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## TERM FORMATION TENDENCIES OF SIMPLE NOUNS IN MATHEMATICS

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**Abstract:** Subject of study are term formation tendencies in mathematics in the English language. The field of terms that undergo analysis will be terms representing the class of simple nouns. One word nouns are examined. Compound nouns of different patterns are not included into research. Terminology documents the knowledge of various subject fields, the research focuses only on mathematics. According to term formation processes, the following suffixes representing bound morphemes are analysed: -ic, -ics, -ion, -ity, -ment, -ant, -er and -or. Terms are analysed according to principles for term formation. The following principles should be followed in the formation of terms and appellations, as far as possible and as appropriate to the language: transparency; – consistency; – appropriateness, linguistic economy; – derivability and compoundability; – linguistic correctness; – preference for native language. The last feature is very interesting because the terminology in mathematics is predominantly borrowed from the Greek and Latin language. In the selected terms on mathematics the origin will be identified and compared. Findings of the origins will be compared with the general postulation of terms originating in the Greek and Latin language. Even though borrowing from other languages is an accepted form of term formation, native-language expressions should be given preference over direct loans. Technically, appellations are not translated but remain in their original language. However, an individual concept may have an appellation in different languages. Whether an individual concept has an appellation in more than one language depends on the following: – the language policy of a country; – how internationally well known the concept is; – the multilingual nature of the entity in question; – the need for international cooperation and relations. Sample of suffixes are selected according to the frequency of noun suffixes, only the the most frequent ones are selected. Subject of analysis are terms in the texts on mathematics of scientific style. Data are collected from the Slovak National Corpus 10.0, i.e. English –Slovak Parallel Corpus 4.0 en. Only English part of the corpus is taken into consideration, the Slovak part does not represent subject of analysis. The methods of quantitative and qualitative analysis are applied. Furthermore, the statistical value ARF (average rate frequency) is taken into consideration. It is a statistical tool representing the average occurrence of words in the corpus.

**Keywords:** mathematical terminology, English terminology work, term formation, term, suffix

### 1. INTRODUCTION

Even though borrowing from other languages is an accepted form of term formation, native-language expressions should be given preference over direct loans. Technically, appellations are not translated but remain in their original language. However, an individual concept may have an appellation in different languages. Whether an individual concept has an appellation in more than one language depends on the following: – the language policy of a country; – how internationally well known the concept is; – the multilingual nature of the entity in question; – the need for international cooperation and relations. ISO 704:2009 (E). Due to outcomes of the research, it can be stated that dynamics of the language or the way of thinking of term creators precedes systems created by man that summarize original features of correct terms. (Číbková, 2012, p. 31).

The main objective of the paper is to describe term formation tendencies of the selected suffixes used in derivation of nouns. The research focuses on terminology work. Pavel and Nolet also define terminology in two ways, terminology can be understood either as a collection of special words belonging to a certain subject field, art, author or social entity, or as a linguistic discipline concerned with the scientific study of the concepts and terms used in specialised languages (Pavel, Nolet, 2001). Stefaniak describes terminology work as follows: “The aim of terminology work is, firstly, to give translators timely terminological support: to find a correct equivalent, to clear the meaning of a concept, to coin a brand new term or to help them choose the right equivalent in a given context, out of many equally correct terms, based on the criteria of consistency, accuracy and clarity. Secondly, the aim of terminology work is to manage the existing terminology resources. This work is both of a descriptive and prescriptive nature ...” (Stefaniak, 2017, p. 109). Basic principle for designating the mathematical terms is disambiguation: one concept - one term. Naturally, this principle is typical for one closed mathematical discipline; in different disciplines, the same term can designate different concepts (Čižmár, 2009, p.8).

“Terminological activities can result in a variety of terminology products, such as terminology standards, SPL dictionaries, glossaries, terminology databases, etc. Terminology products and terminology services, such as terminology consultancy and training services, terminology information and documentation, outsourcing of

terminological tasks, information services, etc., are usually used as tools for the implementation of a national policy” (UNESCO, 2005. p. 4). Similarly, Horecký also sees the difference between terminology and nomenclature. Horecký defines terminology as a collection of specialised terms used in the scientific disciplines. Consequently, in terminology understood in this way, a nomenclature as an individual group of terms naming certain things or concepts classified according to the field system is identified. (Horecký, 1956).

Bozdechová (2016 p.2255) mentions various procedures of term-formation, namely “metaphorization, word-formation, the formation of multi-word terms of different structural types, and the formation of acronyms or abbreviations” which can also be “accompanied by borrowing and loan translation”. She stresses that these procedures usually appear in combinations. Some of these procedures are widely used in certain languages, while others remain rather marginal. Metaphorization is typical feature of fixed expressions. Petrášová (2010, p.170) analysed fixed expression based on metaphorization. Absolute equivalence dominates over partial equivalence.

Two basic groups of terms can be identified on the basis of the number of the constituents, i.e. a) one word terms, b) multi-word terms. Each group contains its types and subtypes. Subject of analysis are one word terms. They are divided into non-derived and derived terms. Research focuses on one word derived terms. One word derived terms can be formed by prefixes, suffixes or simultaneously by prefixes and suffixes. The base word represents the background for derivation

## 2. METHODS

In terminology research, the following methods have been used: term and symbol observation, term excerption, conceptual analysis, term analysis, comparative analysis of bilingual conceptual systems, classification of ordinal numbers, and synthesis of data. Termium Plus states that terminological analysis is “The analysis of terms in context and of the concepts designated by them within a given subject matter in order to determine their interrelationships” (TERMIUM Plus, 2012). methods of term recordings are included. The layout of terminology record is borrowed from Cabré (1999) and entails 1.entry, 2. identification number, 3. reference to the term, 4. synonyms, 5. subject field, 6. formula, abbreviation, 7. context, 8. reference to the context, 9. definition, 10. reference to the definition, 11. degree of equivalence, 12. author of record and 13. date of record. Example of the terminology record is in the table 1.

Data are collected from the Slovak National Corpus 10.0, i.e. English –Slovak Parallel Corpus 4.0 en. Current version par-sken-4.0 is available in the amount 556 mil. tokens (261 mil. Tokens for the Slovak part, 295 mil. tokens for the English part). Only English part of the corpus is taken into consideration, the Slovak part does not represent subject of analysis.

## 3. WORD FORMATION PROCESSES / TERM FORMATION PROCESSES

Term formation processes are based on the word formation processes. In the English language the following processes are applied: derivation, acronyms, backformation, conversion, blending, clipping, compounding, coinage and borrowing. Derivation is the most common process to form new words in English language. It is defined as a process of adding affixes to words to create new words. In this group we differentiate prefixes and suffixes. Prefixes are added to the beginning of the word (such as prefix bi- in bilingual). Then suffixes are added to the end of the word (such as suffix -ish in greenish). Infix is an affix that is incorporated inside another word. Affixation means building a new word by adding a derivational affix to a derivational base. (Lančarič, 2016, p.81). English permits the addition of meaningful, dependent elements both before and after the base form. Most suffixes are purely lexical, their primary function being to change the meaning of the base form; A few are purely grammatical, their role being to show how the word must be used in a sentence. (Crystal, 2018, p.198). There are two main categories of morphemes: lexical morphemes denoting particular phenomena of extralinguistic reality and, such as objects, agents, situations, etc. And grammatical morphemes expressing grammatical features, such as tense, number, definiteness and relationship between individual units. (Lančarič, 2020, p.36). Relationships between the words is expressed in analytical languages by prepositions. Many prepositions in English correspond to case inflections in other languages. (Hudcovičová, 2021, p. 28)

Trnka (2014) presents the following classes of nouns and their productive suffixes: Nomina agentis can be created by conversion. Suffix *-or* intruded into the written language, i.e. the words of the domestic origin, in order to distinguish their meanings and diminish homonymy of the words, e.g. sailor – námorník; sailer - sailing ship. The origin of the suffix *-or* is Old Norman *-our* ( from Latin *-atorem*). From the 16.century suffixes *-our* and *-or* were unified into one form *-or*. In the case of non-existence of Latin noun, the suffix *-or* was substituted by *-er*. It represents the most productive suffix in the English language. Almost all verbs containing the *ing* form can be transformed into nomen agentis with this suffix. The suffix *-ant* appears in the words of old Norman origin denoting to legal vocabulary and social alignment or religious relations, e.g. accuse: accusant, claim:claimant. A lot of nouns

in modern English lack base verbs. (Trnka, 2014). The suffix –ent is typical for borrowing from the Latin language, or it represents a graphic substitution for old Norman suffix –ant, e.g. correspond: correspondent; respond: respondent; Next to suffix –ent, a similar suffix –ient is noticeable in the English words. The suffix is used in Latin to derive present participles act. 3. and 4. conjugation. Base verbs do not exist: coefficient, patient, aperient. In the group of nomina actionis the suffix –ment is productive from the 16.century. (from French –ment, Lat. –mentum). It is used to create names of activities especially from the verbs formed by the prefixes em-, en-, a- and be. The suffix -ition appears to be non-productive, e.g. add- addition, part- partition. In the group of nomina qualitatis the suffix -ity (old Norman –ité) is a productive suffix from 15.century accompanied by alternation, e.g. general-generality, viral-virility). In the group of noun designating state or occupation or the subject of activity of base nouns, the suffixes -ic, ics appear. They designate specific branches of science and art.

#### 4. DISCUSSION

The most frequent suffix was –ion with 8227 030 occurrences, e.g. addition, approximation, division, subtraction, correlation, tessellation. In second place is –er (4 137 793) e.g. remainder, integer, and in third place –ment with 2 469 914 occurrences. Fourth position is occupied by the suffix –ity (1 800 505), e.g. density, probability, fifth position is represented by –ant (1 613 883). The suffix –or occurs in 771 473 instances, e.g. protractor, factor, calculator, denominator, -ic in 83 726, e.g. arithmetic and –ics in 78 910 occurrences, e.g. mathematics.

#### 5. CONCLUSION

First five suffixes occur in millions, only two analysed suffixes are productive in ten thousands. All in all, suffixes represents the class of word forms that are very productive and they fulfil their role in the language. Only word forms representing the part of speech nouns were analysed and examined, other classes with identical suffix were excluded. Definitely, in all cases, the word class of nouns in general occurrence dominates among all considered word classes in the Slovak National Corpus.

Analysis of selected suffixes deals with word formation as well as term formation as the additional process. Taking into consideration term formation processes, it is inevitable to include lexical morphology and etymology because terminology of mathematics is based on borrowings from the Latin and Greek language.

*Table 1 The most frequent suffixes of nouns in Slovak National Corpus*

|       |           |
|-------|-----------|
| -ion  | 8 227 030 |
| -er   | 4 137 793 |
| -ment | 2 469 914 |
| -ity  | 1 800 505 |
| -ant  | 1 613 883 |
| -or   | 771 473   |
| -ic   | 83 726    |
| -ics  | 78 910    |

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**Figure 1 Factor Term record**

|  |         |         |
|--|---------|---------|
|  | 1 (EQU) | 2 (IDN) |
|  | Factor  | 1       |
| 3 (SOU/TER)  |         |         |
| DGT-Acquis <a href="https://ec.europa.eu/jrc/en/language-technologies/dgt-acquis">https://ec.europa.eu/jrc/en/language-technologies/dgt-acquis</a> |         |         |
| 4 (SYN)  |         |         |

|  |                                     |                                   |
|--|-------------------------------------|-----------------------------------|
| 5( <i>SF</i> )<br>NS – MAT   |                                     |                                   |
| 6 ( <i>ABBR</i> )<br>M   |                                     |                                   |
| 7 ( <i>CON</i> )<br><br>Load model 71 shall be multiplied by the factor alpha ( $a$ ) as set out in EN 1991 - 2 : 2003 paragraphs 6 . 3 . 2 ( 3 ) P . The value of $a$ shall be equal to or greater than the values set out in Table 6 .<br>Thus, 1,2,3, and 6 are all factors of 6; $x-1$ and $x + 2$ are factors of $x^2 + x - 2$ , since $(x-1)(x+2) = x^2 + x - 2$ |                                     |                                   |
| 8 ( <i>SOU/CON</i> )<br>DGT-Acquis <a href="https://ec.europa.eu/jrc/en/language-technologies/dgt-acquis">https://ec.europa.eu/jrc/en/language-technologies/dgt-acquis</a><br><br>NELSON, D. Penguin Dictionary of Mathematics. 2008. Penguin Books. ISBN: 0141030232  |                                     |                                   |
| 9 ( <i>DEF</i> )<br><br>A number of polynomial that divides a given number or polynomial exactly.  |                                     |                                   |
| 10( <i>SOU/DEF</i> )<br><br>NELSON, D. Penguin Dictionary of Mathematics. 2008. Penguin Books. ISBN: 0141030232  |                                     |                                   |
| 11 ( <i>DEG/EQU</i> )  |                                     |                                   |
|  | 12 ( <i>AUT</i> )<br>Hudcovičová, M | 13 ( <i>DATE</i> )<br>29.11. 2022 |

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**Standards:**

- ISO 704: 2009. *Terminology work – Principles and methods*
- ISO 22128:2008. *Terminology products and services*
- ISO 1087-1:2000. *Terminology work — Vocabulary — Part 1: Theory and application*
- Slovak National corpus 10.0
- British National Corpus