GRAMMAR

NUMERALS IN POLISH AND ENGLISH

Maciej Sienicki

University of Warsaw

1.0 The fact that the starting point of our syntactic and morphophonological discussion is a part of speech notion will obscure the line of argumentation and divide it into loosely connected topics not all of them being presentable by means of consistently ordered rules. Thus we did not attempt at formalizing all the problems discussed in this paper still the rules analyzing morphophonetic problems of numerals as well as those analyzing their place in the constituent structure of Polish sentence are ordered.

1.1 The string I $\quad$ S→NP+VP is expanded for our purpose as

$$\text{II} \quad \text{NP} \to (\text{Det}) + \text{N} \quad (\text{S})$$

where

$$\text{III} \quad \text{N} \to \begin{Bmatrix} N_m \\ N_f \\ N_n \end{Bmatrix} + C \quad \text{Numb}$$

Nouns are grouped here according to their grammatical gender since the declension of numerals depends on the gender of the noun they determine.

N_n (non-personal masculine and neuter) — okno, samochód

N_f — kobieta, droga

N_m (personal masculine) — chłop, żołnierz

$$\text{IV} \quad \text{Numb} \to \begin{Bmatrix} \text{Sing} \\ \text{Plur} \end{Bmatrix}$$

Sing. co-occurs only with D_n and Adj_n; see below

$$\text{V} \quad \text{C} \to \text{Nom, Gen, Dat, Acc, Intr, Loc.}$$

$$\text{VI} \quad \text{Det} \to \begin{Bmatrix} \text{Quant} \\ D_n \end{Bmatrix}$$

By the rule VI we differentiate "jedn-" from numerals. It is generally agreed upon that "jedn-" should be treated as a demonstrative pronoun because of its declensional similarity to "ten, ta, to". What is more if "jedn-" were to find its place in the category Quant it should not take the Plural morpheme which it does functioning as a synonyme of "pewien", "któryś", "jakiś", "ów" etc.

$$\text{VII} \quad \text{Quant} \rightarrow \begin{Bmatrix} \text{Nrł} \\ \text{Q} \end{Bmatrix}$$

The formal criterion sanctioning the inclusion of some quantifying words (see the Lexicon page 200) in the class Quant is the fact that analogically to numerals as defined hereby they do not take Numb morpheme, they are inflected according to the gender of the N they quantify and in some instances they govern the case of the noun (see below rules XIV and XV).

$$\text{VIII} \quad \text{Nrl} \rightarrow (\text{Nrl}_D) + \begin{Bmatrix} (\text{Nrl}_B) \\ (\text{Nrl}_C) + (\begin{Bmatrix} \text{Nrl}_A \\ D_n \end{Bmatrix}) \end{Bmatrix}$$

The parentheses indicate that the choices are optional but if the symbol Nrl is chosen in the derivation at least one symbol from the right side of the rule must be chosen.

$$\text{IX} \quad \text{Nrl}_A \rightarrow \begin{Bmatrix} \text{Nu}_1 \\ \text{Nu}_2 + \text{C} \end{Bmatrix}$$

$$\text{X} \quad \text{Nrl}_B \rightarrow \begin{Bmatrix} \text{Nu}_3 + \text{C} \\ \text{Nu}_4 + \text{C} \end{Bmatrix}$$

$$\text{XI} \quad \text{Nrl}_C \rightarrow \text{Nu}_5 + \text{C}$$

$$\text{XII} \quad \text{Nrl}_D \rightarrow \text{Nu}_6 + \text{C}$$

For the Lexicon see page 200

The grammatical relation between Nu_1 and the noun it determines is that of agreement in case.

$$\text{XIII} \quad \text{Nu}_1 + \text{N} + \text{C} + \text{Numb} \Rightarrow \text{Nu}_1 + \text{C} + \text{N} + \text{C} + \text{Plur}$$

On the other hand Nu_2, Nu_3, Nu_4, Nu_5, Nu_6 and Quantifiers govern the case of the noun they determine if they are in the Nom, Gen and Acc case.

$$\text{XIV} \quad \begin{bmatrix} \text{Nu}_2 \\ \text{Nu}_3 \\ \text{Nu}_4 \\ \text{Nu}_5 \\ \text{Nu}_6 \\ \text{Q} \end{bmatrix} + \begin{bmatrix} \text{Nom} \\ \text{Acc} \\ \text{Gen} \end{bmatrix} + \text{N} + \text{C} + \text{Plur.} \Rightarrow \begin{bmatrix} \text{Nu}_2 \\ \text{Nu}_3 \\ \text{Nu}_4 \\ \text{Nu}_5 \\ \text{Nu}_6 \\ \text{Q} \end{bmatrix} + \begin{bmatrix} \text{Nom} \\ \text{Acc} \\ \text{Gen} \end{bmatrix} + \text{N} + \text{Gen} + \text{Plur}$$

$$\text{XV} \quad \begin{bmatrix} \text{Nu}_2 \\ \text{Nu}_3 \\ \text{Nu}_4 \\ \text{Nu}_5 \\ \text{Nu}_6 \\ \text{Q} \end{bmatrix} + \begin{bmatrix} \text{Dat} \\ \text{Instr} \\ \text{Loc} \end{bmatrix} + \text{N} + \text{C} + \text{Plur.} \Rightarrow \begin{bmatrix} \text{Nu}_2 \\ \text{Nu}_3 \\ \text{Nu}_4 \\ \text{Nu}_5 \\ \text{Nu}_6 \\ \text{Q} \end{bmatrix} + \begin{bmatrix} \text{Dat} \\ \text{Instr} \\ \text{Loc} \end{bmatrix} + \text{N} + \begin{bmatrix} \text{Dat} \\ \text{Instr} \\ \text{Loc} \end{bmatrix} + \text{Plur}$$

For historical reasons the problem of case government/agreement captured the attention of many linguists[1]. The direct consequence of the above problem is the problem of agreement in gender and number between the NP in subject position and the verb — here the acceptability of certain sentences is not established[2].

In brief: the sequence $\begin{Bmatrix} \text{Nu}_{2-6} \\ \text{Qantifier} \end{Bmatrix} + \begin{Bmatrix} \text{N}_m \\ \text{N}_f \\ \text{N}_n \end{Bmatrix}$ in subject position assigns to

the verb the Neut. and Sing. morphemes. The Nu_{2-6} determining a N_m in subject position will have the ending similar to the endings of oblique cases (see rules XLVI, XLVII).
For example:

1. Dwudziestu żołnierzy śpiewa.
2. Pięciu chłopców grało w piłkę.
3. Wielu chłopców grało w piłkę.

The Nu_{2-6} and the Quantifier determining N_m or N_f will have in such sequence an overt Nom inflection. For example:

4. Pięć niewiast grało w brydża.
5. Wiele matek machało chusteczkami.
6. Dwadzieścia słoni piło ze strumyka.

The inflectional morpheme -u from examples 1 – 3 is analyzed by Graphin as being a form of Gen/Acc[3]. Since the use of this relational regularity between the subject and the verb was extended on the subject NP containing Nu_1. Therefore the sentence:

7. Dwaj żołnierze szli.   is synonymous to the sentence
8. Dwu żołnierzy szło.

This does not apply to subject NP containing Nu_1 and N_f or N_n. In case of the complex numerals ending with Nu_1 the application of this regularity remains

---

[1] For example see articles by Łoś and Szober (1928 : 97 - 119).

[2] Cf. the results of an inquiry by S. Słoński (1935 : 6 - 92).

[3] For a historical analysis of this form see H. Grappin 1950. Chapter XVIII.

optional although given two sentences:

    9. Trzydziestu dwu mężczyzn szło.
  10. Trzydzieści dwaj mężczyźni szli.

the latter is lower on the scale of acceptability.

1.2 The class of words traditionally known as ordinal numerals will be analyzed conformely to their evident similarity to adjectives. Such solution finds its justification in the following observations.

1. The number and the case of both adjectives and ordinal numerals are governed by the number and the case of the nouns they modify.
2. In contradistinction to numerals derived from the NP ordinal numerals take the Numb morpheme.
3. The type of declension is identical for adjectives and ordinal numerals.
4. The similarity between the ordinal numerals and adjectives is illustrated by the trace of comparison in ordinals: "pierwszy" has the superlative degree "najpierwszy".
5. It is true that the premises 1 – 3 point at the possibility of analyzing ordinal numerals together with D_n class ("jeden, pewien, któryś, jakiś, ów, etc."). The grammar using such assumption would not explain the difference between sentence 11 and 12 (see below). Consequently we have:

$$\text{XVI} \quad VP \rightarrow Vb + NP$$

$$\text{XVII} \quad Vb \rightarrow \begin{Bmatrix} Jest + Pred \\ V \end{Bmatrix} (Adv)$$

$$\text{XVIII} \quad Pred \rightarrow \begin{Bmatrix} Collect. \\ Adj_n \\ \dots \end{Bmatrix}$$

The grammatical morphemes will be assigned by transformation thus:

$$\text{XIX} \quad Adj_n \rightarrow \begin{Bmatrix} A_n \\ A_{quant} \\ A_{qual\ 1} \\ A_{qual\ 2} \end{Bmatrix}$$

$$\text{XX} \quad A \rightarrow (A_{n5}) + \left(\begin{Bmatrix} A_{n4} + (A_{n1}) \\ A_{n3} \\ A_{n2} \end{Bmatrix} \right)$$

For the Lexicon see page 200

$$\text{XXI} \quad Adv \rightarrow \begin{Bmatrix} (Prep_1) + An \\ Prep_x + NP \\ \dots \end{Bmatrix}$$

$$\text{XXII} \quad Prep_1 \rightarrow \text{jako}$$

Consider the following sentences:

  11. Pierwszy uczeń zrobił zadanie.
  12. Uczeń pierwszy zrobił zadanie.

We are in a position to discriminate between the structural descriptions of the two sentences saying that 12. is synonymous to 13.

  13. Uczeń zrobił zadanie (jako) pierwszy.

This however could not be done if we decided that A_n is a constituent of the NP. Under such assumption it would be impossible to derive transformationally the adverb in question and even if such a possibility existed we could not have done it without being inconsistent. Consider the sentence:

  14. Drugi artysta zaśpiewał pierwszy[4].

Returning to the rules of formation:

$$\text{XXIII} \quad Prep_x \rightarrow \begin{Bmatrix} \text{przy} + Loc \\ \text{za} \quad + Instr \\ \text{po} \quad + Loc \\ \dots \end{Bmatrix}$$

The rule accounts for sentences of the type.

  15. Jan skoczył za pierwszym razem.
  16. Udało się przy czwartej próbie.
  17. Udało się po czterech próbach.

It is possible to derive adverbials from A_{quant}, $A_{qual\ 1}$, $A_{qual\ 2}$ as in the example:

  18 a Pawła cierpienie jest dwukrotne $\Rightarrow$
     b $\Rightarrow$ Paweł cierpi dwukrotnie.

A transformation will add the morpheme -ie to A_{quant} and the morpheme -o to $A_{qual\ 1}$ or $A_{qual\ 2}$.

Although the problem is of great complexity without going into details we may risk the statement that the restrictions on the formation of adverbs from A_{quant} and $A_{qual\ 1,2}$ are similar to those imposed on the occurrence of manner adverbials.

---

[4] It is also possible to derive this sentence in the following way: Drugi artysta śpiewa. Constituent: Śpiewanie jest pierwsze. In this case, too, our basic assumption concerning ordinals remains valid.

Judging by the surface structure of a certain type of sentences it may be doubted whether this analysis accounts for the appearance of cardinal numerals in predicate position as in the sentence:

     19. Chłopów jest dwudziestu.

Consider now the sentences

     20. Chłopów jechało dwudziestu.
     21. W domu wódki był nadmiar.

from which it can be seen that "dwudziestu" and "nadmiar" function as the subject of the verb in sentences 20, 21 and 19. The specific word order is due to the presence of Emph. element in the structural description of these sentences. Without this element the sentences will read as follows:

     20a Dwudziestu chłopów jechało.
     21a Nadmiar wódki był w domu.

This brings us to the problem of numerals functioning as nominals. Three distinct occurences will be considered.

     1. The numeral may stand alone in the terminal string the noun it determines/modifies being deleted. For example:

     22. Trzech pracowało a jeden spał.
     23. Pierwszy śmiał się drugi łkał.

     2. Cardinal numerals may function as names of abstract notions.

     24. Dwa razy dwa jest pięć.

     3. Collective nouns function as subjects.

     25. Cała dziesiątka pękała ze śmiechu.
     26. Czwórka ruszyła do przodu.

     In sentence 26 "czwórka" may stand for "a group of four horses", "a row of four soldiers", "a bus serving the line number four", or finally "a row-boat manned by four rowers".

1.3.1. The declension of jedn- (D_n) is with some exeptions identical to that of A_n. (The rules will be presented in a simplified but more legible form. The D_n and Adj_n agree in number and case with the determined/modified noun:

$$XXIV \quad \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + N + C + Numb \Rightarrow \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + C + Numb + N + C + Numb$$

From the point of view of meaning when the D_n takes the plural morpheme it functions no longer as a numeral.

$$XXV \quad \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + \begin{bmatrix} \begin{Bmatrix} Gen \\ Acc \\ Dat \end{Bmatrix} \\ \begin{Bmatrix} Loc \\ Instr \end{Bmatrix} \end{bmatrix} Sing + N_m \Rightarrow \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} \begin{bmatrix} -ego \\ -emu \\ -ym \end{bmatrix} + N_m$$

$$XXVI \quad \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + \begin{bmatrix} \begin{Bmatrix} Gen \\ Dat \\ Instr \end{Bmatrix} \\ \begin{Bmatrix} Acc \\ Loc \end{Bmatrix} \end{bmatrix} + Sing + N_f \Rightarrow \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} \begin{bmatrix} -ej \\ -ą \end{bmatrix} + N_f$$

$$XXVII \quad \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + \begin{bmatrix} \begin{Bmatrix} Instr \\ Loc \end{Bmatrix} \\ Gen \\ Dat \end{bmatrix} + Sing + N_n \Rightarrow \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} \begin{bmatrix} -ym \\ -ego \\ -emu \end{bmatrix} + N_n$$

$$XXVIII \quad Adj_n + Nom + Sing + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow Adj_n + \begin{bmatrix} -y \\ -a \\ -e \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$XXIX \quad Adj_n + Acc + Sing + N_n \Rightarrow Adj_n + -e + N_n$$

$$XXX \quad D_n + Nom + Sing \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow D_n + \begin{bmatrix} -\emptyset \\ -a \\ -o \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$XXXI \quad D_n + Acc + Sing + N_n \Rightarrow D_n + -o + N_n$$

$$XXXII \quad \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + Nom + Plur + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + \begin{bmatrix} -i \\ -e- \end{bmatrix} \begin{Bmatrix} N_m \\ N_f \\ N_n \end{Bmatrix}$$

$$XXXIII \quad \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + \begin{bmatrix} \begin{Bmatrix} Gen \\ Loc \end{Bmatrix} \\ Dat \\ Instr \end{bmatrix} + Plur + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow \begin{Bmatrix} D_n \\ Adj_n \end{Bmatrix} + \begin{bmatrix} -ych \\ -ym \\ -ymi \end{bmatrix} \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$XXXIV \quad \begin{bmatrix} D_n \\ Adj_n \end{bmatrix} + Acc + Plur + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} D_n \\ Adj_n \end{bmatrix} + \begin{bmatrix} -ych \\ -e \end{bmatrix} + \begin{Bmatrix} N_m \\ N_f \\ N_n \end{Bmatrix}$$

In complex numerals D_n keeps the uninflected form in Nom and oblique cases.

$$\text{XXXV} \quad \begin{bmatrix} Nu_5 \\ Nu_6 \end{bmatrix} C + D_n + N + C + Numb. \Rightarrow \begin{bmatrix} Nu_5 \\ Nu_6 \end{bmatrix} C + D_n + -\varnothing` + N + C + Plur.$$

as in the sentences:

27. Nie widziałem dwudziestu jeden żołnierzy (okien, kobiet)

or   28. Przyglądali się z uwagą dwudziestu jeden czołgom, dywizjom.

Some speakers however use an irregular form „dwudziestu jedniu" in oblique cases with N_m.

In complex A_n the case agreement remains as indicated in the rules except for A_{n5}.

$$\text{XXXVI} \quad A_{n5} + \begin{bmatrix} A_{n1} \\ A_{n2} \\ A_{n3} \\ A_{n4} \end{bmatrix} \Rightarrow Nu_6 + Nom + \begin{bmatrix} A_{n1} \\ A_{n2} \\ A_{n3} \\ A_{n4} \end{bmatrix}$$

consider for example the following sentences:

29. Na metę przyjechał setny zawodnik.

30. Na metę przyjechał sto pierwszy zawodnik.

1.3.2. The inflectional system of cardinal numerals is not as regular as that of ord. numerals. A number of lexical entries have to be treated individually.

$$\text{XXXVII} \quad \begin{bmatrix} dw- \\ trz- \\ czter- \end{bmatrix} + \begin{Bmatrix} Gen \\ Loc \end{Bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} dw- \\ trz- \\ czter- \end{bmatrix} + \begin{bmatrix} -\text{óch/u} \\ -\text{ech} \\ -\text{ech} \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$\text{XXXVIII} \quad \begin{bmatrix} dw- \\ trz- \\ czter- \end{bmatrix} + Dat + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} dw- \\ trz- \\ czter- \end{bmatrix} + \begin{bmatrix} -\text{om/u} \\ -\text{em} \\ -\text{em} \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$\text{XXXIX} \quad dw- + \begin{Bmatrix} Nom \\ Acc \end{Bmatrix} + \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow dw- + \begin{bmatrix} -\text{ie} \\ -\text{a} \end{bmatrix} + \begin{bmatrix} N_f \\ N_n \end{bmatrix}$$

$$\text{XL} \quad dw- + Nom + N_m \Rightarrow dw- + -aj + N_m$$

$$\text{XLI} \quad dw- + \begin{bmatrix} Acc \\ Loc \end{bmatrix} + N_m \Rightarrow dw- + \begin{bmatrix} -\text{óch} \\ -\text{u} \end{bmatrix} + N_m$$

$$\text{XLII} \quad dw- + Instr + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow dw- + \begin{bmatrix} -\text{oma} \\ -\text{iema} \\ -\text{oma} \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$\text{XLIII} \quad \begin{bmatrix} trz- \\ czter- \end{bmatrix} + \begin{Bmatrix} Nom \\ Acc \end{Bmatrix} + \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} trz- \\ czter- \end{bmatrix} + -y \begin{bmatrix} N_m \\ N_n \end{bmatrix}$$

$$\text{XLIV} \quad \begin{bmatrix} trz- \\ czter- \end{bmatrix} + Nom + N_m \Rightarrow \begin{bmatrix} trz \\ czter- \end{bmatrix} -ej + N_m$$

$$\text{XLV} \quad \begin{bmatrix} trz- \\ czter- \end{bmatrix} + \begin{bmatrix} Instr. \\ Loc \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} trz- \\ czter- \end{bmatrix} + \begin{bmatrix} -ma \\ -ech \end{bmatrix} + \begin{bmatrix} N_m \\ N_f \\ N_n \end{bmatrix}$$

$$\text{XLVI} \quad \begin{bmatrix} Nu_2 \\ Nu_3 \\ Nu_4 \\ Nu_5 \\ Nu_6 \end{bmatrix} + \begin{Bmatrix} Gen \\ Dat \\ Loc \\ Instr \end{Bmatrix} + N \Rightarrow \begin{bmatrix} Nu_2 \\ Nu_3 \\ Nu_4 \\ Nu_5 \\ Nu_6 \end{bmatrix} + -u + N$$

In Instr. case the above numerals are said to have an alternative inflection –oma. We will show two restrictions on the occurence of this ending.

In complex numerals the case agreement follows the same regularities as in the case of simple numerals. The ending -oma however does not appear with Nu_6 in complex numerals, as in the sentences:

31. Posługiwał się dziewięćdziesięcioma przykładami.

32. Posługiwał się stu dziewięćdziesięcioma pięcioma przykładami.

This ending cannot be used in complex numerals containing D_n. Consider the examples:

33. Posługiwał się dziewięćdziesięciu jeden przykładami.

and not   34. Posługiwał się dziewięćdziesięcioma jeden przykładami.

$$\text{XLVII} \quad \begin{bmatrix} Nu_2 \\ Nu_3 \\ Nu_4 \\ Nu_5 \\ Nu_6 \end{bmatrix} \begin{Bmatrix} Nom \\ Acc \end{Bmatrix} + N_m \Rightarrow \begin{bmatrix} Nu_2 \\ Nu_3 \\ Nu_4 \\ Nu_5 \\ Nu_6 \end{bmatrix} + -u + N_m$$

From rules XLVI and XLVII we see that numerals determining the personal masculine nouns have the same endings for all cases. The numerals determining N_f and N_n will need a particular treatment in Acc and Nom.

$$\text{XLVIII} \quad \begin{bmatrix} \text{dziesięć-} \\ \text{pięćdziesiAT-} \\ \text{sześćdziesiAT-} \\ \text{siedemdziesiAT-} \\ \text{osiemdziasiAT-} \\ \text{dziewięćdziesiAT-} \end{bmatrix} \begin{Bmatrix} Nom \\ Acc \end{Bmatrix} \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} \text{dziesięć-} \\ \text{pięćdziesiAT-} \\ \text{sześćdziesiAT-} \\ \text{siedemdziesiAT-} \\ \text{osiemdziesiAT-} \\ \text{dziewięćdziesiAT-} \end{bmatrix} + -\varnothing + \begin{bmatrix} N_f \\ N_n \end{bmatrix}$$

XLIX

$$\begin{bmatrix} \text{jedenaST-} \\ \text{dwanaST-} \\ \text{trzynaST-} \\ \ldots \\ \ldots \\ \text{dziewiętnaST-} \\ \text{dwieST-} \end{bmatrix} + \begin{Bmatrix} \text{Nom} \\ \text{Acc} \end{Bmatrix} \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} \text{jedenaST-} \\ \text{dwanaST-} \\ \text{trzynaST-} \\ \ldots \\ \ldots \\ \text{dziewiętnaST-} \\ \text{dwieST-} \end{bmatrix} + \text{-ie} \begin{bmatrix} N_f \\ N_n \end{bmatrix}$$

L

$$\begin{bmatrix} \text{trzydzieST-} \\ \text{czterdzieST-} \end{bmatrix} + \begin{Bmatrix} \text{Nom} \\ \text{Acc} \end{Bmatrix} + \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} \text{trzydzieST-} \\ \text{czterdzieST-} \end{bmatrix} + \text{-i} \begin{bmatrix} N_f \\ N_n \end{bmatrix}$$

LI

$$\text{sto-} + \begin{Bmatrix} \text{Nom} \\ \text{Acc} \end{Bmatrix} + \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow \text{sto-} + \text{-}\varnothing + \begin{bmatrix} N_f \\ N_n \end{bmatrix}$$

$$\begin{bmatrix} \text{dwadzieST-} \\ \text{trzyst-} \\ \text{czteryst-} \end{bmatrix} + \begin{Bmatrix} \text{Nom} \\ \text{Acc} \end{Bmatrix} + \begin{bmatrix} N_f \\ N_n \end{bmatrix} \Rightarrow \begin{bmatrix} \text{dwadzieST-} \\ \text{trzyst-} \\ \text{czteryst-} \end{bmatrix} + \text{-a} + \begin{bmatrix} N_f \\ N_n \end{bmatrix}$$

1.4 Some readjustment rules are needed in order to give to lexical entries their final representation.

LII

$$x + \text{ST} + \begin{bmatrix} \text{-i} \\ \text{-ie} \\ \text{-a} \end{bmatrix} \# \Rightarrow x + \text{śc} + \begin{bmatrix} \text{-i} \\ \text{-ie} \\ \text{-a} \end{bmatrix} \#$$

which gives: dwanaście
dwadzieścia

LIII

$$x\ \text{ST} + Y\# \Rightarrow x\ \text{st} + Y\#$$

where

$x=$ any string
$Y=$ any vowel other than "i" and "a" and any sequence beginning with other vowel than "i" and "a" "ą"

which gives: trzydziestu,
trzydziesty,
trzydziestoma.

LIV

$$x + \text{AT} + \begin{bmatrix} \text{-u} \\ \text{-i} \end{bmatrix} \# \Rightarrow x \begin{bmatrix} \text{ęc} \\ \text{ąc} \end{bmatrix} + \begin{bmatrix} \text{-iu} \\ \text{-i} \end{bmatrix} \#$$

which gives: osiemdziesięciu, dziewiąci.

LV

$$x\ \text{AT} + \text{-oma} \Rightarrow x\ \text{ęci} + \text{-oma}$$

to give: pięćdziesięcioma

LVI

$$x\ \text{AT} + Y \Rightarrow x\text{ąt} + Y$$

where $Y=$ word boundry or any other vowel than i, o or any string other than beginning with an i or o.
The rule LVI gives: osiemdziesiąt, dziesiąta.

LVII

$$x \begin{bmatrix} \text{m} \\ \text{ć} \end{bmatrix} + \text{-u} \# \Rightarrow x \begin{bmatrix} \text{miu} \\ \text{ciu} \end{bmatrix} \#$$

which gives: sześciu, siedmiu.

LVIII

$$x \begin{bmatrix} \text{g} \\ \text{c} \end{bmatrix} + \text{-e} \# \Rightarrow x \begin{bmatrix} \text{gi} \\ \text{ci} \end{bmatrix} + \text{-e} \#$$

which gives: drugie, trzecie.

LIX

$$x\ \text{c} + \text{-a} \# \Rightarrow x + \text{ci} + \text{-a} \#$$

to give: trzecia

LX

$$x \begin{bmatrix} \text{g} \\ \text{c} \end{bmatrix} + \text{-y} + X \Rightarrow x + \begin{bmatrix} \text{gi} \\ \text{ci} \end{bmatrix} + X$$

where $X=$ any string or word boundry.
The rule gives: drugimi

LXI

$$x \begin{bmatrix} \text{dn} \\ \text{dm} \\ \text{sm} \end{bmatrix} + \varnothing \# \Rightarrow x \begin{bmatrix} \text{den} \\ \text{dem} \\ \text{siem} \end{bmatrix} \#$$

which gives: siedem, jeden, osiem.

LXII

$$\begin{Bmatrix} \text{dwa}\ x \\ \text{dwie}\ x \end{Bmatrix} + \begin{bmatrix} \text{Gen} \\ \text{Dat} \\ \text{Instr} \\ \text{Loc} \end{bmatrix} \Rightarrow \text{dwu}\ x + \begin{bmatrix} \text{Gen} \\ \text{Dat} \\ \text{Instr} \\ \text{Loc} \end{bmatrix}$$

to give: dwudziestoma, dwustoma.

LXIII

$$x + K + \text{-y}\ X \Rightarrow x\ \text{ki} + X \text{ where } X \text{ any string} \#$$

example: dwojakim, dwojaki.

LXIV

$$x\ K + \text{-i} \# \Rightarrow x\ \text{cy} \# \quad \text{example: dwojacy.}$$

LXV

$$x + K + Y \# \Rightarrow x\ \text{ki} + Y \#$$

where $Y=$ any vowel other than "i" or "y"
a string beginning with other than "i" or "y" a vowel

Apart from the rules expanding ST, AT symbols we do not pretend to describe here any phonological regularity which could be valid for a description of Polish language in general.

1.5. The Lexicon

L. 1 $D_n \rightarrow$ jedn-

L. 2 $Nu_1 \rightarrow$ dw-, trz-, czter-;

L. 3 $Nu_2 \rightarrow$ pięć-, sześć-, siedm-, ośm-, dziewięć-.

L. 4 $Nu_3 \rightarrow$ dziesięć-.

L. 5 $Nu_4 \rightarrow$ jedenaST-, dwunaST-, trzynaST-, ... dziewiętnaST-.

L. 6 $Nu_5 \rightarrow$ dwadzieST-, trzydzieST-, czterdzieST-, pięćdziesiAT- sześćdziesiAT- ... dziewięćdziesiAT-.

L. 7 $Nu_6 \rightarrow$ sto-, dwieST-, trzyst-, czteryst-.

L. 8 $Q \rightarrow$ wiele, kilka, parę, tyle, ile... etc.

L. 9 $A_{n1} \rightarrow$ pierwsz-, drug-, trzec-, czwart-, piAT-, szóST-, siódm-, ósm-, dziewiAT-.

L. 10 $A_{n2} \rightarrow$ dziesiAT-.

L. 11 $A_{n3} \rightarrow$ jedenaST-, dwunaST-, trzynaST- ... dziewiętnaST-.

L. 12 $A_{n4} \rightarrow$ dwudzieST-, trzydzieST-, czterdzieST-, pięćdziesiAT-, sześćdziesiAT-, ... dziewięćdziesiAT-.

L. 13 $A_{n5} \rightarrow$ setn-, dwusetn-, trzysetn-(trzechsetn-)...

L. 14 $A_{quant} \rightarrow$ pojedyncz-, podwójn-, potrójn-, poczwórn-, poszóstn-.

L. 15 $A_{qual1} \rightarrow$ jednokrotn-, dwukrotn-, trzykrotn-...

L. 16 $A_{qual2} \rightarrow$ dwojaK-, trojaK-, czworaK-, pięcioraK- ...

L. 17 Collect. $\rightarrow$ mnóstwo, nadmiar, masa, obfitość etc.

There is a number of restrictions on the use of certain lexical entries; for instance there is no such word as "popiątny" and "poszóstny" is used only in reference to a kind of horse team.

2.0. The problem of English numerals lies far from the crucial problems of TG grammars. In most descriptive works numerals are analyzed as being the constituents of the noun phrase. This typical approach is presented best by O. Thomas (in "Transformational Grammar and the Teacher of English", ch. 4.2).

LXVI   Det $\rightarrow$ (Predet) (Preart) $\left\{ \begin{array}{c} \text{Art} \\ \text{Dem} \\ \text{Gen} \end{array} \right\}$ (Postdet)

LXVII   Predet $\rightarrow$ $\left\{ \begin{array}{c} \text{(Preart)} \left\{ \begin{array}{c} \text{Art} \\ \text{Dem} \\ \text{Gen} \end{array} \right\} \text{(Postdet)} \\ N_{quan} \end{array} \right\}$ + of

LXVIII   Postdet $\rightarrow$ (Ord)   (Card)   (Comp)

These rules account for a vast variety of determinative constructions such as for instance: your first two girls; the first of those three bubbles; just the last two of my first five children.

In the lexicon numerals are listed together with other quantifying and ordering determinatives:

LXIX   Card $\rightarrow$ one, two, three ...   several, many, few...

LXX   Ord $\rightarrow$ first, second ...   next, last, final ...

Such presentation suggests that complex (phrasal) numerals are listed as separate lexical entries.

A different analysis sketched by Lakoff (in Irregularity in Syntax appendix F) is based on the fact that the sentence of the type:

35. Everyone in the room knows two languages

requires a description accounting for the ambiguity in "two languages" ("any two languages" and "the same two languages"). Analyzing this and similar examples Lakoff concludes to the necessity of deriving numerals from the Predicate. Although such analysis gives a new insight in the problem of numerals in general and in the problem of question formation in particular the above mentioned problem can be easily solved by means of the traditional descriptive procedure. In the case of such presumed ambiguity we have to do with two strings:

Def   two   languages
Indef   two   languages

The adverbial use of numerals is limited to prepositional phrases such as: "in one leap, at first sight..." Numerals can function as noun substitute as in:

36. He looked for three books and bought only two.
37. Give him one on the nose.

Similarily to Polish jedn- "one" may take the plural morpheme when it functions no longer as a numeral.

In nounal use numerals are used as names of abstract notions:

38. Six divided by three is two.

English numerals are used in predicate position only in colloquial expressions or sentences in which the noun they determine is deleted.

39. She is twenty (years old).
40. The books are five (in number).

These rules account for a vast variety of determinative constructions such as for instance: your first two girls; the first of those three bubbles; just the last two of my first five children.

In the lexicon numerals are listed together with other quantifying and ordering determinatives:

LXIX   Card → one, two, three …   several, many, few…

LXX   Ord → first, second …   next, last, final …

Such presentation suggests that complex (phrasal) numerals are listed as separate lexical entries.

A different analysis sketched by Lakoff (in Irregularity in Syntax appendix F) is based on the fact that the sentence of the type:

     35. Everyone in the room knows two languages

requires a description accounting for the ambiguity in "two languages" ("any two languages" and "the same two languages"). Analyzing this and similar examples Lakoff concludes to the necessity of deriving numerals from the Predicate. Although such analysis gives a new insight in the problem of numerals in general and in the problem of question formation in particular the above mentioned problem can be easily solved by means of the traditional descriptive procedure. In the case of such presumed ambiguity we have to do with two strings:

             Def   two   languages
            Indef   two   languages

The adverbial use of numerals is limited to prepositional phrases such as: "in one leap, at first sight…" Numerals can function as noun substitute as in:

     36. He looked for three books and bought only two.
     37. Give him one on the nose.

Similarily to Polish jedn- "one" may take the plural morpheme when it functions no longer as a numeral.
In nounal use numerals are used as names of abstract notions:

     38. Six divided by three is two.

English numerals are used in predicate position only in colloquial expressions or sentences in which the noun they determine is deleted.

     39. She is twenty (years old).
     40. The books are five (in number).