Notes to accompany SASC Guidance on Assessment of Mathematics Difficulties and Dyscalculia 2025

This document is a copy of the additional guidance and explanatory detail which appear in comment boxes in the SASC Guidance on Assessment of Mathematics Difficulties and Dyscalculia 2025.

This document and the full guidance can be found at www.sasc.org.uk Downloads.

Contents

Dyslexia Delphi study 2025

The two relevant papers:

- Carroll JM, Holden C, Kirby P, Thompson PA, Snowling MJ; Dyslexia Delphi Panel. Toward a consensus on dyslexia: findings from a Delphi study. J Child Psychol Psychiatry. 2025 https://acamh.onlinelibrary.wiley.com/doi/10.1111/jcpp.14123
- Holden, C, Kirby, P, Snowling, MJ, Thompson, PA & Carroll, JM 2025, 'Towards a Consensus for Dyslexia practice: Findings of a Delphi Study on Assessment and Identification', Dyslexia, vol.31, no. 1, e1800. https://doi.org/10.1002/dys.1800

Qualifications, knowledge, training and experience required to assess a SpLD in Mathematics and dyscalculia

Details are in table 3 on page 15 of the full SASC Maths Difficulties Guidance 2025.

Remit of the SASC Maths difficulties and Dyscalculia Working group.

- Revise the definition and guidance in the light of recent research and through consensus of the working group and other parties with expertise in this field.
- Reduce the potential for over-identification of dyscalculia as opposed to more general maths-related difficulties.
- Consider how literacy and numeracy attainment can or should be included in the report formats.
- Update the STEC (SASC Test Evaluation Committee) lists of approved tests.
- Determine whether an assessment of mathematics difficulties/dyscalculia can be effectively delivered remotely via online platform.
- Provide guidance that best meets the needs of all stakeholders

Language

- **Domain-general**: Vocabulary, morphology, phonological processing (sound structure of language), and oral comprehension all have an impact on learning in maths. Reading ability has also been identified as one of the predictors of maths attainment.
- **Domain-specific**: The understanding of mathematics-specific words, which involve understanding of mathematical concepts, such as the meaning of number words and terms such as 'measure', 'multiplication', 'equation', as well as the understanding of linguistic elements that have a mathematical meaning but that do not require precise mathematical knowledge, such as quantitative

terms (more, less) or spatial terms (below, under), the latter of which have sometimes been more narrowly defined as mathematical language.

Numerical magnitude processing

Numerical magnitude processing includes:

- Non-symbolic magnitude processing.
- Numerical (symbolic) magnitude processing
- Magnitude estimation/
- Counting
- Numerical sequencing

Weaker performance on numerical (symbolic) magnitude processing is strongly associated with weak maths achievement (De Smedt et al (2013). Accuracy in symbolic number comparison is specifically associated with mathematical performance (Caviola et al., 2020).

Research findings on the predictive value of non-symbolic magnitude are mixed (Caviola et al., 2020); De Smedt, Noël, Gilmore & Ansari, 2013).

Schwenk et al's (2020) meta-analysis only found a link with symbolic magnitude processing.

Home mathematics environment

There are some issues in defining and interpreting the Impact of home learning.

- Research is often focussed on pre-school or early school years.
- Assessing home numeracy is more problematic than home literacy as relying on what parents perceive as maths activities.
- If parents are maths anxious, this is more likely to be transmitted. However, some parents with maths anxiety might avoid maths activities, others will try to compensate to avoid their children having the same negative experiences.
- There are mixed methodologies.
- It is hard to disentangle whether there are genetic effects because of this. .
- There is evidence to show a positive impact with parents who place a high value on education or who make sure that their children can access specialist support if needed).

- It could be looked at in terms of proactive (e.g. maths activities e.g. games) or reactive (parents recognising the need to support). The reactive aspect is often lost in the data.

Working memory, inhibition and shifting

- **Working memory:** The ability to maintain, update, and manipulate verbal or visuospatial information in memory for short periods of time when engaging in cognitively demanding activity. Working memory capacity increases with age through childhood and adolescence, but there can be wide variations within cohorts.
- In Maths, working memory is of particular importance in learning and retaining basic number facts; keeping track of steps in a procedure or word problem; mental arithmetic and impacts across all topics.
- **Inhibitory control/inhibition**: The ability to inhibit a dominant response or resist interference. This increases rapidly in the early years and typically continues to rise through adolescence. Within a classroom, this can involve ignoring visual and auditory distractions.
- Within word problems, it also involves disregarding irrelevant information or interpreting a word with multiple . A further example is with fractions – inhibiting the perception that 4 is larger than 2 when comparing ¼ and ½.
- **Shifting**: The ability to switch attention between mental sets, tasks or strategies. In mathematics, this can impact on flexibility in using strategies or applying a concept or procedure.

Phonological processing

Difficulties with **phonological awareness** may link to difficulties with assigning values to digits. Recognising phonological sequences is an essential part of phonological awareness. It is likely, therefore, that phonological awareness has been highlighted as a factor contributing to early mathematics development not so much because of its relationship to words (though one needs phonological awareness to recognise differences between digit names and assign quantities to number names), but because it forms part of a store of pattern recognising skills that are essential to early maths learning.

Rapid automatised naming (quick access to information in long-term memory), and **phonological memory** (short-term storage of phonological information) also have an impact on maths learning although are not as strongly associated.

Subitising

Perceptual subitising: The ability to identify a small quantity of items without counting.

Conceptual subitising is the ability to recognise a whole quantity as the result of recognising smaller quantities.

There is evidence to support the use of subitising of up to four objects for pupils up to 11 as a distinguishing factor (peprceptual). (Reeve et al, 2012). Those with dyscalculia may be able to subitise up to four but tend to be much slower. Dot enumeration of quantities up to ten was also a predictor of later attainment at age 11 in a longitudinal study. Decarli et al (2022) also found that children in grades 3 & 4 with dyscalculia underperformed in both symbolic and non-symbolic comparison tests.

There are limited (if any) tools which meet STEC criteria to measure this. As a predictor of future attainment this may be useful for young children (up to 6) but may not necessarily be a useful assessment as part of a diagnostic assessment.

Arithmetic fluency

Conceptual fluency – the "why" referring to an understanding of a concept (e.g. place value and the relationships between numbers and operations.)

Procedural fluency – the "how and when". Students may be able to perform procedures without understanding them, but there is a danger that they will forget or remember incorrectly. (Stigler & Hiebert, 1999).

Within procedural fluency, accuracy, efficiency and flexibility are all key. The NCTM (2023) also stresses the importance of appropriate strategy selection:

Accuracy requires knowledge of number facts, careful transcription and checking.

Efficiency – using a strategy with minimal steps **appropriate** to the task which the individual can carry out effectively without losing track of the different stages within a reasonable time.

Flexibility enables the student to select and adapt an appropriate strategy to solve a range of problems.

The Delphi Dyslexia Study (2025)

Details of the definition (Carroll, J., Holden, C., Kirby, P., Snowling, M. J., & Thompson, P.A. (2025) can be found in sasc-briefing-paper-delphi-dyslexia-study-march-2025.docx in the downloads section of SASC.org.uk

Holden, C., Kirby, P., Snowling, M.J., Thompson, P. A., Carroll (2025) includes further details of the Delphi dyslexia study.

Dyscalculia as a sub-category of a SpLD in mathematics

Including dyscalculia as a sub-category encourages assessors to be more holistic and enables assessors to give a diagnosis of SpLD in mathematics and feel more secure, rather than trying to shoehorn into a dyscalculia diagnosis.

- It is possible to have a SpLD in mathematics, although not dyscalculia, yet it is equally as persistent and impactful.
- The outcome of the assessment is to enable an individual to access appropriate support, regardless of the diagnostic category.
- A SpLD in mathematics is recognised as a disability.

Complex interplay

- For example, some have argued (E.g., Passolunghi (2019) ; Pellizzoni, S., Cargnelutti, E., Cuder, A. and Passolunghi, M.C. (2022),) that the interplay between low working memory capacity and maths anxiety creates risk factor for the development of maths learning difficulties.

Selecting a maths attainment test in a SpLD assessment (dyslexia)

- Whatever the initial reason for referral assessors are encouraged to explore basic levels of attainment in mathematics. Language and literacy difficulties can also affect the acquisition of other skills, such as mathematics.
- The selection of the test(s) should be based on the background information and/or on the emerging profile in the assessment.

Considerations regarding reassessment where an individual has a prior diagnosis of dyslexia

When deciding whether to repeat specific cognitive tests completed in a previous assessment, an assessor should consider the following factors :

- The previous assessor was appropriately qualified.
- The current assessor has read the full report and is satisfied with the content and conclusions.
- How recently the assessment was conducted. This depends very much on the age of the learner as significant developmental changes can occur in young children in shorter timeframes.
- Significant changes in educational or work environment may affect whether to reassess completely or rely on a previous report.

The assessor may also consider it appropriate to reassess certain areas in order to provide a fuller picture when making a diagnostic decision.

Information gathering to determine the assessment content

To cover:

- Health & developmental history
- Vision and hearing
- Language/linguistic history
- Current and historical attainment in mathematics
- Confidence/resilience in mathematics which may include an anxiety checklist
- Family history of access and resilience in mathematics including reported difficulties
- Stability in education (attendance, moving schools beyond typical transitions)
- SEND: levels past and present, areas of support
- Support in Maths, past and present

Full details are listed in Appendix 2 in Table i.

Selection of tests

Assessors are encouraged to select tests which:

- Are informed by the background information.
- Prioritise test areas that add useful information relevant to the reason for referral and the emerging findings of the assessment session.
- Have the potential to contribute meaningfully to the conclusions of the report.
- Avoid under or over-testing and replication of testing of constructs.
- Consider the individual's age and capacity to engage with the assessment process.
- Reflect accepted definitions of specific learning difficulties.
- Open-ended questions are more discriminative than multiple-choice tasks, and the content of curriculum-based measures doesn't seem to matter, as long as they reflect well the current maths curriculum. (Roulstone et al (2024)

Considerations when selecting literacy assessments as part of a Maths difficulties/dyscalculia assessment

The area of assessment will be guided by background information and the emerging profile during the assessment.

Where reading and other literacy skills are well established, the assessor can select the further tests they consider most appropriate based on the background information and emerging findings of the assessment, e.g. a timed single word reading test could be useful if distinct problems with automaticity are noted in other areas of assessment. Similarly, it may be useful to test reading comprehension if an individual is struggling to understand written problems in mathematics.

Caution should be exercised when comparing scores from tests which have not been co-normed.

Informal and/or qualitative assessments

Informal and/or qualitative assessments of mathematics should be used to supplement standardised assessments to provide evidence of:

- The individual's pattern of errors and strategies used to determine levels of understanding across topics and areas of fluency,
- Differences in motivation, determination, perseverance, impulse inhibition, attention, and avoidance
- Level of conceptual understanding of any standard procedures used
- Use of concrete materials and visual representations

Speed of processing and retrieval

- Coding, symbol search and cancellation tasks, i.e. the ability to accurately and fluently scan and identify or copy symbolic content from a stimulus.
- Retrieval fluency tasks, semantic or phonological, i.e. the ability to retrieve, quickly and fluently, vocabulary, knowledge or categories of words in response to a stimulus.
- Visual-motor speed tasks, i.e. the ability to correctly search and /or reach for or mark a visual stimulus.

Memory: Terminology

- Different terms (e.g. verbal working memory, auditory memory) are often used in tests and in the academic research literature. For clarity and reader accessibility assessors are advised to use terms consistently.

Definition: inhibitory control

Inhibitory control within the numerical domain is associated with factual knowledge and procedural skill. Within word problems, it also involves disregarding irrelevant information. A further example is with fractions – inhibiting the perception that 4 is larger than 2 when comparing ¼ and ½.

Visual-spatial processing

The processing of visual-spatial information enables us to make sense of what we see and to interact efficiently and appropriately with the world around us. It is crucial to our performance of everyday tasks in academic and workplace environments. Visual-spatial skills contribute to mathematical performance at a practical level: when reading and interpreting graphs, lining up calculations and comparing visual quantities. The ability to store accurate spatial representations in memory and to marshal these when solving problems is important in the development of mathematical understanding and problem-solving. Spatial skills influence all areas of mathematical thinking, not just shape and space.

'The mapping of numbers to space is central to how we operationalize, learn, and do mathematics' (Hawes & Ansari, 2022, p. 465); The visualisation of space and other spatial skills are significantly correlated for individuals at all educational levels (Atit, Power, Pigott Lee, Geer, Uttal, Ganley & Sorby, 2021).

General visual perception and miscellaneous visual processing skills

- **General visual perception** could be very briefly explored if there were any concerns in the background information or during the assessment process – a range of informal tests of perceptual skills such as visual closure, form constancy, visual discrimination etc. may be used.
- **Miscellaneous visual processing skills**: visual matching tasks, visual digit span, visual attention span.

Guidance from SASC Report Format

- **Accessible** - to ensure assessment reports and their conclusions and recommendations are easily understood by and useful to the individual assessed and to other relevant individuals, organisations and institutions e.g. parents/carers, school/educational/workplace settings and other specialists.
- **Consistent** - to encourage a consistent and best practice approach in SpLD diagnostic assessment.
- **Reliable** - to ensure that the identification of an individual with a specific learning difficulty (e.g. dyslexia), is a robust diagnostic conclusion based on converging evidence from the developmental history, background information, observation, discussion and results of the tests administered. The evidence required will closely relate to a referenced definition and to the relevant diagnostic criteria.
- **Clear** - in reporting test results, there will be an emphasis, within the body of the report, on interpretative comment, showing how and why key elements of test performance contribute to profiles that do or do not support the subsequent identification of the individual assessed with a specific learning difficulty. Synopses and commentary must contribute to a consistent picture throughout the report. If there are unusual results or irregularities in any area, they must be explained.
- **Efficient and Useful** - although the total length and design of an assessment report will inevitably vary depending on choice of font, font size and spacing, number of relevant appendices etc., the writing style of the report should aim to achieve clarity, transparency and succinctness while presenting sufficient detail to support conclusions reached. Assessors should consider reader accessibility by using dyslexia-friendly formatting. The report format will contain an overview section of approximately 2 pages designed to be a clear summary of the report outcomes.

Evidencing knowledge and understanding of assessment without a level 7 qualification

This may be evidenced through a portfolio or APEL route as determined by an individual assessor's professional body.

Preterm birth

The significant increased risk is related to both very preterm birth (before 32 weeks) and extremely preterm birth (before 28 weeks). Simms, V., Gilmore, C., Cragg, L., Clayton, S., Marlow, N., & Johnson, S. (2015).

Home environment

Assessing home numeracy is more problematic than home literacy as it often relies on what parents perceive as maths activities.

If parents are maths anxious, this is more likely to be transmitted. However, whilst some parents with maths anxiety might avoid maths activities, others will try to compensate to avoid their children having the same negative experiences.

There is evidence to show a positive impact with parents who place a high value on education or who make sure that their children can access specialist support if needed).

It could be looked at in terms of proactive (e.g. maths activities such as games) or reactive (parents recognising the need to support).

Some schools acknowledge that parents may find it difficult to support with maths homework through the provision of in-school homework clubs.

Family history of Maths Difficulties

It is unlikely that parents will have had a diagnosis Dyscalculia/SpLD in Mathematics as it is still relatively rare and is likely to be self-reported.

It may reflect negative views of parents rather than a difficulty as such.

Definitions of receptive and expressive language

Drawn from Speech and Language UK [**https://speechandlanguage.org.uk/**](https://speechandlanguage.org.uk/)

NB Assessors should refer on to a Speech and Language Therapist in instances where DLD or other language- based difficulties are suspected.

Receptive language means how children understand and make sense of words and sentences that people say to them. This is also sometimes called understanding of language. Children learn to understand words and sentences gradually over time. Receptive language can involve the following skills:

- Listening, paying attention to and remembering what people say.
- Learning and remembering new words.
- Understanding different sentences, particularly longer or more complicated sentences.

- Understanding grammar such as word endings (e.g. words with '-ed' on the end mean something happened in the past).
- Making sense of 'hidden meanings'.

Expressive language means the words, phrases and sentences that children say. This is sometimes called 'talking'. Expressive language skills don't just include talking – children who use sign language or communicate using a communication device (sometimes called Augmentative and Alternative Communication, or AAC) still use their expressive language skills. Expressive language can involve the following skills:

- Learning and using new words.
- Putting words together in the right order in sentences.
- Using all the important words in a sentence, including little words like 'a' and 'is', and the correct grammar and word endings.
- Putting sentences together in a longer story in a way that is easy to follow and understand.

Definition of developmental language disorder from the Royal College of Speech and Language Therapists:

There has been ongoing debate about the most appropriate terminology to use for children that have difficulties with expressive and/or receptive language skills that impact on everyday life, for example, difficulties producing or understanding complex sentences, or learning new words. Until recently the terms 'Specific Language Impairment', 'language disorder' and 'developmental language impairment' were used.

In 2016, an international group of 57 experts (the CATALISE panel) reached consensus on the criteria used for children's language difficulties (Bishop et al, 2016b).

The panel agreed on the term 'Language Disorder' to refer to children with language difficulties that create obstacles to communication or learning in everyday life and is associated with poor prognosis. 'Developmental Language Disorder' was the agreed term for when the language disorder is not associated with a known condition such as autism spectrum disorder, brain injury, genetic conditions such as Down's syndrome and sensorineural hearing loss.

Non-verbal reasoning

In an assessment focusing on mathematics, exploration of non-verbal reasoning may be more appropriate in the visual spatial processing section.

Research evidence: phonological awareness and maths difficulties

There is some evidence that phonological awareness predicts procedural aspects of arithmetical calculation, particularly in the first few years of school.

(Jordan, J.A., Wylie, J. & Mulhern, G. (2010))

(Vanbinst, K., van Bergen, E., Ghesquière, P., & De Smedt, B. (2020))

Therefore, unless there is a specific concern in this area, assessing for phonological awareness may not be required.

Research evidence: oral language skills and DLD

For a comprehensive review see:

Sansavini, A., Favilla, M. E., Guasti, M. T., Marini, A., Millepiedi, S., Di Martino, M. V., Vecchi, S., Battajon, N., Bertolo, L., Capirci, O., Carretti, B., Colatei, M. P., Frioni, C., Marotta, L., Massa, S., Michelazzo, L., Pecini, C., Piazzalunga, S., Pieretti, M., ... Lorusso, M. L. (2021). Developmental Language Disorder: Early Predictors, Age for the Diagnosis, and Diagnostic Tools. A Scoping Review. Brain Sciences, 11(5), 654. https://doi.org/10.3390/brainsci11050654

Choosing tests in this section: Language and Reasoning Skills

Normally assessors will test both receptive and expressive language skills.

There may be situations where assessors, after drawing on the background information supplied, and/or their informal impressions of the verbal skills of an individual being assessed, may decide that a full range of language tests is not needed. In some instances, there may already be in place, for example, a recent, comprehensive speech and language assessment. Additionally, if assessors have used tests, for example, of listening comprehension and oral skills which they feel have fully covered either language or verbal reasoning abilities, there is no need to add in further separate tests.

Tests of verbal and visual reasoning and of pattern design/construction will normally be used to assess strengths and weaknesses for the purposes of making appropriate recommendations for support. In the investigation of maths or motor difficulties, tests of pattern design/construction can be particularly helpful in pinpointing areas of weakness.

Assessors will hold differing views about the utility and cultural appropriateness of tests of verbal and visual reasoning for particular individuals at particular life stages and caution should always be exercised in interpreting and reporting the results of these tests. Over-interpretative extrapolation of information from these tests is not encouraged.

Assessors should provide a clear rationale or evidence for omitting tests in this section, with reference to the background information, observations and other tests administered.

Choosing tests in this section: mathematics

Testing in this section also provides the opportunity to explore maths attainment levels through qualitative analysis alongside quantitative.

Assessors should provide a clear rationale or evidence for omitting testing in this section, with reference to the background information, observations and other tests administered.

Automaticity

It is recognised that most arithmetic fluency tests focus on automaticity rather than computational fluency per se (See Russell, 2000). Therefore, observations and qualitative information are required to inform judgement on computational fluency. (NB: Individual tests of a single operation (e.g. addition) may yield different results from a test that incorporates more than one.)

Referencing previous assessment reports

Where a SpLD, e.g. dyslexia, has been identified in a previous diagnostic assessment but the individual now seeks a further assessment for, maths difficulties, it may not be necessary to complete a full diagnostic assessment as the new referral will be considered to be an additional assessment for a particular purpose.

The previous diagnostic report would need to have been seen and reviewed, with date and assessor details, and comments on the outcome included in this additional assessment for this particular purpose. The second assessor will need to have full sight of the previous assessment to judge the possible impact of any language, attainment and cognitive weaknesses noted in that assessment.

An assessor may feel it is necessary to do further testing or a new diagnostic assessment, especially if there has been a significant time lapse between the previous and the current assessment. In this instance it would also be essential to fully reference the previous assessment in the background information. Assessors should assure themselves of the quality of the report, and qualifications of the assessor, they are referencing.

Regarding the length of time elapsed since the previous report was written there are a number of things to take into account when making any decision to re-test. It is not possible to suggest an absolute, overarching timeframe. For example, it depends very much on the age of the learner as significant developmental changes can occur in young children in shorter time frames. Significant changes in educational or work environment may affect whether to reassess completely or rely on a previous report.

Rationale

Rationale gives the reasons with research evidence why this area should be covered and considers whether it is appropriate (meaningful) to report standard scores (if a standardised test is used).

Note that the research evidence is complex, and some associations only arise or apply with particular types of mathematical tasks or particular areas of mathematics. It is not possible to capture all these nuances within this summary document.

Speed of processing and retrieval descriptors of tests

Measures of processing speed (the ability to perform relatively simple repetitive cognitive tasks, quickly, accurately and fluently) could include:

- Rapid automised or symbolic naming (RAN), i.e. the ability to retrieve accurately well-known phonological responses (e.g. names of letters, numbers, objects, colours) fluently from long-term memory in response to a visual stimulus.
- Coding, symbol search and cancellation tasks, i.e. the ability to accurately and fluently scan and identify or copy symbolic content from a stimulus.
- Retrieval fluency tasks, semantic or phonological, i.e. the ability to retrieve, quickly and fluently, vocabulary, knowledge or categories of words in response to a stimulus.
- Visual-motor speed tasks, i.e. the ability to correctly search and /or reach for or mark a visual stimulus.

Memory: Terminology

Different terms (e.g. verbal working memory, auditory memory) are often used in tests and in the academic research literature. For clarity and reader accessibility assessors are advised to use terms consistently.

Spatial visualisation and mathematics

The mapping of numbers to space is central to how we operationalise, learn, and do mathematics (Hawes Ansari, 2022, p. 465

The visualisation of space and other spatial skills are significantly correlated for individuals at all educational levels (Atit, Power, Pigott Lee, Geer, Uttal, Ganley Sorby, 2021)

Spatial processing (The ability to hold spatial relations in memory and use the information to carry out tasks effectively)**:** e.g., spatial working memory; spatial thinking skills are used when informally or formally solving problems involving spatial information. These skills are strongly associated with mathematical achievement (Gilligan, Hodgkiss, Thomas & Farran, 2019; Möhring, Newcombe & Frick, 2015; Newcombe, Booth & Gunderson, 2019; Bruce & Hawes, 2015; Sorby & Panther, 2020). *Non-standardised measures can be used to explore these underpinning skills.* (Ramful, Lowrie & Logan, 2017).

For information of spatial scaling see Newcombe et al (2019); Möhring, et al (2015).

General visual perception and miscellaneous visual processing skills

- **General visual perception** could be very briefly explored if there were any concerns in the background information or during the assessment process – a range of informal tests of perceptual skills such as visual closure, form constancy, visual discrimination etc. may be used.
- **Miscellaneous visual processing skills**: visual matching tasks, visual digit span, visual attention span.