Education Scotland
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Scotland's Curriculum Framework
curriculum improvement cycle

Numeracy and Mathematics Curriculum Background and Evidence Paper

November 2025

Executive Summary

In Working Together to Make Change Happen (April 2025) it was identified that an outcome from the analysing stage of the Curriculum Improvement Cycle (CIC) would be the development of an evidence paper for each curricular area or context for learning published on the CIC website. This is the first in the series.

This paper provides an evidence base to inform the ongoing Curriculum Improvement Cycle for Numeracy and Mathematics in Scotland. It draws on national and international data, academic research and stakeholder perspectives to support curriculum improvement and help shape a modern, inclusive, coherent and research-informed mathematics curriculum for all learners aged 3 to 18.

Key Messages

- Mathematics is uniquely positioned to develop numeracy, critical thinking, data literacy and problem-solving skills, enhancing learners' ability to make informed financial decisions, interpret data critically and approach problems with logical reasoning.

- International reports recognise that the mathematics curriculum must strike a balance between knowledge and skills, ensuring clarity of progression through key concepts and fostering deep understanding. It must be carefully sequenced, relevant and engaging. It should allow for opportunities to experience mathematics in authentic real-life contexts and to connect mathematical concepts. It should facilitate the development and use of correct mathematical language and increase conceptual understanding through the use of concrete materials and visual approaches.

- Academic research highlights the value of spatial reasoning, data literacy, financial education and computational thinking through the mathematics curriculum.

- Mathematics increasingly intersects with other disciplines, both shaping and drawing from fields like data science, technology and environmental studies.

- Labour market demands are evolving rapidly. Mathematical skills and data literacy are increasingly important across sectors, driven by the rise of artificial intelligence, digital technologies and the green economy.

- The increasing use of digital tools in society and the workplace should be reflected in the mathematics curriculum.

- There is an increasing uptake in the Applications of Mathematics qualifications, which focus on analysing data, mathematical modelling, finance and solving contextualised problems.

- International benchmarking (PISA) highlights a decline in Scotland's performance relative to previous years, reinforcing the need for curriculum alignment with global standards and future knowledge and skills requirements.

- Equity gaps persist in terms of attainment within numeracy and mathematics, with learners from more deprived backgrounds achieving lower outcomes.

- There exists an opportunity to consider approaches to assessment in this cycle of curriculum improvement.

- The co-creation of the CIC with practitioners, along with a carefully supported enactment of a new evolved technical framework, provides an opportunity to build professional knowledge across educational sectors.

- Learner voice emphasises the importance of purpose, challenge, relevance and application when it comes to learning mathematics. Younger learners respond well to play-based and contextualised approaches, making use of their indoor and outdoor environments to enhance mathematical experiences. Older learners recognised the importance of making clear the relevance of their mathematical learning and would prefer a more gradual increase in the level of difficulty and demand.

Implications for Policy and Practice

- Scotland's curriculum should better integrate financial education, spatial reasoning and data literacy, reflecting current research and societal needs.

- Technology and computational thinking should be embedded across the curriculum to future-proof learners' skills.

- Continued work is required around qualification pathway awareness with the value of the Applications of Mathematics qualifications promoted among learners, educators and employers.

- Assessment and progression require clearer guidance to ensure consistency across settings.

- Subject-specific professional learning must be strengthened to build teacher confidence and capability across all sectors.

Next Steps

The findings of this Evidence Paper will support the development of Scotland's mathematics curriculum, as part of the wider CIC. It also provides evidence for a refreshed professional learning offer. The CIC process will continue to reflect on the evidence base, engage stakeholders, and iteratively refine the curriculum to ensure it meets the evolving needs of learners and society. This work will contribute to a strong mathematics education for all learners, aligned with Scotland's broader educational ambitions for equity and excellence.

Contents

1 Introduction

1.1 Purpose

This paper offers a snapshot of the current educational landscape for numeracy and mathematics in Scotland, up to June 2025, drawing on a diverse range of research and evidence to illuminate prevailing trends, challenges and successes across contexts**.** It serves as a foundation for ongoing curriculum development, offering insights into the policy environment, learner experience and professional perspectives. By incorporating both qualitative and quantitative data, alongside contributions from practitioners, learners and the wider education community, it creates space for reflection and informed discussion. While not all available studies are included, those selected reflect the breadth of work currently shaping thinking in this area. The insights outlined here are intended to support Curriculum Improvement Cycle (CIC) stakeholder groups as they consider key issues and navigate the next steps in the evolution of the curriculum.

1.2 Sources of evidence

A comprehensive body of research was compiled through a collaborative effort involving representatives from Education Scotland's Curriculum, Learning, Teaching and Assessment (CLTA) team, the Data, Performance and Research (DPR) Team, the Scottish Government Analytical Services and the Scottish Government Library Support Service. This collaboration brought together a wide range of expertise to support the identification, evaluation and organisation of relevant literature. The sources drawn upon include, but are not limited to, peer-reviewed academic papers, His Majesty's Inspectorate of Education publications, Scottish Qualifications Authority (SQA) and Achievement of Curriculum for Excellence Level (ACEL) data analysis, surveys, government data sets, research produced by national agencies, Scottish Government reports, and international publications from organisations such as the Organisation for Economic Co-operation and Development (OECD) and the United Nations. Crucially, the perspectives of children and young people are represented through the work of bodies such as the Scottish Youth Parliament and the Children and Young People's Commissioner Scotland.

1.3 Scope of the review

This paper explores the curriculum in its entirety across the 3 to 18 learner journey, considering breadth and depth of provision, progression, and learner outcomes from early level through to the senior phase**.** This paper focuses on the Numeracy and Mathematics curricular area as outlined within Scotland's Curriculum for Excellence. It highlights key policy drivers and educational practices that support the development of numeracy, mathematics and financial capability. It reflects on learning and achievement in the broad general education, drawing on national indicators such as ACEL data and standardised assessments in numeracy, and examines senior phase attainment across the National Qualifications within the Mathematics group (Mathematics and Application of Mathematics). The paper aims to support a holistic understanding of the current curricular landscape, highlighting key themes and emerging patterns that will help inform the CIC process.

1.4 Related national policies

Key features of effective learning and teaching in mathematics and approaches to assessment are described in the paper Mathematics: Principles and practice. This is supplemented by Numeracy across learning: Principles and practice which outlines what it means to be numerate and describes how the development of numeracy skills is the responsibility of all. Realising the Ambition: Being Me (2020) is the national practice guidance for Early Learning and Childcare and early years provision in Scotland.

The Money and Pensions Service (MaPS) defines financial education as any activity that helps develop the knowledge, skills and attitudes they need to be financially capable in later life. The UK Strategy for Financial Wellbeing (2020) is the ten-year framework (2020-2030) which aims to achieve the vision of everyone making the most of their money and pensions. Its goal is that by 2030 two million more children and young people will receive meaningful financial education. The delivery plan for Scotland (2020) outlines the prioritised and long-term activities that the Scottish Government and their associated stakeholders will undertake to implement this action.

The Scottish Government's Science, Technology, Engineering and Mathematics education and training strategy (2017) has the aim of ensuring Scotland has a highly educated and skilled population equipped with the STEM skills, knowledge and capability required to adapt and thrive in the fast-paced changing world and economy. This strategy has led to initiatives such as Young STEM Leaders, the support of Young Engineers and science clubs, the RAiSE programme and the STEM grants programme.

Learning for Sustainability provides a rich context for applying mathematics in real-life contexts to build a better future for our planet. In 2023, the Scottish Government published Target 2030: A movement for people, planet and prosperity: Scotland's Learning for Sustainability Action Plan 2023-2030.

The use of technology plays an increasingly important role in the field of mathematical sciences. In 2016, the Scottish Government published Enhancing Learning and Teaching Through the Use of Digital Technology: A Digital Learning and Teaching Strategy for Scotland. One of its objectives is to ensure that digital technology is a central consideration in all areas of curriculum and assessment delivery.

Numeracy and mathematics provide key skills for the world of work. Current expectations are outlined in the Career Education Standard (3-18) (2015).

Mathematics provides many opportunities to develop creativity through pattern spotting, problem solving and exploration. Since 2015, Creative Scotland and Education Scotland have been working together to ensure that creativity is a key part of Scotland's education system. At the centre of their work has been Scotland's Creative Learning Plan (2013) which sets out a shared vision for the importance of creativity in education.

2 National Data Sets

The following section examines a range of data pertaining to mathematical learning in Scotland **up to and including 2024**. It includes data collected by the Scottish Qualifications Authority (SQA) and the Scottish Government.

2.1 SQA Attainment and Presentation Data

The data included in this section examines attainment and trends across a range of National Qualifications linked to mathematics. There are two main pathways in the Senior Phase for mathematics. The Mathematics pathway in the Senior Phase provides learners with the knowledge and skills needed for further learning and careers in mathematically rich disciplines such as the sciences and engineering. The Applications of Mathematics pathway in the Senior Phase prepares learners for mathematics they will need in life and in a broader range of careers. By offering these pathways, a greater number of learners can study the mathematics that is most relevant to their interests and future needs. There is the opportunity for Gaelic Medium learners to undertake their course assessments in Gaelic.

In this section, attainment is explored by Scottish Credit and Qualifications Framework (SCQF) level up to and including 2024. Further information on 2020 certification can be found here.

2.1.1 SCQF Level 4

During the period 2019-2024, there has been an increase in entries and awards in National 4 Applications of Mathematics. Over the same period there has been a decrease in the number of entries and passes in National 4 Mathematics.

Mathematics National 4 entries, passes and pass rates 2019-2024

							2019-2024		2023-2024	
National 4	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**change**	**%change**	**change**	**%change**
Entries	22,980	20,210	19,970	21,550	22,215	18,375	-4,605	-20.0%	-3,840	-17.3%
Passes	20,450	18,290	16,850	19,050	20,010	15,820	-4,630	-22.6%	-4,190	-20.9%
Pass Rate	89.0%	90.5%	84.4%	88.4%	90.07%	86.10%	-2.90	n/a	-3.98	n/a

Applications of Mathematics National 4 entries, passes and pass rates 2019-2024

							2019-2024		2023-2024	
National 4	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**change**	**%change**	**change**	**%change**
Entries	2,965	3,790	5,295	7,265	9,365	10,085	7,120	240.1%	720	7.7%
Passes	2,380	3,190	4,150	5,900	7,715	8,120	5,740	241.2%	405	5.2%
Pass Rate	80.3%	84.2%	78.4%	81.2%	82.40%	80.52%	0.22pp	n/a	-1.18	n/a

2.1.2 SCQF Level 5

During the period 2019-2024, there has been an increase in entries and awards in National 5 Applications of Mathematics. Over the same period there has been a decrease in the number of entries and passes in National 5 Mathematics.

Mathematics National 5 entries, passes and pass rates 2019-2024

							2019-2024		2023-2024	
National 5	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**change**	**%change**	**change**	**%change**
Entries	41,590	41,285	36,480	38,295	37,555	36,690	-4,900	-11.8%	-865	-2.3%
Passes (A-C)	27,240	32,670	26,635	26,695	23,430	25,000	-2,240	-8.2%	1,570	6.7%
Pass Rate	65.5%	79.1%	73.0%	69.7%	62.39%	68.14%	2.64	n/a	5.75%	n/a

Applications of Mathematics National 5 entries, passes and pass rates 2019-2024

							2019-2024		2023-2024	
National 5	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**change**	**%change**	**change**	**%change**
Entries	4,460	10,430	10,750	14,305	19,020	24,285	19,825	444.5%	5,265	27.7%
Passes (A-C)	2,605	7,850	6,875	9,265	11,765	14,405	11,800	453.0%	2,640	22.4%
Pass Rate	58.5%	75.3%	64.0%	64.8%	61.90%	59.32%	0.82pp	n/a	-2.58	n/a

The percentage of the S4 base cohort achieving an award in the mathematics group has shown a steady increase from 2021 to 2024, incorporating the increase in awards in Applications of Mathematics and the decrease in awards in Mathematics.

% of S4 achieving an award at SCQF 5 (2020–2024), Source: Insight

Qualification	**2020**	**2021**	**2022**	**2023**	**2024**
Mathematics	44.31	39.47	40.08	38.06	36.22
Applications of Mathematics	11.03	9.96	13.96	18.78	22.62
Mathematics Group	48.79	44.75	47.86	47.81	48.52

There continues to be a poverty-related attainment gap in S4 attainment in the mathematics group at SCQF level 5. This has remained consistent across this period at approximately 40 percentage points.

% of S4 achieving an award at SCQF 5 (2020–2024) by deprivation, Source: Insight

Mathematics Group	**2020**	**2021**	**2022**	**2023**	**2024**
Quintile 1 (most) deprived)	29.19	26.54	29.19	29.38	29.73
Quintile 5 (least deprived)	69.49	66.57	69.98	69.05	70.18

Gaelic Medium National 5 Matamataig is available and included in the data above. The table below indicates the number of entries and passes for each year.

Matamataig National 5 entries and passes 2019-2024

							2019-2024		2023-2024	
	2019	2020	2021	2022	2023	2024	change	%change	change	%change
Entries	65	60	55	70	60	90	25	38.5%	30	50.0%
Passes (A-C)	55	50	55	55	45	75	20	36.4%	30	66.7%

Many learners achieve their award at SCQF Level 5 in S5 or S6. The percentage of learners leaving with a grade A to D at this level was 7 percentage points higher in 2023-24 as it was in 2016-17.

School leavers' attainment at National 5 (either Mathematics or Applications of Mathematics)

Year	Number of leavers	Leavers entered for either	Leavers achieving A-D in either	Leavers achieving A-C in either	% Leavers entered for either	% Leavers achieving A-D in either	% Leavers achieving A-C in either
2016 – 2017	51300	31239	25173	23439	60.9	49.1	45.7
2017 – 2018	49748	31332	26125	23837	63.0	52.5	47.9
2018 – 2019	49760	31392	26546	23763	63.1	53.3	47.8
2019 – 2020	47454	30817	27549	25182	64.9	58.1	53.1
2020 – 2021	50746	34027	30561	27938	67.1	60.2	55.1
2021 – 2022	55237	36132	31781	28463	65.4	57.5	51.5
2022 – 2023	54743	35683	30515	26511	65.2	55.7	48.4
2023 – 2024	55988	37270	31486	27178	66.6	56.2	48.5

2.1.3 SCQF Level 6

The percentage entries and passes for Higher Mathematics were slightly lower in 2024 than in 2019 (0.6% and 0.2% respectively).

Mathematics Higher entries, passes and pass rates 2019-2024

							2019-2024		2023-2024	
Higher	2019	2020	2021	2022	2023	2024	change	%change	change	%change
Entries	18,630	19,180	19,420	18,055	18,745	18,515	-115	-0.6%	-230	-1.2%
Passes (A-C)	13,485	15,980	15,560	13,595	13,725	13,460	-25	-0.2%	-265	-1.9%
Pass Rate	72.4%	83.3%	80.1%	75.3%	73.22%	72.70%	0.31	n/a	-0.52%	n/a

Gaelic Medium Higher Matamataig is available and included in the data above. The table below indicates the number of entries and passes for each year.

Matamataig Higher entries and passes 2019-2024

							2019-2024		2023-2024	
	2019	2020	2021	2022	2023	2024	change	%change	change	%change
Entries	35	35	30	45	40	35	0	0.0%	-5	-12.5%
Passes (A-C)	30	35	25	35	30	25	-5	-16.7%	-5	-16.7%

Higher Applications of Mathematics was introduced in 2022. The numbers of entries and passes have increased steadily since then.

Applications of Mathematics Higher entries and passes 2019-2024

							2019-2024		2023-2024	
Higher	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**change**	**%change**	**change**	**%change**
Entries	n/a	n/a	n/a	870	1,615	2,995	n/a	n/a	1,380	46.1%
Passes (A-C)	n/a	n/a	n/a	600	1,190	1,810	n/a	n/a	620	34.3%
Pass Rate	n/a	n/a	n/a	69.0%	73.70%	60.43%	n/a	n/a	13.37pp	n/a

The percentage of S5 learners achieving an award within the SCQF Level 6 Mathematics group has remained fairly consistent at approximately 26% over this period.

% of S5 achieving an award at SCQF 6 (2020–2024), Source: Insight

Qualification	**2020**	**2021**	**2022**	**2023**	**2024**
Mathematics	27.13	26.23	24.26	24.66	23.37
Applications of Mathematics	n/a	n/a	0.90	1.84	2.88
Mathematics Group	27.21	26.29	25.22	26.49	26.25

There continues to be a significant poverty-related attainment gap in S5 attainment in the mathematics group at SCQF level 6. This has remained consistent over this period at approximately 30 percentage points.

% of S5 achieving an award at SCQF 6 (2020–2024) by deprivation, Source: Insight

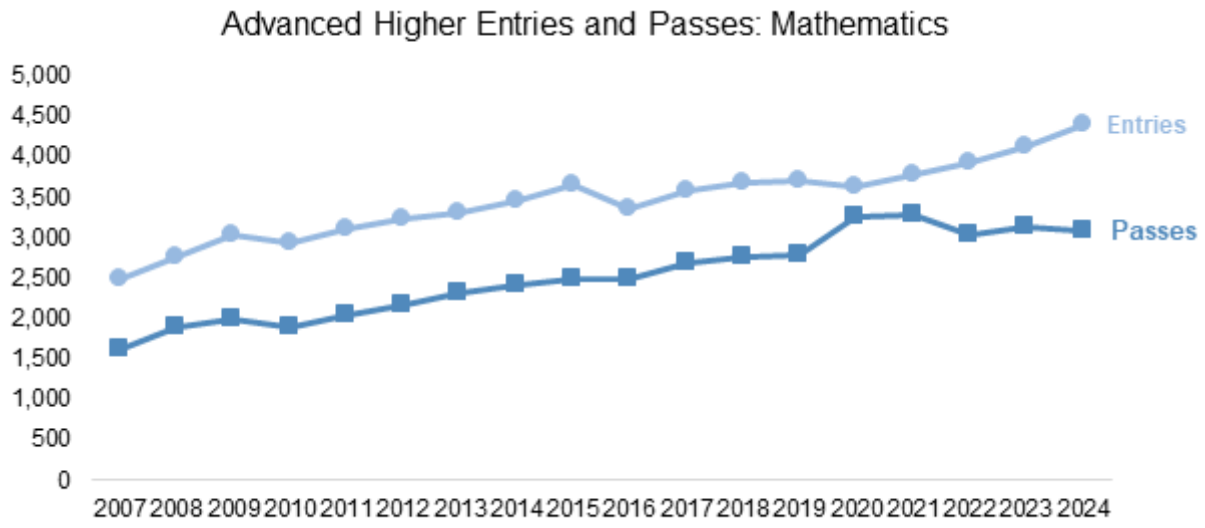
Mathematics Group	**2020**	**2021**	**2022**	**2023**	**2024**
Quintile 1 (most) deprived)	13.56	12.92	12.36	13.74	13.44
Quintile 5 (least deprived)	43.38	42.56	40.83	43.43	42.49

2.1.4 SCQF Level 7

There is a positive trend in the number of entries and passes in Advanced Higher Mathematics over the period 2019-2024.

Mathematics Advanced Higher entries, passes and pass rates 2019-2024

							2019-2024		2023-2024	
Advanced Higher	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**change**	**%change**	**change**	**%change**
Entries	3,705	3,635	3,785	3,915	4,125	4,390	685	18.5%	265	6.4%
Passes (A-C)	2,795	3,245	3,290	3,030	3,135	3,085	290	10.4%	-50	-1.6%
Pass Rate	75.4%	89.3%	87.0%	77.3%	76.00%	70.27%	5.13pp	n/a	-5.73	n/a



The percentage of the S6 base cohort achieving an award (A-D) in Advanced Higher Mathematics has remained consistent at around 9% over this period.

There is a positive trend in the numbers of candidates being entered for Advanced Higher Mathematics of Mechanics. Uptake remains lower for Advanced Higher Statistics.

Mathematics of Mechanics Advanced Higher entries, passes and pass rates 2019-2024

										2019-2024		2023-2024	
	2016	2017	2018	2019	2020	2021	2022	2023	2024	change	%change	change	%change
Entries	222	272	305	295	320	320	275	355	425	130	44.1%	70	19.7%
Passes (A-C)	164	215	245	225	295	270	220	275	275	50	22.2%	0	0.0%
Pass Rate	73.9%	79.0%	79.9%	76.9%	92.5%	84.6%	79.7%	77.0%	64.6%	-12.3	n/a	-12.4	n/a

Statistics Advanced Higher entries, passes and pass rates 2019-2024

										2019-2024		2023-2024	
	2016	2017	2018	2019	2020	2021	2022	2023	2024	change	%change	change	%change
Entries	182	189	185	210	185	205	140	170	150	-60	-28.6%	-20	19.7%
Passes (A-C)	141	146	145	165	165	185	110	130	125	-40	-24.2%	-5	0.0%
Pass Rate	77.5%	77.2%	77.4%	77.8%	89.6%	90.8%	79.0%	77.2%	82.0%	4.2	n/a	4.8	n/a

2.1.5 School Leaver Attainment

Literacy and numeracy are key skills for any school leaver. A range of courses are included in the numeracy measure. These courses are selected based upon the outcomes and assessment standards for SQA's numeracy units at National 3, 4 and 5, with the key criterion being that the main purpose of the qualification or award is to improve numeracy skills.

Percentage of school leavers attaining Numeracy at SCQF Levels, 2019-2024

	2019	2020	2021	2022	2023	2024
3 or better	95.8	96.1	96.1	95.9	95.3	95.5
4 or better	91.4	91.6	91.6	91.3	90.9	90.7
5 or better	68.7	71.0	72.4	70.7	70.8	71.8

There is broad consistency across all levels over this period. It should be noted that attainment at each level describes a wide range in learner performance.

Further information is available at School leaver initial destination and attainment statistics.

2.1.6 National Qualifications Course Reports

SQA course reports, published annually, identify recurring areas for improvement. Recurring messages from these reports are that candidates should practise:

- basic numerical skills
- basic algebra skills
- problem-solving skills in questions that involve reasoning
- presenting conclusions clearly such as when comparing data sets.

2.1.7 SQA Evaluation of National 5 Mathematics (2023)

As part of the SQA's evaluation of the 2023 approach to assessment of graded national courses, they published an analysis exploring pattern of entry and performance in Mathematics and Applications of Mathematics, in particular:

- dual presentation at National 4 and 5
- double presentation at both Mathematics and Applications of Mathematics
- the performance of learners being presented at different stages.

2.2 Labour Market Information

The Sutton Trust, in 2013, published The Employment Equation: Why our young people need more maths for today's jobs. The report notes that the level of mathematics used by people in the workplace and required by employers for all but the most highly numerate and technical jobs is simple mathematics in complex settings. It also notes that the transfer of mathematical skill to the workplace is not always straightforward.

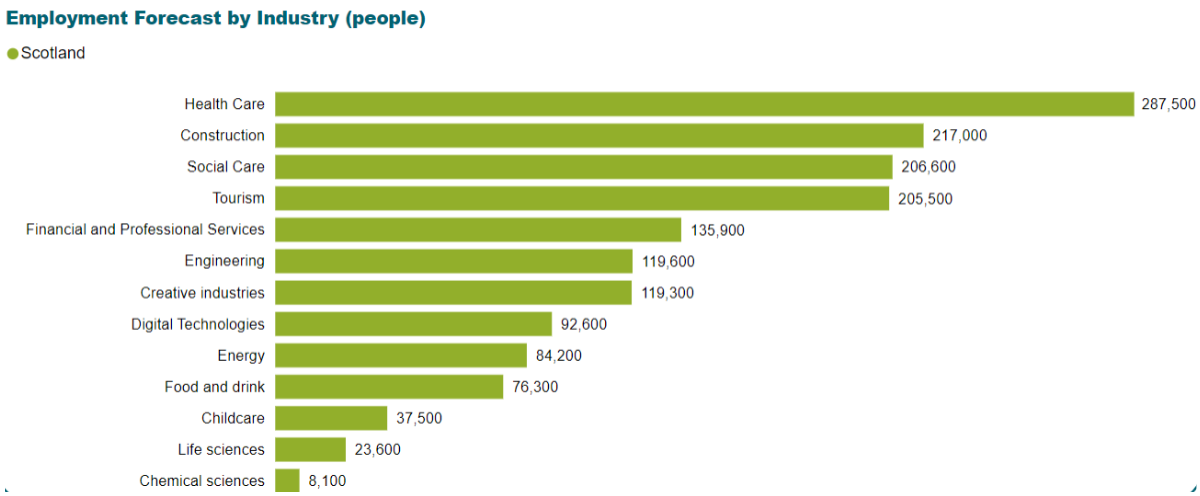
The authors recognise that many people in the workplace are engaged in ICT, particularly in using spreadsheets and graphical outputs but they found many examples of people in the workplace using a 'black-box' approach to some mathematical techniques, where they lack the mathematical knowledge to understand fully the techniques they are using, to control the technology, and to understand and use the outputs.

In their 2023 report, Quantifying the UK economic contribution of the mathematical sciences in 2023, the Academy for the Mathematical Sciences note that the past decade has witnessed profound changes in the workplace. The swift development and application of artificial intelligence (AI), machine learning and data science have reshaped entire industries. They consider a mathematical science occupation to be one requiring a high level of mathematical knowledge. Making significant use of tools and techniques from mathematical science research, they have calculated that in 2023, 4.2 million people were working in mathematical science occupations, including scientific researchers, statisticians, software professionals, several different types of engineers, actuaries and financial analysts. This represents 13% of all employment in the UK, up from 10% in 2010. This employment occurs across a range of industries, including banking and finance, insurance, computing, pharmaceuticals, health and education.

Skills Development Scotland (SDS) provide labour market information using a consistent evidence base to inform future investment in skills, built up from existing datasets and forecasts. They work with key partners and stakeholders in the production of regional skills assessments to ensure an inclusive approach to their development, dissemination and utilisation. Regional skills assessments (RSAs) are published annually, covering all Regional Outcome Agreement areas, City and Growth Deal Regions and rural Scotland. The RSAs offer detailed information on regional labour markets across the country. The data included in these publications, including Oxford Economics forecast data, is the most up-to-date available at the time of writing.

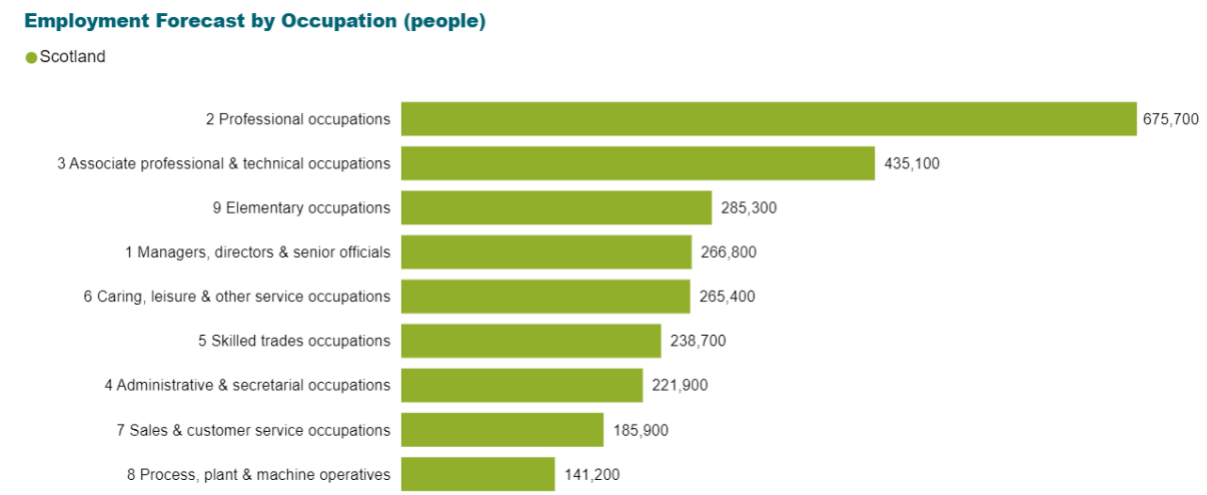
The following graphs show labour market information access in November 2024 to show a 10-year forecast for Scotland as a whole. They were taken from the SDS skills planning data matrix.

The future employment forecast by industry for Scotland in 2034 (SDS, 2024)



As can be seen from the graph; health care, construction and social care are predicted to be the highest employing industries. Health care and Construction have particular implications for mathematics as these areas cover a wide range of jobs (source: My World of Work). All roles will require a basic level of numeracy, but some require a high level of mathematical knowledge, skills and understanding in order to enter into these areas of work. There are many other industries listed here that require workers with high levels of mathematics. These include: financial services, engineering, digital technologies, energy, food and drink, life sciences and chemical sciences.

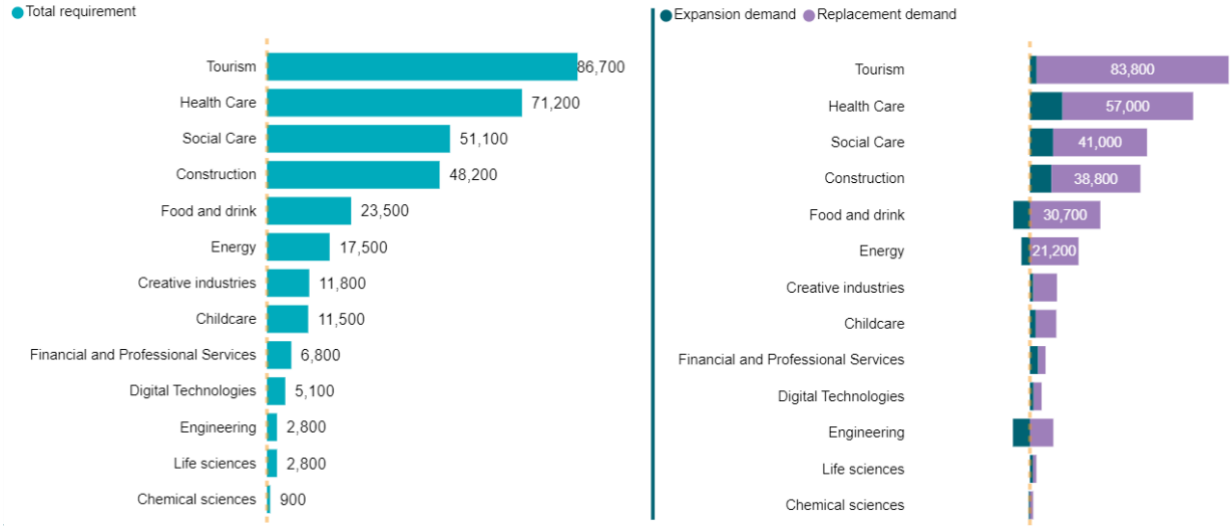
The future employment forecast by occupation for Scotland in 2034 (SDS, 2024)



This has implications for the range of pathways at different SCQF levels needed to allow learners to achieve the right level of qualifications for the jobs available. The Mathematics and Applications of Mathematics pathways allow learners the chance to study the type of mathematics most suited

to their next steps. However, there is further work required in raising awareness of the merits of the Applications pathway, both with further and higher education institutions, and with employers.

The total requirement by industry for Scotland in 2027-2034 (SDS, 2024)



See glossary for definitions of the terms total requirement, expansion demand and replacement demand.

Despite healthcare being forecast to be the largest employing industry in 2034, the actual number of jobs needed to be filled is forecast to be greatest in tourism. The above graph on the right shows how much an industry is forecast to expand or reduce in requirement, as well as the likely replacement requirement (i.e. how many more people will be required due to people leaving the workforce). The graph on the left-hand side shows the total requirement. These numbers are different from the overall employment forecast as these graphs only show additional requirements and not those who will remain working in these industries. Health care, social care and construction show the greatest expansion demand, with food and drink, energy and engineering showing a negative expansion i.e. a reduction in requirements. This may have implications on choice of mathematics pathway made by learners.

2.3 National Statistics

This section includes data relevant to mathematics education from a range of national sources.

2.3.1 Achievement of Curriculum for Excellence Level (ACEL)

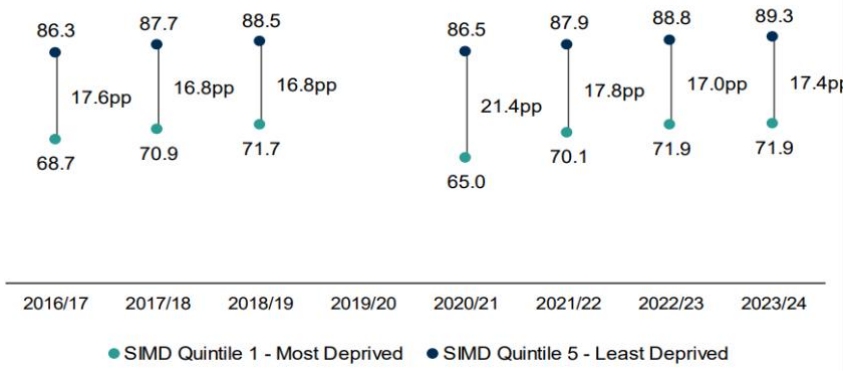
Achievement of Curriculum Levels data is published annually based on teacher judgement reporting on the percentage of school pupils in Primary 1 (P1), Primary 4 (P4), Primary 7 (P7) and Secondary 3 (S3) who have achieved the expected Curriculum for Excellence levels relevant to their stage. Data is available on Curriculum for Excellence levels grouped by Scottish Index of Multiple Deprivation, pupil characteristics, and by local authority. Data is also available for learners in Gaelic medium education and those in special schools or units.

Percentage of pupils achieving expected Numeracy CfE Levels 2016-17 to 2023-24

	2016-17	2017-18	2018-19		2020-21	2021-22	2022-23	2023-24
P1 Early Level	83	85	85		81	84	85	85
P4 First Level	75	76	77		72	75	77	78
P7 Second Level	70	75	76		72	76	78	78
P1, P4, P7 Combined	76	78	79		75	78	80	80
S3 Third Level or better	88	89	90			89	90	90
S3 Fourth Level	56	56	59			59	63	65

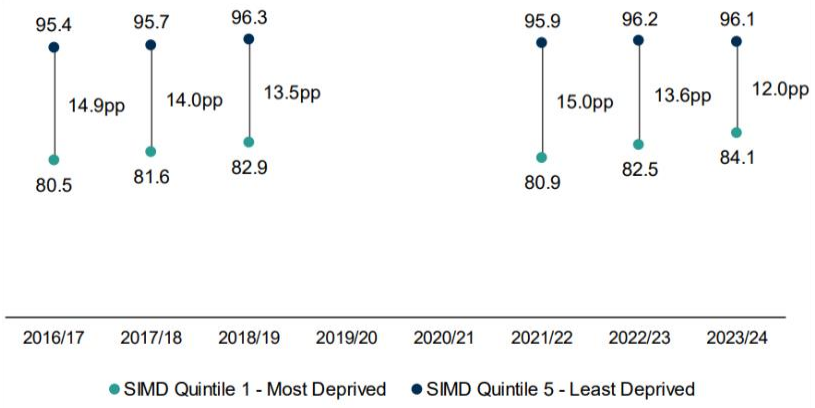
Within the ACEL data, comparisons can be made on the achievement of groups of learners with different characteristics. Also examined is the distribution of learners for all stages across categories that reflect the Scottish Index of Multiple Deprivation (SIMD).

Percentage of P1, P4 and P7 pupils combined achieving expected level in numeracy, grouped by SIMD 2016/17 to 2023/24



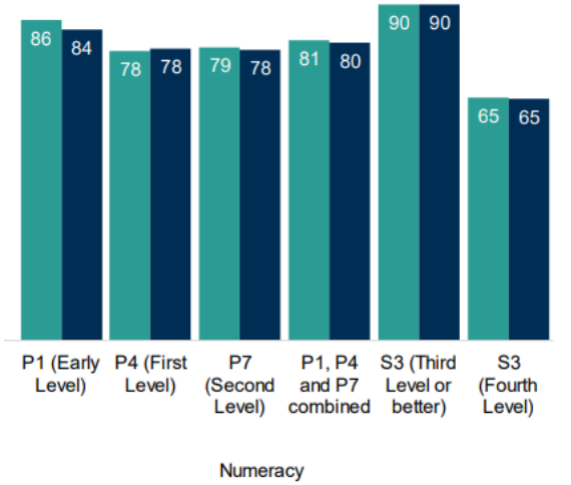
The attainment gap in numeracy at primary level increased in the latest year and remains wider than in 2018-19.

Percentage of S3 pupils achieving Third Level or better in numeracy grouped by SIMD, 2016/17 to 2023/24



The attainment gap in numeracy at S3 narrowed in the latest year to the lowest since 2016-17.

Percentage of pupils achieving expected CfE levels, by sex and stage, 2023-24



In 2023-24 there was little difference between the levels of male and female pupils across all stages.

For primary pupils combined, performance in numeracy in 2023-24 was highest for those of an Asian – Chinese background (94% achieving the expected levels compared to 80% for all pupils). The same was true at S3 for Third Level or better (99% compared to 90%).

The number of pupils identified with additional support needs (ASN) has increased over several years. For primary pupils combined, performance in numeracy in 2023-24 was lower for those with identified ASN (62% compared to 80%). The same was true at S3 for Third Level or better (83% compared to 96%).

In 2023-24 the combined performance in numeracy of primary school pupils with English as an additional language (EAL) was slightly lower than those for whom English is their first language

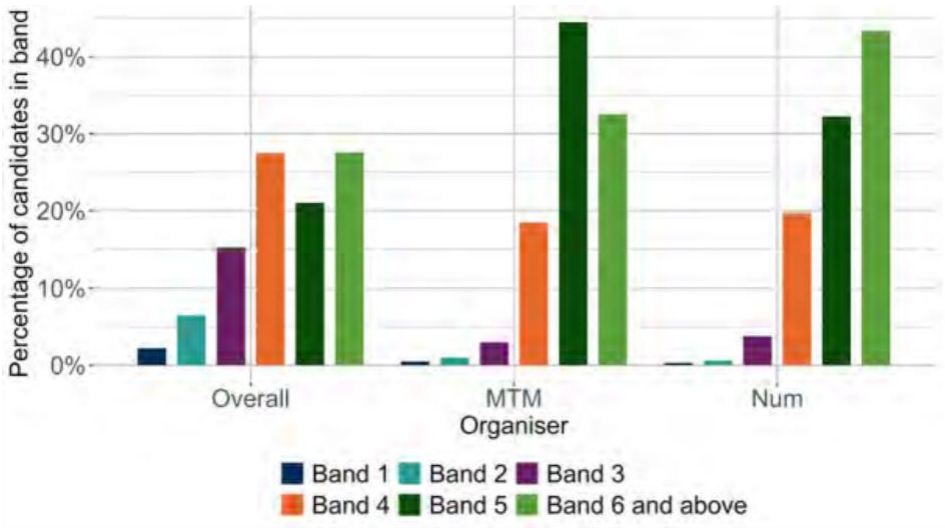
(78% compared to 81%) but the reverse was true at S3 for Third Level or better (93% compared to 90%).

2.3.2 National Standardised Assessments for Scotland

To support professional judgements in achievement of Curriculum for Excellence levels, practitioners can access National Standardised Assessments. In 2025, the Scottish Government published a National Report for Academic Year 2023-24 on Scottish National Standardised Assessments (SNSA) and Measaidhean Coitcheann Nàiseanta airson Foghlam tron Ghàidhlig (MCNG). Performance in numeracy is reported on a single scale with 12 capacity bands. Six of the capacity bands are included in the reports for each stage. P1 covers bands 1 to 6; P4 covers bands 4 to 9; P7 covers bands 6 to 11 and S3 covers bands 7 to 12. These bands have accompanying descriptions which are included in the report.

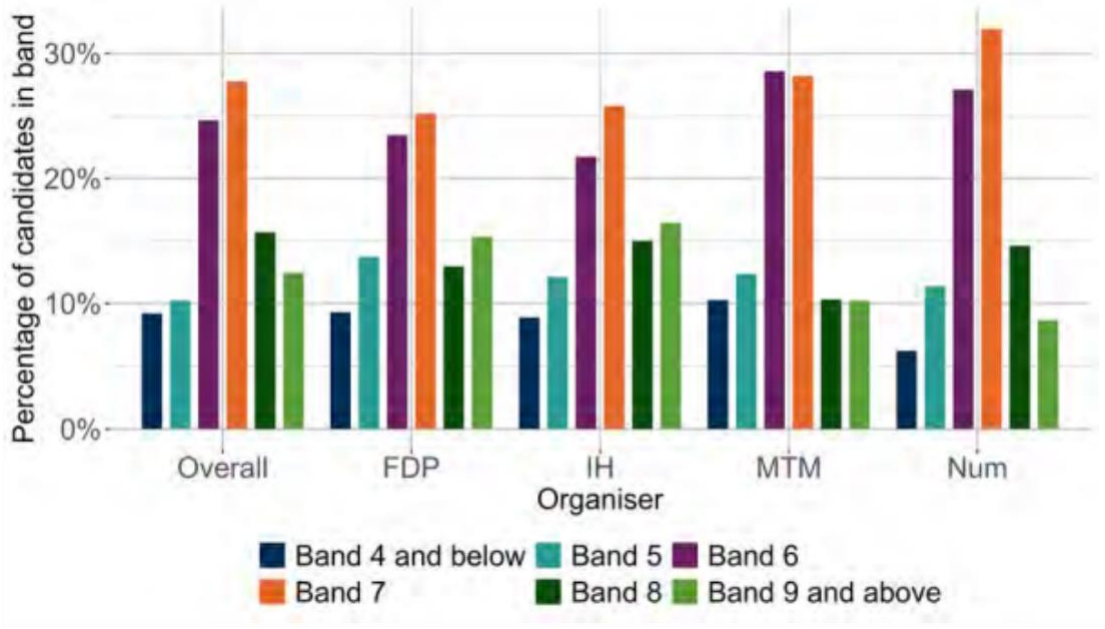
For P1 and S3, the majority of learners achieved outcomes in the mid to upper bands, and for P4 and P7 learners, the middle bands were the most frequently achieved.

The SNSA assessments for P1 focus mainly on the organisers 'Money, time and measurement' (MTM) and 'Number' (Num).



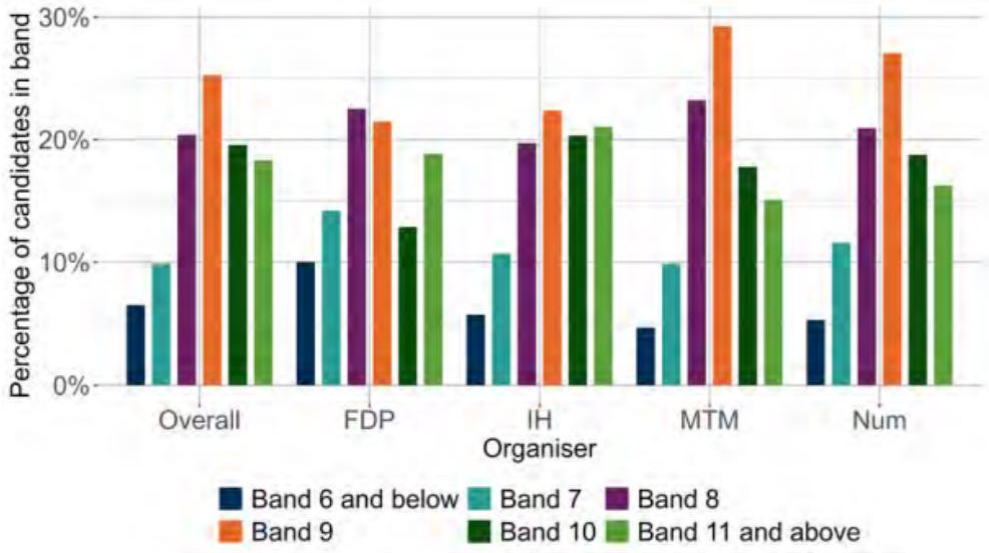
Overall, for P1, the band achieved by the largest proportion of learners was band 6, with over a quarter of learners achieving this band. A greater proportion of learners achieved this band in the Number organiser than in the Money, time and measurement organiser.

The SNSA assessments for P4 include more questions on the organisers 'fractions, decimal fractions and percentages' (FDP) and 'Information handling' (IH).



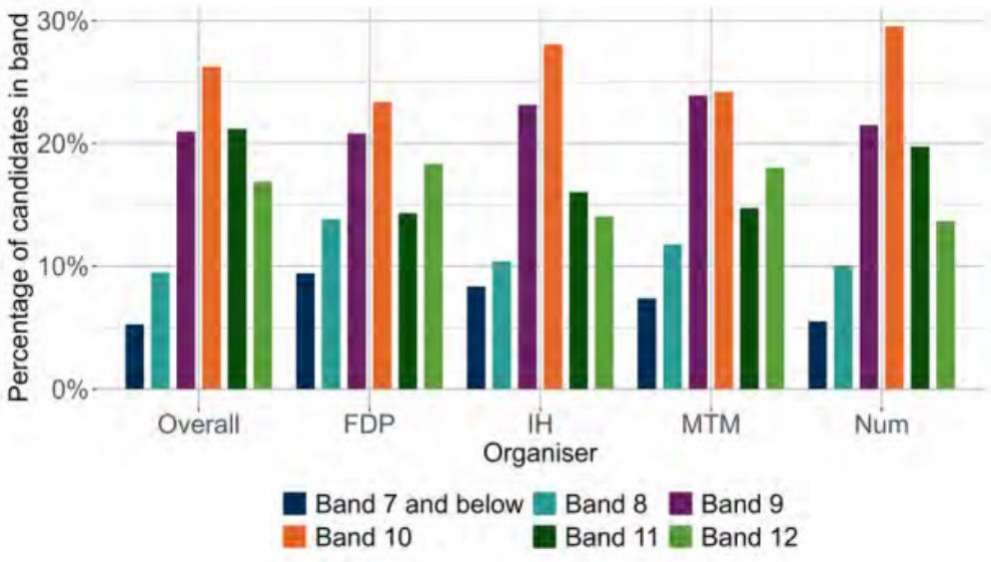
Overall, for P4, the band achieved by the largest proportion of learners was band 7, with over a quarter of learners achieving this band. Over two thirds of learners achieved bands 6 to 8.

The assessments for P7 include questions from across the organisers.



Overall, for P7, the band achieved by the largest proportion of learners was band 9, with over a quarter of learners achieving this band. Just under two thirds of learners achieved bands 8 to 10.

The SNSA assessments for S3 include questions from across the organisers.



Overall, for S3, band 10 was achieved by the largest proportion of learners with over a quarter of learners achieving this band. Over two thirds of learners achieved bands 9 to 11.

Within the SNSA data, data is collected on the achievement of groups of learners with different characteristics. Also examined is the distribution of learners for all stages across categories that reflect the Scottish Index of Multiple Deprivation (SIMD).

For P1, P4, P7 and S3 there were no notable differences between the SNSA outcomes of male and female learners in both the overall and organiser summaries.

At each stage, the proportion of learners with outcomes in the upper capacity band was largest among learners in the least deprived group (SIMD, Quintile 5) and lowest in the most deprived group (SIMD, Quintile 1). The reverse is true for the lowest capacity bands. These trends hold for both the overall and organiser summaries.

There were notably larger proportions with outcomes in the upper two capacity bands among learners not entitled to free school meals than among those with this entitlement (FME). Correspondingly, there were higher proportions of outcomes in the lower two capacity bands among learners with FME. This pattern was evident across all stages, both for numeracy overall and by organiser.

Generally, there were only relatively small differences across the groups of learners from different ethnic backgrounds, both in terms of overall numeracy outcomes and when considering assessment outcomes regarding each of the organisers.

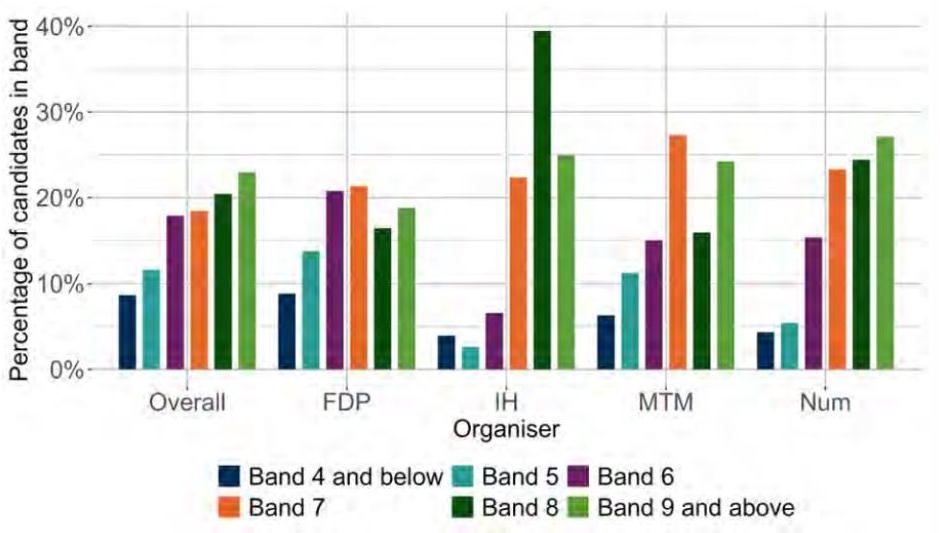
For all stages, the proportions of learners in the two upper bands were notably larger among learners without additional support needs (ASN). Similarly, there were relatively larger proportions of learners with ASN in the two lower bands. These differences were similar for numeracy overall as well as when considering each organiser separately.

The numeracy outcomes for the group of learners registered on the national database, SEEMiS, as Looked After Children (LAC), either at home or away from home, are compared to those of learners not in this group. Across all stages, smaller proportions of learners in this group achieved outcomes in the two upper capacity bands, compared to other learners. This trend was most pronounced at S3. Similarly, for the lower capacity bands, there was a higher proportion of learners in the LAC group achieving these outcomes compared to all other learners. These patterns could be seen across stages and generally held for organiser outcomes in addition to the overall summaries.

When comparing learners for whom English is an Additional Language (EAL) and those for whom English is their first language at P4, P7 and S3, only relatively small differences were observed in the proportion of learners achieving outcomes in the lowest two and highest two capacity bands. At P1, differences between the two groups were larger than for the other stages. When comparing proportions in bands for each organiser, very similar outcomes were observed between the two groups, with only slightly larger proportions of learners who do not have English as their first language achieving outcomes in the highest two bands at S3.

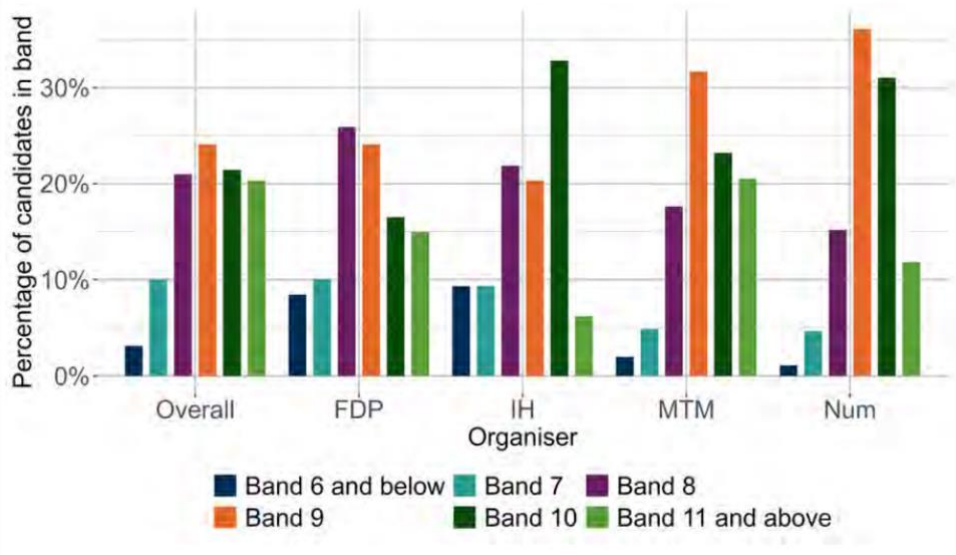
For MCNG numeracy assessments, the data for P1 and S3 is not reported to avoid identifying individual learners.

The MCNG assessments for P4 include questions across the organisers



Overall, for P4, the band achieved by the largest proportion of learners was 9, with just under one quarter of learners achieving this band. The second most common band achieved by learners was band 8. Just over 60% of learners achieved bands 7 to 9.

The assessments for P7 also included questions across the organisers.



Overall, for P7, the band achieved by the largest proportion of learners was 9, with just under a quarter of learners achieving this band. The second most common band achieved by learners was band 10. Approximately one third of learners achieved bands 8 to 10.

Within the MCNG data, data is collected on the achievement of groups of learners with different characteristics. Some comparisons are not reported to avoid identifying individual learners.

For P4, there were differences in the proportion of male and female learners achieving outcomes in the highest band, with a greater percentage of male learners achieving this outcome. Overall, in the lowest capacity bands, a greater proportion of female learners achieved outcomes in these bands. Comparisons for P1, P7 and S3 are not reported. Across all stages, comparisons linked to SIMD and ethnic background are not reported. Overall, for P4, there were slightly larger proportions of learners with FME with outcomes in the upper two bands than for those without FME. Comparisons for P1, P7 and S3 are not reported. For P4, the proportions of learners in the two upper bands were notably larger among learners without ASN. Similarly, there were relatively larger proportions of learners with ASN in the lower two bands. Comparisons for P1, P7 and S3 are not reported.

2.4 Other Data Sets

In 2017, the Scottish Government published research on views on probationer teachers' readiness to teach. Data collected confirmed that a small number of probationer teachers have 'gaps in their knowledge' and showed some conceptual misunderstanding, for example, in numeracy. They felt that this was attributed to a lack of confidence of probation teachers and an over-reliance on a resource to deliver the curricular outcomes, rather than supporting individual pupil progression in numeracy. This is in line with the findings of the Making Maths Count

(2016) report where student teachers were reported as saying that they 'would find it helpful for Initial Teacher Education provision to include more of a focus on how teachers can better understand and support children's thinking processes in maths' (p.19).

The Enhancing Professional Learning in STEM Grants Programme (2019-2022) had a strong focus on supporting professional learning in numeracy and mathematics in rounds 2 and 3. The report highlights the number of projects, professional learning sessions and professional learning hours funded by the programme, with focus on numeracy and mathematics. Major projects focussed on pedagogical approaches and learning through play.

The Commission on School Reform, set up by the think tank Reform Scotland, published a report Broken STEM – Maths and Science Attainment in S4 (2024). This report explores historic mathematics attainment data.

3 International Reports and Comparative Studies

The importance of mathematics to life, learning and work is reflected in the number of international studies and reports published over recent years.

3.1 International Reports

This section contains links to reports and publications directing mathematics policy across many jurisdictions.

3.1.1 Organisation for Economic Co-operation and Development (OECD)

The OECD have published several position papers on mathematics over the last few years. These papers provide provocations and considerations for mathematics education in Scotland.

The working paper When practice meets policy in mathematics education (2022) presents the findings of the Mathematics Curriculum Document Analysis (MCDA) study. This study involves participants from 19 countries and jurisdictions and looks to the future in terms of how school curricula should evolve given the technological advances and other changes that societies are now facing. This paper lists 21st century competences related to mathematics education as communication, creativity, critical thinking, information use, reflection, resilience and systems thinking.

The OECD Learning Compass for Mathematics paper (2023) supports countries and jurisdictions to consider the redesign of the mathematics curriculum within the context of the Learning Compass (launched in 2019).

This paper includes useful definitions of literacy, numeracy, data literacy, digital literacy, computational thinking and financial literacy. It also describes the disciplinary and interdisciplinary knowledge foundational to mathematical learning. It also discusses the importance of making mathematical connections.

An Evolution of Mathematics Curriculum (Where it was, where it stands and where it is going, 2024) discusses the evolution and future of mathematics curricula as part of the OECD's Future of Education and Skills 2030 project, aiming to help countries modernise their education systems for the 21st century. It explores the evolution and redesign of mathematics curricula to meet current and future societal, technological and educational demands. It outlines the uniqueness of mathematics as a school discipline, with foundations laid in ancient times that have been developed across the world, and across the generations since, and which is an ever-progressing field essential for addressing current and future global challenges. However, its hierarchical structure, which is reliant on gradual progression, makes it a 'hard to change' learning area. It also recognises the rising relevance of statistics education.

Future-focused mathematics curricula (Empowering learners for the 21st century, 2025) encourages mathematics curricula to evolve in the face of changing societal and technological demands. This recognises how mathematics is uniquely positioned to develop numeracy, critical thinking, data literacy and problem-solving skills, enhancing learners' ability to make informed financial decisions, interpret data critically and approach problems with logical reasoning. It also recognises that mathematics increasingly intersects with other disciplines, both shaping and drawing from fields like data science, technology and environmental studies. It states that this interconnectedness highlights the need for curricula that integrate interdisciplinary learning.

Mathematics for Life and Work (A Comparative Perspective on Mathematics to Inform Upper Secondary Reform in England) report was commissioned for England. This report explores different outcomes such as performance across countries and how education systems internationally deliver mathematics in upper secondary.

Financial education as a cross curricular theme was regularly given a high degree of importance by children and young people during the consultations carried out as part of the CIC process. This is echoed in a variety of published reports which are referenced in section 5.4. Although learning about money and finance does not sit wholly within the mathematics curriculum, it relies heavily on mathematical understanding.

The OECD have published a number of studies on Financial Education. PISA 2029 will include a Financial Literacy Assessment: Preparing Students for their Financial Future. This is an optional part of the assessment and a decision on Scotland's participation in this section is yet to be taken. A summary of the 2022 Pisa findings on financial literacy can be found here.

3.1.2 United Nations Educational, Scientific and Cultural Organisation (UNESCO)

In 2022, UNESCO published Mathematics for action: supporting science based decision making. The Mathematics for Action toolkit focuses on engaging stories of mathematics in action. Written by mathematicians and thought leaders from across the globe, it presents research of how mathematics is addressing the world's most pressing challenges, which may be relevant for the Scottish Mathematics curriculum.

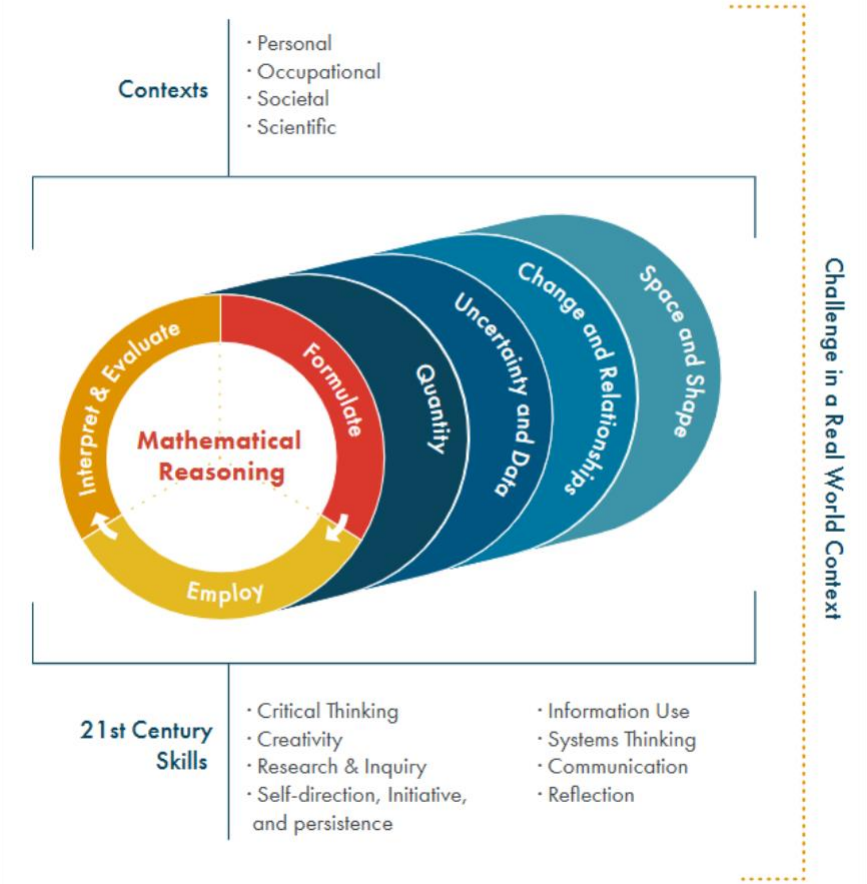
3.2 International Comparative Assessments

Scotland is linked to two large scale international comparative assessments in mathematics which take place periodically across multiple jurisdictions. These surveys provide valuable evidence to support the cycle of curriculum review and improvement.

3.2.1 Programme for International Student Assessment (PISA)

PISA assesses a sample of 15-year-olds' ability to apply mathematics, reading and science knowledge and skills to real-world problems. In 2022, Mathematics was the major domain for PISA. Scotland has taken part in this survey since 2000.

The PISA 2022 mathematics framework defines the theoretical underpinnings of the PISA mathematics assessment based on mathematical literacy, relating mathematical reasoning and three processes of the problem-solving (mathematical modelling) cycle. The framework describes how mathematical content knowledge is organised into four content categories. It also describes four categories of contexts in which students will face mathematical challenges.



In 2023, Scottish Government published PISA 2022: Scotland's results – highlights, including some key findings.

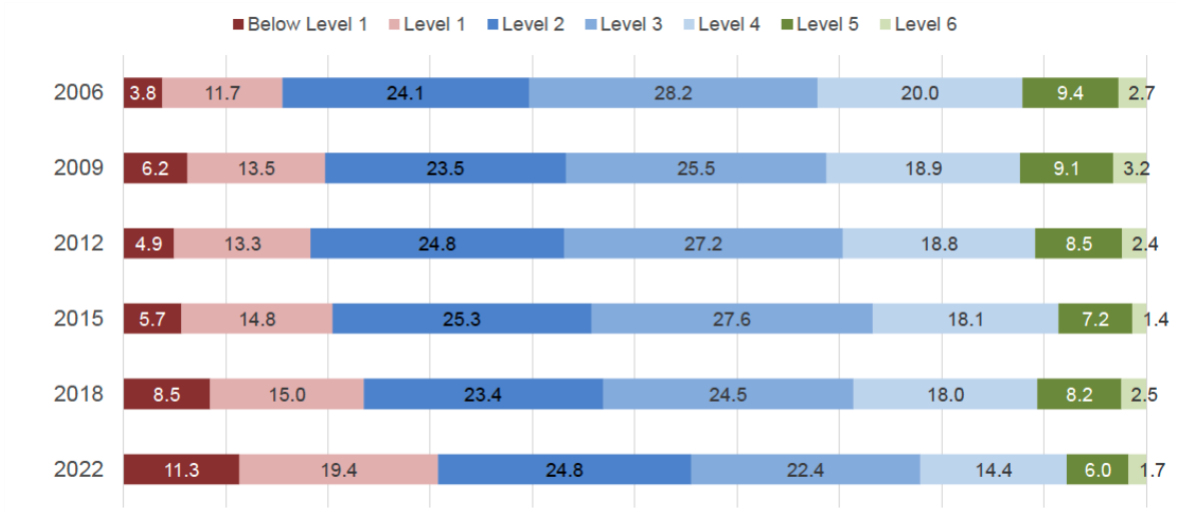
- Scotland's performance was broadly in line with the OECD average but declined compared to previous cycles.

- Boys outperformed girls in mathematics.
- The proportion of students performing below the OECD baseline increased, while the percentage of top performers declined.
- The attainment gap linked to social background widened since 2018.

In 2022 Scotland's mean score in mathematics (471) was similar to the OECD average (472). This was lower than all previous PISA cycles (2003-2018).

The OECD categorise pupil performance into levels. Achievement of Level 2 is considered by the OECD to be the baseline at which pupils begin to demonstrate the knowledge and skill to enable them to participate actively in life situations related to mathematics.

PISA Mathematics proficiency in Scotland (2006-2022)



In 2022, 30.7% of pupils in Scotland performed below PISA Level 2 in mathematics. This was similar to the OECD average (31.1%).

Scotland's performance, by content and process subscales, in PISA 2022 is shown in the table below.

PISA 2022 – Mathematics Subscales		
Content Subscale	**Content Subscale Score (Scotland)**	**Average Subscale Score (OECD)**
Change and Relationships	464	470
Quantity	474	472
Space and Shape	461	471
Uncertainty and Data	476	474
Process Subscale	**Process Subscale Score (Scotland)**	**Average Subscale Score (OECD)**
Employing	465	472
Formulating	462	469
Interpreting	477	474

Reasoning	477	473

In 2022 in Scotland, performance among boys was higher than among girls in mathematics (478 vs. 463). This trend was also the case in 2006, 2009, 2012 and 2018. In 2022 a greater proportion of girls (33.3 %) than boys (28.3%) performed below PISA Level 2 in mathematics. A greater proportion of boys (9.4%) than girls (6.1%) performed at PISA Level 5 or better in mathematics.

The strength of the relationship between students' background and mathematics test scores in 2022 was almost double what it was in 2018. It was also higher than in 2015 but similar to 2006, 2009 and 2012.

3.2.2 Trends in International Mathematics and Science Study (TIMSS)

Scotland will rejoin the Trends in International Mathematics and Science Study (TIMSS) in 2027, providing further insights into the country's global positioning. TIMSS is a digital assessment of fourth- and eighth-grade students' (equivalent in Scotland) mathematics and science achievement conducted every four years since 1995. TIMSS 2027 aims to capture not only academic achievement, but also valuable data that helps contextualise that achievement for educators, researchers and policymakers.

4 Education Scotland evidence

This section includes reports and publications authored by His Majesty's Inspectors (HMI), Education Officers and Senior Education Officers from Education Scotland.

4.1 HMI evidence and reports

In recent years, HM Inspectors from Education Scotland have compiled two thematic inspection reports on numeracy and mathematics.

4.1.1 National Thematic Inspection of Mathematics (2024) - Enhancing the Quality of Mathematics Education in Scotland

In November 2024, His Majesty's Inspectors of Education published a national thematic inspection report on mathematics (Enhancing the Quality of Mathematics Education in Scotland), forming a key part of the CIC. The inspection involved visits to 52 settings and schools across the early learning, primary, secondary, special and Gaelic Medium Education sectors.

There were a number of curricular strengths identified.

- Learners respond positively when mathematics is linked to everyday experiences such as budgeting, cooking and outdoor learning.
- Digital technologies are increasingly used to enhance mathematical learning.
- Gaelic Medium Education was noted for its high-quality integration of cultural and community contexts into mathematics learning.
- There is growing participation in mathematics-focused professional learning, particularly where leadership is strong.

Also identified were areas for curriculum improvement.

- There is variability in subject knowledge and the use of correct mathematical language across sectors.
- Learners, particularly in upper primary and early secondary, reported mathematics as repetitive and lacking challenge.
- Consideration should be given to balancing factual knowledge, procedural fluency, conceptual understanding and skills development.

4.1.2 National Thematic Inspection of Mathematics (2019) - Multiplying Skills, Adding Value

This national thematic inspection, conducted by HM Inspectors of Education and published in 2019 (Multiplying Skills, Adding Value), explored the quality of numeracy and mathematics education across early learning, primary, secondary and special schools in Scotland. The review aimed to evaluate curriculum effectiveness, learning and teaching quality, and attainment and achievement in numeracy and mathematics.

Key strengths were identified with reference to curriculum.

- Curriculum relevance: effective use of real-world contexts, interdisciplinary learning (IDL), and STEM connections enhanced learner motivation.
- Assessment and moderation: growing use of National Benchmarks and collaborative moderation practices improved reliability of teacher judgements.
- Early years practice: practitioners effectively used daily routines and play-based learning to develop early numeracy skills.

Also identified were areas for curriculum improvement.

- Balance: overemphasis on number at the expense of shape, position, movement and information handling.
- Differentiation and challenge: need for more effective planning to meet the needs of all learners, including the most and least able.
- Transitions: inconsistencies in progression from early years to primary and from primary to secondary phases.

Stakeholders were given the recommendation to strengthen leadership for learning and ensure curriculum coherence.

4.2 Other Education Scotland publications

Education Officers and Senior Education Officers within Education Scotland have compiled a number of publications related to mathematics education in Scotland.

4.2.1 Realising the Ambition

Realising the Ambition: Being Me is the national practice guidance for early years in Scotland. It builds upon the original principles and philosophy of pre-birth to three and Building the Ambition. It covers children's learning and development from birth into the early years of primary school. Effective practice in numeracy and mathematics is highlighted within the practice guidance. Practitioners also make use of the Early Level Play Pedagogy Toolkit.

4.2.2 Numeracy Professional Learning Resources

Education Scotland has published a series of professional learning papers which aim to enhance knowledge and understanding of mathematics progression and effective approaches to learning and teaching. Their aim is to support schools and establishments to identify opportunities to enhance the effective teaching of numeracy concepts and associated skills, and to highlight links to other curricular areas.

4.2.3 Milestones to support learners with complex additional support needs.

Education Scotland published a set of milestones with accompanying guidance to specifically support learners with complex additional support needs. The aim of the milestones is to support practitioners to identify next steps in the progression of learning. Milestones for numeracy and mathematics have been produced for learners working at a pre-early level.

4.3 CIC Pilot Reviews

In November 2024, Education Scotland published their Findings from the Pilot Curriculum Reviews 2023/24. This process brought some clarity to the hierarchical nature of the mathematics curriculum (and the associated need for prescription), the need to update the expected knowledge and skills associated with data analysis and financial education, and the challenges of identifying areas which can be deprioritised.

The second paper in this series, Towards an Evolved Technical Framework published in December 2024 describes support for establishing Big Ideas, which capture the core understanding children and young people will develop, the importance of linking knowledge, concepts and skills, considerations on the position of numeracy as a cross curricular expectation, and how a Know-Do-Understand model could be extended into the senior phase. This paper contained early thinking and examples of what form elements of an evolved mathematics technical framework might take.

5 Stakeholder Reports and Reviews

This section includes the names and purposes of a range of stakeholders with a particular interest in mathematics education. It lists a number of relevant reports and reviews published by these stakeholders.

5.1 Key stakeholder reports

This section outlines the work carried out over recent years, in partnership with the Scottish Government, to review and improve mathematics education in Scotland.

5.1.1 Making Maths Count

In 2015, the Scottish Government set up the Making Maths Count group with their final report published in 2016. The report highlighted three key areas for improvement.

1. Transforming public attitudes to maths by:

    - the creation of a culture change strategy for Making Maths Count
    - developing and funding Maths Week Scotland
    - developing local authority strategies around importance of maths to everyday life and future jobs.

2. Improving confidence and fluency in maths for children, young people, parents and all those who deliver maths education to raise attainment and achievement across learning by:

    - all schools and nurseries using a wide range of effective learning and teaching approaches
    - Education Scotland evaluating the quality of children's and young people's learning experiences and attainment in maths
    - undertaking research on how well ITE students are being prepared to teach maths as newly qualified teachers
    - each local authority designing and developing a professional learning strategy
    - Scottish Attainment Challenge schools focusing on raising attainment in numeracy (including parental engagement).

3. Promoting the value of maths as an essential skill for every career by:

    - developing an action plan for improving maths skills for employment
    - involving Developing Young Workforce Regional Groups in this initiative.

A follow up report was published one year subsequently to outline the progress made. The National Numeracy Hub was funded and secondees appointed to Education Scotland to support national networks and drive improvement. Subsequently, Education Scotland undertook an evaluation of the quality of learning experiences and attainment in maths, publishing the thematic inspection report Multiplying Skills, Adding Value (see Section 4.1.2).

5.1.2 National Response to Improving Mathematics (NRIM)

The NRIM Partnership Board was set up in 2021 to respond to the recommendations of the thematic inspection Multiplying Skills, Adding Value, and to build on the themes of the Making Maths Count report. Its aims were:

- to transform Scotland to be a greater maths-positive nation (achieved partly by promoting the joy of mathematics)
- to support and promote the belief that everyone has the capability to become proficient at mathematics, regardless of their circumstances in life
- to ensure that 21st Century Skills are embedded within teaching and learning
- to ensure consistently high standards of professional learning in numeracy and mathematics across Scotland
- to improve levels of mathematical literacy
- to improve attainment in numeracy and mathematics in Scotland.

During 2022, after a period of consultation, several short life working groups were convened to examine key factors for a national improvement plan. The focus themes for these groups were early years, primary, secondary, initial teacher education, the future of the curriculum, and progress with the Making Maths Count themes. In January 2023, NRIM published a position paper which included seven interim recommendations.

1. The design of a national numeracy and mathematics strategy.
2. The implementation of a national numeracy and mathematics strategy.
3. A review of Curriculum for Excellence policy and guidance.
4. The development of a national professional learning offer.
5. The development, by providers of initial teacher and practitioner education, of clear guidance on the roles and responsibilities of all stakeholders involved in supporting beginning and early career teachers and practitioners.
6. The creation of a mathematics-specific self-evaluation toolkit.
7. The development of a plan for implementation of the above.

Education Scotland is currently progressing work across a number of these recommendations.

In 2025, the NRIM Board evolved into the Numeracy and Mathematics CIC Steering Group, who will develop a coherent response to the implementation of change emerging from the CIC, drawing on their shared resources and capabilities. The steering group is co-chaired by the Association of Directors of Education in Scotland, Education Scotland and the Scottish Government and is made up of participants from local authorities, national government and initial teacher education.

5.2 Subject Associations

There are a number of organisations and special interest groups who have an influence over in mathematical education. This section describes their work and provides links to their resources.

5.2.1 The Scottish Mathematical Council

The Scottish Mathematical Council is a non-profit organisation dedicated to supporting the teaching, learning and appreciation of mathematics in Scotland. Their Resources and Publications, including journals, have informed the Mathematics CIC process.

5.2.2 The Joint Mathematical Council (JMC) of the UK

The JMC comprises many participating and observing member bodies from across the UK. Their combined expertise covers the teaching and learning of mathematics in schools, colleges and universities; the initial training and ongoing professional learning of teachers and lecturers; mathematics education research; educational policy; and mathematical applications and interests more generally.

The JMC makes representations to governments and other bodies both proactively and reactively. It works closely with the Royal Society's Advisory Committee on Mathematics Education, oversees the British Congress of Mathematics Education, and undertakes other targeted projects and activities, producing occasional reports and working papers. Their publications and reports are available online.

5.2.3 The Royal Society

The Royal Society is the independent scientific academy of the UK, dedicated to promoting excellence in science for the benefit of humanity. Their Advisory Committee on Mathematics Education provides advice on high-level, cross-cutting issues in mathematics education and beyond. The committee has investigated several specific issues, particularly relating to curriculum and assessment.

5.2.4 The Academy for the Mathematical Sciences

The Academy for the Mathematical Sciences provides a voice for the whole of the mathematical sciences. It brings together academia, education, business, industry and government from across all four nations, providing crucial connectivity for harnessing the power of the discipline.

5.2.5 Other Subject Associations and Relevant Organisations

The Mathematical Association (MA) and Association of Teachers of Mathematics (ATM) provide useful publications, reports and viewpoints on Mathematics education, which can be relevant for Scottish education.

It was announced in July 2025, that the MA, the ATM, the Association of Mathematics Education Teachers (AMET), the National Association of Mathematics Advisers (NAMA) and the National

Association for Numeracy and Mathematics in Colleges (NANAMIC) had voted in favour of merging to create a new, shared home for those involved in mathematics education. The is called the Association for Mathematics in Education (AMiE).

The National Centre for Excellence in the Teaching of Mathematics (NCETM) was set up in 2006. They provide mathematics-specific resources and professional development for schools, colleges and teachers. Although based on the National Curriculum for England, the research and available materials provide high quality support for teachers across the UK.

National Numeracy is a UK charity dedicated to improving the confidence in everyday mathematics. They aim to boost social mobility and inclusion through numeracy in communities where the need is greatest. They publish a variety of impact reports and research which are relevant to Scottish mathematics education. They also run a number of family learning initiatives within Scottish schools.

Organisations such as Money and Pensions Service (MaPS), Young Enterprise, Young Scot, Money Advice Scotland, various banks and other financial services providers offer training and resources to widen the reach and impact of financial education.

MaPS provides financial education guidance for primary and secondary schools to support the Delivery Plan for Scotland as part of the UK Strategy for Financial Wellbeing. Their literature review explores what existing literature tells us about the rise of digital money. It also examines the impact this might have on children and young people's financial capability and the way they learn about money.

5.3 Professional Associations

There are no relevant reports for this section.

5.4 The Perspectives of Children and Young People

The HMI thematic inspection report on mathematics, Enhancing the Quality of Mathematics Education in Scotland (2024), asked children and young people about their thoughts on numeracy and mathematics. Younger learners expressed enthusiasm for mathematics, especially when taught through play and real-life contexts. Older learners highlighted a lack of relevance and challenge, particularly in S1 - S3, and a steep increase in difficulty in the senior phase. Learners valued supportive relationships and digital tools but called for more interactive and collaborative learning.

The consultation paper Education Reform: Consultation with children and young people (2022) found that children and young people would like a greater say in relation to what and how they learn across subjects. Some contributions noted that learning in mathematics was hard, that the pace can be too challenging and that it should be taught in a fun way that is easier to understand. It was also found that children and young people would like to learn life skills such as taxes, money management and how to buy a house.

The Scottish Youth Parliament: SQA Advisory Group Project Report (2024) found that children and young people wanted to spend more time learning about taxes, working rights and wages.

5.5 Other Relevant Reports and Reviews

This section describes some major reports published recently that focus on the future of mathematics education in the UK.

5.5.1 Mathematical Futures: A New Approach to Mathematical and Data Education (Royal Society, 2024)

The Royal Society's Mathematical Futures programme outlines a transformative vision for mathematics and data education in the UK, responding to the growing influence of data, AI and computational technologies across society and the economy. The report proposes a shift from traditional mathematics education to a broader, integrated model called Mathematical and Data Education (MDE). The report is predominantly focussed on England's education system but is also relevant for Scotland.

Key drivers for change are:

- the exponential growth of data and AI technologies is reshaping employment, public services and civic life
- a significant proportion of UK adults lack basic numeracy, with persistent socio-economic and regional inequalities
- current curricula and assessments are not adequately preparing learners for real-world quantitative challenges.

Core components of MDE are that it:

- builds on traditional mathematics with greater emphasis on data, computing and conceptual understanding
- equips all learners with the ability to apply mathematical and data skills to real-world problems, such as financial decision-making, interpreting health statistics, or evaluating public policy
- recognises the growing use of mathematical and data skills across disciplines and professions, from journalism to engineering.

The report makes the following recommendations.

- Integrate data science, statistics and computational tools into mathematics education from early years to post-16.
- Develop new qualifications and low-stakes assessments that reflect real-world applications and digital tool use.
- Invest in sustained professional learning for teachers across all subjects to support MDE.
- Embed tools like spreadsheets, coding platforms and AI into learning and assessment.
- Ensure MDE is accessible to all learners, including those with special educational needs.

5.5.2 Royal Statistical Society Recommendations for the Teaching of Statistics (2024)

In 2024, The Royal Statistical Society published key recommendations for the teaching of statistics in the UK. They make several recommendations which are relevant for Scotland, including:

- a stronger emphasis on relevant, real-world contexts
- a greater focus on statistical literacy and the investigative cycle, using more IT and visualisation software
- a greater emphasis on interdisciplinarity and joining up the statistics taught across different subjects
- the use of more engaging real-world topics within assessments, with more opportunities for the production of statistical reports to form a part of assessment (especially at age 14 and above).

5.5.3 Maths Horizons: How England should reform maths education for the age of AI (2025)

The Maths Horizons project was launched in September 2024 to develop evidence, analysis and recommendations about the future of maths curriculum and assessment in England. This independent report is intended to support England's curriculum and assessment review, and the wider debates about the future of England's education system and economy, with the aims of:

- ensuring that students secure the fundamental maths knowledge needed to navigate education, work and daily life with confidence
- ensuring that students leave education equipped to use their maths to solve abstract and real-world problems with flexibility
- building the pipeline of students who continue with maths beyond age 16 for advanced mathematical study.

5.5.4 Academy for Mathematical Sciences Response to Curriculum and Assessment Review in England

The Academy for Mathematical Sciences published a Response to the DfE's Curriculum and Assessment Review as part of the call for evidence. Key references are made to the need for a greater emphasis on spatial reasoning in the early years, data science and the use of technology. The report highlights the need for coding skills when engaging in further study in mathematics.

5.5.5 Early Childhood Maths Group submissions to the Department for Education

The Early Childhood Mathematics Group (ECMG) is a UK based group of early years mathematics enthusiasts and experts, who work together to promote early childhood mathematics. The ECMG is non-funded and retains independence of any organisation. The ECMG has offered submissions to the Department for Education in England in regards to Curriculum and Assessment Review and the Birth to Seven Mathematics curriculum review. Much of the content of these submissions is also applicable to Scotland, in particular the need to consider research into child development for curricular and pedagogical choices within Early Level, to include spatial reasoning and to emphasise mathematical thinking and problem solving.

5.5.6 The Office for Standards in Education, Children's Services and Skills (OFSTED): Research Review (2021)

In 2021, a research review was published which explores the literature relating to the field of maths education. Its purpose was to identify factors that can contribute to high-quality school

maths curriculums, assessment, pedagogy and systems. This review covers in detail curriculum sequencing and appropriate pedagogy. For example, it stresses the need for planning for transition between the use of appropriate concrete materials and pictorial approaches and developing an abstract understanding of mathematics. It also outlines the progression in and planned obsolescence of early mathematical methods, towards more sophisticated approaches.

This was followed by a subject report for Mathematics, identifying common strengths and weaknesses of mathematics in the schools inspected during 2021 and 2022. This includes reference to the importance of clarity and technical accuracy in written and spoken mathematical communication.

5.5.7 Estyn Thematic Report: Unlocking potential: Insights into improving teaching and leadership in mathematics education (2025)

In June 2025, Estyn published a thematic report focussing on the quality of teaching, learning and leadership in mathematics in schools across Wales.

5.5.8 Royal Meteorological Society (RMetS): Curriculum for Climate Literacy (2024)

In May 2025, the RMetS launched a framework to embed climate literacy across UK school curricula. It includes specific reference to elements which can be used to contextualise mathematical learning.

5.5.9 OCR: Striking the balance: A review of the 11-16 curriculum and assessment in England (2024)

OCR is an awarding body for A-levels, GCSEs and other qualifications. In 2024, they published a review of the assessment landscape in England. They make a number of recommendations on reducing curriculum overload generally and make specific reference to mathematics. They also recognise the growing importance of digital literacy and learning for sustainability.

5.5.10 The National Academies: Adding it up: Helping children learn mathematics (2001)

The findings from this report from the United States advocates for viewing mathematical proficiency as five interwoven and interdependent strands (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition). The five strands provide a framework for discussing the knowledge, skills and beliefs that constitute mathematical proficiency and remain relevant for a future mathematics curriculum.

6 Academic research

This section refers to and provides a commentary on several papers linked to points of consideration for the development of the mathematics curriculum in Scotland. These have been compiled by members of the Education Scotland Curriculum, Learning, Teaching and Assessment Team and the Scottish Government Education Reform Directorate using, amongst other sources, the educational research database EBSCO and the Scottish Government library support service. A range of significant and robust research papers from across the United Kingdom and other contexts are referenced where they provide insights to our context in Scotland. The research highlighted in this section is limited to five areas of particular interest for this CIC. This section does not provide an exhaustive list of the research available.

A rapid research review for mathematics has already been undertaken by the Education Scotland Data and Performance Research Team and this is published separately.

6.1 Mathematics in the Early Years

From a range of sources, key recommendations emerge for younger children recognising the importance of how they learn mathematics. These include the use of manipulatives and representations to develop understanding and building new understanding by making connections to what children already know. These key themes continue into later stages, with additional considerations such as teaching strategies for solving problems and developing a rich network of mathematical knowledge. This evidence has given rise the aim to be more explicit about the use of manipulatives, both concrete and abstract, within the mathematics curriculum, particularly at Early level but across all stages, and to make clearer the progression within Early level.

The Education Endowment Foundation synthesises much of the available research in their evidence review for Early Years and Key Stage 1 Mathematics, leading to their recommendations for Improving Mathematics in the Early Years and Key Stage 1.

The Erikson Institute Early Math Collaborative describes the research-based Big Ideas of Early Math which provides a useful framework for curriculum review at this level.

Other relevant papers include:

- A new mathematics pedagogy for the early years: in search of principles for practice: International Journal of Early Years Education: Vol 12, No 2
- (PDF) The roles of patterning and spatial skills in early mathematics development

6.2 Spatial Reasoning

A strong focus of recent research has been spatial reasoning. The importance of this area has been recognised by the CIC collaborative groups for Mathematics and for Numeracy. The Royal Society recommends that spatial reasoning 'deserves a greater focus in primary mathematics, as research suggests that it has an important role in developing mathematical thinking and understanding'.

This growing interest is reflected in studies and publications such as:

- The Value of Spatial Reasoning in the Curriculum | University of Surrey
- Spatial thinking as the missing piece in mathematics curricula | npj Science of Learning
- Improving CS Performance by Developing Spatial Skills | Glasgow University
- Spatial Visualization Supports Students' Math: Mechanisms for Spatial Transfer
- Effects of Spatial Training on Mathematics Performance: A Meta-analysis
- Cambridge Mathematics | Early development of spatial skills
- Practitioners' perspectives on spatial reasoning in educational practice from birth to 7 years | University of Roehampton

6.3 Financial Education

Although financial education is a cross curricular expectation, there is significant overlap with the mathematics curriculum. Work has been carried out in recent years to promote the importance of financial wellbeing across Scotland and to recognise its importance as an essential skill for life, learning and work and its role is cemented within the current CIC. Recent contributions to the field include:

- Literature Review: The impact of digital money on children and young people's financial education | Money and Pensions Service
- The importance of financial literacy and its impact on financial wellbeing | Journal of Financial Literacy and Wellbeing | Cambridge University Press
- Financial education in schools - House of Lords Library

6.4 Computational Thinking

The link between mathematical thinking and computational thinking is an important consideration when aiming to future proof the mathematics curriculum, and in linking the mathematics and technologies curricular areas.

Cambridge Mathematics have compiled two relevant summaries and associated implications of research in this area:

- Mathematical and computational thinking
- Computational thinking in the classroom

Other relevant publications include:

- Demystifying early childhood computational thinking: An umbrella review to upgrade the field, Yang (2024)
- A Framework for Computational Thinking Dispositions in Mathematics Education, Perez (2018)

6.5 Statistics

A range of research and reports recognise the need to update aspects of learning and teaching of statistics (exemplified in sections 5.5.1 and 5.5.2). Several publications explore this further:

- Royal Society discussion paper | A new approach to mathematics and data education
- American Statistical Association and The National Council of Teachers of Mathematics | Guidelines for Assessment and Instruction in Statistics Education (2020)
- Cambridge Mathematics | Teaching statistics using rich data sets
- Cambridge Mathematics | Teaching and learning early concepts of probability
- Cambridge Mathematics | Teaching statistics using exploratory data analysis
- Cambridge Mathematics | Introducing comparison between data sets

6.6 Further Sources of Relevant Research

There is a huge range of educational research available on mathematical learning. A number of curated sources of research have also informed the CIC process for mathematics. Some of these are linked to below.

The British Educational Research Association (BERA) has a special interest group on mathematics education, with an annual conference and range of blog posts of interest describing mathematics focussed doctoral research projects.

The British Society for Research into Learning Mathematics (BSRLM) is a national organisation for people interested in research in mathematics education. They hold regular conferences where researchers can share their findings. Summaries of the research presentations are available.

Cambridge Mathematics is an evidence-based organisation within the University of Cambridge, committed to enhancing curricula, refining assessments and enriching learning and teaching. Their Espresso series is a collection of filtered research on mathematics education.

The Observatory for Mathematical Education, based at the University of Nottingham, was established to generate and communicate evidence-driven and policy-relevant research to improve mathematics education, learner outcomes and longer-term benefits for individuals and society. Set up in 2023, it builds on the work of the Shell Centre for Mathematical Education.

The Education Endowment Foundation has published an evidence review on Mathematics at Key Stages 2 and 3 leading to their recommendations for Improving Mathematics in Key Stages 2 and 3.

7 Future trends

In 2024, the Royal Society of Edinburgh published Education and skills 2050: Future proofing Scotland. It recognises the need to develop a policy that articulates the demands of policy areas such as economic development and climate action with the education system across all sectors. It suggests Scotland needs a versatile curriculum that can be applied and reapplied to evolving contexts without becoming obsolete. Also mentioned is the importance of the application of knowledge and skills and an assessment and qualifications system that measures this capacity in addition to capturing the knowledge students have learned. The potential of responsible technology is described, including mention of how AI will alter the labour market. It encourages society to value all educational pathways and destinations, and to remove the false distinction between academic and vocational routes. It asks that the education system communicates more effectively with businesses and employers, to prepare learners for a broad range of tasks rather than specific occupations.

The OECD policy programme Future of Education and Skills 2030/2040 was launched in 2015 to support countries in adapting their education systems by considering the types of competences that students and teachers need to thrive in the future. It recognises that students need to develop not only knowledge and skills but also creativity, ingenuity, and the attitudes and values that can guide them towards ethical and responsible actions. The Learning Compass (see section 3.1.1) includes three transformative competencies they see as necessary to meet the challenges of the 21st century. These recognise the importance of creativity, the ability to reconcile tensions and dilemmas, and to take responsibility for one's own actions. It also describes the core foundations that provide a basis for developing student agency and these transformative competencies:

- cognitive foundations (literacy and numeracy)
- health foundations (physical health, mental health and well-being)
- social and emotional foundations (moral, ethical, digital literacy, data literacy).

Other useful elements of the programme are:

- Knowledge for 2030
- Skills for 2030
- Attitudes and Values for 2030

In 2025, the Scottish Government published Future Trends for Scotland: findings from the 2024-2025 horizon scanning project, synthesising sixty trends that could be important for Scotland in the future. These are organised across six overarching themes:

- Politics and Governance
- Economy
- Society and Communities
- Technology
- Natural Resources, Energy and Climate Change
- Health

Of particular interest in the development of mathematical literacy and financial capability are trends linked to:

- democracy, polarisation and misinformation

- living standards and income inequality
- labour market and skills
- poverty and wealth
- artificial intelligence and emerging technologies
- green technologies and life sciences
- cyber security
- climate change and just transition
- biodiversity and soils
- water and marine ecosystems
- food, agriculture, forestry, land and waste
- population health
- Infectious diseases

Scotland's curriculum must give learners the opportunities to develop the mathematical knowledge and skills they need to understand and engage with these trends as citizens, and to provide a choice of appropriate pathways which can lead to entry into related STEM careers.

8 Points to consider

The CIC for Mathematics is ongoing and thus far, has received positive feedback from the system, both from educators and stakeholders involved in the process directly, and those who have commented on the work already conducted.

The CIC process is part of the work being conducted to implement the recommendations from the NRIM Position Paper (see section 5.1.2) and will be a significant influence on a national strategy for numeracy and mathematics and a national professional learning programme.

The position of numeracy should evolve, noting that:

- knowledge and skills across **all** organisers are applicable in everyday contexts, especially those within early, first and second levels
- in secondary settings, much of the mathematics that is applied across other curricular areas is not currently classed as numeracy
- different curricular areas do not (and should not) contribute equally to the development of numeracy skills, and often, it is simple mathematics which is being applied in increasingly sophisticated ways
- there is inconsistency within and across settings in determining achievement of a level.

Learners need to make connections within mathematics and between mathematics and other areas of learning if they are going to be able to develop a deep mathematical understanding which can be applied in everyday life and in new or unfamiliar contexts.

The importance and value of the correct use of mathematical language should be reinforced with clearer expectations within the curriculum.

There are many recent reports and related recommendations on the embedding of financial education, spatial reasoning and data literacy within a modern curriculum. Elements of these within the mathematics curriculum should be developed in line with these recommendations.

The use of technology and computational thinking is increasing in the field of mathematical sciences. This presents a range of opportunities and challenges in the development of the mathematics curriculum.

With Scotland taking part in programmes for international comparison (PISA and TIMMS), the alignment between curriculum, classroom practice and international benchmarks will need to be examined.

Further research should be carried out on the impact of assessment and presentation practices, and to provide clearer guidance on recommended approaches going forward.

9 Declaration

The content of this document was written by the author, exercising full professional judgement. Education Scotland approved AI tools were used to support review, clarity, and quality assurance. Education Scotland staff retain full responsibility and have reviewed and approved all content.

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Version 1	25 November 2025	First published
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		Addition of Declaration on the use of AI.

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