

LESSON 6

Read about this PROVISIONAL EDITION in the front matter to this book.
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Instructions

This lesson introduces many more symbols that you will come across in all areas of mathematics. Look carefully at the print symbol as many look similar to each other. Understand the context – some symbols are used as signs of operation as well as signs of comparison. The function of the symbol must be determined in order to apply proper spacing rules.

SIGNS OF OPERATION, cont.

6.1 Review of Signs of Operation: In braille, no space is left before or after a sign of operation unless it is preceded or followed by a sign of comparison, an ellipsis, a dash, an unrelated word, or an abbreviation. Signs of operation are mathematical symbols and are punctuated accordingly. The following signs of operation have already been introduced.

⠠⠠⠠⠠	+	Plus
⠠⠠⠠⠠	–	Minus
⠠⠠⠠⠠⠠⠠	×	Multiplication Cross
⠠⠠⠠⠠	•	Multiplication Dot
⠠⠠⠠⠠⠠⠠	÷	Division

6.2 Signs of Operation Using Plus and Minus: The following signs are a combination of the plus and minus signs, written either side-by-side or one atop another.

"Plus or Minus"	±	⠠⠠⠠⠠⠠⠠
"Minus or Plus"	∓	⠠⠠⠠⠠⠠⠠
Plus followed by Minus	+ –	⠠⠠⠠⠠⠠⠠⠠⠠
Minus followed by Plus	– +	⠠⠠⠠⠠⠠⠠⠠⠠
Minus followed by Minus	– –	⠠⠠⠠⠠⠠⠠⠠⠠

Note that in the first two symbols, the upper sign is brailled first, followed immediately by the lower sign.

$$\gg 38 \pm 7 \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

$$\gg 38 \mp 7 \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

In the side-by-side symbols, a multipurpose indicator (dot 5) is inserted between the unspaced symbols. The multipurpose indicator indicates that the symbols are printed horizontally, not vertically.

Multipurpose Indicator	$\cdot\cdot$
-------------------------------	--------------

$$\gg 10 + -5 \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

$$\gg 10 - +5 \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

$$\gg 10 - -5 \quad \begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

Review the rules in **1.8.2** regarding the use/nonuse of the numeric indicator with positive and negative numbers.

Example 6.2-1 ± 5 means +5 and -5.

$$\begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

Example 6.2-2 Can $3 \pm 1 = +4$ and $+2$?

$$\begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

Example 6.2-3 Compare: $20 + -3$; $20 - -3$; $-20 - -3$; $-20 + 3$.

$$\begin{matrix} \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \\ \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot & \cdot\cdot \end{matrix}$$

CHALLENGE: If you come across the notation for "plus positive 3", as in $-20 ++3$, how would you braille ++? Using the logic shown in the other side-by-side operation signs, $\cdot\cdot \cdot\cdot \cdot\cdot$ is the correct transcription. Because this symbol is not shown in the Nemeth Code, a transcriber's note explaining its print form ("plus followed by plus") would be required.

6.3 Signs of Operation That Look Like Literary Symbols: Some mathematical symbols use characters also seen in literary writing. When the following symbols are used in mathematical context (as a mathematical sign) the symbols shown below must be used.

Ampersand	&	
Asterisk	*	
Crosshatch	#	
Dagger, Single	†	
Dagger, Double	‡	
Paragraph Mark	¶	
Section Mark	§	

When these symbols are used in literary context they have no mathematical meaning, therefore the symbols and rules of UEB apply. When these symbols are used as mathematical operation signs, the rules of the Nemeth Code apply and spacing rules for operation signs must be followed. *Note:* As mathematical symbols, they may also occur in the superscript position. This usage will be covered in a later lesson.

6.3.1 Ampersand: The ampersand as an operation symbol is commonly encountered in the study of logic, where it means "and". The symbol may be referred to as "logical conjunction".

➤ &

Example 6.3-1 One can define F as $p \& \neg p$ for any proposition p , where "&" is *logical conjunction* and $\neg p$ is "not p ".

When the ampersand is used as a literary device, follow the rules of UEB.

Example 6.3-2 Create a table to compare the price of bananas at the A&P with those at Price Chopper.

6.3.4 Dagger and Double Dagger: The dagger and double dagger may be used as operation symbols in binary operations.

➤ † ⠠⠠⠠⠠

➤ ‡ ⠠⠠⠠⠠⠠

➤ $A † B = B † A$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

➤ $A ‡ B = B ‡ A$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

When a dagger or a double dagger is used as a footnote symbol, follow the rules of UEB.

The BANA Nemeth Code Technical Committee is discussing details regarding daggers used as a reference symbol in mathematical context. This section will be completed after decisions are made.

6.3.5 Paragraph Mark: In mathematical context, the Nemeth Code symbol is used. A numeric indicator is required before a numeral following a paragraph mark.

➤ ¶ ⠠⠠⠠⠠⠠

➤ $A ¶ B$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

➤ $3 ¶ 4 = 4 ¶ 3$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

When the paragraph mark is used as a literary device, follow the rules of UEB.

6.3.6 Section Mark: In mathematical context, the Nemeth Code symbol is used. A numeric indicator is required before a numeral following a section mark.

➤ § ⠠⠠⠠⠠⠠

➤ $A § B$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

➤ $3 § 4 = 4 § 3$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

When the section mark is used as a literary device, follow the rules of UEB.

Instructions: Review the spacing rules for operation signs before transcribing the practice. Transcribe this entire list in Nemeth Code.

PRACTICE 6A

$$4 \pm 1, 400 \pm 10, 6 \mp 1, 600 \mp 10$$

$$\mu \pm 1.645 \sigma$$

$$50 - +5 = 45$$

$$50 + -5 = ?$$

$$-3 - -3 = 0$$

$$A\&B = B\&A$$

$$a * (b * c) = (a * b) * c$$

$$(1 + 2) * (3 + 4) = 3 * 7$$

$$\#A = \#B$$

$$.5\#.7 = .7\#.5$$

$$[(p \dagger p) \dagger (q \dagger q)]$$

$$s \uparrow t = u \uparrow v$$

$$1 \uparrow 3 = 4 \uparrow 3$$

$$m \S y = y \S m = y$$

$$5 \S 6 = 6 \S 5 = 6$$

6.4 Signs of Operation Unique to Mathematics:

Slash	/	⠏⠗
Back Slash	\	⠏⠖
Dot	•	⠠⠨
Hollow Dot	◦	⠏⠗
Intersection ("cap")	∩	⠏⠗
Logical Product	∧	⠏⠗
Logical Sum	∨	⠏⠗
Minus with Dot Over	÷	⠏⠗
Tilde, Simple	~	⠏⠗
Tilde, Extended	≈	⠏⠗⠗
Union ("cup")	∪	⠏⠗
Vertical Bar		⠏⠗
Vertical Bar Negated	∕	⠏⠗

Examples of each symbol are shown below. Note that, as with the other operation signs you have learned, these signs are unspaced from related mathematical terms regardless of the spacing shown in print.

6.4.1 Slash: The "forward slash" slants from lower-left to upper-right. When the slash means "divided by" (or "over"), as in a linear fraction, the slash is a mathematical symbol of operation and a switch to Nemeth Code is required. (In a linear fraction, the numbers are printed in normal size and each number rests on the baseline of writing, in line with the text.) No space is left between the slash and any numeral to which it applies.

➤ / ⠏⠗

Example 6.4-1 3/8 of the class are girls.

⠏⠗ ⠏⠗⠗⠗⠗⠗⠗ ⠏⠗ ⠏⠗ ⠏⠗⠗⠗⠗⠗⠗⠗ ⠏⠗⠗⠗⠗⠗⠗⠗

In Nemeth Code, the numeric indicator is not needed for a numeral immediately following a slash.

6.4.3 Dot: You have seen the dot used as a multiplication sign. It may also be used to denote "and" as an operation sign in the study of logic. In either case, the symbol is brailled without a space.

➤ · ⠠⠠

Example 6.4-7 In logic, $p \cdot q$ is read "p and q".

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

6.4.4 Hollow Dot: The hollow dot may be used as a sign of operation.

➤ ° ⠠⠠

Example 6.4-8 $a \circ (b \circ c) = (a \circ b) \circ c$

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

The hollow dot is often seen in function notation. Be sure to braille the hollow dot symbol – this is not a letter "o".

➤ ($f \circ g$) ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Example 6.4-9 $(f \circ g)(x)$ is not the same as $(g \circ f)(x)$.

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

The hollow dot used as a raised sign representing degrees of temperature or angle measurement will be discussed in a later lesson.

6.4.5 Intersection: This operation symbol is also called a "cap".

➤ ∩ ⠠⠠

➤ $A \cap B = B \cap A$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

6.4.6 Logical Product: In the study of logic, this operation sign means "and" or "meet".

➤ ∧ ⠠⠠

➤ $p \wedge q \wedge r$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

6.4.7 Logical Sum: In the study of logic, this operation sign means "or" or "join".

➤ ∨ ⠠⠠

➤ $p \vee q \vee r$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

6.4.8 Minus With Dot Over: This operation sign means "proper difference".

➤ ÷ ⠠⠠

➤ $x \div y = 0$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

6.4.9 Tilde: In logic, the tilde may be used as a sign of operation meaning "not".

➤ ~ ⠠⠠

➤ $\sim p$ ⠠⠠⠠⠠

➤ $\sim (\sim p)$ ⠠⠠⠠⠠⠠⠠⠠⠠

When two symbols for the tilde follow one another, a multipurpose indicator (dot 5) is inserted between them to indicate that they are written horizontally.

➤ $\sim \sim p \vee q$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

The extended tilde is one symbol with two "bumps".

➤ $\sim\sim$ ⠠⠠⠠⠠

➤ $\sim\sim s \vee t$ ⠠⠠⠠⠠⠠⠠⠠⠠

When the tilde symbol is used to replace the word "approximately", "about", or "around" it is brailled as an unspaced symbol.

Example 6.4-10 The test will begin in ~15 seconds.

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

The tilde is also used as a sign of comparison. Read the context to determine its meaning. See [6.7.14](#).

6.4.10 Union: This operation symbol is also called a "cup".

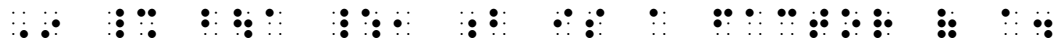
➤ U ⠠⠠

➤ $A \cup B = B \cup A$ ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

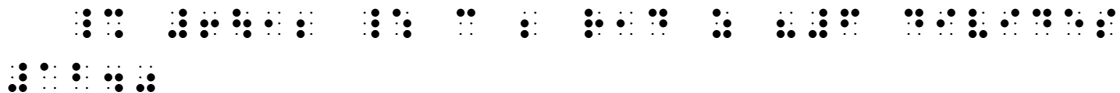
6.4.11 Vertical Bar: When the vertical bar means "is a factor" or "divides", it is functioning as an operation sign.



Example 6.4-11 In $b|a$, b is a factor of a.



Example 6.4-12 $6 | 12$ can be read as "6 divides 12."



The vertical bar is also used as a sign of grouping and as a sign of comparison. Read the context to determine its meaning. See 3.9 and [6.7.16](#).

6.4.12 Negated Vertical Bar: This symbol means "does not divide".



FORMAT: SIMPLE TABLES

6.5 Introduction to Table Format: Guidelines for the layout of tables are given in *Braille Formats*. Study or review *Braille Formats* regarding the definition of a table, margins used, column separation lines, space between columns, use of guide dots, and considerations when a table is too wide to fit on the braille page.

Column Separation Line (varies in width)	⠠⠨⠠⠨⠠⠨⠠⠨
Guide Dots (a minimum of two)	⠠⠠⠠⠠

When table entries consist of technical material, the entire body of the table is brailled in Nemeth Code, including any words. One opening Nemeth Code indicator precedes row 1 and one Nemeth Code terminator is placed at the end of the table. Words within the table are brailled without contractions, and the single-word switch indicator is not used. Further details regarding tables in Nemeth Code will be covered in **Lessons 15 and 17**. The following example illustrates the layout you will use in Practice 6B, which begins like this:

Name	Symbol
Dot	•
Vertical Bar	
⠠⠨⠠⠨	⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨
⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠
⠠⠠	⠠⠠
⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	⠠⠠
⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	⠠⠠
(further entries)	⠠⠠
⠠⠠	⠠⠠

- Line 1:* The column headings are not mathematical. Contractions are used.
- Line 2:* Column separation lines are inserted according to Braille Formats guidelines.
- Line 3:* The opening Nemeth indicator is placed in cell 1.
- Line 4:* The first row is brailled in Nemeth Code. Guide dots are inserted according to Braille Formats guidelines. Symbols in column 2 do not use the UEB dot locator.
- Line 5:* Words are uncontracted.
- Lines 6+:* Column 1 will need to be wider once you determine the widest table entry.
- Last line:* Terminate Nemeth Code on the line after the completion of the table, in cell 1.

Instructions: Practice brailleing these operation signs in table format. See instructions in [6.5](#), above.

PRACTICE 6B

<u>Name</u>	<u>Symbol</u>
Dot	•
Vertical Bar	
Negated Vertical Bar	⌋
Logical Product	∧
Simple Tilde	~
Logical Sum	∨
Extended Tilde	≈
Backslash	\
Slash	/
Hollow Dot	◦
Intersection	∩
Union	∪
Minus with Dot Over	÷

SIGNS OF COMPARISON, cont.

6.6 Review of Signs of Comparison: A space must be left before and after a sign of comparison. However, no space is left between a sign of comparison and a sign of grouping, a braille indicator, or a punctuation mark which is related to it. The following signs of comparison have already been introduced.

⠠⠨⠠	=	Equals	⠠⠨⠠⠠	∴	Proportion
⠠⠨⠠⠠	>	Greater Than	⠠⠨⠠	⠠⠨⠠	Ratio
⠠⠨⠠	<	Less Than			

6.7 More Signs of Comparison:

Greater Than with Curved Sides	⤿	⠠⠨⠠⠠⠠
Less Than with Curved Sides	⤿	⠠⠨⠠⠠⠠
Arc, Concave Upward)	⠠⠨⠠⠠
Arc, Concave Downward	(⠠⠨⠠⠠
Equivalence	⌊	⠠⠨⠠⠠⠠⠠⠠
Identity	≡	⠠⠨⠠⠠
Inclusion	⊂	⠠⠨⠠⠠⠠
Membership	ε or ⋈ or ∈	⠠⠨⠠⠠
Parallel to	∥	⠠⠨⠠⠠
Perpendicular to	⊥	⠠⠨⠠⠠
Relation	R	⠠⠨⠠⠠
Reverse Inclusion	⊃	⠠⠨⠠⠠⠠
Reverse Membership	∋	⠠⠨⠠⠠
Tilde, Simple	~	⠠⠨⠠⠠
Tilde, Extended	⋈	⠠⠨⠠⠠⠠
Variation	∝	⠠⠨⠠⠠
Vertical Bar		⠠⠨⠠

Examples of each symbol are shown below. Note that, as with the other comparison signs you have learned, these signs are preceded and followed by a space regardless of the spacing shown in print.

6.7.1 Greater Than With Curved Sides ("is greater than")

➤ $7 > 4 > 3$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.2 Less Than With Curved Sides ("is less than")

➤ $5 < 9 < 11$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.3 Arc, Concave Upward

➤ $x \frown y$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.4 Arc, Concave Downward

➤ $x \smile y$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.5 Equivalence ("is equivalent to")

➤ $x \approx y$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.6 Identity (Triple Bar): This symbol is used in several different contexts. Most commonly it means "is identical with" or "is congruent to". The transcriber brailles the same symbol regardless of its meaning. Do not confuse the triple bar with the Greek letter Xi or the triple bond in Chemistry.

➤ $A + B \equiv B + A$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.7 Inclusion: This symbol is generally used for sets and their elements, meaning "is contained in" or "is a subset of".

➤ $A \subset D$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.8 Membership: This symbol is generally used for sets and their elements, meaning "is an element of" or "belongs to". It must not be mistaken for the Greek uncapitalized epsilon even though it may be referred to as such.

➤ $5 \in B$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.9 Parallel To ("is parallel to")

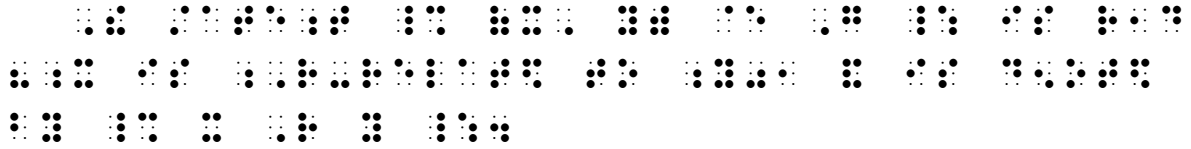
➤ $AB \parallel CD$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.10 Perpendicular To ("is perpendicular to")

➤ $PQ \perp RS$ ⠠⠨⠠⠗ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓ ⠠⠨⠠⠔ ⠠⠨⠠⠓

6.7.11 Relation: When a letter R is used between two expressions to show relation ("is related to"), the letter is treated as a sign of comparison with a space before and after it regardless of print spacing. Read the surrounding narrative to realize the meaning of the letter "R" in order to transcribe it correctly.

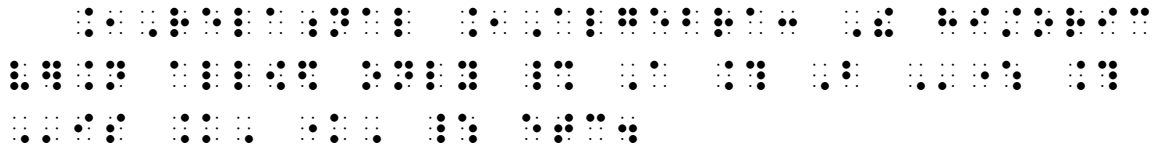
Example 6.7-1 The statement $(x, y) \in G$ is read "x is R-related to y", and is denoted by xRy.



The comparison sign (R) is preceded and followed by a space in braille.

Other letters or signs may also be used to show relation.

Example 6.7-2 Relational Algebra: The historic version allowed only $A\theta B$ where θ is =, <, etc.



6.7.12 Reverse Inclusion: This symbol may mean "contains" or, in logic, "implies".

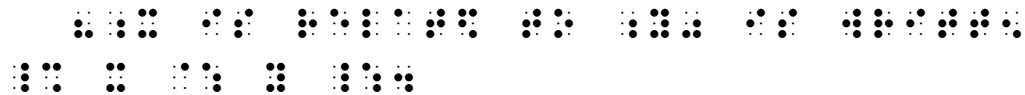
$$\supseteq D \supset A$$

6.7.13 Reverse Membership: This symbol means "contains the element".

$$\supseteq B \ni 5$$

6.7.14 Tilde as a Sign of Comparison: When used as a comparison sign (often encountered in set theory and relations) the tilde means "is related to" or "is similar to". The simple tilde has one peak.

Example 6.7-3 "x is related to y" is written $x \sim y$.



The extended tilde has more than one peak.

$$\supseteq x \sim y$$

The tilde is also used as a sign of operation. Read the context to determine its meaning. See section [6.4.9](#).

6.7.15 Variation ("varies as")

$\Rightarrow x \propto y$

6.7.16 Vertical Bar: When used as a sign of comparison, the vertical bar means "such that" or "given". As a comparison sign, it usually occurs in an expression within braces used for set notation. The print copy may or may not show this as a spaced symbol; in braille, comparison signs must be preceded and followed by a space.

$\Rightarrow \{x \in E | \Phi(x)\}$

Example 6.7-4 $\{(x, y) | x + y < 6\}$ means "The set of points (x, y) such that $x + y < 6$."

$\{(x, y) | x + y < 6\}$

Example 6.7-5 $P(A|B)$ means "The probability of Event B **given** Event A."

$P(A|B)$

A vertical bar may also appear in other situations as a sign of comparison. Read the context to determine its meaning. Recall that this symbol is also used as a sign of grouping and as a sign of operation. Apply proper spacing according to its function. See 3.9 and 6.4.11.

6.7.16.a Colon Meaning "Such That": A colon may also be used to mean "such that" in set notation. Regardless of the spacing shown in print, the colon is brailled unspaced from the letter, preceded by a punctuation indicator. A space follows the colon in braille.

Example 6.7-6 $\{x : x > 0\}$ means "The set of numbers x such that $x > 0$."

$\{x : x > 0\}$

Instructions: Review the spacing rules for comparison signs before transcribing the practice. Assume all tildes and vertical bars are comparison signs in these examples.

PRACTICE 6C

$$A \ni x$$

$$\{x \in A \mid x \sim a\}$$

$$j \approx k$$

$$r \propto s$$

$$f(x) \equiv D(x) \cdot q(x)$$

$$-12 < -4 < 0$$

$$.9 > .5$$

$$m \smile l$$

$$l \frown m$$

$$(A \cup E) \subset (F \cup B)$$

$$Q \supset Z$$

$$PQR \sim P'Q'R'$$

$$AB \parallel MN$$

$$CD \perp OP$$

$$EF \parallel GH \perp QR$$

$$\{m \mid 3(m - 6) = -9\}$$

$$\{x : x \text{ has the property } T\}$$

6.8 Signs of Comparison Compounded Vertically: When two or more simple signs of comparison are arranged one under the other, the combination becomes a single comparison sign compounded vertically. The symbol for the uppermost sign is written first, immediately followed by and unspaced from the symbol for the lower sign. Comparison signs compounded vertically not shown in the lists below are transcribed in accordance with this principle.

6.8.1 Greater Than Or Equal To: The "equal to" sign may be printed as an equals sign or as a single line – either a horizontal bar or an oblique line. Note that both the horizontal bar and the oblique line are represented by the same braille symbol, ⠨.

Bar Over Greater Than	$\bar{>}$ or $\bar{>}$	⠨⠨⠨
Equals Sign Over Greater Than	\equiv or \equiv	⠨⠨⠨⠨⠨
Greater Than with Bar Under	\geq or \geq	⠨⠨⠨⠨
Greater Than with Equals Sign Under	\cong or \cong	⠨⠨⠨⠨⠨

$\gg a \bar{>} b$ ⠨⠨⠨⠨⠨⠨
 $\gg a \equiv b$ ⠨⠨⠨⠨⠨⠨⠨⠨
 $\gg x \geq y$ ⠨⠨⠨⠨⠨⠨
 $\gg |x| \cong 0$ ⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨

6.8.2 Inclusion ("is a subset of")

Bar Over Inclusion	\subsetneq	⠨⠨⠨⠨⠨
Equals Sign Over Inclusion	\subsetneq	⠨⠨⠨⠨⠨⠨⠨
Inclusion with Bar Under	\supseteq	⠨⠨⠨⠨⠨
Inclusion with Equals Sign Under	\supseteq	⠨⠨⠨⠨⠨⠨⠨

$\gg C \subsetneq B'$ ⠨⠨⠨⠨⠨⠨⠨⠨⠨
 $\gg C \equiv B'$ ⠨⠨⠨⠨⠨⠨⠨⠨⠨
 $\gg (D \cap E) \supseteq (E \times E)$ ⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨
 $\gg (D \cap E) \cong (E \times E)$ ⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨⠨

6.8.3 Intersection: The intersection sign is a sign of comparison when modified by a bar or equals sign below it. It is also called a "cap".

Intersection with Bar Under	\cap	$\cdot\cdot\cdot\cdot\cdot\cdot$
Intersection with Equals Sign Under	\sqcap	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$

➤ $X \cap Y$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$

➤ $X \sqcap Y$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$

An unmodified intersection sign is a sign of operation. See [6.4.5](#).

6.8.4 Less Than Or Equal To

Bar Over Less Than	\lessgtr or \lessless	$\cdot\cdot\cdot\cdot\cdot\cdot$
Equals Sign Over Less Than	\lesseqgtr or \lesseqless	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$
Less Than with Bar Under	\lessgtr or \lessless	$\cdot\cdot\cdot\cdot\cdot\cdot$
Less Than with Equals Sign Under	\lesseqgtr or \lesseqless	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$



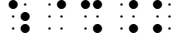





➤ $v - 1 \lessgtr 5$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$


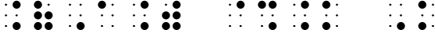

➤ $v - 1 \lesseqgtr 5$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$

➤ $6 \lessgtr x \lessgtr 9$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$

➤ $6 \lesseqgtr x \lesseqgtr 9$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$ $\cdot\cdot\cdot\cdot\cdot\cdot$




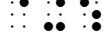


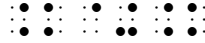
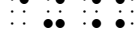
6.8.5 Logical Product: The logical product sign is a sign of comparison meaning "meet" when modified by a bar or equals sign above or below it.


Bar Over Logical Product	$\bar{\wedge}$	
Bar Over and Bar Under Logical Product	$\bar{\underline{\wedge}}$	
Bar Over and Equals Sign Under Logical Product	$\bar{\underline{=}}{\wedge}$	
Logical Product with Bar Under	$\underline{\wedge}$	
Equals Sign Over Logical Product	$\overline{\wedge}$	
Equals Sign Over and Bar Under Logical Product	$\overline{\underline{\wedge}}$	
Equals Sign Over and Equals Sign Under Logical Product	$\overline{\underline{=}}{\wedge}$	
Logical Product with Equals Sign Under	$\underline{=}{\wedge}$	


- $ABD \bar{\wedge} A'B'D'$ 
- $\{A\} \underline{\wedge} K$ 
- $p \underline{=}{\wedge} q$ 

An unmodified logical product sign is a sign of operation. See [6.4.6](#).

6.8.6 Logical Sum: The logical sum sign is a sign of comparison meaning "join" when modified by a bar or equals sign above or below it.





Bar Over Logical Sum	$\bar{\vee}$	
Bar Over and Bar Under Logical Sum	$\bar{\bar{\vee}}$	
Bar Over and Equals Sign Under Logical Sum	$\bar{\underline{\vee}}$	
Logical Sum with Bar Under	$\underline{\vee}$	
Equals Sign Over Logical Sum	$\overline{\vee}$	
Equals Sign Over and Bar Under Logical Sum	$\overline{\underline{\vee}}$	
Equals Sign Over and Equals Sign Under Logical Sum	$\overline{\underline{\underline{\vee}}}$	
Logical Sum with Equals Sign Under	$\underline{\underline{\vee}}$	

$\gg ABC \bar{\vee} A'B'C'$ 

$\gg P(E \underline{\vee} F)$ 

An unmodified logical sum sign is a sign of operation. See [6.4.7](#).

6.8.7 Reverse Inclusion

Bar Over Reverse Inclusion	\supsetbar	
Equals Sign Over Reverse Inclusion	$\overline{\supset}$	
Reverse Inclusion with Bar Under	\supsetbar	
Reverse Inclusion with Equals Sign Under	$\underline{\supset}$	

$\gg B \supsetbar A$ 

$\gg D \underline{\supset} C$ 

6.8.8 Tilde:

Bar Over Single Tilde	$\bar{\sim}$	
Equals Sign Over Single Tilde	$\bar{=}$	
Double Tilde	\approx	
Bar Over Double Tilde	$\bar{\approx}$	
Equals Sign Over Double Tilde	$\bar{\cong}$	
Single Tilde with Bar Under	$\underset{\sim}{\sim}$	
Single Tilde with Equals Sign Under	$\underset{=}{\sim}$	
Double Tilde with Bar Under	$\underset{\approx}{\approx}$	
Double Tilde with Equals Sign Under	$\underset{\cong}{\approx}$	

➤ $3.14159 \approx 3.1416$

➤ $ABC \cong DEF$

6.8.9 Union: The union sign is a sign of comparison when modified by a bar or equals sign above or below it. It may also be referred to as a "cup".

Bar Under Union	$\underline{\cup}$	
Equals Sign Under Union	$\underline{=}$	

➤ $A \underline{\cup} B$

An unmodified union sign is a sign of operation. See [6.4.10](#).

Instructions: Change the two-column format to a nested list by starting each phrase in cell 1, with each math example starting on a new line in cell 3. Braille "Signs of Comparison Compounded Vertically" as a cell-5 heading.

PRACTICE 6D

Signs of Comparison Compounded Vertically

Greater Than Or Equal To	$ab \overline{\equiv} de$ $ y \geq 0$
With Inclusion	$C' \subset F'$ $(B \cap E) \subseteq (E \times E)$
With Intersection	$X \cap Y$ $X \underline{\cap} Y$
Less Than Or Equal To	$q - 7 \leq 5z$ $-6 \leq x \leq -1$
With Logical Product	$QRS \overline{\wedge} Q'R'S'$ $y \underline{\wedge} z$
With Logical Sum	$ABC \overline{\vee} A'B'C'$ $M(E \underline{\vee} H)$
With Reverse Inclusion	$D \supset C$ $B \supseteq A$
With Tilde	$3.14159 \approx 3.1416$ $ABC \cong DEF$
With Union ("Cup")	$A \underline{\cup} B$

6.9 Signs of Comparison Compounded Horizontally: When two or more signs of comparison are arranged side by side, the combination becomes a single comparison sign compounded horizontally. A multipurpose indicator (dot 5) is inserted between the unspaced symbols to indicate that they are printed horizontally, not vertically. Comparison signs compounded horizontally not shown in the lists below are transcribed in accordance with this principle.

6.9.1 Greater Than ...

Followed by Less Than	$><$	$\cdot\cdot\cdot\cdot\cdot\cdot$
Followed by Equals Followed by Less Than	$>=<$	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$

$$\gg n > < 1 \quad \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

$$\gg n > = < 1 \quad \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

6.9.2 Less Than ...

Followed by Greater Than	$<>$	$\cdot\cdot\cdot\cdot\cdot\cdot$
Followed by Equals Followed by Greater Than	$<=>$	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$

$$\gg n < > 1 \quad \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

$$\gg n < = > 1 \quad \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

6.10 Negated Signs of Comparison: In print, a sign of comparison may be negated by a vertical or a slanted line drawn through it. The print negation symbol may be slanted in either direction. In braille, $\cdot\cdot\cdot$ represents any of the print negation lines. $\cdot\cdot\cdot$ is placed immediately before the sign of comparison being negated. Some examples are shown below. Negated signs of comparison not illustrated below are transcribed according to the same principle.

Negated Equals Sign	\neq or \neq	$\cdot\cdot\cdot\cdot\cdot\cdot$
Negated Parallel To	\nparallel	$\cdot\cdot\cdot\cdot\cdot\cdot$
Negated Perpendicular To	\nperp	$\cdot\cdot\cdot\cdot\cdot\cdot$
Negated Greater Than or Equal To	\ncong	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$
Negated Membership	\notin or \notin	$\cdot\cdot\cdot\cdot\cdot\cdot$

$$\gg 4 \times 13 \neq 14 \quad \cdot$$

$$\gg CD \nparallel EF \nperp GH \quad \cdot$$

$$\gg 4 \ncong 7 \quad \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

$$\gg 9 \notin D \quad \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot$$

Instructions: Use the principles learned in this section to construct symbols that are not shown in the examples.

PRACTICE 6E

- (1) $x \notin A$ means "x is not an element of A".
 - (2) By typing \leq the symbol \leq will appear. By typing \nless the symbol \nless will appear.
 - (3) $A \not\subseteq B$ means that at least one element of A is not an element of B.
 - (4) $WXY \sim VXW$
 - (5) Since $L \nparallel M$ and $M \nparallel N$, does it follow that $L \nparallel N$?
 - (6) The domain is all $x \neq -4, 0, 5$.
-

FORMAT: INSTRUCTIONS

6.11 Margins for Instructions Preceding Itemized Material (5-3): When a group of numbered or lettered problems is preceded by instructions, the instructions begin in cell 5, with runovers in cell 3. One line is left blank above instructions unless the instructions follow a cell-5 or a cell-7 heading. Instructions may begin on line 1 of the braille page if no running head is in use. The related itemized material follows on the next line unless the material itself requires a blank line before it.

Example 6.11-1 (The dashed line indicates a page turn in the print copy.)

Problem Set 7F Tell whether the following ratios are equivalent.

1. $3 : 2 = 75 : 50$

2. $6 : 4 = 15 : 30$

Which of the following sentences are true? Which are false?

3. $328 \div 4 = 41 \times 2$

4. $672 - 415 < 312 \div 3$

Multiply.

54

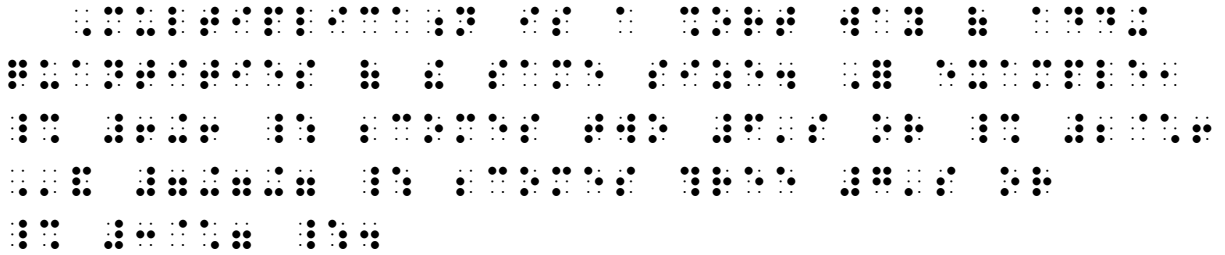
5. $11,251.54 \times 1436$

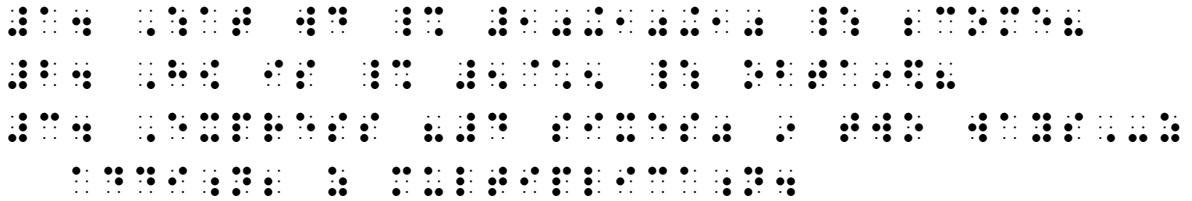
6. $1000 \times 476,792$

Example 6.12-3

Multiplication is a short way of adding quantities of the same size. For example, $6 + 6$ becomes two 6's or 2×6 and $7 + 7 + 7$ becomes three 7's or 3×7 .

1. What would $10 + 10 + 10$ become?
2. How is 5×5 obtained?
3. Express "4 sixes" in two ways—as addition; as multiplication.

A Braille representation of the equation $10 + 10 + 10 = 30$. The number 10 is represented by a dot 6 followed by a dot 1, and 30 by a dot 3 followed by a dot 10. The equation is written as: 10 + 10 + 10 = 30.

A Braille representation of the equation $5 \times 5 = 25$. The number 5 is represented by a dot 5, and 25 by a dot 2 followed by a dot 5. The equation is written as: $5 \times 5 = 25$.

Instructions: Braille "Signs of Comparison" and "Adding and Subtracting Integers" as cell-5 headings.

PRACTICE 6F

Signs of Comparison

These examples illustrate the basic spacing rules for comparison signs learned in this unit.

(1) $5 < 9 < 11$

(2) $11.7 > 1.17$

(3) $550 : 11 :: ? : 12$

Adding and Subtracting Integers

Find the sum or difference as indicated by the signs.

1) $-6 + -5 = \underline{\quad}$

2) $5 + -19 = \underline{\quad}$

3) $-7 - -13 = \underline{\quad}$

4) $29 - -24 = \underline{\quad}$

For further practice, see Appendix A—Reading Practice.

ANSWERS TO PRACTICE MATERIAL

1. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

2. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

3. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

4. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

5. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

6. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

7. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

8. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

9. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

10. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

11. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

12. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

13. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

14. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

15. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

16. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

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$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

$\frac{d^2y}{dx^2} = -2x$

The words are part of the math and so are brailled uncontracted without switching out of Nemeth Code. Each single letter requires an ELI because each is preceded and followed by a space and/or punctuation (or begins a new line). The presence of a single grouping symbol is ignored when determining whether an ELI is needed.

