



THE NEMETH BRAILLE CODE FOR MATHEMATICS

DR. ABRAHAM NEMETH



BIRTH OF THE NEMETH CODE

- Dr. Nemeth's personal code
- Dr. Clifford Wicher, physicist
- Adopted as the official code in 1952



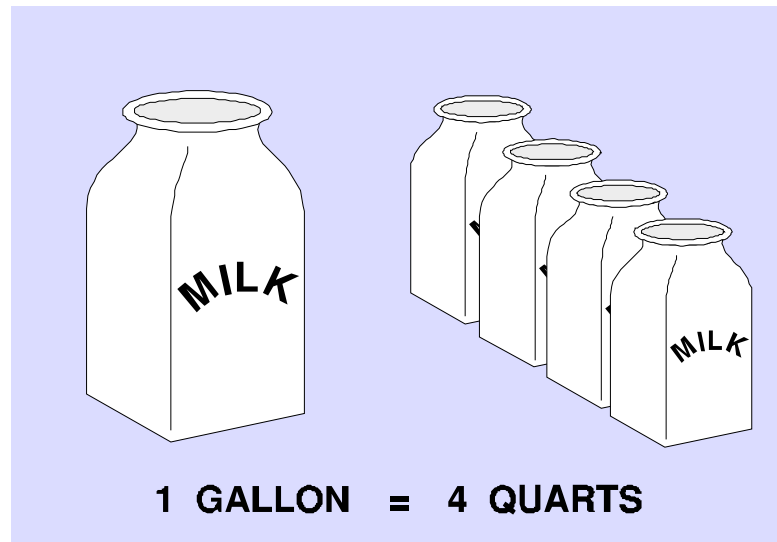
DR. NEMETH'S PERSPECTIVE

- Braillewriters
- Alternate Media
- Graphics



TRANSCRIPTION OF MATH TEXTBOOK MATERIAL

- A different set of rules and braille symbols
- Math illustrations & graphs



- Translation programs = gibberish
- Knowledge of mathematics



EXAMPLE OF THE USE OF TRANSLATION SOFTWARE

○ Sample page

ADVANCED HIGH SCHOOL MATHEMATICS 3

Chapter 6 **Polynomials**

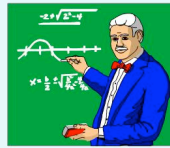
**State whether each function is a polynomial function.
Give the zeros of each function, if they exist.**

a. $f(x) = 2x^3 - 32x$

Solution The function f is a polynomial function. To find its zeros, we solve $f(x) = 0$.

$$\begin{aligned} 2x^3 - 32x &= 0 \\ 2x(x^2 - 16) &= 0 \\ 2x(x + 4)(x - 4) &= 0 \\ x^2(x + 4)(x - 4) &= 0 \\ x = 0 \text{ or } x = -4 \text{ or } x = 4 \end{aligned}$$

The zeros of f are 0, -4, and 4.




b. $g(x) = \frac{x+1}{x-1}$

Solution The function g is *not* a polynomial function. To find its zeros, we solve $g(x) = 0$:

$$\begin{aligned} \frac{x+1}{x-1} &= 0 \\ x+1 &= 0 \\ x &= -1 \end{aligned}$$

The only zero of g is -1.



c. If $P(x) = 3x^4 - 7x^3 - 5x^2 + 9x + 10$, find: $P(-3n)$.

$$\begin{aligned} P(x) &= 3x^4 - 7x^3 - 5x^2 + 9x + 10 \\ &= 3(-3n)^4 - 7(-3n)^3 - 5(-3n)^2 + 9(-3n) + 10 \\ &= 3(81n^4) - 7(-27n^3) - 5(9n^2) + 9(-3n) + 10 \\ &= 243n^4 + 189n^3 - 45n^2 + 9 - 27n + 10 \end{aligned}$$

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EXAMPLE OF THE USE OF TRANSLATION SOFTWARE (CONT.)

Chapter 6

P01yn0mia1□□

State whether each function is a **polynomial function**. Give the zeros of each function, if they exist.

a. $f(x) = 2x^3 - 32x$

Solution The function f is a polynomial function. To find its zeros, we solve $f(x) = 0$.

$$2x^3 - 32x;$$

$$= 2x(x^2 -$$

$$16) = 0;$$

$$2x(x + 4)(x - 4) = 0$$

$$x = 0 \text{ or } x = -4 \text{ or } x = 4,$$

The zeros of

f are 0, -4, and 4.

Solution

The function

g is not a polynomial

function. To find its zeros, we solve

$$g(x) = 0:$$

$$x +$$

$$1 = 0$$

$$x = -1$$

The only zero of g is -1.

c. If $P(x) = 5x^2 + 9x + 10$, find: $P(-3n)$.

$$P(x) = 5x^2 + 9x + 10,$$

$$= 5(-3n)^2 + 9(-3n) + 10$$

$$\text{find: } P(-3n).$$

$$= 5(9n^2) - 27n + 10$$

$$5x^2 + 9x + 10$$

$$9(-3n) + 10$$

$$- 27x - 5$$

$$x^2 + 9x + 10,$$

$$P(x) = 5x^2 + 9x + 10$$

$$= 5(-3n)^2 + 9(-3n) + 10$$

$$5x^2 + 9x + 10$$

$$= 5(9n^2) - 27n + 10$$

$$7(-3n)^2 - 5(-3n) + 10$$

$$10 = 3(81n^2)$$

$$) \cdot$$

$$= 7(-27n) - 5$$

$$= 45n^2 + 189n - 27n + 10$$

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3 ▶ State whether each function is a polynomial
 4 function. Give the zeros of each function,
 5 if they exist.

6 ▶ a. $f(x) = 2x^3 - 32x$

7 ▶ Solution The function f is a
 8 polynomial function. To find its zeros, we
 9 solve $f(x) = 0$.

10 ▶ $2x^3 - 32x = 0$;

11 ▶ $2x^2(x - 16) = 0$.

12 ▶ The zeros are 0 and 4 .

13 ▶ $2x^2(x - 16) = 0$ or $x^2(x - 16) = 0$
 14 ▶ $x^2(x - 16) = 0$.

15 ▶ The zeros are 0 or $x = 16$ or $x = 4$,

16 ▶ The zeros of f are 0 , -4 , and 4 .

17 ▶ Solution The function g is not a
 18 polynomial function. To find its zeros,
 19 we solve $g(x) = 0$:

20 ▶ $x^2 + 1 = 0$

21 ▶ $x^2 = -1$

22 ▶ The only zero of g is -1 .

23 ▶ c. If $P(x) = 5x^2 + 9x + 10$, find: $P(-3)$.

24 ▶ $P(x) = 5x^2 + 9x + 10$

25 ▶ $P(-3) = 5(-3)^2 + 9(-3) + 10 = 45 - 27 + 10 = 28$



PROOFREADING AND USE OF THE FULL NEMETH CODE

- Proofread
- Use the full Nemeth Code
- Be consistent
- Having trouble with the math...ask questions



COMPOSITION SIGNS AND NEMETH SYMBOLS

- Composition signs are unique to the braille code and have no counterpart in ink print.
- In Nemeth there are many symbols which have no print counterpart.



QUICK REFERENCE

- All numbers are brailled as lower cell symbols
- Mush the expressions together. In a math equation, spaces are usually only required before and after signs of comparison (ie. =, >, <)

$$3 + 12x \neq 16$$

Spaces are also required before and after abbreviations in many cases

$$100\text{ m} + 1000\text{ m} \neq 1\text{ km}$$

- The dot 4 precedes math symbols in literary formatting. This is NOT the case in Nemeth
- There are plenty of exceptions to every rule 😊

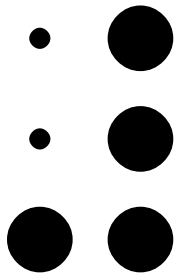


NEMETH SYMBOLS V. EBAE BRAILLE SYMBOLS

	Print	Literary	Nemeth
comma	,	⠠,	⠠,
left parenthesis	(⠠(⠠(
right parenthesis)	⠠)	⠠)
left angle bracket	<	⠠<	⠠<
right angle bracket	>	⠠>	⠠>
left square bracket	[⠠[⠠[
right square bracket]	⠠]	⠠]
left brace	{	⠠{	⠠{
right brace	}	⠠}	⠠}
dollar sign	\$	⠠\$	⠠\$
percent sign	%	⠠%	⠠%
asterisk reference	*	⠠*	⠠*
degree sign (hollow dot)	°	⠠°	⠠°



THE NUMERIC INDICATOR



USING THE CORRECT COMMA

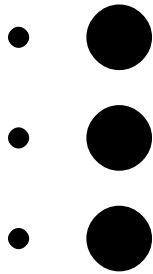
- The dot 6 is the Nemeth Comma.
- The dot 2 is the Literary Comma.
- It is important to use the correct comma.
- Example:

The polynomial below, the rational solutions are

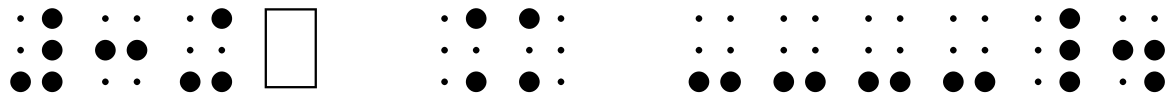
$$x = -1, -3, \text{ and } -5.$$



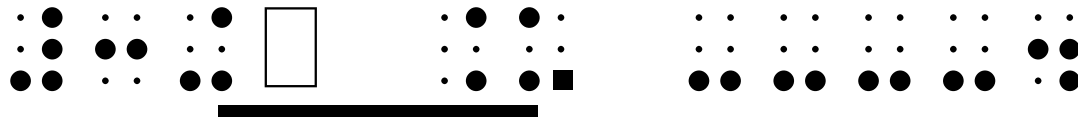
THE PUNCTUATION INDICATOR



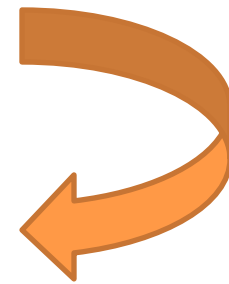
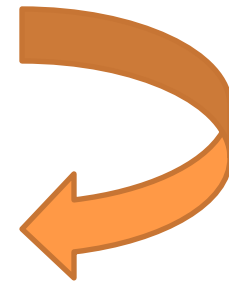
THE PUNCTUATION INDICATOR (CONT.)



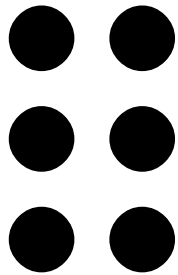
$$3 + x =$$



$$3 + x = \underline{\hspace{2cm}}4$$



THE GENERAL OMISSION SYMBOL



1. $4y + 6y =$

2. $9! = ?$



CONTRACTIONS

- 63 braille symbols.
- Context
- Special contractions: to, into, and by
- When a word “touches” any math symbol, spell it out.
- When in doubt spell it out

th



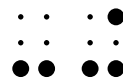
en



ar



“coming”



LETTER SIGNS

- Is it an abbreviation? Does the abbreviation end in a period ?

6 m (six meters)

- A single letter which is not an abbreviation:

space
or
punctuation
before

Y

space
or
punctuation
after

- The letter “touches” math

x^2



NEMETH V. LITERARY FORMATTING

- Paragraphs
- Kindergarten and 1st Grade—Blank Lines
- Transcriber Note Symbols
- Directions



NEMETH V. LITERARY FORMATTING (CONT.)

- Numbers Following Letters
- Blank Lines After Cell 5 Headings
- Displayed Material



DIVISION OF EXPRESSIONS

- Keep an equation on one braille line
- Sometimes it is necessary to break an expression that will not fit on one braille line
- Keep units together...

$$(x^2 + 6x - 4)(2 + x)(y^3 + y^2 + 6)(w + 11.19)(s^2 + 16s + 45)$$



Break between units...in this case between parentheses



For Reference... All of the Letter Indicator Rules with Examples

Blue font requires the letter indicator (dots 56)

Red font indicates letter placement which does not require the letter indicator

Unlocking the Mystery of the Letter sign in Nemeth...

Abbreviations: (Single letter & short-form combinations)

- | | | |
|------|--|-------------|
| 38a. | Abbreviations without a period | YES ELI |
| | F is the abbreviation for Fahrenheit. | |
| 38b. | Abbreviation with a period | NO ELI |
| | C. is the abbreviation for Celsius. | |
| 38B. | Abbreviation with uncertainty whether period applies | NO ELI |
| | The abbreviation for Centigrade is C. | |
| 53 | Enclosed in Sign of Grouping | YES/NO ELI* |
| | 1 liter (l) 1 liter (l.) 1 year (yr.) = 12 months (mo) 1 year (yr) = 12 months (mo) | |

*Depends on whether ELI is needed if S.O.G. is not present



Other Letters and short-form combination...

- 32a. Preceded AND followed by spaces or punctuation YES ELI
l, m, n are in Set S. "a" is less than "B".
a. $5 + 6 = 11$ (letter in itemized material)
- 32b. Joined by a hyphen or a dash YES ELI
Not-p Label the X- and Y-axes.
- 33a. Preceded or followed by a Sign of Comparison (=) NO ELI
If $a = c = d$, then $ac = cd$.
(unless separated by punctuation) "x" = "y" YES ELI
- 33b. Combinations of letters contain any Capital letters NO ELI
 Ac means A times c. Let Dcv be "c divides v."
- 33d. Unspaced with Greek Letters $m\pi$ NO ELI
Unspaced with numbers $4a$ NO ELI
Unspaced with Sign of Operation (+) $a + a + a \dots + a$ NO ELI
Unspaced with any other Math symbol 35 equals $N\%$ of 120 NO ELI
- 33e. With plurals, possessives, and ordinal endings YES/NO ELI*
A's, B's, and C's The ABC's
*Depends on whether ELI is needed if ending is not present
- 52a. Entirely enclosed in signs of grouping NO ELI
(a), (b), and (c). (ab) and (cd) are not equal.



52b. Unspaced/Direct contact with opening or closing Sign of Grouping (a, b, and c) (p is less than q) (b' is read "b prime")
 (j = 1, 2, 3, ..., n) a) $3 \times 4 = \underline{\quad}$ YES/NO ELI*

*Depends on whether ELI is needed if S.O.G. is not present

(exception: if sign of grouping carries a prime) t)' NO ELI

54b. Enclosed lists {a, b, c} {0, a, 1, b 2} NO ELI

91a. Roman Numeral – single capital letter V X YES ELI

Roman Numeral – lower case letters I iv xix YES ELI

Roman Numeral – double capitalized III XIV NO ELI

122a. After a space following a sign of shape NO ELI

\triangle PQR \angle a \angle iii

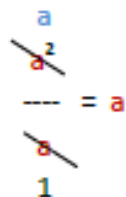
122b. Letter followed by a space and a sign of shape used as a sign of omission NO ELI

x ■ y ac \triangle cd

145a. Following a function name or its abbreviation NO ELI

sin x cos y tan ab

176 In spatial problems in accordance with the above rules YES/NO ELI

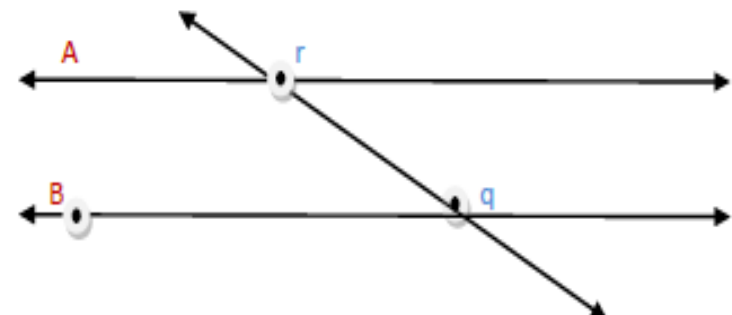


183e. In a determinant/Matrix NO ELI

$$\begin{vmatrix} ab & cd \\ ac & ce \end{vmatrix}$$

185 Single letter labels in diagrams and Tactiles – lower case YES ELI

185 Single letter labels in diagrams and Tactiles – Capitalized NO ELI



Quick Guide to formatting...
What braille cell do I begin my transcription in?

Formatting in Nemeth

1	3	5	7	9	11	⇒	A quick guide to the cell numbers
	<p>Narrative text should begin in cell 3 just like regular textbook formatting and it should runover in cell 1.</p> <p>Displayed Expressions within narrative text should also begin in cell 3 but should runover in cell 5.</p> <p>A linked expression requiring special margins should begin in cell 3 and runover in cell 7.</p> <p>Each link to the linked expression should begin in cell 5 and also runover in cell 7.</p>						Within Narrative Text
	<p>When non-spatial itemized material contains MAIN DIVISIONS with NO SUBS, they must begin in cell 1 and runover in cell 3.</p> <p>Any succeeding paragraph begins in cell 5 and runovers in cell 3.</p> <p>A displayed expression within this begins in cell 5 and runovers begin in cell 7.</p> <p>A linked expression requiring special margins should begin in cell 5 and runover in cell 9.</p> <p>Each link begins in cell 7 and runover in cell 9.</p>						Main Divisions w/ NO Subdivisions



When non-spatial itemized material contains MAIN DIVISIONS & SUBDIVISIONS, the main division begins in cell 1 and runover in cell 5.

The subdivisions begin in cell 3 and also runover in cell 5.

Succeeding paragraphs begin in cell 7 and runover in cell 5.

Displayed expressions begin in cell 7 and runover in cell 9.

Linked expressions requiring special margins begin in cell 7 and runover in cell 11.

Each link begins in cell 9 and also runover in cell 11.

**Main
Divisions &
Subdivisions**

Directions should begin in cell 5—AFTER A BLANK LINE (except after pg. chg. Indic)—with runovers in cell 3. The last line of the direction must be on the same page as the first line of the exercise which follows.

1 3 5 7 9 11

