a qualitative adjective, nouns and qualitative adjective joined by a comparative marker, or qualitative adjectives preceded/followed by a degree markers. The examples adhering to this rule are:

(i) $sundar vastuen sabako achchhee lagatee hain.$

(ii) $usakee seeetaa kee see sundar aankhen thee.$

(iii) $vah ati sundar laRakee thee.$

(iv) $bhaarat ratn bhaarat kaa mahaanatam puruskaar hai.$

2.3.3 Noun in Genitive Case Phrase

The following rules describe structure of a noun in genitive case phrase. Symbols KA, KA_AD and NP9 denote genitive case marker (i.e. kaa, ke, kee), noun in genitive case phrase and noun phrase, respectively. This section contains 6 rules to describe noun in genitive case phrase.

The rules proposed to describe the structure of a noun in genitive case phrase are:
This rule states that a noun in genitive is a noun phrase followed by a genitive case marker. The noun phrase present here is either a noun, an adjective or a pronoun. In the rule, the defining equations for number and gender helps later in testing the agreement between the modifier and the noun following it. The examples adhering to this rule are:

(i) sohan kaa bhaahee adhyaapak ban gayaa hai.
(ii) raam kee laRakee paas ho gayaa hai.

This rule works in conjunction with the previous rule (i.e. rule number two). The rule states that a noun in genitive case phrase consists of more than one noun in genitive case. This rule is applicable only when the gender and number information of all nouns phrase in genitive case are identical. This rules is terminated by application of previous rule at the end. The constraint equations test the number and gender agreement among all the nouns in genitive case. The examples adhering to this rule are:

(i) sohan kaa bhaahee kaa laRakaa adhyaapak ban gayaa hai.
(ii) raam kee laRakee kaa laRakaa paas ho gayaa hai.

2.3.4 Indicative Phrase

The following rules describe structure of an indicative phrase. Symbols DEMO, INDCTV, INDEF, INTRO, PROX, REFLX, REL and REMOT denote demonstrative pronouns, indicative pronouns, indefinite pronouns, interrogative pronouns, proximate pronouns, reflexive pronouns, relative pronouns and remote pronouns. This section contains 17 rules to describe indicative pronoun phrase.
The rules proposed to describe the structure of an adjective phrase are:

1. $\text{INDCTV} \rightarrow \text{DEMO}(^\wedge = !) \mid \text{INDEF}(^\wedge = !) \mid \text{INTRO}(^\wedge = !) \mid \text{REFLX}(^\wedge = !) \mid \text{REL}(^\wedge = !)$

   This rule states that an indicative pronoun phrase is either demonstrative, indefinite, interrogative, reflexive pronouns, and relative pronouns. The examples adhering to this rule are:
   
   (i) $\text{ve chhar laRake khel rahe hain}$.
   (ii) $\text{kuchh laRake khel rahe hain}$.
   (iii) $\text{kis aadamee ko bulaanaa hai}$.
   (iii) $\text{shyaam kaa apanaa aa raha hai}$.

2. $\text{DEMO} \rightarrow \text{PROX}(^\wedge = !) \mid \text{REMOT}(^\wedge = !)$

   This rule states that a demonstrative pronoun is either proximate or remote. The examples adhering to this rule are:
   
   (i) $\text{ve chhar laRake khel rahe hain}$.
   (ii) $\text{ve vidyaarthee parh rahe hain}$.

2.3.5 Participle Phrase

The following rules describe different types of participle phrase. A participle phrase is a participle form of the verb which may be preceded by either a subject, an object, subject and indirect object, or object and indirect object. A verb in participle form is either a verb in perfect or imperfect aspect, which may be followed by auxiliary suffix. In the following rules symbols $\text{ADVP}$, $\text{MPP}$, $\text{SP}$, $\text{V}$ and $\text{V_AD}$ denote adverb phrase, primary aspect suffix ($\text{moolpaksh pratyaya}$), participle suffix ($\text{sahaayak pratyaya}$), verb and participle, respectively. Symbols $\text{GFS4}$, $\text{GFS5}$, $\text{GFS6}$, $\text{GFS7}$, $\text{GFS8}$, $\text{GFS9}$ and $\text{GFS10}$ denote grammatical functions, and an intermediate symbol $\text{V_MPP_SP}$ denotes sequence of verb, primary aspect suffix and participle suffix.

The rules proposed to describe the structure of a participle are:
1. \( \text{V\_AD} \rightarrow \text{ADVP}(\wedge = !) \quad \text{V\_MPP\_SP}(\wedge = !) \) (\(^\wedge \text{type} = 1\))

This rule \( \text{V\_MPP\_SP} \) stands for a sequence of verb, primary aspect suffix (\textit{moolpaksh pratyaya}) and may be a participle suffix (\textit{sahaayak pratyaya}). This rule states that a participle phrase is a sequence of an adverb phrase, verb, primary aspect suffix and participle suffix. The defining equation in the rule sets value of the attribute "type" either 1 or 2. This later at noun phrase level, helps in referring the noun following the modifier phrase either as subject or object of the verb present in participle phrase. The value 1 of the attribute "type" states that the noun following the modifier phrase has to be referred to as subject and value 2 of the attribute "type" states that the noun following the modifier phrase has to be referred to as an object. The examples adhering to this rule are:

(i) \textit{bageeche me khelataa huaa bachchaa bahut sundar hai.}
(ii) \textit{seeRhiyaan chaRhatee huee aurat phisal paRee.}

2. \( \text{V\_AD} \rightarrow \text{V\_MPP\_SP}(\wedge = !) \) (\(^\wedge \text{type} = 1\))

This rule states that a participle phrase is a sequence of a verb, primary aspect suffix and participle suffix. The examples adhering to this rule are:

(i) \textit{bahataa huaa paanee swachchh rahataa hai.}
(ii) \textit{bhaagatee huee laRakiyaan haanph rahee hain.}

3. \( \text{V\_AD} \rightarrow \text{GFS4}(\wedge = !) \quad \text{V\_MPP\_SP}(\wedge = !) \) (\(^\wedge \text{type} = 1\))

In this rule GFS4 stands for a grammatical function consisting of an object may be followed by an adverb phrase. This rule states that a participle phrase is either a sequence of an object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a sequence of an object, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:

(i) \textit{mohan ko laaThee se peeTataa huaa aadamee usakaa baRaa bhaae hai.}
(ii) \textit{suresh ko vidaa karke aate laRake usakedost hain.}

4. \( \text{V\_AD} \rightarrow \text{ADVP}(\wedge = !) \quad \text{GFS4}(\wedge = !) \quad \text{V\_MPP\_SP}(\wedge = !) \) (\(^\wedge \text{type} = 1\))

This rule states that a participle phrase is either a sequence of an adverb phrase,
object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a 
sequence of an adverb phrase, object, verb, primary aspect suffix and may be 
participle suffix. The examples adhering to this rule are:

(i) *laaThee se mohan ko peeTataa huq aadamee usakaa baRaa bhaaee hai.*
(ii) *chammach se chaaval khatee huue auraten amereekee hain.*

5. $V_{AD} \rightarrow GFS5(^\neq !) \ V_{MPP}\_SP(^\neq !) (^\text{type} = 2)$

In this rule $GFS5$ stands for a grammatical function consisting of a subject may be 
followed by an adverb phrase. This rule states that a participle phrase is either a 
sequence of a subject, adverb phrase, verb, primary aspect suffix and may be participle 
suffix, or a sequence of a subject, verb, primary aspect suffix and may be participle 
suffix. The examples adhering to this rule are:

(i) *kalam se raam dvaaaraa likhaa huaa khat mujhe mil gayaa.*
(ii) *kamare men maan dvaaaraa rakhee huuve kameejen kho gayee.*

6. $V_{AD} \rightarrow ADVP(^\neq !) GFS5(^\neq !) \ V_{MPP}\_SP(^\neq !) (^\text{type} = 2)$

This rule states that a participle phrase is either a sequence of an adverb phrase, 
subject, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a 
sequence of an adverb phrase, subject, verb, primary aspect suffix and may be participle 
suffix. The examples adhering to this rule are:

(i) *raam dvaaaraa kalam se likhaa huaa khat mujhe mil gayaa.*
(ii) *maan dvaaaraa kamare men rakhee huuve kameej kho gayee.*

7. $V_{AD} \rightarrow GFS6(^\neq !) \ V_{MPP}\_SP(^\neq !) (^\text{type} = 1)$

In this rule $GFS6$ stands for a grammatical function consisting of a sequence of an 
indirect object, adverb phrase and an object where adverb phrase is an optional 
constituent. This rule states that a participle phrase is either a sequence of an indirect 
object, adverb phrase, object, verb, primary aspect suffix and may be participle suffix, 
or a sequence of an indirect object, object, verb, primary aspect suffix and may be 
participle suffix. The examples adhering to this rule are:

(i) *rakesh ko kalam se khat likhataa huq laRakaa usakaa puraanaa dost hai.*
(ii) *mohan ko almaaree se nikaalkar pustaken dete hue viddyaarthee hichkichaa*
rahaa thaa.

8. V_AD -> ADVP(= !) GFS6(= !) V_MPP_SP(= !) (type = 1)
This rule states that a participle phrase is either a sequence of an adverb phrase, indirect object, adverb phrase, object, verb, primary aspect suffix and may be participle suffix, or a sequence of an adverb phrase, indirect object, object, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:
   (i) kalam se rakesh ko khat likhataa huaa laRakaa usakaa puraanaa dost hai.
   (ii) almaaree se nikaalkar mohan ko pustak dete hue viddyaarthee hichkichaara haa haa.

9. V_AD -> GFS7(= !) V_MPP_SP(= !) (type = 2)
In this rule GFS7 stands for a grammatical function consisting of a sequence of an indirect object, an adverb phrase, and a subject where adverb phrase is an optional constituent. This rule states that a participle phrase is either a sequence of an indirect object, adverb phrase, subject, verb, primary aspect suffix and may be participle suffix, or a sequence of an indirect object, subject, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:
   (i) bachche ko khareedkar pitaa dvaaraa diyaa khilaunaa TooT gayaa.
   (ii) dhobee ko dhone ke liye mere dee huee saarinyaan phaT gayeen.

10. V_AD -> ADVP(= !) GFS7(= !) V_MPP_SP(= !)
This rule states that a participle phrase is either a sequence of an adverb phrase, indirect object, adverb phrase, subject, verb, primary aspect suffix and may be participle suffix, or a sequence of an adverb phrase, indirect object, subject, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:
   (i) khareedkar bachche ko pitaa dvaaraa diyaa khilaunaa TooT gayaa.
   (ii) dhone ke liye dhobee ko mere dee huee saariyaan phaT gayeen.

11. V_AD -> GFS8(= !) V_MPP_SP(= !) (type = 1)
In this rule GFS8 stands for a grammatical function consisting of a sequence of an object, adverb phrase, indirect object and adverb phrase, where adverb phrase is an optional constituent. This rule states that a participle phrase is either a sequence of an object, adverb phrase, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a sequence of an object, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix or a sequence of an object, adverb phrase, indirect object, verb, primary aspect suffix and may be participle suffix, or a sequence of an object, indirect object, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:

(i) *pustak almaaree se nikaalkar mohan ko detaa huaa raam hichkichaa rahaa thaa.*

(ii) *khat kalam se rakesh ko likhatee huee laRakee usakee chhoTee bahan hai.*

12. \( V_{AD} \rightarrow ADVP(\wedge = 1) \) GFS8(\(\wedge = 1\)) V_MPP_SP(\(\wedge = 1\)) (\(^\wedge\) type = 1)

This rule states that a participle phrase is either a sequence of an adverb phrase, object, adverb phrase, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a sequence of an adverb phrase, object, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix or a sequence of an adverb phrase, object, indirect object, verb, primary aspect suffix and may be participle suffix, or a sequence of an adverb phrase, object, indirect object, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:

(i) *almaaree se nikaalkar pustak mohan ko detaa huaa raam hichkichaa rahaa hai.*

(ii) *kalam se khat rakesh ko likhatee huee laRakee usakee chhoTee bahan hai.*

13. \( V_{AD} \rightarrow GFS9(\wedge = 1) \) V_MPP_SP(\(\wedge = 1\)) (\(^\wedge\) type = 2)

In this rule GFS9 stands for a grammatical function consisting of a sequence of a subject, adverb phrase, indirect object and adverb phrase, where adverb phrase is an optional constituent. This rule states that a participle phrase is either a sequence of a subject, adverb phrase, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a sequence of a subject, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a sequence of a subject, indirect object, adverb phrase,
verb, primary aspect suffix and may be participle suffix or a sequence of a subject, adverb phrase, indirect object, verb, primary aspect suffix and may be participle suffix, or a sequence of a subject, indirect object, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:

(i) *pitaa dvaaraa khareedkar bachchee ko dee hee guRiyaa aankhen TapTapaatee hai.*

(ii) *mere dvaaraa daak se maan ko bheje hue patra gaayab ho gaye.*

14. $V\_AD$ -> $ADVP(^=!)\ GFS9(^=!)\ V\_MPP\_SP(^=!)\ (^$ type = 2)$

This rule states that a participle phrase is either a sequence of an adverb phrase, subject, adverb phrase, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix, or a sequence of an adverb phrase, subject, indirect object, adverb phrase, verb, primary aspect suffix and may be participle suffix or a sequence of an adverb phrase, subject, adverb phrase, indirect object, verb, primary aspect suffix and may be participle suffix or a sequence of an adverb phrase, subject, indirect object, verb, primary aspect suffix and may be participle suffix. The examples adhering to this rule are:

(i) *khareedkar pitaa dvaaraa bachchee ko dee hee guRiyaa aankhen TapTapaatee hai.*

(ii) *daak se mere dvaaraa maan ko bheje hue patra gaayab ho gaye.*

15. $GFS4$ -> $OBJ(^\ obj = !)\ ADVP(^=!)$

This rule states that a grammatical function $GFS4$ is an object followed by a an adverb phrase. The examples adhering to this rule are:

(i) *mohan ko laaThee se peeTataa huaa aadamee usaka aRaa bhaaee hai.*

(ii) *bachche ko doodh pilaatee aurat usakee maan hai.*

16. $GFS4$ -> $OBJ(^\ obj = !)$

This rule states that a grammatical function $GFS4$ is an object. The examples adhering to this rule are:

(i) *chaaval khataa huaa aadamee amereek ee hai.*

(ii) *doodh peetaa huaa bachcha ro rahaa hai.*
17. **GFS5** $\rightarrow$ **SUBJ**($^\wedge$ subj $= !$) **ADVP**($^\wedge$ $= !$)

This rule states that a grammatical function GFS5 is a subject followed by a an adverb phrase. The examples adhering to this rule are:

(i) *maan dvaaraa kamare men rakhee huee kameej kho gayee.*

(ii) *pita aa dvaaraa uphaar men dee ghaRee TooT gayee.*

18. **GFS5** $\rightarrow$ **SUBJ**($^\wedge$ subj $= !$)

This rule states that a grammatical function GFS5 is a subject. The examples adhering to this rule are:

(i) *raam dvaaraa likhaa huaa khat mujhe mil gayaa.*

(ii) *bhaaee dvaaraa bhejaa patra mujhe mil gayaa.*

19. **GFS6** $\rightarrow$ **IOBJ**($^\wedge$ iobj $= !$) **ADVP**($^\wedge$ $= !$) **GFS4**($^\wedge$ $= !$)

This rule states that a grammatical function GFS6 is either a sequence of indirect object, adverb phrase, object and adverb phrase, or a sequence of indirect object adverb phrase and object. The examples adhering to this rule are:

(i) *mohan ko almaaree se nikaalkar pustak khushee se detaa huaa raam muskaraa rahaa hai.*

(ii) *mohan ko almaaree se nikaalkar pustak detaa huaa raam muskaraa rahaa hai.*

20. **GFS6** $\rightarrow$ **IOBJ**($^\wedge$ iobj $= !$) **GFS4**($^\wedge$ $= !$)

This rule states that a grammatical function GFS6 is either a sequence of indirect object, object and adverb phrase, or a sequence of indirect object and object. The examples adhering to this rule are:

(i) *mohan ko pustak khushee se detaa huaa raam muskaraa rahaa hai.*

(ii) *rakesh ko khat likhataa huaa laRaakaa usakaa puraanaa dost hai.*

21. **GFS7** $\rightarrow$ **IOBJ**($^\wedge$ iobj $= !$) **ADVP**($^\wedge$ $= !$) **GFS5**($^\wedge$ $= !$)

This rule states that a grammatical function GFS7 is either a sequence of indirect object, adverb phrase, subject and adverb phrase, or a sequence of indirect object,
adverb phrase and subject. The examples adhering to this rule are:

(i)  *mohan ko khushee se raam dyaaraa almaaloo se nikaalakar dee huee pustak achchhee hai.*

(ii) *rakesh ko khushee se rekhaa dyaaraa likhoo patra mil gayaa.*

22. GFS7 -> IOBJ(\obj = !) GFS5(\ = !)

This rule states that a grammatical function GFS7 is either a sequence of indirect object, subject and adverb phrase, or a sequence of indirect object and subject. The examples adhering to this rule are:

(i)  *bachche ko pitaa dyaaraa pyaar se diyaa huaa khilaunaa TooT gayaa.*

(ii) *dhobe ko mere diye hue kapaRe phaT gaye.*

23. GFS8 -> GFS4(\ = !) GFS10(\ = !)

This rule states that a grammatical function GFS8 is either a sequence of an object, adverb phrase, indirect object and adverb phrase, or a sequence of object, adverb phrase and indirect object, or sequence of object, indirect object and adverb phrase, or object and indirect object. The examples adhering to this rule are:

(i)  *pustak khushee se mohan ko pyaar se detaa huaa raam muskaraa raha thaa.*

(ii) *pustak khushee se mohan ko detaa huaa raam muskaraataa hai.*

(iii) *pustak mohan ko pyaar se detaa huaaam muskaraataa hai.*

(iv) *pustak mohan ko detaa huaaam muskaraa raha thaa.*

24. GFS9 -> GFS5(\ = !) GFS10(\ = !)

This rule states that a grammatical function GFS9 is either a sequence of a subject, adverb phrase, indirect object and adverb phrase, or a sequence of subject, adverb phrase and indirect object, or sequence of subject, indirect object and adverb phrase, or subject and indirect object. The examples adhering to this rule are:

(i)  *pitaa dyaaraa khareedkar bachchee ko pyaar se dee hee guRiyaa aankhen TapTapaatee hai.*

(ii) *pitaa dyaaraa khareedkar bachchee ko dee hee guRiyaa aankhen TapTapaatee hai.*

(iii) *pitaa dyaaraa bachchee ko pyaar se dee hee guRiyaa aankhen TapTapaatee
25. GFS10 -> IOBJ(^ iobj = !) ADVP(^ = !)
This rule states that the grammatical function GFS10 is an indirect object followed by an adverb phrase. The example adhering to this rule is:
   \textit{rakesh ko kalam se khat likhataa huaa laRakaa usakaa puraanaa dost hai.}

26. GFS10 -> IOBJ(^ iobj = !)
This rule states that the grammatical function GFS10 is an indirect object. The example adhering to this rule is:
   \textit{rakesh ko khat likhataa huaa laRakaa usakaa puraanaa dost hai.}

27. V_MPP_SP -> V(^ = !) MPP(^ = !) SP(^ = !)
This rule states that an intermediate symbol V_MPP_SP is a sequence of verb root, aspect suffix and auxiliary suffix. The example adhering to this rule is:
   \textit{baha faa huaa paanee peenaa chaahiye.}

28. V_MPP_SP -> V(^ = !) MPP(^ = !)
This rule states that an intermediate symbol V_MPP_SP is a verb root followed by an aspect suffix. The example adhering to this rule is:
   \textit{bhaaga faa ghoRaa arabee hai.}

2.4 Lexical Entry for Nouns

Noun roots are inflected by number, gender and case markers. Nouns are always in third person. There are two numbers - singular and plural, two genders - masculine and feminine, and two case - direct and oblique. Pronouns are inflected by person also. Thus, the lexical entry for a noun contains the root (or word) noun/pronoun, syntactic category of the word, number, gender, person attributes, and the semantic information. These semantic information consists of predicate and some other features of the noun.
such as 'animate', 'human'. The number, gender, person and semantic information are stored in form of functional equations. Following are some examples of lexical entries for some nouns:

**laRaka**: noun
- ^gender = masculine
- ^number = singular
- ^case = direct
- ^predicate = 'laRaka'
- ^type = common
- ^animate = +
- ^human = +

**shaadee**: noun
- ^gender = feminine
- ^number = singular
- ^case = direct
- ^predicate = 'shaadee'
- ^type = common
- ^verbal_noun = +

**raat**: noun
- ^gender = feminine
- ^number = singular
- ^case = direct
- ^predicate = 'shaadee'
- ^type = common
- ^advtype = +

**ham**: pronoun
- ^number = plural
- ^case = direct
- ^pred = 'ham'
- ^type = personal

**hamko**: pronoun
- ^number = plural
- ^case = oblique
- ^pred = 'ham'
- ^type = personal

2.5 Lexical Entry for Modifiers

Like nouns, the lexical entry for an adjective contains the root, syntactic category of it, its number gender and case information, and semantic information. Following are some examples of lexical entries for adjectives:

**baRaa**: adjective
- ^gender = masculine
- ^number = singular
- ^pred = 'baRaa'
- ^type = qualitative
- ^noun_type = +

**sundar**: adjective
- ^pred = 'baRaa'
- ^type = qualitative
sau : CARDNI  hazaar : CARDNI  ek : CARDN  do : CARDN
(\(^\text{card} = 'sau'\))  (\(^\text{card} = 'hazaar'\))  (\(^\text{card} = 'ek'\))  (\(^\text{card} = 'do'\))

lagabhag : APPROX  kareeb : APPROX  pahalaa : ORDN
(\(^\text{approx} = 'lagabhag'\))  (\(^\text{approx} = 'kareeb'\))  (\(^\text{ord} = 'pahalaa'\))

teesaraa : ORDN  gunaa : MULT  savaa : FRACT
(\(^\text{ord} = 'teesaraa'\))  (\(^\text{mulp} = 'gunaa'\))  (\(^\text{fract} = 'savaa'\))
aadhaa : FRACT  joRaa : COLLECT  darzan : COLLECT
(\(^\text{fract} = 'aadhaa'\))  (\(^\text{coll} = 'joRaa'\))  (\(^\text{coll} = 'darzan'\))

kilo : MEASR  gaj : MEASR  yah : PROX  aisa : PROX
(\(^\text{meas} = 'kilo'\))  (\(^\text{meas} = 'gaj'\))  (\(^\text{prox} = 'yah'\))  (\(^\text{prox} = 'aisa'\))
vah : REMOT  vaisaa : REMOT  apanaa : REFLX
(\(^\text{indctv} = 'vah'\))  (\(^\text{indctv} = 'vaisaa'\))  (\(^\text{indctv} = 'apanaa'\))
svayam : REFLX  jo : REL  jaisaa : REL  koi : INDEF
(\(^\text{indctv} = 'svayam'\))  (\(^\text{indctv} = 'jo'\))  (\(^\text{indctv} = 'jaisaa'\))  (\(^\text{indctv} = 'koi'\))
kuchh : INDEF  kyaa : INTRO  kaun : INTRO
(\(^\text{indctv} = 'kuchh'\))  (\(^\text{indctv} = 'kyaa'\))  (\(^\text{indctv} = 'kaun'\))

kaa : KA  ke : KA  kee : KA
(\(^\text{ka} = 'kaa'\))  (\(^\text{ka} = 'ke'\))  (\(^\text{ka} = 'kee'\))
gunaa : MULTMK  men : CRK_MRK  se : CRK_MRK
(\(^\text{mlpmrk} = 'gunaa'\))  (\(^\text{cpmrk} = 'men'\))  (\(^\text{cpmrk} = 'se'\))

ati : DGRE1  maha : DGRE1  tam : DGRE2  tar : DGRE2
(\(^\text{degree} = 'ati'\))  (\(^\text{degree} = 'maha'\))  (\(^\text{degree} = 'tam'\))  (\(^\text{degree} = 'tar'\))