

Monarch Nemeth Braille Cheat Sheet

(for use with all APH/Humanware notetaking devices
that utilize the Nemeth braille code for math input and output)

Note: All Nemeth rules and page numbers that are referenced here correspond to *The Nemeth Braille Code for Mathematics and Science Notation 1972 Revision*. This document can be downloaded in PDF and BRF formats from the Braille Authority of North America website at <https://www.brailleauthority.org/nemeth-code>. More information on use of the Nemeth code with Unified English Braille (UEB) can be found in *Guidance for Transcription Using the Nemeth Code within UEB Contexts*, also available in PDF and BRF formats at <https://www.brailleauthority.org/nemeth-code>.

Nemeth Indicators and Punctuation (Rule VI, pages 41-42)

Name	Braille Symbol	Braille Dot Numbers
Opening Nemeth code indicator	⠠⠠	4-5-6, 1-4-6
Closing Nemeth code indicator	⠡⠡	4-5-6, 1-5-6
Nemeth switch indicator (for a single word in Nemeth context)	⠠⠠⠠	6, 3
Punctuation indicator	⠠	4-5-6
Grade 1 (English letter) indicator	⠠	5-6
Literary comma	⠠	2
Mathematical comma	⠠	6
Long dash (blank space)	⠠⠠⠠⠠	3-6, 3-6, 3-6, 3-6
Ellipsis	⠠⠠⠠	3, 3, 3
Decimal point	⠠	4-6

Signs of Operation (Rule XIX, pages 128-130)

Signs of operation are not typically preceded or followed by a blank space.

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Plus	+		3-4-6
Minus	-		3-6
Multiplication cross	x		4, 1-6
Multiplication dot	•		1-6
Division	÷		4-6, 3-4
Plus or minus	±		3-4-6, 3-6
Plus followed by minus	+ -		3-4-6, 5, 3-6
Asterisk	*		4, 3-4-5-6
Crosshatch/pound sign	#		4-6, 3-4-5-6
Hollow dot	◦		4-6, 1-6
Union	∪		4-6, 3-4-6
Intersection	∩		4-6, 1-4-6
Vertical bar			1-2-5-6

Comparison Symbols and Arrows (Rule XX, pages 134-135)

Signs of comparison, including arrows, are always preceded and followed by a blank space.

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Equals	=		4-6, 1-3
Not equal to	≠		3-4, 4-6, 1-3

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Approximately equal	$\approx$	$\dots\dots\dots$	4, 1-5-6, 4-6, 1-3
Similar	$\sim$	$\dots\dots$	4, 1-5-6
Greater than	$>$	$\dots\dots$	4-6, 2
Greater than or equal to	$\geq$	$\dots\dots\dots$	4-6, 2, 1-5-6
Less than	$<$	$\dots\dots$	5, 1-3
Less than or equal to	$\leq$	$\dots\dots\dots$	5, 1-3, 1-5-6
Proportion	$::$	$\dots\dots$	5-6, 2-3
Ratio	$:$	$\dots\dots$	5, 2
Arc	$\cap$	$\dots\dots$	1-2-4-6, 1
Inclusion	$\subset$	$\dots\dots\dots$	4-5-6, 5, 1-3
Intersection	$\cap$	$\dots\dots$	4-6, 1-4-6
Membership (element)	$\in$	$\dots\dots$	4, 1-5
Parallel	$\parallel$	$\dots\dots$	1-2-4-6, 1-2-3
Perpendicular	$\perp$	$\dots\dots$	1-2-4-6, 1-2-3-4
Tilde	$\sim$	$\dots\dots$	4, 1-5-6
Vertical bar	$ $	$\dots\dots$	1-2-5-6
Left arrow	$\leftarrow$	$\dots\dots\dots$	1-2-4-6, 2-4-6, 2-5, 2-5
Right arrow, contracted	$\rightarrow$	$\dots\dots$	1-2-4-6, 1-3-5
Right arrow, uncontracted	$\rightarrow$	$\dots\dots\dots$	1-2-4-6, 2-5, 2-5, 1-3-5
Left/right arrow	$\leftrightarrow$	$\dots\dots\dots$	1-2-4-6, 2-4-6, 2-5, 2-5, 1-3-5

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Up arrow	↑	⠠⠠⠠⠠⠠⠠	1-2-4-6, 1-2-6, 2-5, 2-5, 1-3-5
Down arrow	↓	⠠⠠⠠⠠⠠⠠	1-2-4-6, 1-4-6, 2-5, 2-5, 1-3-5
Up/down arrow	↕	⠠⠠⠠⠠⠠⠠⠠⠠	1-2-4-6, 1-2-6, 2-4-6, 2-5, 2-5, 1-3-5
Right over left arrow	⇒	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	1-2-4-6, 2-5, 2-5, 1-3-5, 1-2-4-6, 2-4-6, 2-5, 2-5
Left over right arrow	⇐	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	1-2-4-6, 2-4-6, 2-5, 2-5, 1-2-4-6, 2-5, 2-5, 1-3-5

Grouping Symbols (Rule XVIII, pages 122-123)

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Opening Parenthesis	(	⠠	1-2-3-5-6
Closing Parenthesis	)	⠡	2-3-4-5-6
Opening Square Bracket	[	⠠⠠	4, 1-2-3-5-6
Closing Square Bracket	]	⠠⠠	4, 2-3-4-5-6
Opening Brace	{	⠠⠠	4-6, 1-2-3-5-6
Closing Brace	}	⠠⠠	4-6, 2-3-4-5-6
Opening Angle Bracket	<	⠠⠠⠠	4-6, 4-6, 1-2-3-5-6
Closing Angle Bracket	>	⠠⠠⠠	4-6, 4-6, 2-3-4-5-6
Vertical Bar		⠠	1-2-5-6

Fractions and Fraction Indicators (Rule XII, page 75)

A simple fraction is a single numerator over a single denominator. A mixed number is a whole number combined with a simple fraction. A complex fraction is a simple fraction over another simple fraction. See pages 76-78 for some examples.

Name	Braille Symbol	Braille Dot Numbers
Opening simple fraction indicator	$\frac{\cdot}{\cdot}$	1-4-5-6
Closing simple fraction indicator	$\frac{\cdot}{\cdot}$	3-4-5-6
Opening mixed number indicator	$\frac{\cdot}{\cdot}$	4-5-6, 1-4-5-6
Closing mixed number indicator	$\frac{\cdot}{\cdot}$	4-5-6, 3-4-5-6
Opening complex fraction indicator	$\frac{\cdot}{\cdot}$	6, 1-4-5-6
Closing complex fraction indicator	$\frac{\cdot}{\cdot}$	6, 3-4-5-6
Simple horizontal fraction line	$\frac{\cdot}{\cdot}$	3-4
Complex horizontal fraction line	$\frac{\cdot}{\cdot}$	6, 3-4
Diagonal fraction line	$\frac{\cdot}{\cdot}$	4-5-6, 3-4

Superscripts and Subscripts (Rule XIII, page 82)

See pages 83-85 for some examples of different levels of superscripts.

Name	Braille Symbol	Braille Dot Numbers
Baseline indicator	$\frac{\cdot}{\cdot}$	5
Superscript	$\frac{\cdot}{\cdot}$	4-5
Superscript with superscript	$\frac{\cdot}{\cdot}$	4-5, 4-5
Superscript with superscript with superscript	$\frac{\cdot}{\cdot}$	4-5, 4-5, 4-5
Subscript	$\frac{\cdot}{\cdot}$	5-6
Subscript with subscript	$\frac{\cdot}{\cdot}$	5-6, 5-6

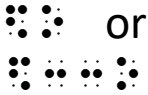
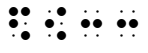
Name	Braille Symbol	Braille Dot Numbers
Subscript with subscript with subscript	⠨ ⠨ ⠨	5-6, 5-6, 5-6
Superscript with subscript	⠨ ⠨	4-5, 5-6
Superscript with subscript with subscript	⠨ ⠨ ⠨	4-5, 5-6, 5-6
Superscript with subscript with superscript	⠨ ⠨ ⠨	4-5, 5-6, 4-5
Superscript with superscript with subscript	⠨ ⠨ ⠨	4-5, 4-5, 5-6
Subscript with superscript	⠨ ⠨	5-6, 4-5
Subscript with superscript with superscript	⠨ ⠨ ⠨	5-6, 4-5, 4-5
Subscript with superscript with subscript	⠨ ⠨ ⠨	5-6, 4-5, 5-6
Subscript with subscript with superscript	⠨ ⠨ ⠨	5-6, 5-6, 4-5

Square Roots and Radical Indicators (Rule XV, page 108)

The radical is the square root symbol that houses the radicand, or number whose root is being taken. The index is the number that tells you which root to find. For example, in square roots, the index is 2 and is not printed; in cube roots, the index is 3 and is printed in small font at the top of the radical symbol. See pages 108-110 for some examples of different uses for radical indicators.

Name	Braille Symbol	Braille Dot Numbers
Radical (square root) sign	⠨	3-4-5
Index-of-radical indicator	⠨	1-2-6
First inner radical	⠨	4-6
Second inner radical	⠨ ⠨	4-6, 4-6
Third inner radical	⠨ ⠨ ⠨	4-6, 4-6, 4-6
Termination indicator	⠨	1-2-4-5-6

Shape Symbols (Rule XVI, pages 110-114)

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Angle			1-2-4-6, 2-4-6
Arc			1-2-4-6, 1
Right arrow			1-2-4-6, 1-3-5 or 1-2-4-6, 2-5, 2-5, 1-3-5
Left arrow			1-2-4-6, 2-4-6, 2-5, 2-5
Up arrow			1-2-4-6, 1-2-6, 2-5, 2-5, 1-3-5
Down arrow			1-2-4-6, 1-4-6, 2-5, 2-5, 1-3-5
Circle			1-2-4-6, 1-4
Diamond			1-2-4-6, 1-4-5
Ellipse			1-2-4-6, 1-5
Hexagon (regular)			1-2-4-6, 2-3-5
Parallel			1-2-4-6, 1-2-3
Perpendicular			1-2-4-6, 1-2-3-4
Parallelogram			1-2-4-6, 1-2-4-5
Pentagon (regular)			1-2-4-6, 2-6
Quadrilateral			1-2-4-6, 1-2-3-4-5
Rectangle			1-2-4-6, 1-2-3-5
Rhombus			1-2-4-6, 1-2-5
Square			1-2-4-6, 2-5-6
Star			1-2-4-6, 2-3-4
Trapezoid			1-2-4-6, 1-3-5-6
Triangle (equilateral)			1-2-4-6, 2-3-4-5

Modifiers (Rule XIV, pages 97-99)

Modifiers are symbols (like lines, arcs, arrows, carets, etc.) that are printed above or below a related symbol or mathematical expression. Modified expressions are brailled in the following order, without spaces:

- 1) Multipurpose indicator
- 2) Expression being modified
- 3) Directly-over or directly-under indicator (depending on whether the modifier symbol is printed above or below the expression being modified)
- 4) Modifier symbol
- 5) Termination indicator

See pages 99-103 for some examples.

Name	Braille Symbol	Braille Dot Numbers
Multipurpose indicator	⠠	5
Directly-over indicator	⠠	1-2-6
Directly-under indicator	⠡	1-4-6
Termination indicator	⠠	1-2-4-5-6

Miscellaneous Symbols (Rule XXII, pages 152-153)

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Cent	¢	⠠	4, 1-4
Dollar	\$	⠠	4, 2-3-4
Degree	°	⠠	4-5, 4-6, 1-6
Percent	%	⠠	4, 3-5-6
Prime	′	⠠	3
Caret	^	⠠	4-5-6, 1-2-6
Null set	∅	⠠	4-5-6, 3-5-6

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Factorial	!	$\cdot$	1-2-3-4-6
Infinity	∞	$\cdot$	6, 1-2-3-4-5-6
Integral	$\int$	$\cdot$	2-3-4-6
At sign	@	$\cdot$	4, 1
Checkmark	✓	$\cdot$	4, 3-4-5
Ditto mark	“	$\cdot$	6, 3
Therefore	$\therefore$	$\cdot$	6, 1-6
Tally mark		$\cdot$	4-5-6

Function Names and Abbreviations (Rule XVII, pages 118-120)

The function abbreviation is always followed by a blank space. Usually, a space does not precede the function abbreviation unless it comes at the beginning of a mathematical expression.

Name	Abbreviation	Braille Symbol	Braille Dot Numbers
Arc	arc	$\cdot$	1, 1-2-3-5, 1-4
Cosine	cos	$\cdot$	1-4, 1-3-5, 2-3-4
Cosecant	csc	$\cdot$	1-4, 2-3-4, 1-4
Cotangent	cot	$\cdot$	1-4, 1-3-5, 2-3-4-5
Determinant	det	$\cdot$	1-4-5, 1-5, 2-3-4-5
Limit	lim	$\cdot$	1-2-3, 2-4, 1-3-4
Natural logarithm	ln	$\cdot$	1-2-3, 1-3-4-5
Logarithm	log	$\cdot$	1-2-3, 1-3-5, 1-2-4-5
Maximum	max	$\cdot$	1-3-4, 1, 1-3-4-6

Name	Abbreviation	Braille Symbol	Braille Dot Numbers
Minimum	min	$\cdot\cdot\cdot$	1-3-4, 2-4, 1-3-4-5
Secant	sec	$\cdot\cdot\cdot$	2-3-4, 1-5, 1-4
Sine	sin	$\cdot\cdot\cdot$	2-3-4, 2-4, 1-3-4-5
Tangent	tan	$\cdot\cdot\cdot$	2-3-4-5, 1, 1-3-4-5

Greek Letters (Rule IV, pages 23-24)

The Greek letter indicator is dots 46. All letters in the following table are lowercase (the uppercase print symbols for Delta, Sigma, and Omega are also included in parentheses). To capitalize a letter, add a capital indicator (dot 6) after the Greek letter indicator. (*Example:* Lowercase Alpha is dots 46, 1. Capital Alpha is dots 46, 6, 1.)

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Alpha	A	$\cdot\cdot\cdot$	4-6, 1
Beta	B	$\cdot\cdot\cdot$	4-6, 1-2
Gamma	Γ	$\cdot\cdot\cdot$	4-6, 1-2-4-5
Delta	δ (Δ)	$\cdot\cdot\cdot$ $\cdot\cdot\cdot$	4-6, 1-4-5 (4-6, 6, 1-4-5)
Epsilon	E	$\cdot\cdot\cdot$	4-6, 1-5
Zeta	Z	$\cdot\cdot\cdot$	4-6, 1-3-5-6
Theta	Θ	$\cdot\cdot\cdot$	4-6, 1-4-5-6
Lambda	Λ	$\cdot\cdot\cdot$	4-6, 1-2-3
Mu	M	$\cdot\cdot\cdot$	4-6, 1-3-4
Nu	N	$\cdot\cdot\cdot$	4-6, 1-3-4-5
Pi	Π	$\cdot\cdot\cdot$	4-6, 1-2-3-4

Name	Print Symbol	Braille Symbol	Braille Dot Numbers
Sigma	σ (Σ)	⠠⠠⠠⠠⠠⠠	4-6, 2-3-4 (4-6, 6, 2-3-4)
Tau	τ	⠠⠠⠠	4-6, 2-3-4-5
Chi	χ	⠠⠠⠠	4-6, 1-2-3-4-6
Omega	ω	⠠⠠⠠⠠⠠⠠	4-6, 2-4-5-6 (4-6, 6, 2-4-5-6)

Typeforms (Rule V, page 36)

When adding a boldface or italic indicator to a single letter in Nemeth, remember to include a grade 1 indicator (dots 56) after the indicator. An opening boldface or italic indicator that is used for a word, phrase, or statement is preceded and followed by a blank space, and the closing indicator is likewise preceded and followed by a blank space.

Name	Braille Symbol	Braille Dot Numbers
Boldface (single letter)	⠠	4-5-6
Italic (single letter)	⠡	4-6
Opening Boldface (words, phrases, and statements)	⠠⠠⠠	6, 3, 4-5-6
Closing Boldface (words, phrases, and statements)	⠠⠠⠠	4-5-6, 6, 3
Opening Italic (words, phrases, and statements)	⠡⠠⠠	6, 3, 4-6
Closing Italic (words, phrases, and statements)	⠡⠠⠠	4-6, 6, 3