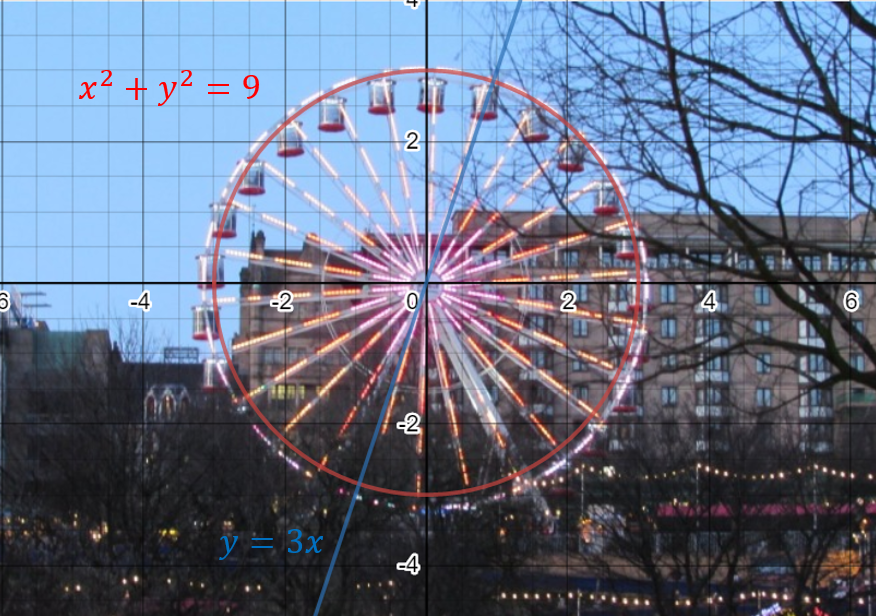
Edinburgh learns  
\_\_\_\_\_

Numeracy and Mathematics Strategy



**

Aims and Rationale

*Mathematics is important in our everyday life, allowing us to make sense of the world around us and to manage our lives. Using mathematics enables us to model real-life situations and make connections and informed predictions. It equips us with the skills we need to interpret and analyse information, simplify and solve problems, assess risk and make informed decisions.*(Curriculum for excellence: mathematics principles and practice)

Our vision is for all of Edinburgh’s children and young people to thrive and take their place as highly skilled workers in a world-class city (*Edinburgh Learns, 2018*). To achieve this, learners must develop excellent skills for learning, life and work, regardless of socio-economic barriers. It is a vision that is both ambitious and inclusive.

According to a report from Skills Development Scotland (2018), in the Edinburgh and South East Scotland area there are expected to be over 27,000 new job openings in science and technology over the next decade. We have a duty to make sure that our developing workforce are equipped to meet this demand, and to take advantage of these opportunities. Ensuring that we deliver the highest quality teaching and learning (and subsequent attainment) in numeracy and mathematics, is a fundamental part of this task.

This strategy is informed by the Validated Self Evaluation (2018/19) and draws on several of the *Edinburgh Learns* frameworks, as well as national documents, as shown in the diagram below.



This strategy sets out four key aims:

1. To improve attainment in numeracy and mathematics throughout the years of the Broad General Education (BGE) and Senior Phase.
2. To improve outcomes and reduce inequity in numeracy and mathematics development.
3. To increase confidence and fluency in mathematics for those who deliver mathematics education.
4. To improve the quality of learning, teaching and assessment in numeracy and mathematics.

We set out below the actions that will be taken by council officials and schools in order to deliver these key aims.

Mathematics VSE: key findings

**Strengths**

In schools with good practice, the following was commonly noted:

* Effective tracking and monitoring of pupil progress
* Effective planned interventions
* Effective feedback (teacher-learner and peer to peer)
* Effective consolidation of skills and content
* Effective use formative assessment
* Effective, progressive learning pathways
* Shared approaches to pedagogy and methods

**Areas for development**

The following areas for development were identified in the scoping paper, and confirmed by the VSE:

* A need for increased expectation
* A need for effective differentiation
* A need for increased pace and challenge
* Better moderation to ensure validity of assessment data
* Pathways that allow progression as well as breadth and depth
* A need to evaluate the impact of planned approaches and interventions
* More opportunities to use digital technology to display and interpret data within the topic of information handling

In addition, these areas were identified by the VSE:

* A need for effective questioning
* A need to revisit formative assessment strategies
* Concerns regarding transition from P7 to S1 and from S3 to S4 (the BGE to the Senior Phase)

**Feedback from staff**

As part of the VSE, surveys were conducted of primary teachers, secondary mathematics teachers and Curriculum Leaders with responsibility for Mathematics; a focus group with Pupil Support Assistants was also conducted.

Staff reported the following strengths in Local Authority support:

* Professional Learning
* Support materials on Office 365
* Provision of PSAs
* Numeracy Coordinators Meetings
* Support from the SEIC (conferences, professional reading)

The following additional support was commonly suggested:

* More informal support, e.g. via TeachMeets
* Digital/iPad professional learning
* Maths lessons for teachers
* Additional resources for teaching
* Time to observe colleagues in other schools/sectors
* On-line professional learning
* Transition – progression, conversations
* Opportunities for collegiate planning, professional dialogue

The surveys showed a very mixed picture in terms of the allocation of time per week to delivery of numeracy and mathematics content:

* Primary – allocations ranged from 4 to 8 hours, with an average of 5 hours.  
  Over half of primary staff reported teaching no numeracy/mathematics on Fridays.
* Secondary – again, there was a wide variety in terms of allocation. The average allocation within the BGE (S1 to S3) was around 3.5 hours, but some schools allocated fewer than 3 hours and other allocated over 4 hours.

Analysis of data from the international PISA programme shows that on average across OECD countries, learning time in regular mathematics lessons is positively correlated to student performance, even after accounting for various student and school characteristics, including socio-economic status (OECD, 2013). From the data, the optimum time allocation is between 4 and 6 hours per week.

**Expectations**

We would ask that schools work towards the following time allocations:

* Primary – a minimum of 5 hours of numeracy/mathematics per week (including delivery on Fridays); this can also be supplemented by revisiting content in other curricular areas as appropriate (e.g. STEM, IDL).
* Secondary – a minimum of 4 hours of numeracy/mathematics per week in the BGE

What does research tell us?

The *Making Maths Count* report identified the following:

Good learning and teaching should emphasise the connections between:

* different aspects of maths (for example, connections between topics such as shape, number and algebra)
* different representations of mathematics (for example, moving between symbols, words, diagrams, objects and graphs)
* learners’ methods (for example, encouraging learners to explain their thinking and promoting collaborative learning).

The general principles recommended were:

* a coherent approach to skills development and progression
* consistency in models, images and pedagogic vocabulary
* an emphasis on memorised facts to help learners develop a secure bank of memorised number facts to support them in making mental calculations and other aspects of maths
* “over-learning” – drawing repeatedly on fundamental concepts and key skills
* practising skills, strategies and methods to embed learning
* constant small interventions and differentiating learning with an emphasis on supporting pupils to achieve their best and ensuring that there are no gaps in learning.

Some schools using improvement science have achieved success in improving the quality of instruction (and attainment) by implementing Barak Rosenshine’s *Principles of Instruction* (2012), which draws on recent research from cognitive science:

* Daily review of material
* Present new material in small steps
* Ask questions
* Provide models
* Guide learner practice
* Check learner understanding
* Obtain a high success rate
* Provide scaffolds for difficult tasks
* Independent practice (overlearning)
* Weekly and monthly review of material

For a content-rich subject like mathematics, it is vital that we improve not just lesson planning (and delivery), but the planning of sequences of lessons.

Approaches to learning

***Concrete, Pictorial, Abstract***

At all school stages concrete, pictorial, abstract supports learner development of understanding in numeracy and mathematics. Concrete materials can be used to introduce new learning, by allowing students to explore using hands-on manipulatives and make sense of the problem, based on their prior learning. When ready, the learners can progress to create their own pictorial representations (based on what they learnt from concrete materials) to solve problems. The aim is that learners will be able to use their learning from concrete and pictorial phases to be able to represent and solve problems in an abstract way. This is not always a one-way progression and teachers and learners may move between these stages as appropriate. Learners may also be solving abstract problems in one area (e.g. addition) but using pictorial representations in another (e.g. fractions).

***Interleaving***

With interleaving, we switch between topics so that we are often re-visiting a topic rather than covering all the learning just once and never returning. It is important not to switch too often to encourage breadth and depth, but to use this strategy to link new learning to prior learning and to provide many opportunities to consolidate learning.

***Retrieval Practice and Spacing***

Retrieval practice is a strategy to rehearse already learned information by trying to retrieve it from memory: to locate the piece of information in your mind. It is based on what is known as “the testing effect”: the findings that future long-term memory performance is enhanced when content is practised by testing. Unfortunately, tests are often negatively associated with assessment and performance measurement. In retrieval practice tests are used as a tool for learning and to practise, rather than as a means to formally assess progress.

**Spacing** is a powerful strategy that boosts learning by spreading lessons and retrieval opportunities out over time, so learning is not crammed all at once. By returning to content every so often, **students’ knowledge has had time to rest** and be refreshed.

Increasing the spacing (timing) between retrieval practice opportunities over time improves the retention of learning.

Spaced retrieval with expanding intervals is believed to be so effective because with each expanded interval of retrieval it becomes more difficult to retrieve the information because of the time elapsed between test periods; this creates a deeper level of processing of the learned info in long term memory at each point. Another reason that the expanding retrieval model is believed to work so effectively is because the first test happens early on in the rehearsal process.

What does data tell us?

**Numeracy Attainment in the BGE**:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NUMERACY** | **2016-17** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** |
| **P1** | 86% | 86% | 87% |  | 85% | 87% | 88% |
| **P4** | 78% | 81% | 81% |  | 79% | 82% | 81% |
| **P7** | 76% | 78% | 81% |  | 78% | 81% | 82% |
| **P1, 4, 7 combined** | 80% | 82% | 83% |  | 80% | 83% | 84% |
| **S3 (3rd Level or better)** | 91% | 92% | 95% |  |  | 94% | 95% |
| **S3 (4th Level)** | 59% | 64% | 70% |  |  | 76% | 78% |

Analysis of CEC numeracy BGE attainment data shows that primary numeracy levels at both P1 and P7 increased in 2022-23, compared to session 2021-22 (with both years also higher than session 2020-21). There has been a slight decrease in P4 numeracy attainment between 2021-22 and 2022-23, but both years show an increase on 2020-21 results.

For secondary BGE attainment, there has been an increase in the percentage of learners achieving third level or better in 2022-23, compared to 2021-22. The percentage of learners achieving fourth level has also increased.

**Numeracy Attainment Gap in the BGE**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NUMERACY** | **2020/21** | **2021/22** | **2022/23** | **2022/23 Stretch Aim** |
| **P1,4,7 combined** | 24pp | 20pp | 19pp | 16pp |
| **S3 (3rd Level or better)** |  | 9pp | 7pp |  |
| **S3 (4th Level)** |  | 29pp | 33pp |  |

The numeracy attainment gap for learners at P1, 4, 7 (combined) is decreasing over time. In 2022/23 the gap was 3pp more than the stretch aim of 16pp. The attainment gap at third level is reducing (and is in single digits). However, the attainment gap for fourth level is larger and increased further between 2021/22 and 2022/23.

**Attainment In Numeracy (Primary):**

This graph shows that numeracy attainment in P1, P7 and combined (P1, P4, P7) increased from 2020-21 to 2022-23. In P4, there has been some improvement but that attainment dipped between 2021-22 and 2022-23.

**Attainment Gap in Numeracy (Primary):**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Numeracy | 2017-18 | | | 2018-19 | | | 2020-21 | | | 2021-22 | | | 2022-23 | | |
| Q1 | Q5 | Gap | Q1 | Q5 | Gap | Q1 | Q5 | Gap | Q1 | Q5 | Gap | Q1 | Q5 | Gap |
| P1 | 75% | 93% | 18pp | 77% | 95% | 18pp | 71% | 92% | 21pp | 73% | 95% | 22pp | 79% | 94% | 15pp |
| P4 | 65% | 90% | 25pp | 68% | 90% | 22pp | 62% | 89% | 27pp | 73% | 89% | 16pp | 67% | 90% | 23pp |
| P7 | 64% | 88% | 24pp | 67% | 90% | 23pp | 63% | 88% | 25pp | 67% | 90% | 23pp | 71% | 90% | 19pp |

The above data shows that the numeracy attainment gap between learners in Quintile 1 and those in Quintile 5 is currently at its lowest level for the last five years for P1 and P7. The numeracy attainment gap in P4 is more variable and increased between 2021-22 and 2022-23.

**Attainment in Numeracy (Secondary BGE):**

There is a general upward trend in attainment at third level (with a slight dip in 2021-22) and an upward trend in attainment at fourth level.

**Attainment Gap in Numeracy (Secondary):**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Numeracy** | **2021-22** | | | **2022-23** | | |
| **Q1** | **Q5** | **Gap** | **Q1** | **Q5** | **Gap** |
| **S3 (3rd Level or better)** | 88% | 97% | 9pp | 91% | 98% | 7pp |
| **S3 (4th Level)** | 59% | 88% | 29pp | 59% | 91% | 33pp |

The data shows that for third level the attainment gap between Q1 and Q5 is reducing. However, the attainment gap between Q1 and Q5 for fourth level increased between 2021-22 and 2022-23.

Current support and advice

Within the BGE the experiences and outcomes provide progression of learning, with benchmarks providing clarity on the national standard for achievement of a level.

[City of Edinburgh progression pathways](https://cityofedinburgheducation.sharepoint.com/sites/EdinburghLearns/Curriculum/Mathematics/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FEdinburghLearns%2FCurriculum%2FMathematics%2FShared%20Documents%2FBGE%2FNumeracy%20and%20Mathematics%20Progression%20Pathways%20%28updated%20pathways%20available%20for%20August%202024%29&viewid=f8275c12%2D32ba%2D427b%2Da8c8%2Dec6a4ba24920) and [SEAL Progressions](https://cityofedinburgheducation.sharepoint.com/:w:/r/sites/EdinburghLearns/Curriculum/Mathematics/Shared%20Documents/SEAL/Teacher%20Resources/Learning%20and%20Teaching%20Progressions/Learning%20and%20Teaching%20Progressions%20Sheets.doc?d=w9f0e7b536cbc4b4db113de5682e8a689&csf=1&web=1&e=ILgsvz) provide greater detail and support with planning progressive learning through the BGE.

[CEC Extended Early Level Numeracy and Mathematics Progressions](https://cityofedinburgheducation.sharepoint.com/:w:/r/sites/EdinburghLearns/Curriculum/Mathematics/Shared%20Documents/BGE/Progression%20Pathways%20(new%20pathways%20available%20for%20August%202024)/Extended%20Early%20Level%20Numeracy%20and%20Mathematics%20Progressions.docx?d=w08b9edb48bcd49d49b37b99b341ef9ba&csf=1&web=1&e=AAZABH) provide smaller stepped progressions through early level to inform planning of learning and teaching for learners with more complex additional support needs.

For early years, [City of Edinburgh Early Years Mathematics and Numeracy Guidance](https://cityofedinburgheducation.sharepoint.com/:f:/r/sites/EdinburghEarlyYears/Shared%20Documents/CEC%20Guidance/Maths%20%26%20Numeracy?csf=1&web=1&e=VbhgAy) supports children’s development and learning in the early years

Schools and establishments should use these documents as a basis to develop pathways which support children and young people to build on prior learning and meet the needs of all their learners. All teachers should use CEC progression pathways, and SEAL documentation where appropriate, to plan progressive learning, teaching and assessment in all aspects of numeracy and mathematics within the BGE.

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[SEAL Progressions](https://cityofedinburgheducation.sharepoint.com/:w:/r/sites/EdinburghLearns/Curriculum/Mathematics/Shared%20Documents/SEAL/Teacher%20Resources/Learning%20and%20Teaching%20Progressions/Learning%20and%20Teaching%20Progressions%20Sheets.doc?d=w9f0e7b536cbc4b4db113de5682e8a689&csf=1&web=1&e=ILgsvz) – emergent, perceptual (approx. early level); figurative, counting-on, facile (approx. first level).

[CEC Progression Pathways](https://cityofedinburgheducation.sharepoint.com/sites/EdinburghLearns/Curriculum/Mathematics/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FEdinburghLearns%2FCurriculum%2FMathematics%2FShared%20Documents%2FBGE%2FNumeracy%20and%20Mathematics%20Progression%20Pathways%20%28updated%20pathways%20available%20for%20August%202024%29&viewid=f8275c12%2D32ba%2D427b%2Da8c8%2Dec6a4ba24920) (early to fourth levels) for Numeracy and Mathematics – progressive statements for each outcome

A screenshot of a computer

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[CEC Extended Early Level Progression Pathways for Numeracy and Mathematics](https://cityofedinburgheducation.sharepoint.com/:w:/r/sites/EdinburghLearns/Curriculum/Mathematics/Shared%20Documents/BGE/Progression%20Pathways%20(new%20pathways%20available%20for%20August%202024)/Extended%20Early%20Level%20Numeracy%20and%20Mathematics%20Progressions.docx?d=w08b9edb48bcd49d49b37b99b341ef9ba&csf=1&web=1&e=AAZABH)

[CEC Early Years Mathematics and Numeracy Guidance](https://cityofedinburgheducation.sharepoint.com/sites/EdinburghEarlyYears/Shared%20Documents/Forms/AllItems.aspx?csf=1&web=1&e=VbhgAy&cid=46008524%2D83f9%2D483a%2Da856%2D7815692d70fc&FolderCTID=0x0120002D157053A9B7A3468C117BFA26997381&id=%2Fsites%2FEdinburghEarlyYears%2FShared%20Documents%2FCEC%20Guidance%2FMaths%20%26%20Numeracy) – suite of guidance to support the development of mathematics and numeracy learning in the early years.

Benchmarks support teacher judgement of achievement of a level and support planning for assessment.

For learners with complex additional support needs, planned learning should continue to be based on Curriculum for Excellence Experiences and Outcomes (see above). Teachers can access the [Education Scotland ‘Milestones to Support Learners with Complex Additional Support Needs’](https://education.gov.scot/resources/milestones-to-support-learners-with-complex-additional-support-needs-literacy-and-english/) to:

* support the tracking of progression for learners with complex additional support needs who are working at a Pre-Early Level
* promote consistency of language used in reporting progress.

A cover of a book

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Education Scotland milestones for Numeracy and Mathematics (pre-early level)

The Edinburgh Learns Teaching and Learning framework gives guidance to schools and establishments on high quality teaching and learning. The four key components are formative assessment for learning, differentiation, skills and leadership of learning. Schools or establishments which identify a need to improve in these areas should look at the teaching and learning framework and source relevant professional learning as appropriate.

***Roles, Remits, Responsibilities***

In order to meet our aims, the following actions will be undertaken:

***Senior Officers (Central Team, Edinburgh Learns Team, Chair of Learning Teaching Assessment Board):***

* Support and challenge schools to analyse attainment data and identify children requiring targeted support in numeracy and mathematics.
* Build the capacity of senior staff and teachers in schools in using tracking and monitoring tools.
* Support numeracy and mathematics moderation within and across sectors to improve teacher understanding of standards and ensure consistency teacher judgement of ACEL levels.
* Support Curriculum Leaders of Mathematics to develop evidence-based approaches to raising attainment.
* Share high quality learning identified through quality assurance processes (e.g. supported self-evaluation visits, HMIE Inspections).
* Provide professional learning for teachers in key aspects of numeracy and mathematics.
* Support schools to implement guidelines for supporting learners with numeracy difficulties and dyscalculia
* Provide professional learning for PSAs in key aspects of numeracy and mathematics.
* Promote the CEC numeracy and mathematics progression pathways (BGE) and online resources to support planning in this area.
* Provide professional learning for primary Numeracy Coordinators and support them to enhance practice in their own establishments
* Engage primary Numeracy Coordinators and secondary mathematics practitioners in joint professional learning activities to support depth and challenge in the teaching of mathematics.
* Support the development of high-quality learning, teaching and assessment materials for mathematics SQA National Qualifications.
* Support the development of materials to support additional qualifications in mathematics, including Applications of Mathematics National 5 and Higher; and Data Science NPAs.
* Support professional learning to update and enhance the professional practice of staff in relation to National Qualifications in mathematics.
* Promote the use of digital technologies in numeracy and mathematics to enhance children’s and young people’s skills and learning experiences.
* Develop online resources to support the teaching of numeracy and mathematics.
* Promote involvement in Maths Week Scotland and showcase innovative practice.

***Senior Leaders in schools:***

* Audit staff confidence in delivery of aspects numeracy and mathematics and agree PL/support.
* Audit deployment of PSAs to ensure effective use in the support of numeracy and mathematics.
* Audit and monitor time allocations to numeracy and mathematics to ensure suggested allocations are met.
* Ensure effective transition arrangements are in place for numeracy and mathematics.
* Effectively track the SCQF numeracy levels attained by learners to ensure school leavers attain the highest possible levels.
* Audit and review approaches to home learning in numeracy and mathematics to ensure equity of provision, and to ensure home learning is used appropriately. (National Action Plan on parental involvement, engagement, family learning and learning at home (2018-21).
* Support staff with the use of practitioner enquiry, including opportunities to collaborate with colleagues (including in other schools and sectors).
* Plan, lead and evaluate strategic improvement to raising attainment in numeracy and mathematics.

***Secondary Curriculum Leaders with responsibility for Numeracy and Mathematics:***

* Ensure that effective calendars, plans and learning progressions are in place for all year groups and levels.
* Ensure that progression for all learners is offered in the Senior Phase, with regard to the range of courses available.
* Support staff to work towards greater consistency in approaches to teaching and learning, with a particular focus on agreeing common mathematical methods and vocabulary.
* Ensure effective digital practice is embedded in the delivery of high-quality learning, teaching and assessment.

***Numeracy Co-ordinators:***

* Work with the Headteacher to produce, coordinate, and implement the school Numeracy Strategy which takes account of national and local policy guidance.
* Be informed by the overview of numeracy attainment tracking and progress for their school.
* Support class teachers in the implementation of best evidence-based practice in numeracy.
* Undertake professional learning provided by partner agencies and external organisations to be able to support others.
* Facilitate the sharing of positive evidence-based practice within the school and learning community.
* Consult with the Edinburgh Learns Digital Team to ensure best and current practice in the use of digital technologies.
* Maintain their own professional learning through involvement in local authority networks and learning community meetings.
* Promote the development of effective numeracy across learning through their own professional learning, supporting the training of staff and by being in class.

***Teachers/Educators:***

* Implement the school’s/establishment’s Numeracy Strategy
* Use Numeracy and Mathematics Experiences and Outcomes, along with CEC Numeracy and Mathematics Progression Pathways to plan learning in numeracy.
* Use the Benchmarks to assess learning.
* Plan an appropriate range of assessment activities that allow children and young people to demonstrate their learning.
* Ensure parents and carers are informed and knowledgeable of their child or young person’s numeracy progress and attainment.
* Make use of a wide range of learning environments and creative teaching approaches, including digital technologies.
* Ensure a numeracy rich environment for learning with a clear focus in Early Years on the use of the Early Years Mathematics and Numeracy Guidance and the Circle Document across all sectors.
* Gather appropriate evidence of learning to support professional judgement in numeracy, including breadth, challenge, and application.
* Attend relevant professional learning activities to develop current skills and understanding.
* Set appropriate home learning tasks in line with school policy on home learning.
* Make use of Numeracy Difficulties and Dyscalculia – Identifying and Meeting Needs (2023), to ensure the needs of all learners are being met.
* Support the development of numeracy through the effective use of digital technology to engage learners and further develop numeracy skills.
* Contribute positively to the development of a whole school numeracy culture, including the sharing and analysis of numeracy attainment across all stages and faculties.
* Use transition information on individual children’s numeracy development, to inform next steps in their numeracy learning.

Quality Assurance

***Quality Assurance at Local Authority Level:***

* The Quality Improvement Team will regularly review a range of performance data in numeracy, in order to identify improvements in attainment and to highlight and share good practice. This will include attainment predictions submitted annually by all schools in November and March, end of year attainment submitted to Scottish Government, national qualifications data.
* Scrutiny activity undertaken regularly by the Quality Improvement Team will include supported self-evaluation visits, follow through visits, coaching support in context with the headteacher and senior leadership team, attainment and tracking meetings and involvement in shared classroom experiences.

***Quality Assurance at school level:***

* All schools will have a Quality Assurance calendar in place at the start of each new academic session, which sets out all scrutiny activity for the year.
* Scrutiny activities will ensure the triangulation of evidence-based information and data, people’s views and direct observations of practice, and involve all school staff, learners, partners and other stakeholders, as referred to in the diagram below.
* Identified activities across all schools will include learner conversations, observations of practice and shared classroom experience visits, tracking and monitoring meetings of predictions/Curriculum for Excellence levels, tracking of numeracy interventions and planned assessment activities as part of the school’s corporate assessment policy

A diagram of quality and quality

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