



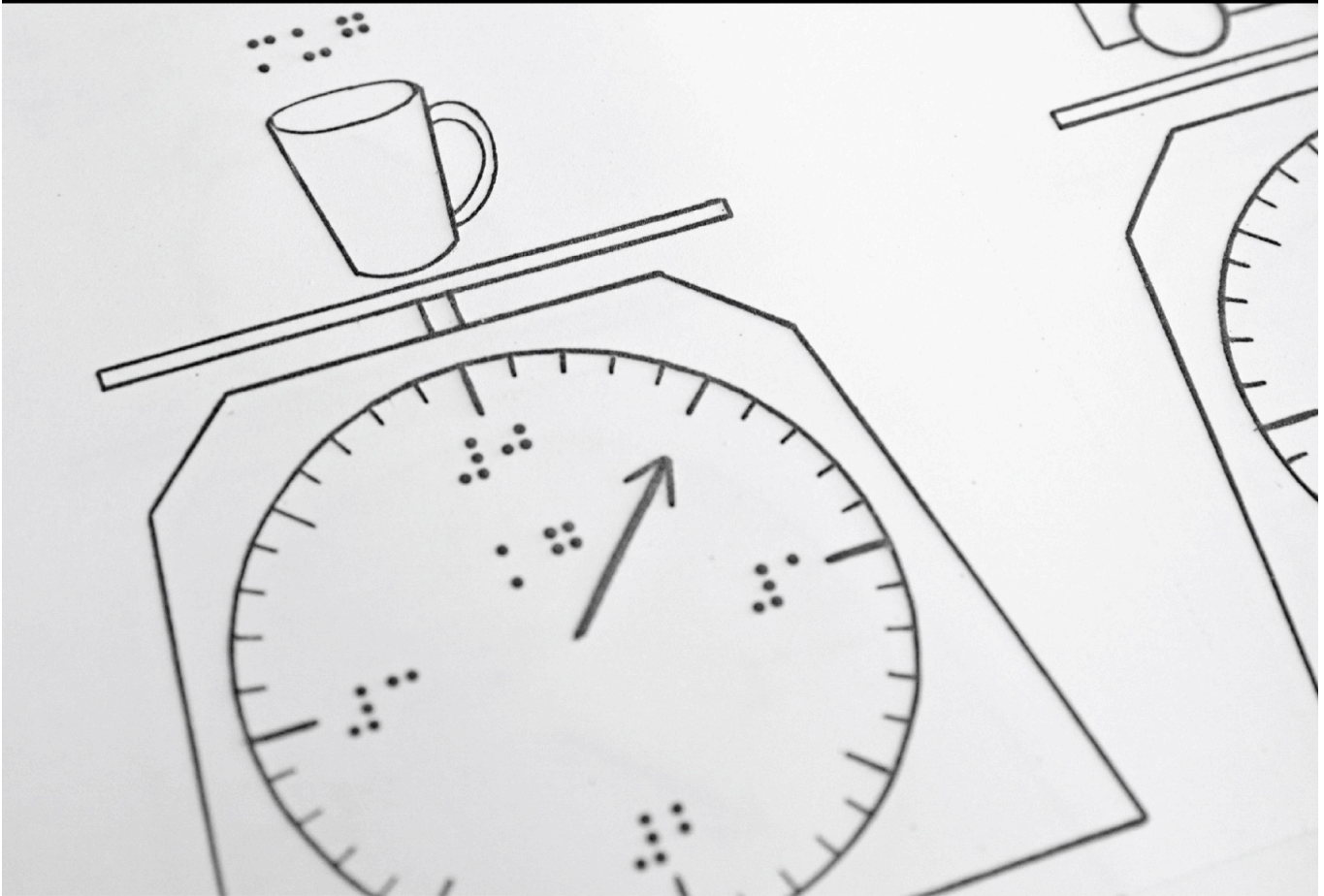
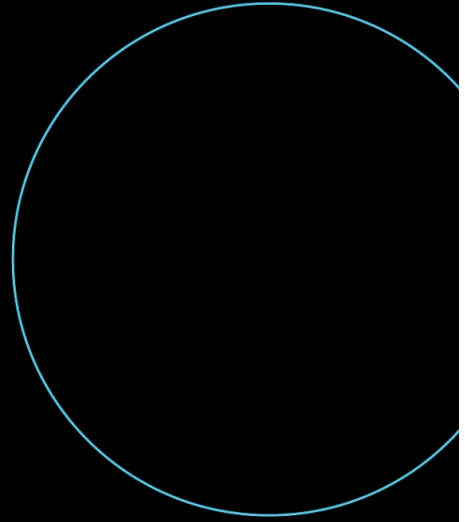
Advancing the RIDBC Renwick Centre experience.



Unified English Braille Training Manual

# Introductory Mathematics

Josie Howse



 **UEBOnline**

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NextSense Institute is Australia's leading centre for research and professional studies in the field of education for children with sensory disabilities; offering webinars, short courses, and degree programs for parents, carers, educators, and health professionals. NextSense Institute is committed to providing high-quality teaching and learning opportunities. Our programs are conducted by leading national and international experts for education and health professionals who support people who are deaf, hard of hearing, blind or have low vision.

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## 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.

NextSense 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 Next Sense'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,  
NextSense Institute

## **Contributors**

### **Author: Josie Howse, PSM**

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Josie Howse is an Adjunct Research Fellow with NextSense Institute 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 NextSense Institute 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      ⠠⠠⠠⠠⠠⠠





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:

2<sup>nd</sup>       $\begin{array}{cccc} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{array}$

3<sup>rd</sup>       $\begin{array}{cccc} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{array}$

### 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      ⠠⠢⠏⠏⠠⠠⠠⠠

1<sup>st</sup>      ⠠⠠⠠⠠⠠⠠⠠⠠

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.  $\text{Area} = bh = 10 \cdot 3 = 30$
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.  $5 - 5 = 0$

## Lesson 5

### Omission Marks

A variety of different ways are used in print to indicate that something is missing in the sequence. While decisions may be made at the time of print to braille transcription in the best interest of the student's learning, please follow the print for the purposes of these exercises.

**Note:** In the list of signs of omission and example below a Grade 1 indicator is needed in front of the question mark as it has a contracted meaning "his" and is standing alone.

### Signs of Omission

⠠⠠⠠ — Long dash (shown as a centred horizontal line in print)

⠠⠠ \_ Underscore

⠠⠠⠠⠠ ---- 4 hyphens

⠠⠠ ? Question mark

Examples:

$$2 + 5 = \text{—}$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

$$5 + 2 = \text{----}$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

$$7 + 5 = ?$$

⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠

**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 ( $\text{⠠}$ ), 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:

$\text{⠠}$   $\square$  Square Box

$\text{⠠}$   $\triangle$  Triangle

$\text{⠠}$   $\circ$  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:

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

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

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

### Use of Shape Termination Indicator

$\text{⠠}$  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:

$\square, \square$   $\text{⠠}$   $\square$   $\text{⠠}$   $\square$   $\text{⠠}$   $\square$   $\text{⠠}$   $\square$



**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.

## Lesson 7

### Roman Numerals

Roman Numerals should be brailled as if they were normal letters of the alphabet using the rules for capitalisation and Grade 1 mode.

**Note:** In the examples below:

1. The letters “V” and “x” have a contracted meaning when standing alone and so will require Grade 1 indicators. The letter “I” and “i” do not have a contracted meaning and so will not require Grade 1 indicators.
2. The letters CD may be read as a short form could so will also require a Grade 1 indicator.

Examples:

Read parts I, II and V.

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

Answer only questions i, vi and x.

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

CD

⠠⠠⠠⠠⠠⠠⠠⠠ ⠠⠠⠠⠠⠠⠠

**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  $(5 \times 50)$  and  $(8 \times 40)$
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  $15^{\circ}\text{C}$  to  $29^{\circ}\text{C}$ .
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 1<sup>st</sup> 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  $90^\circ\text{F}$ .



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