The Right Way Round

A Companion Guide for Parents, Teachers, Occupational Therapists and Educational Psychologists

The Everyday Learner · Book One

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Contents

SECTION 1

About this guide

The Right Way Round is a practice workbook for children who are learning to write letters and numbers the right way round, in the right order, and with the right value in the right place. The child traces, copies, writes from memory, writes from dictation, puts letters and numbers in order, and says out loud how they know. It is an activity book, and a parent can work through it with a child without reading another word of this guide.

For a teacher, an occupational therapist or an educational psychologist, the same book offers something more. Every exercise holds one thing constant and varies another, and every page records the conditions for the exercise as well as the result. A completed copy is a record of how a child performed as the demands in each area changed.

The workbook offers practice, arranged as a progression. This guide describes that progression, sets out the principles behind it and connects each principle to the research. Any interpretation of a child's performance is a matter for professional judgement, and this guide is written to support any assessments based on the exercises in the workbook.

What the book is not

Reversals and digit-order errors are common at this age and usually resolve with time and practice. Their occurrence alone is not a marker of dyslexia, of attention difficulty, or of a visual or neurological condition. What carries information is persistence, frequency, breadth and functional impact.[1,2,4]

The relationship between letter reversals and dyslexia is neither necessary nor sufficient.[2,3] Longitudinal work found that the rate of reversals in early writing did not predict later literacy at around age eight, while general accuracy of letter production did.[4] That finding shaped the book, which practises accurate production far more than it tests orientation.

The book is not normed. It produces no standard scores, no cut-offs and no bands. A page score reflects the results on that page and nothing beyond it. Systematic reviews also report that handwriting programmes of fewer than

1 Blackburne et al. (2014)
2 Treiman et al. (2014)
3 Brooks et al. (2011)
4 Fischer et al. (2016)

about 20 sessions have not been found effective on their own.[7,8] Book One is one book of distributed practice within a series, not a course of treatment.

This guide is a research-referenced observational resource intended to supplement professional assessment. It does not replace formal clinical diagnostic tools or standardised psychological testing.

7 Hoy et al. (2011)
8 Fancher et al. (2018)

SECTION 2

A note on our research

The workbook was designed from research on mirror generalisation, letter reversal and place-value transposition in children aged five to nine. It draws on the 12 sources listed in section 7, and the passages quoted through this guide are taken from those sources.

Reversals are ordinary

Mirror-oriented errors are common during early literacy, because reading and writing require a learned exception to the visual system's ordinarily useful habit of treating a reflected object as the same object.[1,6]
Orientation-sensitive processing of print develops gradually with reading experience. In typically developing children aged 5 to 12, the adult pattern of early neural differentiation between correctly oriented and reversed letters is not yet consistently present.[1] The report's reading of this is that reversal errors do not mean a child sees things backwards, and that the specialised print system is more plausibly not yet automatic under every condition.

Children also learn the visual regularities of the writing system, and can preserve a letter's broad shape while applying the orientation that is more frequent across the alphabet.[2] Reversal errors are therefore patterned rather than random.

The three domains are distinct

A mirrored letter changes which letter it is and which sound it makes. A number written with its digits transposed uses correctly formed digits and changes magnitude. A mirrored stroke involves a motor sequence that has not yet stabilised.[6] The report treats these as three phenomena rather than one.

1 Blackburne et al. (2014)
2 Treiman et al. (2014)
6 Schott (2007)

Performance moves with the task

The same child can perform differently on the same content depending on what is asked. Recognition, copying, writing from memory, dictation, reading a numeral, writing a dictated number and comparing magnitudes each load different processes.[5] Reversals also appear more readily in unfamiliar tasks, in fast writing, under time pressure and with fatigue.[1,3]

Formation is a whole-body task, not a visual one

Handwriting integrates retrieval of a stable letter or digit representation, orientation and spatial configuration, stroke order and start point, fine-motor execution, and monitoring of the output while attention is divided.[6,7] Systematic reviews of handwriting intervention support explicit instruction combined with actual writing practice, and find perceptual or discussion-only approaches insufficient.[7,8] Foundational-skills guidance supports linking a letter's form to its name and sound, and practising across formats.[11]

Number errors are not necessarily visual

Writing a number that is heard requires a child to parse the spoken phrase, hold its elements in working memory, apply the syntax of the base-ten system, map each component to its positional value, and write the digits in serial order including any zero placeholders. In research with second graders, executive working memory was the strongest predictor of general transcoding performance, while the structure of the language was related specifically to inversion errors.[5]

The mathematics guidance that this report draws on adds the rest of what the number groups are built from. Teach meaning and procedure together; use proportional representations; link notation to magnitude; ask the learner to explain rather than only to select; include translation in both directions; and contrast close pairs deliberately.[9,10]

1 Blackburne et al. (2014)
3 Brooks et al. (2011)
5 Zuber et al. (2014)
6 Schott (2007)
7 Hoy et al. (2011)
8 Fancher et al. (2018)
9 Wilson et al. (2006)
10 What Works Clearinghouse (2021)
11 What Works Clearinghouse (2016)

SECTION 3

How the book was built

Research, then principle, then exercise. Each finding in section 2 produced a rule about how a page should be built, and the rules resulted in exercises. This section covers how the exercises were made, how they are presented on the page, and how the practice is balanced across the book.

3.1 Creating the exercises

Four derivations shape the workbook.

Multiple paths to the same target

> *"reversals, both by mouth and hand, may reflect momentary breakdowns in working memory while reading, as reflected in RAN reversals, or momentary breakdowns in working memory while handwriting, as reflected in alphabet letter writing reversals."*
>
> Brooks, Berninger and Abbott (2011)[3]

The principle: The path by which material reaches the child, and the path by which it comes back, is a dimension of the book rather than a way of keeping pages varied.

In the book: Six paths, and every group runs several of them over one target, so performance on the same content can be read across tasks.

3 Brooks et al. (2011)

One error class per page

> *"Regression analyses confirmed that language was the only significant predictor of inversion errors. Working-memory components, in contrast, were the only significant predictors of transcoding errors."*
>
> Zuber, Pixner, Moeller and Nuerk (2014)[5]

The principle: Orientation, serial order and place value are never combined inside an exercise, and never inside a group.

In the book: Every exercise works one error class in isolation, named in its code.

Support fades within each group

> *"As students' reading skills develop, scaffold by providing fewer prompts and supports and expecting students to apply skills and strategies independently."*
>
> What Works Clearinghouse (2016)[11]

The principle: Support falls away within each group, and the same material is met at more than one level of support so that the comparison exists on the page.

In the book: Four support levels, from a model in view to a single attempt under time constraint with nothing to look at.

5 Zuber et al. (2014)
11 What Works Clearinghouse (2016)

Structured exercises under specific conditions

> *"The term 'systematic' indicates that instructional elements intentionally build students' knowledge over time toward an identified learning outcome(s)."*
>
> What Works Clearinghouse (2021)[10]

> **The principle:** Each exercise should play a specific developmental role rather than simply offer opportunities for practice.
>
> **In the book:** Every exercise carries a four-field code in the page footer representing the specific conditions for that page.

3.2 Presenting the exercises

Every exercise carries a record strip and a code.

Done and Fixed

Record strips carry **Done** and **Fixed** indicators, which separate completion from self-correction. Marking Done tells the child that the "doing" is finished and the "checking" starts, and Fixed records what they then put right themselves. Error coding frameworks treat self-correction as its own field.[3]

The Fixed field is excluded from the 33 exercises where a self-correction pass is either not possible or not useful.

Score

Every exercise is scored. The score is there to give the child a result on every page and a sense of achievement as errors reduce, and to give a point of comparison for the repeated exercise and for any later attempt at the same page. Where an exercise is repeated, both scores are required in the record strip, **First try ___ / n | This try ___ / n**.

3 Brooks et al. (2011)
10 What Works Clearinghouse (2021)

Time as a constraint

Each exercise group closes with a timed exercise, and the clock is there as a constraint for complexity. The recorded minutes are not the point.
Reversals appear more readily under fast writing, fatigue and unfamiliar demands,[1] so repeating a task under time constraint puts a condition in play that was previously absent, on material that is otherwise unchanged.

Changing one thing at a time

Consecutive exercises within a group differ by a single feature. Every exercise carries a four-field code in its footer, and the code represents the attributes of each exercise.

E22 · REC · MIR · S1

The exercise number, the path the material took, the error class the page works, and the support level that was available. Section 4 defines the values each field can take. Two exercises whose codes differ in one field differ in one thing, and where two exercises are built to be compared they carry the same items in the same order rather than similar material.[3]

3.3 Balancing the effort

The book promises practice for letter and number reversals and mirroring. The frequency and distribution of the target set of letters and numerals demonstrates the delivery of that promise. For each of the letters and numerals in the target set, the table below shows:

- **Exercises** — how many exercises practise that character, in any mode;
- **Occurrences** — how many times the character is practised, written down.

1 Blackburne et al. (2014)
3 Brooks et al. (2011)

Character	Exercises	Occurrences
3	39	74
5	41	71
9	43	68
6	41	66
4	39	65
7	42	63
2	40	59
b	22	58
d	19	49
a	20	42
e	21	28
p	21	25
g	14	19
s	16	17
r	13	9
q	6	6
y	4	6
j	7	4
z	6	4
f	6	3

Place value is targeted on nine exercises and number transcoding on eight, with further exposure through the tens answer on the number-reading page and three-digit ordering in the final group.

SECTION 4

The framework

Two sets of principles govern the exercises, and an exercise can be a reflection of more than one principle.

1. **Mechanisms of learning.** The paths by which each target letter or numeral reaches the child, and is asked to be produced by the child.
2. **Learning progression.** How the task demand ramps up as support falls away.

Every exercise carries a four-field code in the page footer. The sections below describe each field.

Exercise Ref · Mode · Target · Support

4.1 Mechanisms of learning

4.1.1 Mode

Material reaches the child by eye or by ear, and it comes back as a mark on the page, as handwriting, or as speech. Each pairing of the two is a path, and the path an exercise takes is what we call its Mode. The Mode is indicated in the exercise code as one of six values.

Code	What the child had to do
REC	Recognise, identify or choose
COP	Copy from a visible model
MEM	Write with the model withdrawn or absent
DIC	Write what an adult reads aloud
SEQ	Reproduce or produce an order
EXP	Say something aloud, with nothing written

Seeing: 43 exercises present their material to be seen, then recognised, copied, reproduced or reordered. Recognition pages isolate judgement; they never stand in for production, because handwriting improves through actual writing practice rather than through perceptual or discussion-only work.[7,8]

Hearing: 14 exercises are dictation. The adult speaks and the child writes, with nothing visible to copy. Dictation loads listening, phonological representation, working memory and writing at the same time,[5] and for numbers it loads the whole transcoding chain described in section 2.

Explaining: Seven exercises ask the child to speak rather than write. Four ask for reasoning: which number is bigger and how they know; what the 7 in 71 means; how they tell *a* **b** from *a* **d**. Three ask the child to read printed items aloud so that the adult hears how they are read. Asking a child to explain, rather than only to select, is an evidence-based principle in place-value teaching.[10]

The same content down more than one path: Where the path changes, the material does not. That is what makes two pages comparable rather than merely similar.

- The same 18 letters are traced with a start point supplied, copied from a covered model, and the first 10 dictated under time constraint.
- The same seven reversal-prone numerals are judged alone, and then judged inside two-digit numbers where exactly one digit of a wrong item is reversed.
- The same eight number pairs are judged for size on one page and explained aloud on another.
- The same numerals are read aloud on one page and written from dictation on another, so both directions of the mapping are on record.

4.1.2 Target

Most exercises are built around one of six defined error classes, referred to as targets, each working on a specific area for development. The final group uses a combination of error classes, where the combination is the target of the exercise. The Target is indicated in the exercise code as one of six values.

5 Zuber et al. (2014)
7 Hoy et al. (2011)
8 Fancher et al. (2018)
10 What Works Clearinghouse (2021)

Code	What the page is about
STR	Stroke sequence and start point
MIR	Mirror orientation
TRA	Transposition, the order of letters or digits
PLV	Place value
NSY	Number syntax and transcoding
MIX	More than one error class in one exercise

4.2 Learning progression

Foundations before practice

The workbook opens with character formation. Handwriting integrates retrieval, orientation, stroke order and start point, motor execution and monitoring, all under divided attention, and explicit work on form, start point and direction combined with actual writing practice is what the evidence supports.[6,7,8,11]

Progressive complexity through a support ladder

Within a group the child is presented with reducing levels of support as they move through the learning progression. The Support level is indicated in the exercise code as one of four values.

Code	What is available
S3	A model visible throughout, a picture clue, or a rehearsal step supplied
S2	A model shown and then covered, or partial support
S1	No model
S0	No model, a single attempt, under time constraint

Letter and Number Formation demonstrates the support ladder clearly. A model to be traced is presented with character formation starting points

6 Schott (2007)
7 Hoy et al. (2011)
8 Fancher et al. (2018)
11 What Works Clearinghouse (2016)

and stroke direction clearly marked. Then the same model is presented without the dots and arrows. Then the model is shown, covered and copied from memory. Then nothing to look at. Then the item read aloud and written from dictation.

Support is not only a model. On the b and d pages a picture and a spoken word carry the item, so the child works from meaning rather than from a printed answer; on one dictation page the child says the number back before writing it. Both are counted as **S3**.

The shape of a group

Each group opens with an exercise that establishes a baseline for measuring progress. The baseline sits at **S1**, with no model and nothing to copy from, on the group's own target, in the mode that puts that target under load most directly. The exercises then move through a progression of modes and targets while the support ladder ramps down. Towards the end the baseline exercise is repeated and the results compared. The group closes with a challenge under time constraint, which is the final rung of the ladder.

Consolidation across the workbook

The final group combines letters, numerals, words and numbers within single pages, after every area has been practised on its own. Generalising beyond isolated production into dictation, connected writing and ordinary classroom tasks is where practice becomes useful.[11]

11 What Works Clearinghouse (2016)

SECTION 5

Exercise summary

The summaries below give a brief overview of each exercise group, along with links to the research and the principles (see section 4) that shape it.

Group 1: Letter and Number Formation

Exercises E1 to E9. Target **STR**.

Handwriting integrates retrieval of the character, its orientation, its stroke order and start point, the motor execution and the monitoring of the result under divided attention.[6,7] Systematic reviews support explicit work on form, start point and direction combined with actual writing practice.[7,8,11] The group applies foundations before practice (4.2) and takes the support ladder from a model marked with its start point down to dictation, once for letters and once for numerals. General accuracy of letter production, rather than reversal rate, is what predicted later literacy in the longitudinal work,[4] which is why the book opens here and returns to unaided production in its final group.

Group 2: Mirror Letters

Exercises E10 to E17. Target **MIR**.

Reading and writing require a learned exception to the visual system's ordinary treatment of a reflected form as the same form, since letters built from a shared shape have to be held apart as distinct symbols.[1,6] Direction is connected to identity and sound rather than presented as an abstract visual rule,[11] so the pages that work **b** and **d** carry a picture and a spoken word, and no mnemonic device appears anywhere in the book. The group runs all three paths (4.1) and steps down the support ladder from a printed model to dictation under time constraint (4.2).

1 Blackburne et al. (2014)
4 Fischer et al. (2016)
6 Schott (2007)
7 Hoy et al. (2011)
8 Fancher et al. (2018)
11 What Works Clearinghouse (2016)

Group 3: Mirror Numbers

Exercises E18 to E25. Target **MIR**.

The group works the seven numerals that change visibly under reflection. Orientation is judged on an isolated numeral and then inside a two-digit number where digit order is held constant, which is one feature changing at a time (3.2). It also carries the book's spoken orientation page, since asking a child to account for an answer rather than only to give one is an evidence-based principle.[10] Reversals appear more readily under fast writing, fatigue and unfamiliar demands,[1] and the group closes on its own material under time constraint.

Group 4: Letter Order

Exercises E26 to E33. Target **TRA**.

Serial order is a separate construct from orientation, observed and tracked separately. Every page here is built so that the letters carry no information and only their arrangement separates a right answer from a wrong one. The group runs all three paths (4.1), with words heard, words seen, and words read aloud with writing removed altogether. Support falls from both members of a pair printed, to a picture clue, to no clue, to dictation under time constraint.

Group 5: Tens and Ones

Exercises E34 to E41. Target **PLV**.

The mathematics guidance the report draws on asks for meaning and procedure to be worked together, for proportional representations, for notation to be linked to magnitude, and for the learner to explain rather than only to select.[9,10] The base-ten artwork is drawn geometrically, so a ten-stick equals ten ones on the page. The mapping between quantity and numeral is worked in both directions, and so are decomposition and composition, which is the same content taken down more than one path (4.1). One page removes writing altogether and asks only for the account.

1 Blackburne et al. (2014)
9 Wilson et al. (2006)
10 What Works Clearinghouse (2021)

Group 6: Number Order

Exercises E42 to E49. Target **TRA**.

Contrasting close pairs, and being explicit about why a changed position changes the value, is the recommended approach, and the pairs used here are the ones the guidance names.[10] On the group's judgement pages both numbers in a pair are the same two digits, so digit identity carries nothing and only the order separates the larger from the smaller. One page repeats another item for item with the reasoning added, which separates the account from the answer while everything else stays still (3.2). The group also carries the book's ordering task on whole sets, where a set is right or wrong as a set.

Group 7: Hearing and Writing Numbers

Exercises E50 to E57. Target **NSY**.

Writing a heard number runs through five steps, and in research with second graders executive working memory was the strongest predictor of transcoding performance while language structure related specifically to inversion errors.[5] Each step is given a page where it carries the load, and the group holds a rehearsal step, the teen and ten distinction that English number words invite, the zero that a spoken number never names, and three-digit forms. Every page is adult-led, and the items exist only in the adult's read-aloud panel, so the child never sees them written. One page runs the mapping backwards, with printed numerals read aloud (4.1).

5 Zuber et al. (2014)
10 What Works Clearinghouse (2021)

Group 8: Mixed Practice

Exercises E58 to E64. Targets **MIR**, **TRA**, **PLV**, **MIX**.

Foundational-skills guidance asks for practice to generalise beyond isolated production into dictation, spelling, sentence writing and ordinary classroom tasks.[11] This is the only group whose pages change the class of item within the page, and it returns to every target the book has covered, which is where the balance of practice (3.3) does its work. It carries the book's only sentence-level writing, its only page combining letter and numeral orientation in a single scan, and a reasoning page whose prompts span the whole book.

11 What Works Clearinghouse (2016)

SECTION 6

Exercise index

Ref	Title	Exercise Code	What varies
E1	First Try	**E1 · MEM · STR · S1**	No model, before any practice: the book's baseline
E2	Patterns	**E2 · COP · STR · S3**	The movement alone, with no symbol on the page
E3	Starting Points	**E3 · REC · STR · S3**	Start point and direction supplied, and traced
E4	Starting Points	**E4 · COP · STR · S3**	The same treatment, on numerals
E5	Where It Starts	**E5 · MEM · STR · S2**	The model kept, its markings removed, the start point produced
E6	Letters	**E6 · COP · STR · S3**	E3's letters in E3's order, model covered
E7	Numbers	**E7 · COP · STR · S3**	The same, on numerals
E8	Try Again	**E8 · MEM · STR · S1**	E1 repeated, item for item
E9	Time for a Challenge	**E9 · DIC · STR · S0**	E6's first 10 letters, heard rather than seen, timed
E10	First Try	**E10 · REC · MIR · S1**	Orientation judged on an isolated letter
E11	b	**E11 · COP · MIR · S3**	The form, with the answer given
E12	d	**E12 · COP · MIR · S3**	E11 with one letter changed
E13	b or d	**E13 · REC · MIR · S3**	The choice, with the form supplied
E14	p and q	**E14 · REC · MIR · S2**	All four of the shared-shape family on one page
E15	Whole Words	**E15 · MEM · MIR · S2**	The letter inside a whole word, model covered

Ref	Title	Exercise Code	What varies
E16	Try Again	E16 · REC · MIR · S1	E10 repeated, item for item
E17	Time for a Challenge	E17 · DIC · MIR · S0	E15's first eight words, heard, timed
E18	First Try	E18 · REC · MIR · S1	Orientation judged on an isolated numeral
E19	Numbers	E19 · COP · MIR · S3	Model in view, start point withdrawn, four attempts each
E20	Numbers	E20 · MEM · MIR · S2	Numerals with the model covered
E21	Two Digits	E21 · MEM · MIR · S2	The same, at two digits
E22	Inside a Number	E22 · REC · MIR · S1	Orientation judged inside a string, digit order held constant
E23	Explain It	E23 · EXP · MIR · S1	Orientation stated rather than applied
E24	Try Again	E24 · REC · MIR · S1	E18 repeated, item for item
E25	Time for a Challenge	E25 · DIC · MIR · S0	The group's numerals heard, most of them twice, timed
E26	First Try	E26 · REC · TRA · S1	Order, with the word heard rather than seen
E27	Matching Pairs	E27 · REC · TRA · S3	Order, with both words printed and nothing produced
E28	Build the Word	E28 · SEQ · TRA · S3	Order built, with the letters supplied and a picture clue
E29	Words	E29 · MEM · TRA · S2	Order recalled with the model covered
E30	Reading Aloud	E30 · EXP · TRA · S1	Order in reading, with writing removed
E31	Turn It Round	E31 · SEQ · TRA · S2	E28 with the clue removed
E32	Try Again	E32 · REC · TRA · S1	E26 repeated, read in the same order
E33	Time for a Challenge	E33 · DIC · TRA · S0	Anagram pairs heard consecutively, timed

Ref	Title	Exercise Code	What varies
E34	First Try	E34 · REC · PLV · S1	What a digit stands for, with no apparatus
E35	Sticks and Dots	E35 · REC · PLV · S3	Quantity and numeral both present, only the match open
E36	Draw It	E36 · COP · PLV · S3	The same mapping produced in the other direction
E37	Break It Apart	E37 · MEM · PLV · S2	Decomposition written, tens and ones separately markable
E38	Put It Together	E38 · MEM · PLV · S2	E37 run backwards
E39	Explain It	E39 · EXP · PLV · S1	The account rather than the answer
E40	Try Again	E40 · REC · PLV · S1	E34 repeated, item for item
E41	Time for a Challenge	E41 · MEM · PLV · S0	E37 with the clock and a single attempt
E42	First Try	E42 · REC · TRA · S1	Size of digit-swapped pairs, digit identity carrying nothing
E43	Matching Pairs	E43 · REC · TRA · S3	The digit-swap relation with the size judgement removed
E44	Reading Aloud	E44 · EXP · TRA · S3	The numeral read aloud, and its tens written
E45	Two-Digit Numbers	E45 · MEM · TRA · S2	Digit order recalled with no partner to compare against
E46	Bigger	E46 · EXP · TRA · S1	E42 with the reasoning required
E47	In Order	E47 · SEQ · TRA · S1	A whole set ordered rather than a pair chosen
E48	Try Again	E48 · REC · TRA · S1	E42 repeated, item for item
E49	Time for a Challenge	E49 · SEQ · TRA · S0	E47 with the clock and a single attempt
E50	First Try	E50 · DIC · NSY · S1	A heard number written with no support at all
E51	Say It First	E51 · DIC · NSY · S3	E50 with a rehearsal step added

Ref	Title	Exercise Code	What varies
E52	Teens and Tens	E52 · DIC · NSY · S2	Number language isolated, thirteen against thirty
E53	Round Numbers	E53 · DIC · NSY · S2	The zero the spoken number never names
E54	Reading Aloud	E54 · EXP · NSY · S1	The numeral turned into speech, the group run backwards
E55	Three Digits	E55 · DIC · NSY · S1	E50 at three digits, every item carrying a zero
E56	Try Again	E56 · DIC · NSY · S1	E50 repeated, from an identical panel
E57	Time for a Challenge	E57 · DIC · NSY · S0	The group's task timed, with the length switching
E58	Letters and Numbers	E58 · MEM · MIR · S1	E1's demand, with the class of symbol alternating
E59	Words and Numbers	E59 · DIC · TRA · S1	Order under dictation, word and number alternating
E60	Sentences	E60 · DIC · MIR · S1	Orientation inside continuous dictated text
E61	Explain It	E61 · EXP · PLV · S1	Reasoning across every error class in one page
E62	Right Way Round	E62 · REC · MIX · S1	Orientation with letters and numerals in one scan
E63	Sort It Out	E63 · SEQ · MIX · S2	E47's task with the number length raised
E64	Time for a Challenge	E64 · DIC · MIX · S0	Dictation timed, with the class of item changing every line

SECTION 7

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