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ABBREVIATION USE IN MATHEMATICS

The language of mathematics is unique and complex. One feature of the mathematical register is the use of symbols and abbreviations. Whilst it may be possible for a student to think mathematically in the absence of symbols, the written communication of mathematical ideas cannot be achieved concisely without the use of mathematical symbols. Further, it is possible that the fear and dislike of algebra can be attributed to the failure to understand fully the symbols inherent in this area of mathematics.

This article examines some of the complexities of the symbolic aspects of mathematical language, where possible using the 2010 National Assessment Program: Literacy and Numeracy (NAPLAN) (ACARA, 2010) numeracy test items as examples.

It is important to clarify what is meant by mathematical symbols and abbreviations. Many symbols are familiar to even the youngest students: they include the ten numerals (*0* through to *9*) and the 26 letters of our alphabet. Others, such as the symbols used for equality, currency, and the four arithmetic operations (*=, $, cents, +, -, x, /*) are introduced at an early stage of schooling. Others, such as the letters of the Greek alphabet, and the symbols used to represent more complex mathematical ideas (*%*, [square root], <, >, [+ or -], [infinity]) are encountered only in the later years of schooling. The recall or recognition of the symbols themselves is not complex. It is the semantics or meanings that we assign to the symbols or the concepts that they represent, that makes them challenging for students. Further, the syntax, or the way in which the symbols are used, introduces additional complexities for students.

Students should be able to decode and verbalise the full range of mathematical symbols relevant to their stage of mathematical studies. They can be classified into seven groups:

- numerals: the Hindu-Arabic numerals (*0, 1, 2, 3, 4, 5, 6, 7, 8,* and *9*) and also those of other numeration systems such as Roman (*I, V, X, D, C, L*, and *M*) that are used, in various combinations, to represent numbers of all types;
- operators: the arithmetic operators such as +, -, *x,* + and their 'synonyms' such as *x* (dot) and / (vinculum), but also operators such as [square root] and *!* and the generic operator * that are introduced in later years;
- comparatives: the symbols used to denote equality and inequality and other relationships: =, <, >, [less than or equal to], [greater than or equal to], [equivalent to], [approximately equal to], [varies], [subset] and their converse forms (usually involving a line through the relevant symbol) [not equal to], [not subset], [not less than], [not approximately equal to];
- grouping symbols such as parentheses ( ), braces { }, brackets [ ] and also the vinculum; pronumerals that can be variables, unknowns, or parameters; they can be represented by any symbol, but most commonly by the upper and lower case forms of the 26 letters of our alphabet (italicised) and the 24 letters of the Greek alphabet; included in this group are the 'tandard' pronumerals used to represent certain concepts such as gradient (*m*), radius (*r*), mass (*m*), area (*A*);
- geometric symbols such as [DELTA], [perpendicular to];
- shortened forms which may be abbreviations or symbols, which can be further subdivided as mathematical (*%*, [therefore], [infinity], f( ), [+ or -], [integral], [there exists], [for all]); units of measurement, where any letters used are not italicised (*$, cents, km*, [cm.sup.2], [m.sup.3], *L, g, mL*, [degrees] *C, s, h*); and common use (*3D, N, S, E, W, am, pm*).

This classification can assist students to understand the wide variety of different symbols used in mathematics, and their different purposes. Classification and matching games (such as

concentration, dominoes, and card shuffles) and investigation of similarities and differences can be used to teach the meaning of these symbols.

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Halyna Kushnir

POLTAVA SOILS: ENVIRONMENTAL PROBLEMS AND SOLUTIONS

Soil is the basis of our existence, our breadwinner; it is an essential part of us. Unfortunately we face the serious problems connected with preservation and restoration of soils as people often destroy environment. Destructive ecological situation is connected most of all with the anthropogenic effect. That is why the research connected with soils condition is among topical ones.

Living in Poltava we decided to study the aspect in our region to know the real problems and find its solutions. There are about 50 different types of soil in the Poltava region, and they divided into 12 groups: black soil, marshy soil, sodic soil, solod soil, sod-podzolic, turfy, podzolized soil, meadow chernozem soil, meadow soil, meadow-swamp soil, peat-bog soil and peatery. The black soils occupy the biggest percent. This type of soil has a high fertility. It is characterized by granulated structure, high permeability of moisture, considerable organic substances level, etc. According to the research materials of the lands of the Poltava region that was conducted during 1888–1894 by by V.V. Dokuchaev, this soil had on an average 6 % humus, and today, it is 4 % [1, p. 44]. It means that the yearly loss of humus in the region is about 3 million tons. Such a big damage of the soil of our region makes:

1) the abuse by human of chemical fertilizer and pesticide that leads to damage people, but also to the destruction of fertile soil layer;