

# **UNIFIED ENGLISH BRAILLE (UEB)**

## **TRAINING MODULES**

# Unified English Braille

## (UEB)

### Training Modules

\*Brackets indicate the section and page reference where material can be found in the “The Rules of Unified English Braille, Second Edition 2013”

#### **Principles of Unified English Braille (1.2, p 2)**

- Unified English Braille (UEB) is a system of English braille which represents all subjects except music.
- The purpose of UEB is to allow the reader to understand without ambiguity what symbols are being expressed by a given braille text.
- The primary transcribing rule is to produce braille that, when read, yields exactly the original print text (apart from purely ornamental aspects).
- A print symbol has one braille equivalent in UEB. Use the braille sign for the print symbol regardless of the subject area.
- In UEB the 64 braille characters including the space are designated as being either a prefix or a root.

(Cited from The Rules of Unified English Braille, Second Edition 2013)

#### **The Rules of Unified English Braille AND The Guidelines for Technical Material**

can be downloaded free at: <http://www.iceb.org/ueb.html>

## Contractions, Spacing and Capitalization

There are nine contractions which have been eliminated in UEB. They are:

**by**      **into**      **to**

**ble**      **com**      **dd**

1.3, p3

**ation**      **ally**      **o'clock**

The main reason these were eliminated was to allow for more accurate automatic forward- and back-translation between print and braille. There was a need to create more symbols in UEB without creating conflicts in the code, and also an attempt to reduce exceptions to braille rules. More specific reasons for eliminating the above contractions are listed below:

- **to**, **into** and **by** were eliminated to allow for greater consistency in usage of other symbols. Also, the special spacing rules closed off options for making new symbols.
- **ation** and **ally** were eliminated because they created complications in rules having to do with capital letters in the middle of words.
- **com** was eliminated to make room for greater flexibility in the placement and usage of hyphens and dashes.
- **ble** was eliminated to allow for unambiguous reading and writing of numbers wherever they occur in literary contexts.
- **dd** was eliminated to allow for a single way to show the period, dot, decimal point even when it occurs in the middle of words or numbers.
- **o'clock** was eliminated because of a problem with capitalization.







Let's Practice!!

1. The Prime Minister's visit was inspirational for Canada's national unity.
2. Freddy Mercury was universally known as a really flamboyant conversationalist and singer.
3. It is four o'clock, so we should be at the radio station.
4. Internationally, in commerce, he took additional courses which doubled his money.
5. Benedict Dunghill
6. foreseeably available
7. derail at the bridge
8. freedom from pandemonium
9. for the end of the day
10. into braille
11. with the rest of the group
12. L.B.J., JFK and G.W. BUSH were USA Presidents.
13. FOUR-BY-FOUR
14. PLEASE GET OUT OF MY WAY!
15. I'm going to need a caddy for my golf game.





## Parameters for When Contractions Can and Cannot Be Used

(10.7 pages 125-132)

### Contraction "had"

Use the contraction for "had" when the "a" is short unless other rules limit its use.

e.g. haddock ⠠⠏⠗⠠⠏⠠⠏⠠⠏

Use the "had" contraction in the word "haddock" because the "dd" contraction is eliminated in UEB

BUT do not use in

shadow ⠠⠏⠗⠠⠏⠠⠏ (using "had" would affect pronunciation)

### Contraction "ever"

Use the contraction for "ever" when the stress is on the first "e" and when the letters are not preceded by "e" or "i"

e.g. fever ⠠⠑⠑⠠⠑⠠⠑

BUT do not use in

severity ⠠⠑⠑⠠⠑⠠⠑⠠⠑⠠⠑ (stress is on second "e") OR

believer ⠠⠑⠑⠠⠑⠠⠑⠠⠑⠠⠑ (preceded by an "i")

### Contractions "here"

Use the contractions for "here" when the letters it represents are pronounced as one syllable unless other rules limit its use.

e.g. atmosphere ⠠⠠⠠⠠⠠⠠⠠⠠

BUT do not use in

coherence ⠠⠠⠠⠠⠠⠠⠠ (the last "e" of "here" is needed to pronounce "ence")

### Contraction "some"

Use the contraction for "some" when the letters it represents form a syllable of a basic word.

chromosome ⠠⠠⠠⠠⠠⠠⠠

BUT do not use in

somersault ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ (the "e" in "some" forms part of the next syllable)



## UEB Prefixes (1.2.5, p2)

- In UEB all braille characters are designated as either a prefix or a root.
- There are eight prefixes: The numeric indicator plus the braille characters formed from the dots in the right column of the cell. The UEB prefixes are:

⠠ ⠡ ⠢ ⠣ ⠤ ⠥ ⠦ ⠧

- The last two braille characters are special prefixes.

⠨ ⠩

A special prefix may be used in combination with another special prefix to form a braille sign. Such braille signs are used only as indicators.

Example:

The passage indicators ⠠⠠⠠⠠ and ⠠⠠⠠⠠

- Any other braille sign in UEB is constructed from a root or from a root plus one or more prefixes.

so ⠠ some ⠠⠠ Greek Sigma Letter ⠠⠠ ⠠ long dash ⠠⠠⠠



EBAE

UEB

- asterisk (3.3, p21)



**NOTE:** Usually the asterisk appears raised from the baseline in print. This is not considered the superscript position.

M\*A\*S\*H



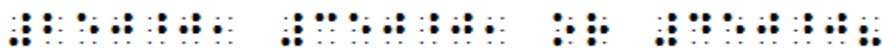
EBAE

UEB

- degree (3.11, p27)



250°, 350°, or 450°?



EBAE

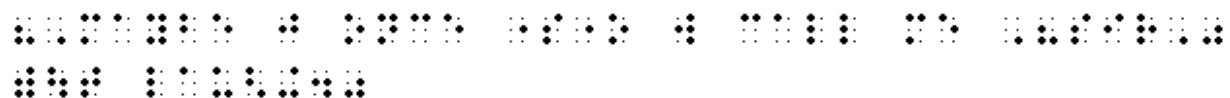
UEB

- single closing quotation mark (7.6, p76)



**NOTE:** The closing single quotation mark was changed to conform to UEB symbol construction principles (prefix, root).

“Maybe just once someone will call me ‘sir’ without laughing.”









NEMETH      UEB

- brace, curly bracket (7, p69)

⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠

primary colours {red, blue, yellow}

⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠

EBAE      UEB

- transcriber’s note, opening and closing (3.27, p39)

⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠

**NOTE:** Opening and closing transcriber’s note are used as enclosures around words of explanation embedded within the text. These symbols are not used on a separate preliminary page listing general transcriber’s notes.

[open tn] The following three charts appear side by side in the print.  
[close tn]

⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠

⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠⠠   ⠠⠠⠠⠠⠠⠠⠠⠠⠠

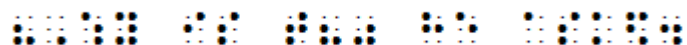
## Quotation Marks (7.6, p76-78)

In general, quotation marks will appear as they do in EBAE, except for the single closing quotation mark which has been changed as previously indicated. However, there will now be a way to represent different kinds of quotation marks which appear in print.

**NOTE:** Use one-cell, nonspecific quotation marks most of the time.

- quotation marks, nonspecific, opening and closing 

“Why is that?” he asked.




- quotation marks, single, opening and closing 

She said, “Sing ‘Happy Birthday’.”



If the text uses single quotation marks throughout the text (as in British texts), and double quotation marks are used within the text, then use:

- quotation marks, double, opening and closing 




She said, ‘Sing “Happy Birthday”.’



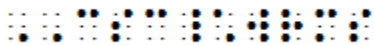
\*\*See 7.6 of Rules of Unified English Braille for examples of other infrequently used types of quotation marks\*\*


## New Symbols

Here are some new symbols that were not available in EBAE. These symbols follow the prefix and root formation of UEB and can be used wherever they occur in literary contexts. Follow print for the use of these symbols.

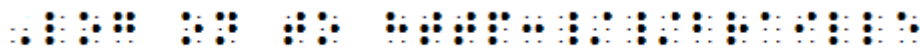
- back slash (7, p69) \ 

CSC\wrms



- forward slash (7.4, p74) / 

Log on to <http://braille>



**NOTE:** In the forward slash, the root is the same as forward slash in EBAE, but in UEB it requires the prefix dots 4-5-6.

- bullet (3.5, p24) • 

Nutritional facts include:

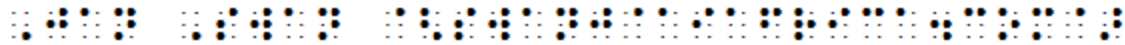
- carbohydrates
- protein
- fat
- cholesterol
- fiber
- sodium



- angle brackets, opening and closing (7, p69) < >



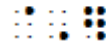
Jan Swan <swanj@iafrica.com>



- dagger (3.3, p21) †



- double dagger (3.3, p21) ‡



**NOTE:** A dagger may be used as a reference mark, or as the Christian cross to signify death or a member of the clergy. Follow print for the use of the dagger and double dagger, regardless of meaning. Sometimes the dagger and double dagger appear raised from the baseline in print. This is not considered the superscript position.

The painter included daisies\*, white roses† and ivy‡ in the portrait.

\*symbolizing innocence

†symbolizing virtue

‡symbolizing fidelity





## Exercises

Dollar:

1. The candy costs \$1.
2. They are charging \$5 at the door.

Percent:

3. He scored 82% on the test.
4. The admission fee increased 50%.

Asterisk:

5. Press \*98 for voicemail access.
6. The code for school entry is 11940\*

Degree:

7. 350°
8. 425°

Single close quotation mark:

9. "How many of you have read 'The Hunger Games' series?"

Dash/Long Dash:

10. We came—we saw—we conquered.
11. Live – love – l---

Ellipsis:

12. One, two, three...

13. Ready, set, go .....

Parenthesis:

14. Identify the verb(s) in the sentences.

15. (page 72)

Bracket:

16. [Glossary reference]

17. The recipe calls for sweet potatoes [or yams].

Brace:

18. Gender {girl or boy}

19. {see below}

Tilde:

20. <http://www.wrms/ca~find>

Underscore:

21. \_\_\_ and \_\_\_ were seen running through the field.

Angle brackets:

22. Jane Smith <jane.smith@me.com>

Dagger:

23. Father John Duffy†

Dot:

24. 13.5 million people live in New York City.



25. [www.wrms.ca](http://www.wrms.ca)

26. The tickets cost \$35.50 each.

www.wrms.ca

\$35.50

www.wrms.ca    25    35.50    25    35.50

www.wrms.ca    25    35.50    25    35.50    25    35.50    25    35.50

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## Transcriber Defined Symbols

Use a transcriber-defined symbol for any print symbol which has no UEB equivalent. List each transcriber-defined symbol used and its meaning on the symbols page or in a transcriber's note.

Note: In grade 2 braille, use grade 1 mode for the first transcriber-defined print symbol.

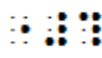
 Happy face

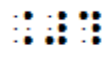
 Flower symbol

 Girl stick person

 Boy stick person

 Cloud

 Sun

 Star

\*\*\*The items beside each transcriber-defined symbol above are arbitrarily attached as examples. The symbols could have other meanings assigned as defined by the transcriber.





## **Typeforms** (page 91 of the Rules of Unified English Braille)

It is not always necessary to indicate different typeforms when transcribing into braille.

Typeform indicators are considered necessary in braille when the print change in typeform is significant because it indicates emphasis or shows distinction. Place a modifier before the letter it modifies in braille, irrespective of whether it appears above, below or overlaying the letter(s) in print. Whenever a transcriber-defined modifier is used, give the print symbol it represents in a transcriber's note or on a symbols page.

⠠⠠ Italic symbol indicator

⠠⠠ Italic word indicator

⠠⠠ Italic passage indicator

⠠⠠ Italic terminator

⠠⠠ boldface symbol indicator

⠠⠠ boldface word indicator

⠠⠠ boldface passage indicator

⠠⠠ boldface terminator

⠠⠠⠠ underlined symbol indicator

⠠⠠⠠ underlined word indicator

⠠⠠⠠ underlined passage indicator

⠠⠠⠠ underlined terminator

⠠⠠⠠ script symbol indicator

⠠⠠⠠ script word indicator

⠠⠠⠠ script passage indicator

⠠⠠⠠ script terminator

NOTE: When setting more than one kind of typeform for a PASSAGE (e.g. italics, bold and underline), the typeforms must be terminated in reverse order (e.g. underline, bold, italics). This is referred to as “nesting” in UEB. The order that you set typeforms is not prescribed in UEB.

⠠⠠⠠⠠ first transcriber-defined typeform symbol indicator

⠠⠠⠠⠠ first transcriber-defined typeform word indicator

⠠⠠⠠⠠ first transcriber-defined typeform passage indicator

⠠⠠⠠⠠ first transcriber-defined typeform terminator



**NOTE:** Typeform indicators consist of two parts: a prefix and a root. The prefix designates the typeform and the root determines its extent. Additional transcriber-defined typeforms may be formed using the following prefixes:

⠠⠠ Prefix for second transcriber-defined typeform

⠠⠠⠠ Prefix for third transcriber-defined typeform

⠠⠠⠠⠠ Prefix for fourth transcriber-defined typeform


⠠⠠⠠⠠⠠ Prefix for fifth transcriber-defined typeform

### Practice Exercises: Typeforms

1. The *merry-go-round* with its calliope **(a carousel's steam whistle instrument)** brings childhood memories *galore*.
2. **Produce** the **product** for **profit** as well as **refusing pesticides**.
3. February, nominated for the **Man Booker Prize**, is *Lisa Moore's* book on the *Ocean Ranger* disaster (set in *Newfoundland*).
4. The letter famously began *Dear John*.
5. ~~Omit crossed-out sections.~~



## Dot Locator for "Mention" (3.13, p28)

A dot locator for "mention"  is used unspaced before a braille symbol which is under discussion, as in a symbols list, a transcriber's note or in a publication about braille. The *Rules of Unified English Braille* manual makes use of the dot locator for "mention" throughout the text.

**NOTE:** The dot locator is not shown in print.

Example:

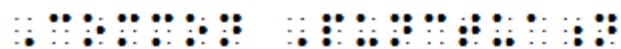
Common Punctuation

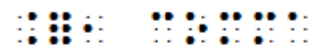
, comma

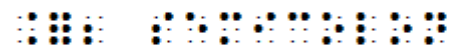
; semicolon

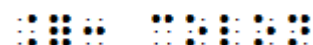
: colon

. period










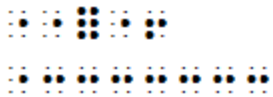


## Dot Locator for "Use" (3.14, p29)

A dot locator for "use"  is used unspaced before a braille symbol to assure that it will be physically recognizable to the tactual reader. An isolated braille symbol that contains lower dots, or dots on the right hand side of the cell, may be misread.

Example:

+	-	÷



# Grade 1 Indicator – A Fundamental Concept of UEB

(5, p51-58)

## Overview:

In English Braille American Edition, dot 5-6 is known as the **letter sign**.

In UEB, dot 5-6 is called the **Grade 1 Indicator**, and is an integral part of the literary and math code.

A braille symbol may have an uncontracted, contracted or numeric meaning. A grade 1 indicator is used to set grade 1 mode when the grade 1 meaning of a symbol could be misread as a contraction or a numeric meaning.

## What we already know in EBAE ...

In EBAE, a single dot 5-6 means that the next symbol is in grade 1.

For example, in contracted braille if you want to make a "j" as opposed to the word "just", then you would braille a dot 5-6 in front of the "j" to tell the reader the "j" is in grade 1 mode.

## Let's look at UEB...

Grade 1 symbol indicator: A single Grade 1 indicator [dot 5-6] means that the next **symbol** is in grade 1 mode and is only used if there is ambiguity.

I think Mr. X is mysterious.

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Grade 1 word indicator: A double Grade 1 indicator [dot 5-6, 5-6] means that the next **word** is in grade 1 mode.

f-f-f-freezing (Note the two ways this can be brailled.)

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ OR ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Grade 1 passage indicator: A triple Grade 1 indicator [dot 5-6, 5-6, 5-6] means that the next **passage** (three or more words) is in grade 1. To show the end of the passage, dot 5-6 dot 3, is used; this is called a **grade 1 terminator**.

I w-ll l-ve y-u f-r-v-r!

⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Let's braille some examples of a Grade 1 **symbol** indicator:

1. Old Macdonald says e, i, e, i, o.
2. You forgot the ? in your sentence.

Let's braille some examples of a Grade 1 **word** indicator:

3. I spell his name s-a-n-t-a.
4. The party was t-e-r-r-i-f-i-c.

Let's braille some examples of a Grade 1 **passage** indicator:

5. Try cracking this secret message: Th-s d-y w-ll g- d-wn -n h-st-ry.
6. Put the vowels in this sentence: H- c-n t-lk f-st.

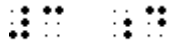
### Grade 1 Mode and the Numeric Indicator

Grade 1 mode can also be set by the numeric indicator (number sign dot 3-4-5-6).

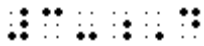
When grade 1 mode is set by the numeric indicator, it is terminated by a space, hyphen or dash or a grade 1 terminator.

Examples:

3 d



3-D



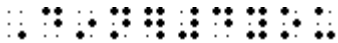
3k



1st

(The “s” shows that it is no longer in numeric mode, BUT it is still in grade 1 mode.)

Dinner4you



Dinner4edwards (**NOTE:** you can put a grade 1 terminator after the 4 and then use contractions in the word “edwards”)



## Grade 1 Mode and Avoiding Confusion with Contractions

Grade 1 mode prevents a letter from being read as an alphabetic word sign.

Example: Finish letters “o” to “t”.



**NOTE:** There is no letter sign in front of the “o”, but there is a letter sign in front of the “t” because it could be confused with “that”.

Let’s braille an example:

7. Mind your p’s and q’s.

8. Mr. I. C. White, M.D.

Grade 1 mode also prevents a letter sequence from being read as a short form.

Example: Press the Alt key.



**NOTE:** “Alt” could be misread as altogether without the grade 1 indicator.

Let’s braille an example:

9. Put in the CD-ROM. (**NOTE:** CD could be confused with the short form could.)

In text entirely in grade 1 braille (using no contractions), grade 1 indicators are only used for the lowercase letters a-j following digits, and a question mark in an unusual position.

Example: Do question 5g





## Standing Alone Rule

Used to determine when a braille sign is read as a contraction. The braille symbol is unaccompanied by additional letters, symbols or punctuation (exceptions outlined in 2.6 of Rules of Unified English Braille).

## Grade 1 Mode and Arithmetic

Grade 1 indicators will not be needed for simple arithmetic problems involving numbers, operation signs, numerical fractions and mixed numbers.

Example:

$$3-2 = 1$$



As previously stated, a braille symbol may have an uncontracted, contracted or numeric meaning. A grade 1 indicator is used to set grade 1 mode when the grade 1 meaning of a symbol could be misread as a contraction.

Simple algebraic equations which include letters may need grade 1 symbol indicators where letters stand alone or follow numbers.

Example:

$$y = x + 4c$$



Let's braille an example:

$$10. B = 4y + x + 2$$



## UEB and Math

Math will now be represented using UEB. The phasing out of Nemeth Code is part of the UEB implementation plan for Ontario.

All numbers will be represented by the following (6, p59):

1    2    3    4    5    6    7    8    9    10  
 ⠠⠠   ⠠⠠   ⠠⠠⠠   ⠠⠠⠠   ⠠⠠⠠   ⠠⠠⠠   ⠠⠠⠠   ⠠⠠⠠   ⠠⠠⠠   ⠠⠠⠠⠠

The following are some basic operation signs (11.2, p169):

Addition	+	⠠⠠⠠
Subtraction	-	⠠⠠⠠
Multiplication	X	⠠⠠⠠
Division	÷	⠠⠠⠠
Multiplication Dot	·	⠠⠠⠠

The following are some common comparison signs (11.2, p169):

Equals	=	⠠⠠⠠
Less than	<	⠠⠠⠠
Greater than	>	⠠⠠⠠

NOTE: Comparison signs are generally spaced on either side, but this is not a hard rule. Spacing can follow local teaching practice.

## Indicators:

**Grade 1 Mode:** A grade 1 indicator ⠠ is used to set grade 1 mode when the grade 1 meaning of a symbol could be misread as a contraction meaning or a numeric meaning (5, p51-53).

Grade 1 symbol indicator	⠠
Grade 1 word indicator	⠠⠠
Grade 1 passage indicator	⠠⠠⠠
Grade 1 passage terminator	⠠⠠⠠⠠

**Numeric Mode:** A “number sign” ⠼ initiates numeric mode. The following symbols may occur in numeric mode: The ten digits, decimal (period), comma, the numeric space, simple numeric fraction line, and the continuation indicator. Any other symbol will terminate numeric mode.

Numeric mode indicator ⠼ also sets grade 1 mode. When grade 1 mode is set by the numeric indicator, it is terminated by a space, hyphen or dash. A grade 1 indicator will not be required unless lower case letters a-j are immediately following a digit, decimal (period) or comma. The numeric passage indicator ⠼⠼ sets numeric mode and grade 1 mode for all text until it is terminated by the numeric terminator ⠼⠼⠼ (1.2.2, p 2, Technical Material).

## Ordinal Numbers, Dates, Time (2, p9-10)

Examples:

1<sup>st</sup>

⠠⠠⠠⠠⠠⠠

4<sup>th</sup>

⠠⠠⠠⠠⠠⠠

10/05/1995

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

10-05-1995

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

10:15 pm

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

### Spacing (1.1, p 1, Technical Material):

- The braille should follow the print as much as possible. Best practice is having operation signs unspaced on both sides. For younger learners, including spaces on either side of the operation sign may be beneficial. Spacing should be consistent throughout the same work.

$$4 + 8 = 12$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ OR ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

$$\begin{array}{r} 14 \\ + 8 \\ \hline 22 \end{array}$$

$$\begin{array}{r} 8^{14} \\ - \frac{6_1 7}{1 \ 7} \end{array}$$

$$2.5 + 2.5 = 5$$

321

$$\begin{array}{r} \times 11 \\ 321 \\ \hline 3210 \\ 3531 \end{array}$$

OR

$$\begin{array}{r} 321 \\ \times 11 \\ \hline 321 \\ 3210 \\ \hline 3531 \end{array}$$

$$\begin{array}{r} \underline{3} \\ 7)21 \end{array}$$

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

OR

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

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$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

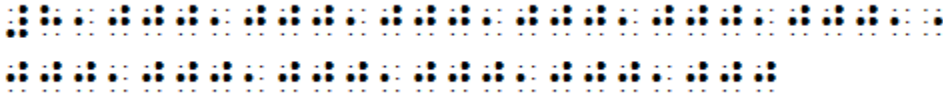
$$\begin{array}{r} 195 \\ 5 \overline{)975} \\ \underline{5} \\ 47 \\ \underline{45} \\ 25 \\ \underline{25} \\ 0 \end{array}$$



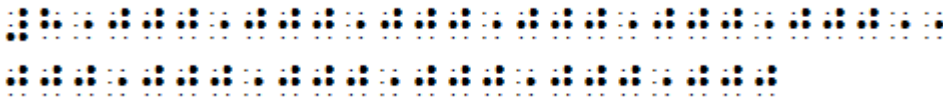


Example:

8,000,000,000,000,000,000,000,000,000,000,000



8 000 000 000 000 000 000 000 000 000 000 000

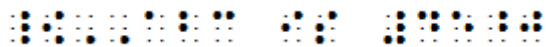


**Angles (11, p50, Technical Material):**

Angle Sign	∠	⠠
Measured Angle Sign	∠	⠠⠠
Measured Right Angle Sign	∟	⠠⠠
Degree	°	⠠

Example:

∠ABC is 45°



**Fractions (6, p31-33, Technical Material):**

Simple numeric fraction line	⠠⠨
General fraction line	⠠⠨⠠
General fraction open indicator	⠠⠨
General fraction close indicator	⠠⠨

A simple **numeric fraction** line is one whose numerator and denominator contain only digits, decimal points, commas or separator spaces and whose fraction line in print is drawn between two vertically (or nearly vertical) arranged numbers. A numeric fraction line *does not* terminate numeric mode.

Examples:

$\frac{6}{9}$   
 ⠠⠨⠠

$6/9$   
 ⠠⠨⠠

$6/9$   
 ⠠⠨⠠⠨

The **general fraction indicator** is used when the numerator or denominator is not entirely numeric (consists of only digits, decimal points, commas or numeric spaces). The general fraction open and closing indicators are also used.

Examples:

$$\frac{x}{y}$$



$$y = \frac{x}{2}$$

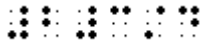


### Mixed Numbers:

Mixed numbers should be treated as two unspaced numeric items.

Example:

$$2 \frac{3}{4}$$



### Superscripts and Subscripts (7, p34-38, Technical Material):

Level change down (subscript)	A Braille cell with dots 4, 5, and 6 raised, representing a level change down.
Level change up (superscript, exponent or power)	A Braille cell with dots 2, 3, and 4 raised, representing a level change up.

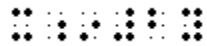
\*\* In a grade 2 passage where a subscript or superscript appears, it may need a grade 1 indicator to avoid it being read as the “en” or “in” contraction.

Examples:

$x^2$



$x^2y$



$x_1, x_2$



**NOTE:** The superscript and subscript only apply to the next “item”.

**Braille Grouping:** ⠠ ⠡ are used to “group” an expression so that they are all affected by a preceding indicator or considered an “item” (11.4, p172).

It may be necessary to use **braille grouping symbols** when using superscript and subscripts in algebraic equations.

Examples:

$x^{2+y}$



$x_{y^2}$



**Radicals (Roots) (8, p40-41, Technical Material):**

Open radical (root)	⠠
Close radical (root)	⠨

\*\* In a grade 2 passage where an open or close radical sign appears, it may need a grade 1 indicator to avoid it being read as a contraction.

The expression inside the square root sign in print should be preceded by the open radical sign and followed by the close radical sign.

Examples:

$$\sqrt{4} = 2$$

⠠ ⠠⠠⠠⠠⠠ ⠠⠠ ⠠⠠

$$\sqrt{a^2 + b^2}$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Other roots are expressed as a superscript immediately following the opening radical symbol.

Examples:

$$\sqrt[3]{8}$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

$$\sqrt[mn]{xy}$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

**Shapes (14, p65, Technical Material):**

Shape indicator	
Shape terminator	
Equilateral triangle	
Square	
Circle	

\*\* For more shape indicators please see section 14.1 in the UEB Guidelines for Technical Material.

A Grade 1 indicator may be required before the shape indicator.

If a shape is followed by a space, then no termination symbol is needed.

Example:

Δ DEF

ΔDEF

**Arrows (13, Technical Material):**

Arrow indicator	
Bold arrow indicator	
Simple right pointing arrow (east)	
Simple left pointing arrow (west)	
Simple up pointing arrow (north)	
Simple down pointing arrow (south)	

\*\* The arrow indicator may need a Grade 1 indicator. The bold arrow indicator will not need one as it does not have a Grade 1 meaning.

Chapter 13 in the *Guidelines for Technical Material* provides additional information on arrows and unusual arrows.

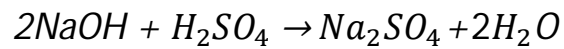
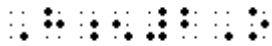
Examples:

n → s

input → process → output



Some Examples of Chemistry (16, p74-82, Technical Material):



Let's Practice!

1.  $4 - 2\frac{3}{4}$

2.  $9 + 9 = 18$

3. 
$$\begin{array}{r} 2500 \\ + 425 \\ \hline 2925 \end{array}$$

4.  $y = x + 8a$

5.  $3x - 4y + y^2 = x^2$

6.  $\frac{x^2+2x}{1+x^2} = 1$

7.  $\sqrt{625} = 25$

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