Teaching Students the Nemeth Braille Code for Mathematics and Science Notation: A Free Totally Accessible Online Approach

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K12 Access Summit, July 28, 2022

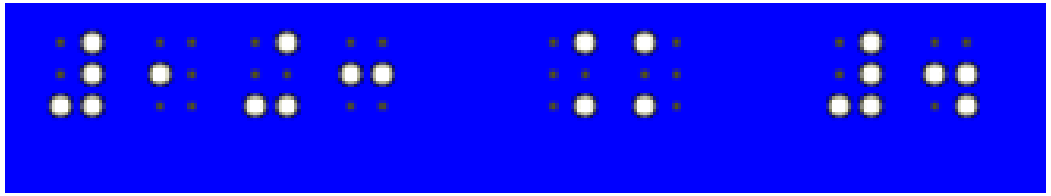
Objectives

The participants will be able to:

- Identify three strategies that can be used to teach Nemeth Code to young students who read braille.
- Make connections between learning the Nemeth Code and learning math across all grade levels.
- Locate Nemeth Code symbols and examples in mathematical context using the Nemeth Symbol Library for a variety of uses, including mathematical and Nemeth Code learning.

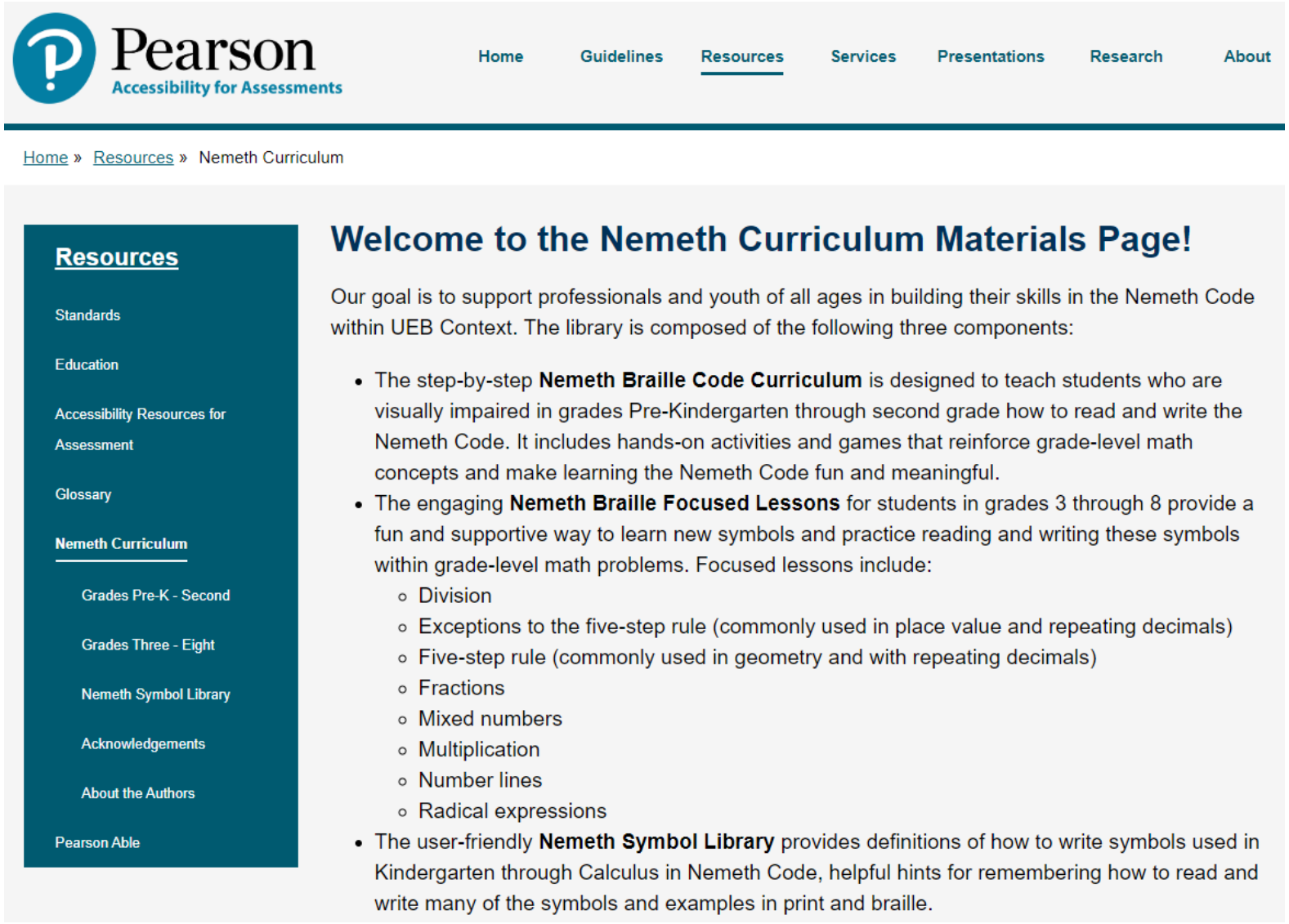
When should Nemeth Code instruction begin?

Never too young!!



Pearson Nemeth Curriculum Materials Page

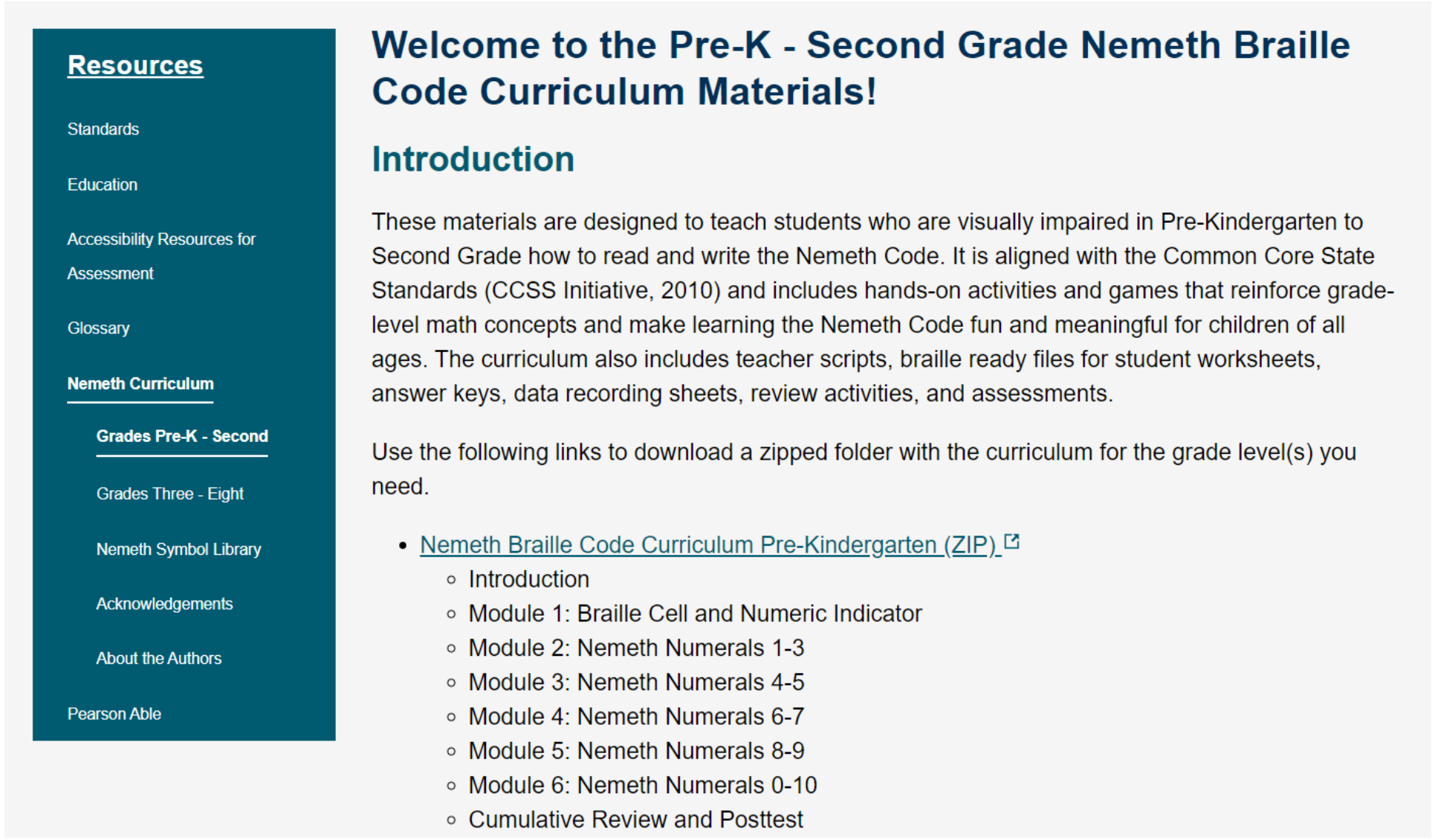
https://accessibility.pearson.com/resources/nemeth-curriculum/



Pearson Nemeth Curriculum Materials

- The *Nemeth Braille Code Curriculum* (Pre-K through Second Grade)
- The *Nemeth Braille Code Focused Lessons* (Third Grade through Eighth Grade)
- The *Nemeth Symbol Library*

Pre-K – Second Grade Nemeth Braille Code Curriculum



Resources

Standards

Education

Accessibility Resources for Assessment

Glossary

Nemeth Curriculum

Grades Pre-K - Second

Grades Three - Eight

Nemeth Symbol Library

Acknowledgements

About the Authors

Pearson Able

Welcome to the Pre-K - Second Grade Nemeth Braille Code Curriculum Materials!

Introduction

These materials are designed to teach students who are visually impaired in Pre-Kindergarten to Second Grade how to read and write the Nemeth Code. It is aligned with the Common Core State Standards (CCSS Initiative, 2010) and includes hands-on activities and games that reinforce grade-level math concepts and make learning the Nemeth Code fun and meaningful for children of all ages. The curriculum also includes teacher scripts, braille ready files for student worksheets, answer keys, data recording sheets, review activities, and assessments.

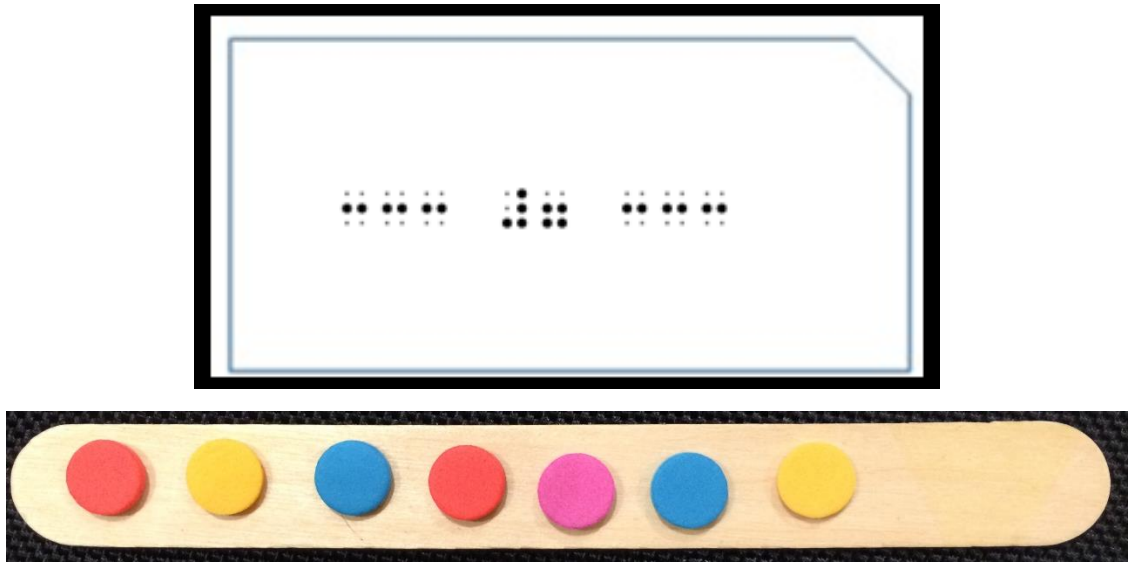
Use the following links to download a zipped folder with the curriculum for the grade level(s) you need.

- Nemeth Braille Code Curriculum Pre-Kindergarten (ZIP)
  - Introduction
  - Module 1: Braille Cell and Numeric Indicator
  - Module 2: Nemeth Numerals 1-3
  - Module 3: Nemeth Numerals 4-5
  - Module 4: Nemeth Numerals 6-7
  - Module 5: Nemeth Numerals 8-9
  - Module 6: Nemeth Numerals 0-10
  - Cumulative Review and Posttest

Nemeth Braille Code Curriculum (Pre-K through Second Grade)

- Teaches students to read and write Nemeth Code within UEB Contexts
- Pre-K, kindergarten, first grade, and second grade materials
- Aligned with the Common Core State Standards (CCSS Initiative, 2010)
- Hands-on games and activities
- Includes teacher scripts, braille ready files for student worksheets, answer keys, data recording sheets, review activities, and assessments

Pre-Kindergarten – Building a Train



Materials

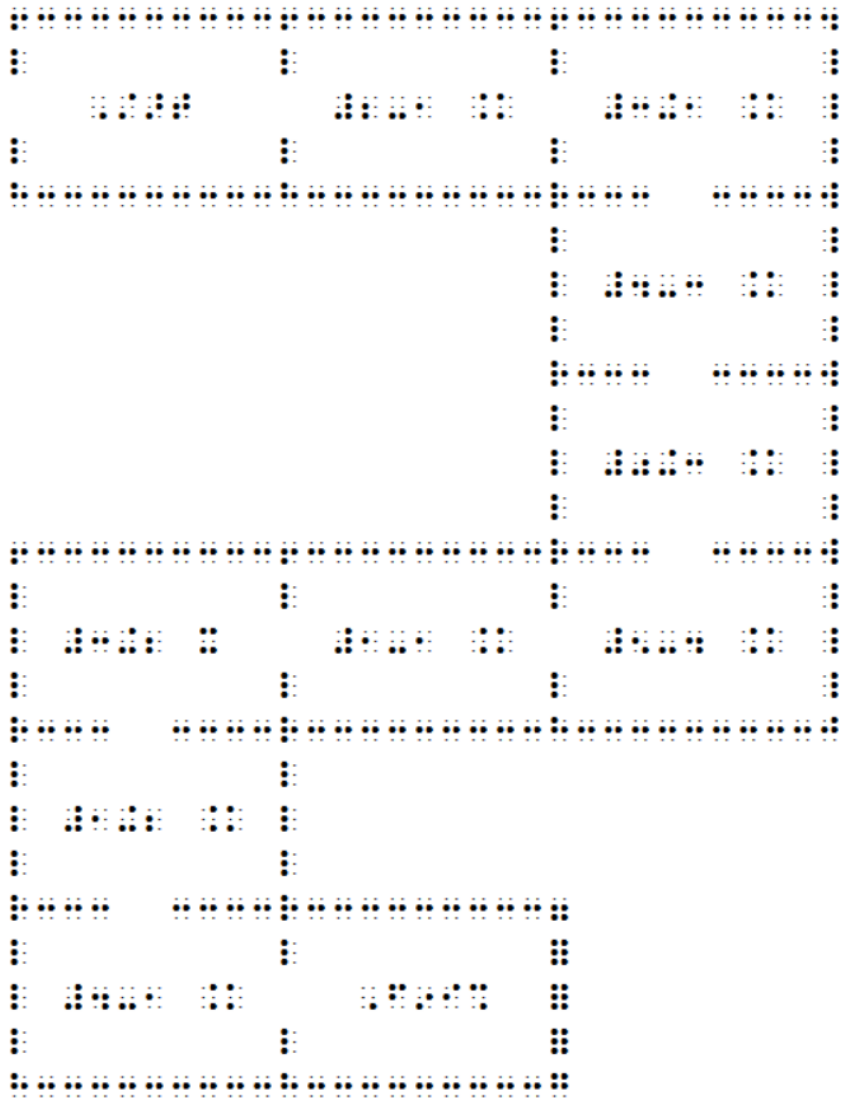
- Foam stickers
- Craft sticks
- Flash cards labeled 1- 7

Steps

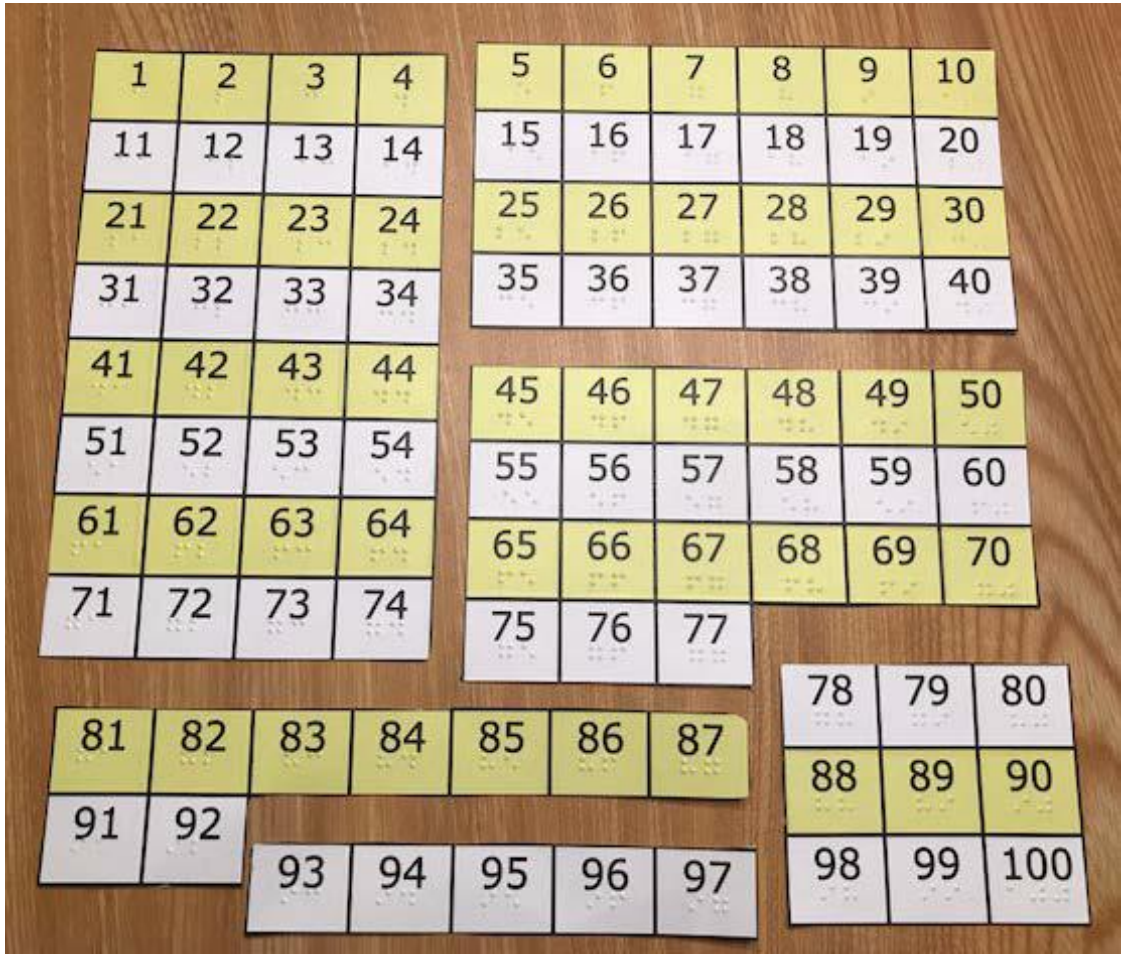
- Student shuffles flash cards
- Student draws a card and reads the numeral on the card
- Student uses stickers to “build” the train

If you add print numbers to the flash cards, your student can do the activity with a friend.

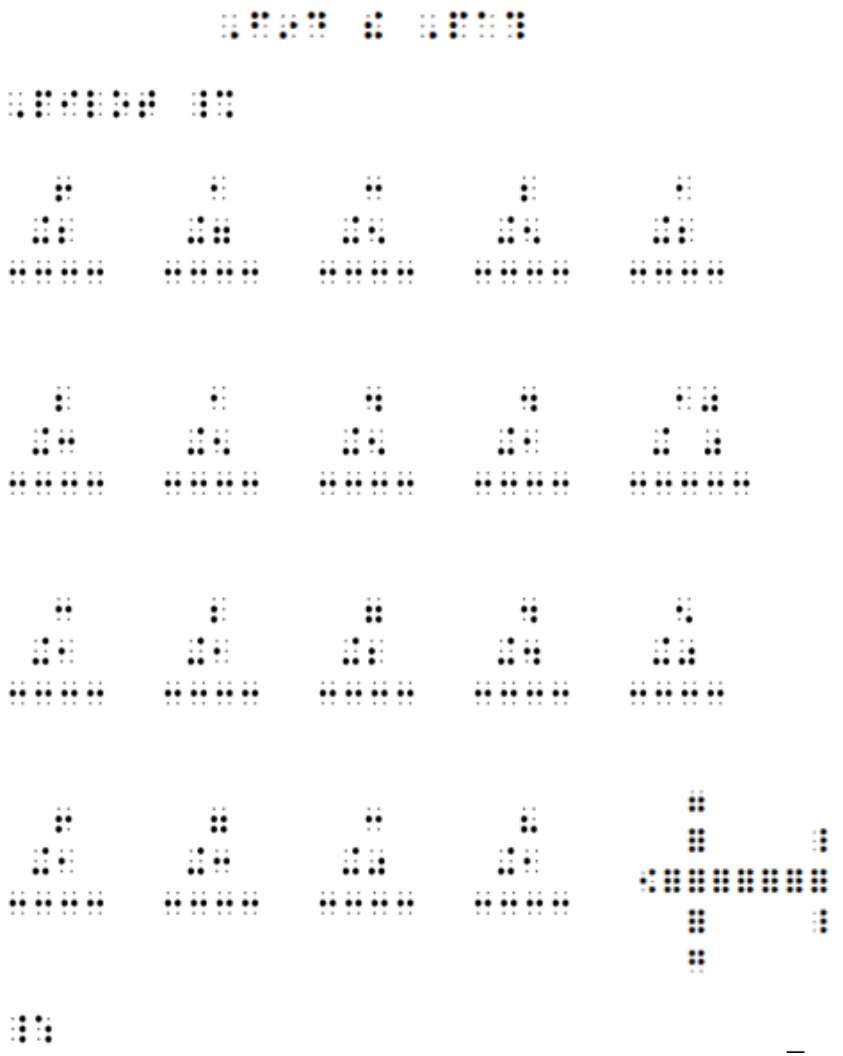
Kindergarten – Maze



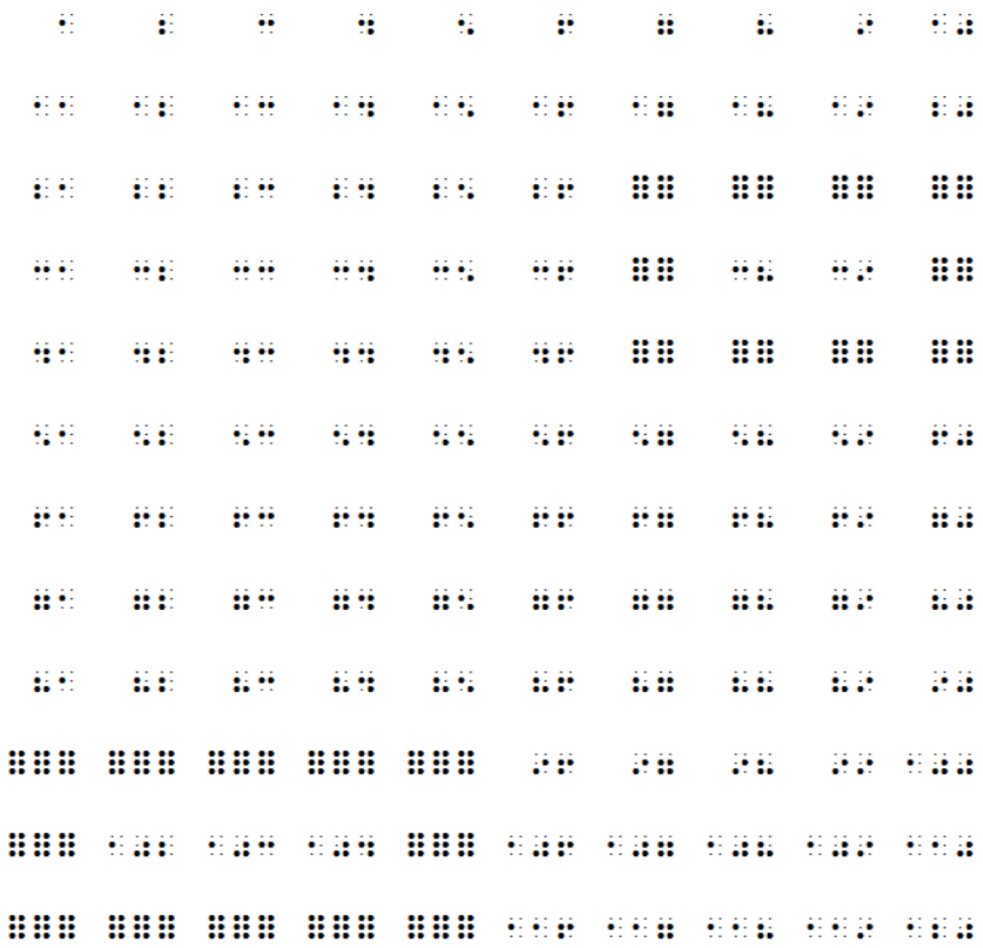
Kindergarten - Rebuild a Hundreds Chart



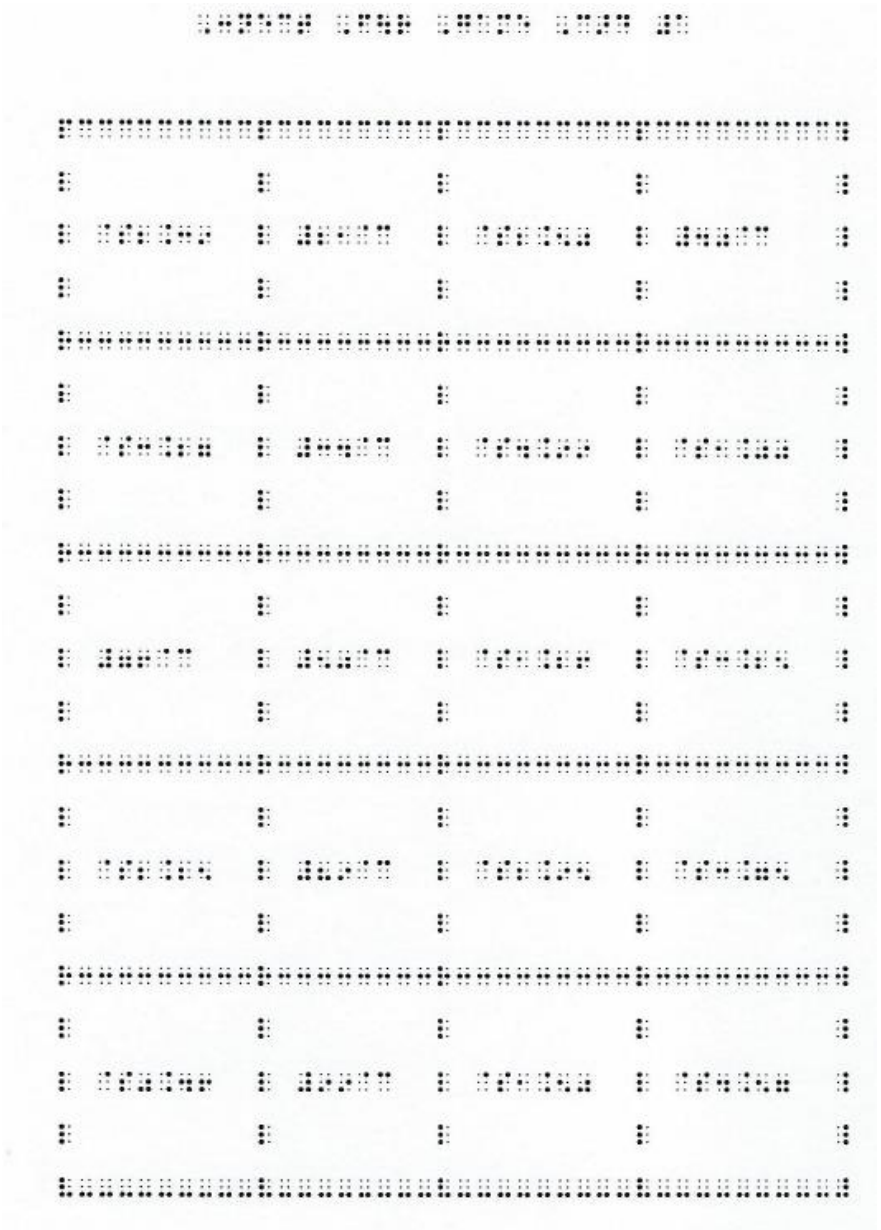
First Grade – Find the Path Activity and Help the Pilot Get to the Airplane!



First Grade – Determine the Shape and Then Write the Missing Numbers



Second Grade – Connect Four



More Hands-on Materials and Manipulatives for Math and Science

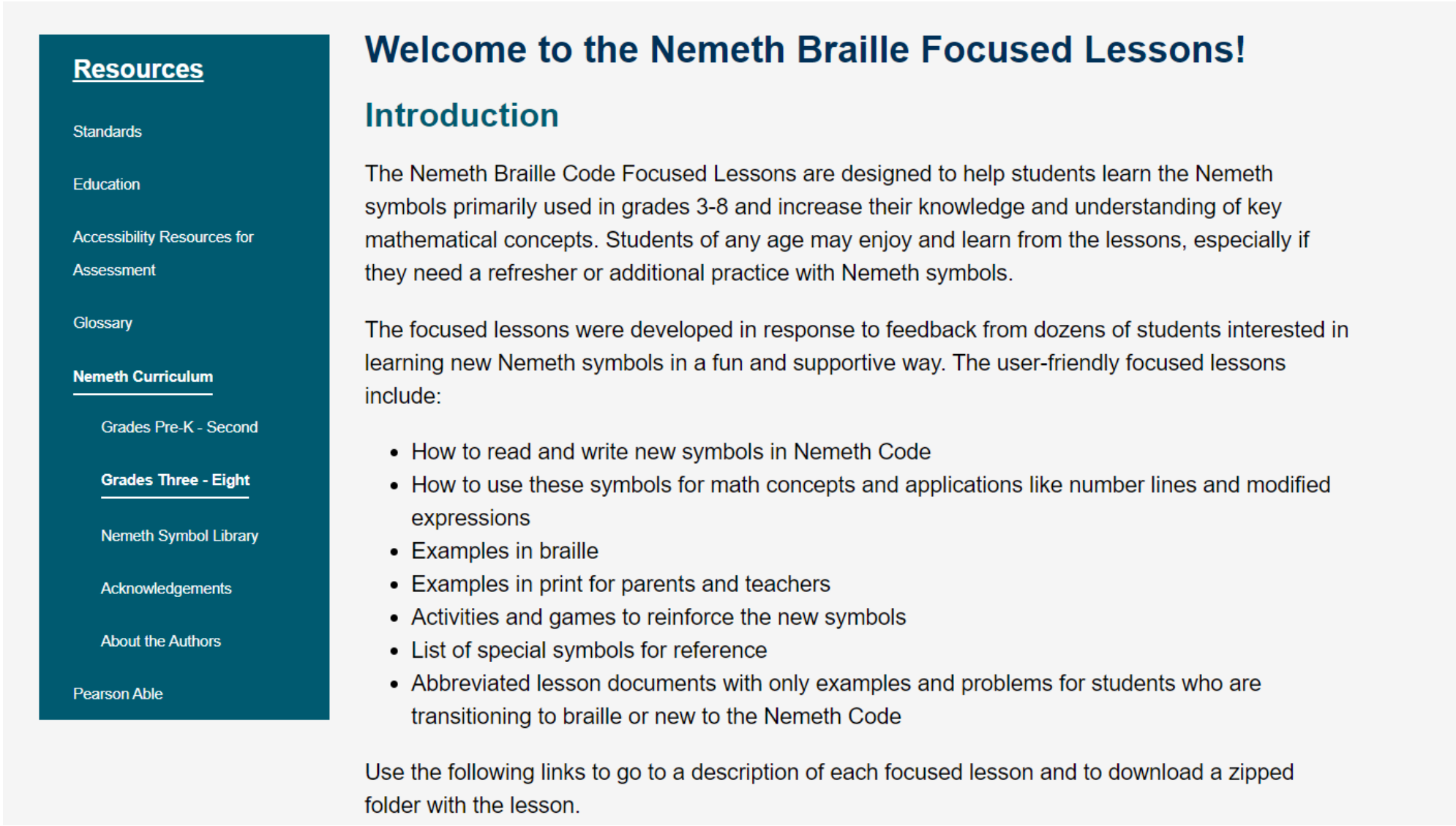
- Templates for BINGO cards
- Template for Five Frame
- Template for Ten Frame
- Number Search
- Guess My Number
- Roll and Race Game Cards
- Flash Cards
- Shapes Activity
- Counting to 120 Chart
- Place Value Chart

Strategies for Supporting the Student in Building Math Skills

Brailling the Equals Sign (=) ⠶

- Begin brailling using two fingers of the right hand.
- Then follow with two fingers of the left hand.
- Memory cues:
  - Two fingers are “equal to” two fingers.
  - Two dots are “equal to” two dots.

Nemeth Braille Code Focused Lessons



Focused Nemeth Lessons

The *Nemeth Braille Code Focused Lessons* are designed to help students learn the Nemeth symbols primarily used in grades 3-8 and increase their knowledge and understanding of key mathematical concepts.

Students of any age may enjoy and learn from the lessons, especially if they need a refresher or additional practice with Nemeth symbols.

- Five-Step Rule and Exceptions
- Fractions and Mixed Numbers
- Multiplication and Division
- Number Lines
- Radical Expressions

Five-Step Rule and Exceptions

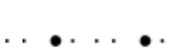
1. The following steps outline how to write three hundred fifty-six with a bar under the 5:

$3\underline{5}6$

a. Numeric indicator (dots 3-4-5-6) 
b. Three (dots 2-5) 
c. Five (dots 2-6) 
d. Directly-under indicator (dots 1-4-6) 
e. Horizontal bar (dots 1-5-6) 
f. Six (dots 2-3-5) 

$\overline{AB}$

Below are the steps used to write this modified expression.

Step 1: Multipurpose indicator (dot 5) 
Step 2: Expression being modified (AB) 
Step 3: Directly-over indicator (dots 1-2-6) 
or directly-under indicator (dots 1-4-6) 
Step 4: Modifier (Horizontal bar, dots 1-5-6) 
Step 5: Termination indicator (dots 1-2-4-5-6) 

Fractions and Mixed Numbers

7. $\frac{y}{z} \cdot \frac{z}{x}$

open fraction y over z close fraction times (multiplication dot) open fraction z over x close fraction

Answer: ⠷⠽⠌⠵⠾⠈⠦⠷⠵⠌⠭⠾

8. $\frac{p-q}{p+q} + \frac{q-p}{p+q}$

open fraction p minus q over p plus q close fraction plus open fraction q minus p over p plus q close fraction

Answer: ⠷⠏⠤⠟⠌⠏⠖⠟⠾⠬⠷⠟⠤⠏⠌⠏⠖⠟⠾

Write the following problems involving mixed numbers using a horizontal fraction line and number each problem.

1. $3\frac{1}{2} + 2\frac{1}{4}$ three and one-half plus two and one-fourth

Answer: ⠼⠉⠼⠁⠌⠃⠬⠼⠃⠼⠁⠌⠙

2. $52\frac{4}{5} \cdot \frac{5}{8}$ fifty-two and four-fifths times (multiplication dot) five-eighths

Answer: ⠼⠑⠃⠼⠙⠌⠢⠼⠑⠌⠓

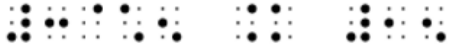
Multiplication and Division

Multiplication is related to addition. For example, if you buy five ice cream cones for your friends and each cone has three scoops, how many scoops are there in all? You could determine the number of ice cream scoops by adding the same number, 3, five times.

$3+3+3+3+3=15$

However, there is another way to approach this problem. It could also be written as an equation using multiplication. Three times (multiplication cross) five equals fifteen.

$3\times5=15$



Division is related to multiplication. For example, if your aunt buys a dozen chocolate chip cookies for her family of four, how many cookies can each person have? You could determine the number of cookies by figuring out what number multiplied by four equals twelve.

$?\times4=12$

However, there is another way to approach this problem. It could also be written as an equation with a divided by sign. Twelve divided by four equals what number.

$12\div4=?$

Creating Braille Number Lines

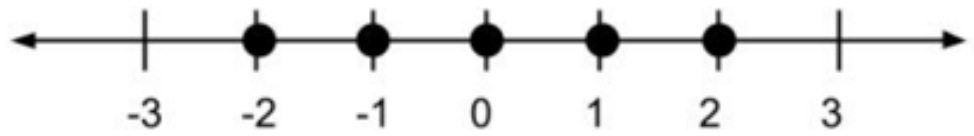
Braille number lines can be created with specific Nemeth code number line symbols using a braillewriter. Since number lines take up two lines of braille, a one-line refreshable braille display is not able to display them properly. These tactile number lines are also quite "visual". That is, they look very much like the print versions of number lines. Therefore, it is rather easy for a sighted math teacher to interpret them, once they are given the rules for the various symbols. So, here is what you could teach your math teacher.

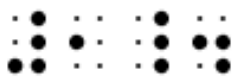
The following symbols are used to create number lines:

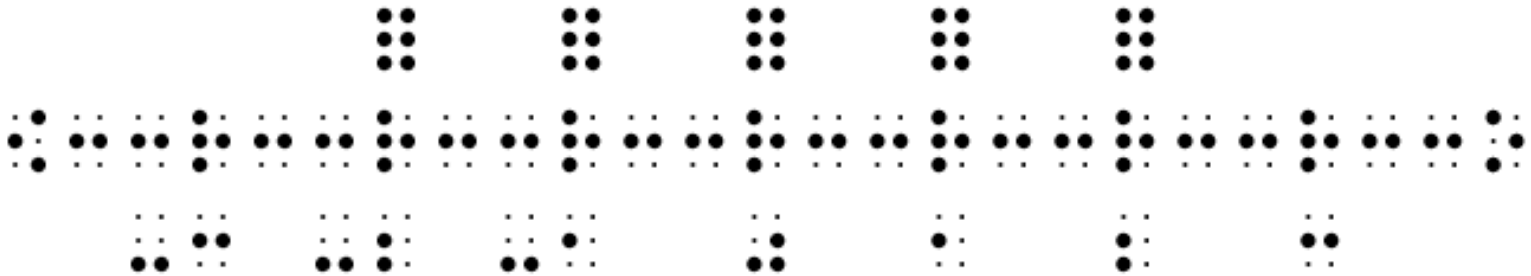
- left-pointing arrowhead (dots 2-4-6)
- line (axis line) (dots 2-5)
- scale mark (dots 1-2-3-5)
- right-pointing arrowhead (dots 1-3-5)

Graphing Points on a Number Line

1. Graph the following integers on a number line: -2, -1, 0, 1, 2.





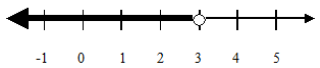


A braille number line is shown. The scale marks are in increments of 1 starting with -3 and ending with 3. A closed circle is placed above the scale marks at -2, -1, 0, 1, and 2.

Graphing and Interpreting Inequalities on a Number Line

1. Graph x is less than 3 on a number line.

$x < 3$



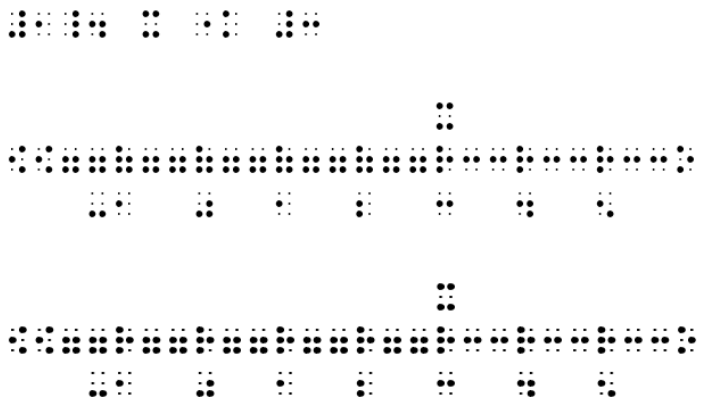
Step 1: Construct a number line and space it so that you have at least two scale marks larger than 3 and a few smaller than 3.

Step 2: Label it from -1 through 5, and add an additional left-pointing arrowhead (or bold left-pointing arrowhead).

Step 3: Braille an open circle (point not included) above the scale mark at 3.

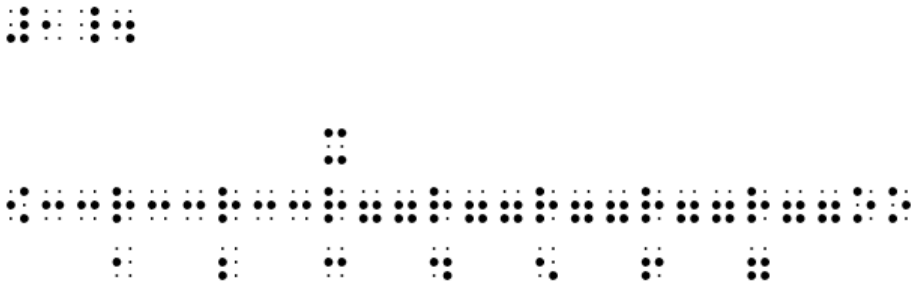
Step 4: Starting just to the right of the 2nd left-pointing arrowhead, "shade" the number line all the way up to, but not including, the 3.

Tip: You may find it easier to shade on top of scale marks, but transcribers do not do that. Our examples will be done as a transcriber, since that is the way you will see number lines graphed in a textbook or on a test.



Number Lines Lesson 3
Graphing Inequalities
Greater Than Interpreting Activity
Answer Key

1. A braille number line is shown. The scale marks are in increments of 1 starting with 1 and ending with 7, and an additional right-pointing arrowhead is added. An open circle is placed above the scale mark at 3 and shading goes from just to the right of 3 to just to the left of the 1st right-pointing arrowhead.



Answer:

1. x is greater than 3.

$x > 3$

Reading and Writing Radical Expressions

Basic Rules for Writing a Square Root

When writing a square root, you follow three simple steps. You would braille:

1. The radical symbol (dots 3-4-5) ($\sqrt{\ }$) ⠜
2. The radicand, value inside/under a radical symbol, which you want to find the root of
3. The termination indicator (dots 1-2-4-5-6) ⠸⠱

The following steps outline how to write the principal square root of 4 in Nemeth Code:

1. Radical symbol (dots 3-4-5) ($\sqrt{\ }$) ⠜
2. Four (dots 2-5-6) ⠲
3. Termination indicator (dots 1-2-4-5-6) ⠸⠱

$\sqrt{4}$

⠜⠲⠸⠱

Basic Rules for Reading a Square Root

To keep the terminology simple, from here on out "the square root" of a number refers ONLY to the principal square root. So, for most square roots you will just say "the square root of" and then read the radicand.

Examples of Square Roots

1. the square root of twenty-five

   $\sqrt{25}$

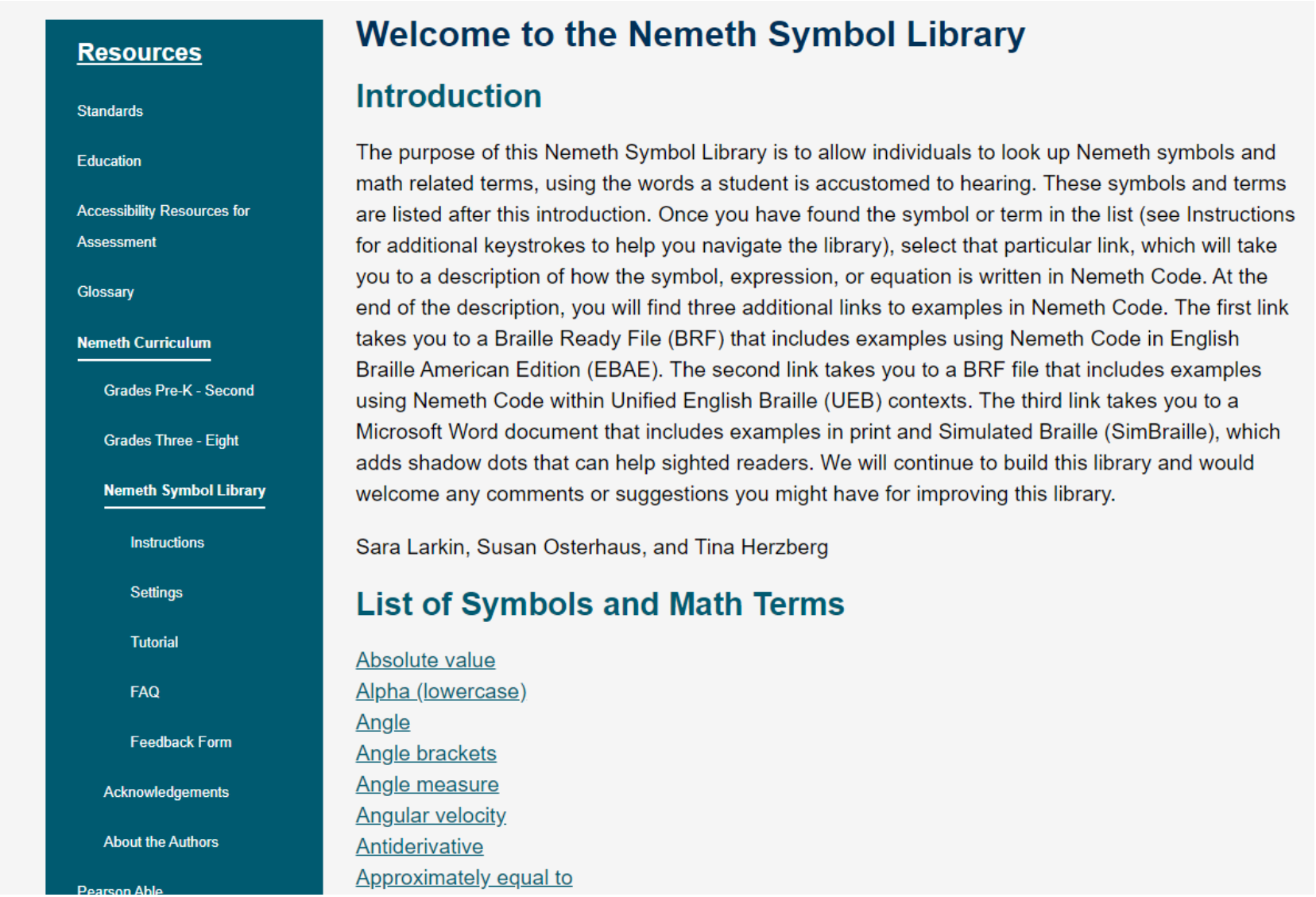
   ⠜⠼⠑⠸⠱ ⠜⠼⠃⠑⠸⠱

2. the square root of x

   $\sqrt{x}$

   ⠜⠭⠸⠱ ⠜⠭⠸⠱

Nemeth Symbol Library Webpage



Nemeth Symbol Library

- Began with higher grade levels
- Has extended down through all grade levels
- Incorporates over 600 examples at different grade levels
- Includes tutorial and list of commands used to access library
- Contains 240 terms, 136 definitions

Organization of the Nemeth Symbol Library

- The glossary of terms used in math are linked to a description of how to write each in Nemeth Code related to that content.
- Several terms land you on the same description so if your terminology is slightly different, you still get the same description.
- There are lots of examples from easy first to more complex later in the file.

Examples in the Nemeth Symbol Library

Include the following:

- Nemeth in EBAE as a brf file for students
- Nemeth within UEB Contexts as a brf file for students
- Nemeth in Print and SimBraille for teachers

Nemeth Symbol Library Contents

- Absolute Value
- Alpha (lowercase)
- Angle
- Exponent
- Exponent of an exponent
- Fahrenheit
- Vectors
- Wavelength
- Whole numbers

Tutorial

- Learn more about how the library is structured
- Learn keystrokes for navigating to a webpage and around a webpage within the context of the library
- Practice looking up definitions and examples

Nemeth Field Study

- Pearson and the NFB are seeking participants who are Teachers of the Visually Impaired, parents of blind students, or blind students who are either using or learning to use braille materials.
- If you are interested in participating in this field study, please complete the Nemeth Code Curriculum Field Study Recruiting Survey at: https://accessibility.pearson.com/research/2022studies/nemeth/
- The study is being conducted between September 5th and December 16th and will explore the effectiveness and usability of the curriculum.
- Each participant will receive compensation. In addition, everyone involved in the study will have access to the new updated curriculum materials.

Let’s hear from you!

- Thank you for your kind attention.
- Now, it’s time for questions…

- Or contact us at:
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