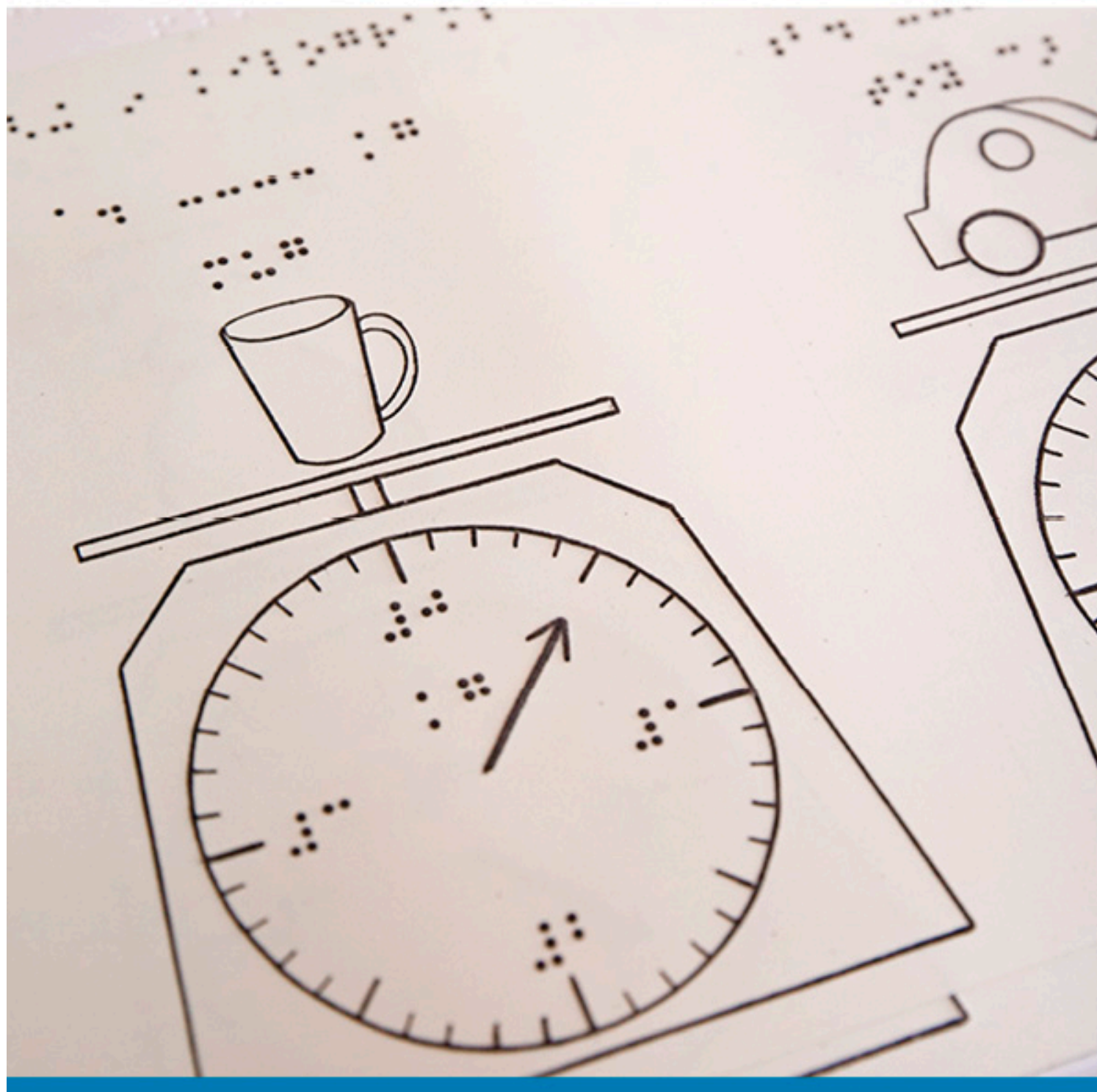


Unified English Braille Training Manual: Introductory Mathematics

Josie Howse



Unified English Braille Training Manual: Introductory Mathematics
Revision 5

© 2019 North Rocks Press

Royal Institute for Deaf and Blind Children
361-365 North Rocks Road
North Rocks NSW 2151
Australia
<https://www.ridbc.org.au/>

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International Licence.

- Attribution: You must give appropriate credit to the author
- Non-Commercial: You must not use the material for commercial purposes
- No derivatives: If you remix, transform or build upon the material, you may not distribute the modified material.

To view a copy of this licence, visit <https://creativecommons.org/licenses/by-nc-nd/4.0/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California 94105 USA



ISBN 978-0-949050-04-0



A catalogue record for this
book is available from the
National Library of Australia

The RIDBC Renwick Centre for Research and Professional Education is administered by the Royal Institute for Deaf and Blind Children. The Centre is committed to the provision of high quality teaching and learning opportunities for professional and families supporting people with vision or hearing impairment, in addition to research and related community service in these same areas.

Table of Contents

Foreword	5
Contributors	7
Lesson 1	8
Introducing Number	8
Numeric Mode	8
Numeric Mode Symbols	8
Termination of Numeric Mode	10
Ordinal Numbers	10
Numeric Indicators Set Grade 1 Mode	11
Termination of Grade 1 Mode	11
Exercise 1	12
Extra Exercise 1	12
Lesson 2	13
Operation and Comparison Signs	13
Operation Signs	13
Comparison Signs	14
Exercise 2	15
Review Exercise 2	15
Lesson 3	16
Grade 1 Mode	16
Grade 1 Symbol Indicator	16
Use of Grade 1 Indicators	16
Exercise 3	18
Review Exercise 3	18
Lesson 4	19
Special Print Symbols	19
Exercise 4	20
Review Exercise 4	21
Lesson 5	22
Omission Marks	22
Signs of Omission	22

Exercise 5	23
Review Exercise 5	23
Lesson 6.....	24
Shape Indicators.....	24
Use of Shape Termination Indicator	24
Exercise 6	25
Review Exercise 6	25
Lesson 7.....	26
Roman Numerals.....	26
Exercise 7	27
Review Exercise 7	27
Lesson 8.....	28
Fractions	28
Simple Fractions, Mixed Numbers and Linear Fractions	28
Simple Numeric Fraction.....	28
Mixed Numbers	29
Linear Fractions	29
Exercise 8	30
Review Exercise 8	30
Lesson 9.....	31
Revision Lessons 1 to 8	31
Review Exercise 9	31
Lesson 10.....	32
UEB Introductory Mathematics Test.....	32
Test Exercise 10	32
References.....	33

Foreword

Mathematics is widely considered a core learning area during the formal years of education, since the study of mathematics involves reasoning, abstraction, generalisation and problem-solving, combined with use of symbols to access and express mathematical ideas and knowledge. Mathematics is, therefore, an essential component of education, employment and everyday life in the 21st Century. The growth of accessible, inclusive digital technologies offers the opportunity for students with vision impairment or other print disabilities to participate in mathematics classrooms on an equitable basis with their sighted peers.

The **purpose** of this UEB introductory mathematics training manual and associated online training program is to clearly articulate the application of Unified English Braille (UEB) to reading and writing mathematical symbols and expressions during the primary years of education. Prior knowledge of UEB in literary contexts is considered essential before embarking on the UEB Introductory Mathematics lessons. You are referred to the UEB Online literacy training program that is available at <https://uebonline.org>. An understanding of UEB in literary contexts will enable professionals and parents to understand and connect language, literacy and mathematics development in children, and to plan teaching and learning experiences that are inclusive of children and young people with vision impairment.

The **target audience** for the training manual includes educators, parents and caregivers, allied health professionals, education administrators and policy makers who support or promote the use of braille as a medium for information access and communication in literacy and mathematical contexts.

The aims of UEB Introductory Mathematics are to enable professionals and parents/caregivers to:

- Develop knowledge of Unified English Braille as it is applied to the continuum of those mathematical concepts and symbols that are typically taught during the primary school years;
- Use their acquired knowledge of Unified English Braille to support braille-using students in accessing mathematics textbooks and print-based materials;
- Possess some basic skills in print-to-braille transcription; and
- Appreciate the enabling potential of knowledge of UEB in directly supporting students with vision impairment to appreciate, engage and communicate mathematical understanding in a broad range of contexts.

The Manual's content is presented as a series of lessons that address specific topics in primary level mathematics. The lessons include practice and review exercises involving print to braille transcription. The lessons build on each other, enabling progressive consolidation and mastery of content.

The RIDBC Renwick Centre, Royal Institute for Deaf and Blind Children, acknowledges with thanks those organisations and individuals who have contributed to developing the introductory mathematics training manual and Online UEB Introductory Mathematics program – see <https://uebonline.org>. The UEB Online Project Team recognises the expertise of Josie Howse, our content author; online program developer Craig Cashmore of Peppacode Pty Ltd; as well as Sonali Marathe and Tarna Cosgrove of RIDBC's Alternative Format Production department who have assured the accuracy of the braille content as well as the accessibility and layout of the training manual. The Project Team also extends its appreciation to the Duchen Family Foundation, the JLDJS Foundation, Sibley Endowment, the Skipper-Jacobs Charitable Trust and the Thomas Hare Investments Trust. Without their financial support, UEB Mathematics Online and this UEB introductory mathematics training manual would not have been possible.

We hope that this contribution to the disability field will provide professionals and parents with the required knowledge to support and encourage children and young people with vision impairment to actively and confidently engage with the exciting world of mathematics and scientific thought.

Frances Gentle
UEB Online Project Team Leader and Conjoint Lecturer,
RIDBC Renwick Centre,
Royal Institute for Deaf and Blind Children (Australia)

Contributors

Author: Josie Howse, PSM

M.Spec. Ed. (Sensory Disability) – University of Newcastle,
BA (Ed.) – Macquarie University

Josie Howse is an Adjunct Research Fellow with the RIDBC Renwick Centre and Manager of the Braille and Large Print Services, NSW Department of Education. The NSW Department of Education team provides all texts and examinations in braille, large print and e-text to students with vision impairment in the government sector and is the largest producer of alternate format student textbooks and examinations in Australia.

Josie has been working in the field of vision impairment for more than 40 years. She has held a number of executive positions at national and state levels and has extensive experience in braille code development at an international level. Josie was the editor of the 2006 Unified English Braille Primer: Australian Edition, and co-editor of the 2016 Unified English Braille: Australian Training Manual.

Josie was awarded the Public Service Medal (PSM) in the Queen's Birthday Honours list in 2007, has been listed annually in Who's Who of Australian Women since 2008, and is the recipient of a Lifetime Achievement Award from the Round Table on Information Access for People with Print Disabilities in 2012.

UEB Online Developer: Craig Cashmore

B. Eng. (Hons) - UTS

Craig holds an Engineering Degree in Telecommunications and has worked in the software development industry for over 30 years, holding senior software design, software architecture and technical management positions in companies including Jtec, Ericsson and LongReach Networks.

More recently Craig founded Peppacode, a web and app development business focused on 'out-of-the-ordinary' strategic web and software development for small business, start-ups and educational institutions.

Some of Craig's achievements at Peppacode include the successful launch of UEB Online for RIDBC and a vehicle tracking and management system for a bus operator.

Craig continues to work on new and innovative projects using modern web technologies.

Lesson 1

Introducing Number

Numeric Mode

Numeric Indicator ⠠ dots 3 and 4 5 6

The number system is formed by using the letters of the alphabet a – i for the numbers 1-9 and j for 0 preceded by the numeric indicator (⠠) dots 3456.

1	2	3	4	5	6	7	8	9	0
⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠

The numeric indicator sets numeric mode for the remainder of the symbols-sequence.

Numeric Mode Symbols

The following symbols may occur in numeric mode:

- **The Ten Digits**

1	2	3	4	5	6	7	8	9	0
⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠	⠠⠠⠠

Examples:

2 ⠠⠠⠠

20 ⠠⠠⠠⠠

21 ⠠⠠⠠⠠

2018 ⠠⠠⠠⠠⠠⠠

- **A Full Stop or Period as Commonly Used in Decimals**

Examples:

0.5 ⠠⠠⠠⠠⠠

0.74 ⠠⠠⠠⠠⠠⠠

1.67 ⠠⠠⠠⠠⠠⠠

14.921 


- **Comma**

Examples:

2,500 

9,250 

14,921 

325,961 

1,000,000 


- **Numeric Space**

Examples:

2 500 

9 250 

15 000 

1 000 000 

- **Line Continuation Indicator**

A line continuation indicator, dot 5, is placed immediately at the end of the line to indicate that the symbols-sequence does not fit and is continuing to the next line.

Since the line continuation indicator does not terminate numeric mode, a numeric indicator is not required when the sequence is continued on the next line.

When making this decision, choice of the run over position should follow mathematical structure:

- before operation signs
- before comparison signs
- before fractions
- before shapes

Further information regarding breaking of the symbols-sequence can be found in “Unified English Braille Guidelines for Technical Material” (International Council on English Braille, 2014).

- **Simple Fraction (as outlined in more detail in Lesson 8)**

Example:

$$\frac{1}{2} \quad \begin{array}{cccc} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{array}$$

Termination of Numeric Mode

Numeric mode is terminated by a space or any symbol not listed above such as a hyphen, dash, slash/oblique stroke and colon.

In such cases, the numeric indicator will need to be repeated after these signs for the remainder of the symbols-sequence.

Examples:

1915-1918 $\begin{array}{cccccccccccc} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{array}$

1915–1918 $\begin{array}{cccccccccccc} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{array}$

1915/1918 $\begin{array}{cccccccccccc} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{array}$

5:30 am $\begin{array}{cccccccc} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{array} \quad \begin{array}{cc} \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \end{array}$

Ordinal Numbers

Occasionally ordinal numbers may be written in a smaller font size or in a superscript position. When print is shown in a smaller font size or in a superscript position it is ignored in braille and brailled as standard print.

Examples:

2nd $\begin{array}{cccc} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{array}$

3rd $\begin{array}{cccc} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{array}$

Numeric Indicators Set Grade 1 Mode

The numeric mode indicator also sets Grade 1 mode. When Grade 1 mode is in effect, contractions may not follow a number.

Termination of Grade 1 Mode

When Grade 1 mode is set by a numeric indicator, it is terminated by a space, a hyphen, a dash or a Grade 1 terminator. More information on Grade 1 mode will be included in Lesson 3.

Example:

4th ⠠⠒⠠⠏⠠⠒⠠⠐

1st ⠠⠒⠠⠏⠠⠒⠠⠐

3-D ⠠⠒⠠⠐⠠⠒⠠⠐⠠⠒⠠⠐⠠⠒⠠⠐

Exercise 1

1. 3 plus 7 equals 10
2. 4 minus 2 equals 2
3. 5 times 5 equals 25
4. 8 divided by 4 equals 2
5. John enjoys the music of the 60s.
6. Lara has a greater preference for the music of the 70's.
7. What is the answer if I add 21.6, 14.8 and 255.97 together?
8. 0.19 is the same way as writing .19
9. My telephone number is 02 9886 7313.
10. Class begins at 9:00 am sharp.

Extra Exercise 1

1. School finishes at 3:15 pm.
2. I am wondering whether midnight is 12 a.m. or 12 p.m.
3. Australia Day celebrations are on January 26th each year.
4. Today is 12.10.18.
5. Tomorrow is 13-10-18.
6. I plan to go overseas on 20/9/18.
7. The date can also be written 2019/08/04
8. Although more uncommon, the date can be written as 7:12:2018
9. Her birthday falls on the 1st of December.
10. We have a public holiday on the 4th April this year.

Lesson 2

Operation and Comparison Signs

Operation Signs

- ⠠⠨⠠⠨ + plus (dot 5, dots 2 3 and 5)
- ⠠⠨⠠⠨ - minus (dot 5, dots 3 and 6)
- ⠠⠨⠠⠨ × times, a multiplication sign as shown in print as a cross (dot 5, dots 2 3 and 6)
- ⠠⠨⠠⠨ · running product (dot 5, dots 2 and 5 6)
- ⠠⠨⠠⠨ ÷ divided by (dot 5, dots 3 and 4)
- ⠠⠨ : ratio sign as shown in print as a colon (dots 2 and 5)

Note: Although the ratio sign shown above is used to compare two numbers, it is best treated as an operation sign for the purposes of spacing.

Operation signs are generally unspaced from numbers both preceding and following it.

Examples:

$$3 + 5 \quad \text{⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨}$$

$$5 - 3 \quad \text{⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨}$$

$$2 \times 2 \times 2 \quad \text{⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨}$$

$$4 \div 2 \quad \text{⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨}$$

$$6 \cdot 2 \quad \text{⠠⠨⠠⠨⠠⠨⠠⠨⠠⠨}$$

$$2:4 \quad \text{⠠⠨⠠⠨⠠⠨⠠⠨}$$

For a younger student or a developing braille reader the operation signs may be spaced.

It is however recommended as a teaching strategy that spaces between the operation signs be omitted as soon as the learner has mastered an understanding of mathematics.

Exercise 2

1. $9 + 5 + 3 = 8$
2. $3\,500 \div 70 =$
3. $0.7 < 0.69$. True/False?
4. Area = $bh = 10 \cdot 3 = 30$
5. $4:8 = 12:24$
6. $0.69 > 0.7$. True or false?
7. $50 \times 100 \div 25 + 1 =$
8. $51 \times 9 = 459$
9. $48 \div 8 = 6$
10. $300 + 59 + 1 = 360$

Review Exercise 2

1. Write the number that is one thousand greater than 3 499 000.
2. 0.645 012
3. $4.37 + 0.96 + 2.15 + 3.07 =$
4. A stopwatch display reads 1:10:43. How many seconds is this?
5. $5.25 - 1.80 =$
6. The date today can be written as 01/01/2019
7. $201 \times 50 = 10,050$
8. $77 \div 11 = 7$
9. $100 \div 10 + 21 - 16 = 15$
10. The date tomorrow can be written as 27:04:18

Lesson 3

Grade 1 Mode

Grade 1 Symbol Indicator

⠠ Grade 1 symbol indicator (dots 5 6)

Additional Grade 1 mode indicators will be introduced in Lesson 2 of the UEB Training Manual: Advanced Mathematics.

Use of Grade 1 Indicators

A braille symbol may have a Grade 1 (uncontracted) meaning and a Grade 2 (contracted) meaning.

A Grade 1 indicator is used to set Grade 1 mode when the meaning of a symbol could be misread as a contraction.

Example:

T-shirt

⠠⠠⠠⠠⠠⠠⠠⠠

A Grade 1 indicator is required for any of the lower case letters a-j that immediately follow a digit, as they themselves will be read as part of the number.

Examples:

5b (not 52)

⠠⠠⠠⠠⠠⠠

10a (not 101)

⠠⠠⠠⠠⠠⠠

A Grade 1 indicator is required for any of the letter combinations that form a short form so they are not misread.

Note: In accordance with the rules for capitalisation, a capitalised word indicator is terminated by a space, a single capital letter, a nonalphabetic symbol, or a capitals terminator (dot 6 and dot 3).

Examples:

Class AB

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

Exercise 3

1. $5 \text{ cm} + 3 \text{ cm} = 8 \text{ cm}$
2. $5\text{cm} + 3\text{cm} = 8\text{cm}$
3. $500 \text{ g} \times 10 = 5000 \text{ g} = 5 \text{ kg}$
4. $500\text{g} \times 10 = 5000\text{g} = 5\text{kg}$
5. School starts at 9 am each day.
6. School starts at 9am each day.
7. School finishes at 3 pm every day.
8. School finishes at 3pm every day.
9. Is a prism 2-D or 3-D?
10. All the family are going to sit in Row 15F for the concert.

Review Exercise 3

1. How many CD's do you have?
2. We are approaching an "S" bend in the road.
3. After that next corner we will reach a "T" intersection.
4. Class 6A won the school debating competition.
5. Class 6C came second in the competition.
6. Today is 24-9-18.
7. I received 55c in my change from buying the drink.
8. How many c in 5 dollars?
9. A scale of 1:250
10. An AC adapter is required for the plug.

Lesson 4

Special Print Symbols

⠠⠠	¢	cent, dot 4, dots 1 and 4 (dot 4, c)
⠠⠠	\$	dollar, dot 4, dots 2 3 and 4 (dot 4, s)
⠠⠠	€	euro, dot 4, dots 1 and 5 (dot 4, e)
⠠⠠	£	pound sterling, dot 4, dots 1 2 3 (dot 4, l)

Refer to “Unified English Braille Guidelines for Technical Material” (International Council on English Braille, 2014) for additional special print symbols for different currencies (see reference list).

⠠⠠	%	percent, dots 4 and 6, dots 3 and 5 6 (dots 4 6, lower j)
⠠⠠	°	degree, dots 4 5, dots 2 and 4 5 (dots 4 5, j)
⠠	'	foot or minute, dots 2 3 and 5 6 (lower g)
⠠⠠	"	inch or second, dots 2 3 and 5 6, dots 2 3 and 5 6 (lower g, lower g)
⠠⠠	(open round bracket, dot 5, dots 1 2 and 6
⠠⠠)	close round bracket, dot 5, dots 3 and 4 5
⠠		tally mark (vertical line segment), dots 4 5 6

Follow the order shown in the print version for spacing, capitalisation and punctuation of abbreviations when using the signs indicated above.

Examples:

\$US25 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

£25 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

€25 ⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

25¢ ⠠⠨⠠⠘⠠⠘⠠⠘⠠⠘⠠⠘

25% ⠠⠨⠠⠘⠠⠘⠠⠘⠠⠘⠠⠘

25° ⠠⠨⠠⠘⠠⠘⠠⠘⠠⠘

2' 5" ⠠⠨⠠⠘⠠⠘⠠⠘⠠⠘⠠⠘⠠⠘

||| ⠠⠨⠠⠘⠠⠘⠠⠘ 3 tally marks

|||| ⠠⠨⠠⠘⠠⠘⠠⠘⠠⠘⠠⠘ 4 tally marks with a strike through
(representing 5 items)

Exercise 4

1. How many A\$ in 500c?
2. How many ¢ in \$5?
3. How many c in \$5?
4. \$10.00 - \$5.50 =
5. \$1.00 - 55c?
6. What is 10% of 800?
7. What is the minimum temperature if the range is 13°C and the maximum is 38°C?
8. Water boils at 100°C and freezes at 0°C.
9. 1'6" is about half a yard and is about 45 cm or 0.45 m.
10. 50 cents can be written as \$0.50, 50c or 50¢.

Review Exercise 4

1. Do I show the dollar sign as US\$ or \$US?
2. 9 L of water weighs 9000 g.
3. The class achieved a 70% pass rate in the exam.
4. The temperature today is 31°C.
5. She will be starting school in Kindergarten on 31/05/2019.
6. There is an “S” bend in the road ahead.
7. I will catch the train on 06.05.19.
8. April Fools’ Day is on the 1st April each year.
9. $70 \div 7 = 10$
10. $5 - 5 = 0$

Exercise 5

1. $5 + 9 = _$
2. $25 + 5 = ?$
3. $15 \times ? = 45$
4. $197 + _ = 215$
5. $196 \div 4 = _$
6. James has ---- caps.
7. $72 - 9 = 8$
8. $72 \div 9 = 8$
9. 4, 7, 10, $_$, $_$.
10. 2, 4, 6, 8, $?$, $?$.

Review Exercise 5

1. $15 - 7 = ?$
2. $25 + 19 = _$
3. 25/10/2018
4. $\$19 + \$15 = \$_$
5. $15c - 12c =$
6. $31 + ---- = 77$
7. Class 5A and 6B went to the oval to play football.
8. I only received 13c as my change.
9. My initials are CD and my friend's initials are AB
10. $16.7 + 13.3 = 30.0$.

Lesson 6

Shape Indicators

There are a number of different shapes that occur in print. These shapes are often indicated by the sign for the shape indicator, that is, dots 1246 (⠠), and followed by the number of sides of the shape. The most common shape indicators are presented below.

Note: As the shape indicator also has a Grade 2 meaning, unless you are already in Grade 1 mode, a Grade 1 symbol indicator will be needed before the shape indicator.

Examples:

$\text{⠠} \text{⠠} \text{⠠} \text{⠠}$ □ Square Box

$\text{⠠} \text{⠠} \text{⠠} \text{⠠}$ Δ Triangle

$\text{⠠} \text{⠠} \text{⠠}$ O Circle

Note: In the examples below, the shape indicator needs a Grade 1 symbol indicator in front of it as the shape indicator has a contracted meaning.

Examples:

$2 + 5 = \square$ $\text{⠠} \text{⠠} \text{⠠} \text{⠠} \text{⠠} \text{⠠}$ $\text{⠠} \text{⠠}$ $\text{⠠} \text{⠠} \text{⠠} \text{⠠}$

$5 \Delta 2 = 7$ $\text{⠠} \text{⠠}$ $\text{⠠} \text{⠠} \text{⠠} \text{⠠}$ $\text{⠠} \text{⠠}$ $\text{⠠} \text{⠠} \text{⠠}$ $\text{⠠} \text{⠠}$

$7 \text{O} 5 = 2$ $\text{⠠} \text{⠠}$ $\text{⠠} \text{⠠} \text{⠠}$ $\text{⠠} \text{⠠}$ $\text{⠠} \text{⠠} \text{⠠}$

Use of Shape Termination Indicator

⠠ Shape termination indicator, dots 1 5 6

If a shape is followed by a space, then no termination to the symbol is necessary.

If a shape symbol is followed by punctuation or is unspaced from a following symbol then the shape termination indicator must be used.

Note: While the shape termination indicator has a Grade 2 meaning, in the example below the shape termination indicator will not require the Grade 1 symbol indicator as the numeric indicator has set Grade 1 mode.

Example:

□, □ $\text{⠠} \text{⠠} \text{⠠} \text{⠠} \text{⠠} \text{⠠}$ $\text{⠠} \text{⠠} \text{⠠} \text{⠠}$

Exercise 6

1. $5 + 9 = \square$
2. $25 + \square = 30$
3. $16 \Delta 3 = 13$
4. $197 + 10 = \Delta$
5. $196 \div O = 49$
6. James has \square caps.
7. $72 \Delta 9 = 8$
8. $72 O 9 = 8$
9. 4, 7, 10, \square , \square .
10. 2, 4, 6, 8, —, —.

Review Exercise 6

1. $159 + 77 - 21 = ?$
2. $55 + \square + 48 = 120$
3. $\Delta - 59 = 100$
4. $25, 30, 35, \square, 45 = 175$
5. I was given 5 CDs for my birthday.
6. $3 + \square = 7$
7. I sat in row 9C and my son sat in row 9D.
8. I received 55c change from \$5.
9. My initials are AC and my friend's initials are AD.
10. $16.7 + 13.3$ is 30.0.

Exercise 7

1. $X - VI =$
2. $C + L - XV =$
3. Answer questions i, ii and iii only.
4. A lower case Roman nine is ix.
5. An upper case Roman nine is IX.
6. $v + i = vi$
7. $M + LX =$
8. $iv + v + x =$
9. LX is another way of writing 60.
10. What is $XC + CCC$ in Roman Numerals?

Review Exercise 7

1. $C + L = \text{---}$
2. $175 \div 5 = O$
3. $221 - 73 + 54 =$
4. What colour is a \$100 note?
5. What are the next 2 squared numbers:
 $16, 36, 64, \square, \square?$
6. Write 21:36 in digital time.
7. $\$7.93 = \text{---- cents.}$
8. Is 0.6 smaller than 0.57?
9. $67 \times 20 = \square$
10. What number is 400 000 less than 9 640 400?

Lesson 8

Fractions

Simple Fractions, Mixed Numbers and Linear Fractions

There are a number of methods of indicating fractions in print.

Simple Numeric Fraction

A simple numeric fraction is one whose numerator (top of the fraction line) and denominator (bottom of the fraction line) contain only:

- digits,
- decimal points,
- commas, or
- separator spaces,

and, if the fraction line in print (often referred to as the vinculum) is drawn between the two vertically (or near vertically) arranged numbers.

If the fraction complies fully with the definition above for a simple fraction, then a numeric fraction line symbol ($\frac{\cdot}{\cdot}$) is used between the numerator and the denominator and continues the numeric mode as previously mentioned in Lesson 1.

Examples:

$\frac{1}{2}$ (vertically) or

$\frac{1}{2}$ (near vertically)

$\frac{17}{28}$ (vertically) or

$\frac{17}{28}$ (near vertically)

$\frac{2.500}{10.000}$ (decimals)

$\frac{10,000}{50,000}$ (commas)

$\frac{10\ 000}{50\ 000}$ (separator spaces)

Exercise 8

1. $\frac{5}{8}$ of the class are girls
2. $\frac{5}{8}$ of the class are girls
3. $1\frac{3}{4}$ m = 1750 cm.
4. $0.08 + \frac{3}{5}$
5. $\frac{2}{3}$ teaspoon of vanilla is needed in the recipe.
6. $\frac{1}{4} + \frac{1}{2} + \frac{3}{4} =$
7. $\frac{5.5}{4,000}$
8. Write 9.9/10.0 as a decimal.
9. Calculate $\frac{7.7}{2\,000}$
10. Write $\frac{77}{100}$ as a percentage.

Review Exercise 8

1. 3 cm + 5 cm = 8 cm
2. $75 \neq 40 + 25$
3. Add (5×50) and (8×40)
4. $\$5.30 - \$5.00 = \square$
5. $0.75 < 0.7$. True or False?
6. How many \$ in 400c?
7. $55\text{cm} + 22\text{cm} + 23\text{cm} = 1\text{m}$
8. $3.9 \times 4.1 = 0$
9. VII + XXX =
10. Anzac Day in Australia is 25th April each year.

Lesson 9

Revision Lessons 1 to 8

Review Exercise 9

1. g in 5 kilograms
2. 5 m 97 cm = —
3. $34 + \square = 41$
4. How many 20c coins in \$5.60?
5. L in 2,900 millilitres
6. How many minutes from 10:37 a.m. to 12:29 p.m.?
7. cm in 346 millimetres
8. Write $1\frac{56}{100}$ as a decimal.
9. Hindu Arabic for XCVIII.
10. $8 \times 7 + 7 + 9 = \text{—}$
11. $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} =$
12. The temperature rose from 15°C to 29°C .
13. $72 \Delta 8 = \text{—}$
14. 60% of \$150
15. 6 litres of paint at \$19.99/litre.
16. $\frac{3}{4}$ of 800 mL
17. $\frac{1}{2}$ of \$10,000 is
18. $13.2 + 15.9 =$
19. $50\,000 + 7\,000 + 500 + 40 + 3$
20. How many millimetres in 9 cm?

Lesson 10

UEB Introductory Mathematics Test

Test Exercise 10

1. $(55 + 99) + (21 + 12) =$
2. Convert 6101 cm to metres and centimetres.
3. $510 \text{ mm} + 33 \text{ mm} =$
4. What is $\frac{4}{5}$ as a decimal?
5. $\square \div 100 = 10$
6. 1, 3, \square , 7
7. The recipe requires $\frac{2}{3}$ cup sugar
8. My friend's initials are GD
9. $5.5/3,000$
10. The school holidays will begin on the 1st of next month.
11. $77 \Delta 7 = 11$
12. The ISBN is 0-14-300414-X
13. Tomorrow will be 29/10/2018
14. Write the decimal .717 as a fraction.
15. Calculate 75% as a fraction.
16. What is $30 \cdot 10$ as a running product?
17. $9.625 + 3.127 =$
18. 5000 mm is \square centimetres?
19. $50\% = \frac{50}{100} = 0.5 = \frac{1}{2}$
20. The temperature today is expected to reach 90°F .

References

- Howse, J. (2018). *Unified English Braille Maths K – 6*. Workshop delivered at the RIDBC Renwick Centre, Royal Institute for Deaf and Blind Children, North Rocks NSW Australia. NSW Department of Education.
- Howse, J. (2018). *Unified English Braille Maths 7 – 12*. Workshop delivered at the RIDBC Renwick Centre, Royal Institute for Deaf and Blind Children, North Rocks NSW Australia. NSW Department of Education.
- Howse, J. Riessen, K. and Holloway, L. (Eds.) (2014; 2016). *Unified English Braille training manual*. Available from <http://brailleaustralia.org/unified-english-braille/unified-english-braille-australian-training-manual-2013/>
- International Council on English Braille. (2014). *Unified English Braille guidelines for technical material*. Available from [http://www.iceb.org/guidelines for technical material 2014.pdf](http://www.iceb.org/guidelines%20for%20technical%20material%202014.pdf)
- Simpson, C. (Ed.). (2013). *The rules of Unified English Braille*. (2nd. ed.). International Council on English Braille (ICEB). Available from <http://iceb.org/Rules%20of%20Unified%20English%20Braille%202013.pdf>