Llywodraeth Cymru
Welsh Government

Number: WG55310

Welsh Government
Consultation

Mathematics and numeracy progression detail

Statutory guidance in relation to mathematics and numeracy progression in the Curriculum for Wales

Date of issue: 16 November 2026
Action required: Responses by 22 February 2027

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Relevant legislation

The Curriculum and Assessment (Wales) Act 2021 (the Act) established the Curriculum for Wales in law and replaced the basic curriculum (which included the national and local curricula set out in Part 7 of Education Act 2002). The Act makes provision about progression and assessment in connection with the curriculum for 3 to 16 year olds. It also has some limited effects on the curriculum for learners above compulsory school age at maintained schools. However, much of what currently applies to them is not affected by the Act and does not change.

This guidance is issued to support the design, adoption and implementation of curricula under section 71 of the Curriculum and Assessment (Wales) Act 2021. It supplements the requirements of the Act and should be read alongside the wider legislative framework.

It is statutory guidance to all those persons and bodies set out below. Those persons must have regard to this guidance when exercising functions under the Act. This means that those persons and bodies must take the guidance into account when making decisions about curriculum design and implementation and must have good reasons if they wish to depart from it.

This guidance is directed at:

- governing bodies of maintained schools including maintained nursery schools;
- head teachers at maintained schools including maintained nursery schools;
- local authorities in relation to pupil referral units (PRUs);
- teachers in charge of PRUs;
- a provider of funded non-maintained nursery education (i.e. private nurseries which are funded by the local authority under section 118 of the School Standards and Framework Act 1998 to provide nursery education to children below compulsory school age).

Although the statutory duties rest with the persons and bodies identified above, individual practitioners will wish to take note of this guidance in supporting the planning and delivery of learning and teaching.The guidance draws on practitioner expertise and evidence-informed practice. It is intended to support curriculum realisation while allowing appropriate flexibility for schools and PRUs to respond to their learners, communities and contexts.

Throughout this document, terminology is used consistently with the Curriculum and Assessment (Wales) Act 2021 and related statutory guidance. References to learners, practitioners, schools and PRUs should be understood within that legislative framework.

This guidance is not and does not purport to be a comprehensive statement of the law and so should not be taken to be advice as to what the law requires.

Use of language in this guidance

The language used in this guidance reflects its statutory and advisory functions.

- **Must** refers to a legal requirement set out in legislation.
- **Should** indicates a strong recommendation about the approaches most likely to support effective curriculum design and implementation.
- References to **practitioners** relate to those involved in planning and delivering learning and teaching. Where expectations relate to organisational responsibilities, these are placed on the relevant governing body, head teacher or local authority, rather than on individual practitioners directly.

As noted above the guidance is not legally directed to teachers, school support workers or school teaching assistants. In the context of maintained schools, for example, it is directed at head teachers and governing bodies as they are responsible under the Act to design and implement the curriculum for Wales. Those persons and bodies will need to put in place arrangements to ensure that practitioners in the school follow the guidance as they will implement the guidance in the classroom on a day to day basis. In order to make the guidance more accessible we frame the advice as to what practitioners should do. This is just a matter of style and the guidance is legally directed at those persons set out above and it is for them to ensure that they have regard to it and that it is reflected in the teaching practices in the setting.

Introduction

This guidance is intended to support practitioners in understanding, planning for and recognising mathematical development across the 3–16 continuum. They help practitioners understand the development of the learner as a mathematician and the development of mathematical understanding within the statements of what matters: Number, Algebra, Geometry and Statistics.

Descriptions of learning provide guidance on how learners should progress within each statement of what matters as they journey through the continuum of learning. These are arranged in five progression steps which provide reference points for the pace of that progression. These expectations are expressed from the learner's perspective and are framed broadly so that they can sustain learning over a series of years within the learning journey. They are not designed as stand-alone tasks, activities or assessment criteria. While the learning continuum is the same for each learner, the pace of progress through it may differ.

Curriculum provides the mathematical experiences for learning to take place and learner development is the change that these experiences support. Progression involves more than the introduction of additional content or carrying out increasingly difficult procedures. It should also mean that we can see the changing quality of learners' mathematical thinking: in the connections they make, the structure they notice, the representations they choose, the reasoning they develop, the decisions they take and the increasing independence and criticality with which they engage in mathematics.

Used alongside the Curriculum for Wales descriptions of learning and the progression steps playlists this guidance aims to support curriculum design, lesson and sequence planning, observation of learning, professional dialogue, learner monitoring and reporting. In each case their purpose is to strengthen professional judgement rather than replace it.

The guidance is intended to give practitioners clarity on what learners should learn and when. The guidance aims to provide a shared professional language for considering both what mathematics learners are entitled to experience and how their mathematical thinking is developing through those experiences.

We recognise the way in which the contents of this guidance have been formatted for consultation purposes may not be the best presentation of the material. When final guidance is published this will be designed for greater accessibility and an improved overall user experience.

Purpose and structure

In line with the Curriculum for Wales approach, this guidance recognises that the learning journey of individual learners is not linear or uniform. Learners develop at different rates, and the descriptions here are written to support professional judgement, provide clarity and to support a more consistent learning offer across Wales. Many learners may have some difficulty in learning at some point in their education and/or require a differentiated approach in some aspect of their learning. Taking a person-centred approach will help practitioners think about how best to use this guidance to support the learning journey of different learners. Learners with English and Welsh as additional languages who have come from other education systems may not have studied the same areas of mathematics and numeracy that are taught in Wales. There will also be challenges for these learners in terms of unfamiliar mathematical vocabulary.

This consultation focuses on the substance of the detail. We welcome views about how the final statutory guidance can be best presented. Practitioners should be prepared to read backwards and forwards across adjacent columns and across domains. The aim is not to locate a learner at a single point, but to understand their mathematical development in context and to consider what experiences may help them to develop further. The guidance is not intended to affect the content or requirements of current qualifications.

This additional progression detail can help practitioners:

- understand the learning experiences that support progression through the mathematics and numeracy area of learning and experience
- understand the typical development of learners as they progress on their mathematical learning journey
- understand when learners may need additional support or additional stretch and challenge

Each progression step is broken down in a table into aligned pre-school and school year groups. These tables describe what the learning experiences should include at this point in the learning journey and what learners should typically be able to do confidently and reliably as a result of these learning experiences.

The Number, Algebra, Geometry and Statistics sections describe learner development within the mathematics by progression step. Each progression step is broken down in a table into aligned pre-school and school year groups and include information set out as:

- **Learning experiences should include:** this describes curriculum and pedagogical entitlement: the mathematical contexts, problems, representations, interactions, variations, tools and opportunities learners should have access to. It is designed to give professionals direction about what to focus teaching and learning on.
- **Learners can confidently and reliably**: this describes recognisable learner development: mathematical behaviour that has become sufficiently established to be noticed across appropriate experiences and contexts

The recognisable learner development is intended to inform professionals' understanding of progress over time: what to expect as learners progress. It is not intended to be a checklist either to assess learners in lessons or as a level descriptors that must be met before learners can proceed to further learning.

A rich mathematical experience may contribute to several aspects of development, while a particular mathematical behaviour in a learner may emerge through many different experiences. Listing what is offered or taught is not the same as describing what is learnt.

There is evidence that learners' mathematics self-efficacy is strongly associated with learning behaviours and learner outcomes. As learners progress through the mathematics and numeracy area of learning it is important that practitioners think about how the learner is developing as a mathematician. This can help learners to develop the confidence they need to think of themselves as capable in mathematics and numeracy, which will in turn support them to develop and progress.

The pedagogical approach

Learners should experience mathematics as something to explore, represent, connect, conjecture about, test, explain, justify, refine and use. Procedural fluency matters, but it develops alongside conceptual understanding, communication using symbols, logical reasoning and strategic competence. These five proficiencies are interdependent; none is intended to stand alone nor are they intended to form a hierarchy. Particularly in the earliest stages, these mathematical experiences may arise through play, everyday routines, outdoor and indoor exploration, learner-initiated activity and responsive interaction with adults who notice and build upon the mathematics that is emerging.

Purposeful practice has an important place within this approach. Practice can build fluency whilst also drawing attention to structure, inviting comparison, making variation visible, exposing relationships and prompting learners to explain why methods work. The aim is not simply more repetition, but practice designed to deepen mathematical understanding.

As learners develop, they should increasingly have opportunities to make mathematical choices:

- to select and compare approaches, representations and tools
- to move between particular examples and more general relationships
- to attend to pattern, structure, change and invariance
- to consider more than one viewpoint
- increasingly use evidence, counterexample and deduction critically.

Error and uncertainty are part of this mathematical activity. An unsuccessful approach, unexpected result or counterexample can become a resource for checking assumptions, refining thinking and exposing mathematical structure.

Mathematical development should not and does not require uncertainty to be eliminated. Productive mathematical activity includes encountering the unfamiliar, tolerating ambiguity, exploring possibilities and being willing to revise an idea as understanding develops.

Reflection is an important quality to develop, through processes such as:

- trying again
- checking
- explaining revision
- using contradiction/counterexample
- critical evaluation.

Learning experiences are entitlements and invitations, not predictions of exactly what learners will notice, say or do; rich mathematical activity should leave room for unexpected approaches, questions and connections to emerge.

Early mathematical development may be visible in anticipation, preference, matching, discrimination, repeated action, spatial exploration, response to quantity, or purposeful use of objects, movement or gesture. Throughout it is important that the material is read keeping in mind how a learner with limited speech, motor access or recording capacity could still demonstrate the mathematical behaviour described here through an alternative representation or interaction.

Mathematical thinking may be made visible in many ways: through objects and manipulatives, pictures and diagrams, symbols, speech, writing, gesture, movement, digital representations or other accessible forms. Communication, sensory or physical barriers must not be interpreted as absence of mathematical capability. Written fluency, verbal fluency, rapid recall and speed may provide useful information in some contexts, but they should not become proxies for mathematical capability. The central concern is the mathematical quality of what a learner notices, understands, represents, reasons about and is able to do with increasing purpose and independence.

Support and challenge should not be understood as simply giving some learners easier content and others harder content. A common mathematical idea can offer different forms of access and different depths of development. Carefully chosen representations, questions, variations and opportunities for explanation or enquiry can enable learners to participate in the same mathematical community whilst developing from different starting points. A question to keep in mind is:

- what mathematics is the learner making sense of now and what experiences might open worthwhile possibilities for what comes next.

Numeracy means that learners must be given opportunities across the curriculum to be able to use numbers and solve problems in real-life situations. Numeracy is a cross-curricular skill .

Proposed arrangements for the implementation of final guidance

We intend to publish final guidance, post consultation, in late spring 2027. We understand that practitioners will need time to familiarise themselves with this guidance. We appreciate that the curriculum planning cycle for schools and settings will already be underway at the time of publication. We therefore propose that the guidance be implemented through curriculum design in schools and settings from the start of the academic year 2028-2029.

We will work with Adnodd and Dysgu to explore and understand the need for resources and professional learning to support the implementation of this guidance. The findings will directly inform the development and refinement of Dysgu's professional learning offer and Adnodd's commissioning plans.

Progression step 1

Introduction – the developing learner

High-quality, inclusive early childhood play, learning and care environments support children's learning and development from birth, help reduce inequalities in outcomes and provide enriching experiences that build strong foundations for learning. An understanding of these foundations will help practitioners to build on them through experiences and development that continue into Nursery and Reception.

Practitioners should also consider:

- Early childhood play, learning and care in Wales
- Curriculum and assessment arrangements for funded non-maintained nursery settings
- Enabling learning

Mathematics and numeracy are part of a learner's natural exploration of the world: they are willing to have a go, repeat actions and enjoy noticing when something is the same, different or changes.

Children are developing in early progression step 1 (pre-school) so that they explore by tinkering, visualizing, asking, guessing and trying possibilities, using trial and error without needing every attempt to succeed. Learners notice mathematical features in familiar objects, routines and play, describing, matching and comparing through talk, gesture, movement, objects, images or marks. They show mathematical thinking in accessible ways and begin to connect what they do, see and say, including through practical resources and simple digital representations where these add to the exploration. Conceptual understanding, communication, fluency, reasoning and strategic competence are beginning to grow together through doing, noticing and talking. Learners start to test possibilities, notice when something does not work and are willing to try again, beginning to see that changing an action can change a result. Some learners will arrive at school without having had the early learning experiences that provide the important foundations for further development in mathematics and numeracy. They will need time and support to build this foundational learning before their learning journey can progress further.

As learners move through the middle of progression step 1, practitioners should expect learning to develop so that they increasingly use mathematics intentionally, making simple choices about what to do and showing growing confidence in familiar mathematical situations. This includes increasingly using mathematics intentionally, making simple choices about what to do and showing growing confidence in familiar mathematical situations. Learners start to recognise simple relationships and recurring features, inventing or extending arrangements and beginning to explain what they notice. They can test ideas, visualise possibilities, guess, invent and begin to conjecture, comparing what they

expected with what actually happens. They communicate increasingly clearly through chosen objects, images, words, symbols, movement or age-appropriate digital forms and begin to use one representation to support another. The mathematical proficiencies become more intentional: emerging understanding supports action, communication and increasingly purposeful choices. Learners are able to test possibilities, notice when an approach is unhelpful and make another attempt, beginning to use checking and comparison to refine their thinking.

In late progression step 1, practitioners should look for development in learners that demonstrates emerging independence, persistence with familiar problems and to increasingly see themselves as someone who can make mathematical decisions. This includes noticing connections, breaking situations into manageable parts and using familiar relationships to make sense of what they encounter. Learners are able to choose what to try, visualise possibilities and test emerging conjectures, learning that a useful mathematical idea may need more than one attempt. Learners can be expected to explain and show thinking through a growing range of representations and begin to compare what different representations make visible. Their level of understanding should increasingly support secure choices and purposeful calculation, while the five proficiencies begin to interact more visibly. Learners should start to reconsider approaches, check what happened against what was expected and use the result to decide what to do next.

What can practitioners do to support that change?

The Mathematics and Numeracy Area of Learning and Experience: Progression step 1 playlists - Resources offer practitioners, supporting learners to develop at progression step 1, advice on:

- the 5 mathematical proficiencies
- granular detail of the descriptions of learning
- key vocabulary
- questions for mathematical thinking
- teaching notes
- considerations for lesson planning

Progression step 1 - Number

The number system is used to represent and compare relationships between numbers and quantities.

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learning experiences should include:	• exploring and playing with quantities and numbers in varied indoor, outdoor and age-appropriate digital environments • number songs, rhymes and stories that develop familiarity with counting and number patterns • using everyday objects and other manipulatives to create, arrange, combine, separate and compare small collections • perceptual subitising of small quantities, initially to around five, including seeing the same quantity in different arrangements • encountering cardinal, ordinal and nominal	• perceptual and emerging conceptual subitising, counting games, sorting and movement-based number activities • counting forwards and backwards within 10 and from different starting points, using songs, games, objects and number-rich contexts • matching numerals to quantities and finding, recognising and using numbers in meaningful everyday situations • using manipulatives such as counters, frames and other structured or everyday objects to represent, compare,	• experiences involving cardinal, ordinal and nominal numbers, number charts, number lines and multisensory numeral formation, including appropriate digital tools • counting forwards and backwards from different starting points, counting objects in varied settings and solving simple problems through counting • comparing and estimating quantities using conceptual subitising, everyday contexts and mathematical language such as more than, less than and equal to • • forming, combining and changing quantities in different ways, including predicting what will happen

	numbers in meaningful everyday contexts • multisensory exploration of numbers and quantities through objects, movement, touch, images, gesture, talk and other accessible representations • counting and comparing small collections in different arrangements, testing whether moving or spreading objects changes how many there are and developing one-to-one correspondence • estimating, guessing and comparing quantities in familiar situations, with opportunities to check ideas by counting or rearranging • practical experiences of sharing, grouping and recognising equal and unequal parts of objects and collections	combine and separate quantities • multisensory and age-appropriate digital experiences of representing and forming numerals, alongside concrete and pictorial representations • comparing, ordering and estimating quantities in practical contexts, including opportunities to predict and then check • generating and comparing different ways of making the same small total, including finding one more and one less and testing whether changing an arrangement changes the quantity • combining and separating quantities through practical problems, stories and play, with opportunities to describe and explain what changes	when objects are added or taken away • grouping and sharing objects in different ways, including fair and unfair sharing and exploring the relationship between doubling and halving • using objects, drawings and other manipulatives to explain how groups can be formed, split and recombined while the total is considered • opportunities to make guesses, predictions and comparisons, then check and explain them using counting, objects or other representations • practical money experiences that compare coin values, including cases where physical size and value conflict, and involve buying items, receiving change and making simple spending choices

	• exploring doubles and halves of small quantities through matching, pairing, sharing and making two equal groups with objects, images and other representations • using coins, counters and other tokens in play and familiar real-life contexts to explore money as exchange, including matching, sorting and comparing coins by visible features	• sharing, grouping, doubling and halving small quantities using objects and other representations, including exploring halves, wholes and other emerging fraction language • using coins and pre-money tokens in play and familiar transactions, including naming coins, comparing prices and considering whether there is enough money to buy an item	

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learners are confidently and reliably:	• recognising small quantities without counting through perceptual subitising • recognising and using numbers in familiar everyday contexts, including numbers that tell how many, show position or act as labels • counting forwards from 1 to 10 in familiar contexts and joining in with familiar backwards counting sequences • counting small collections using one-to-one correspondence and recognise that rearranging objects does not change how many there are • comparing familiar quantities and collections, using everyday mathematical language to describe more, fewer and the same	• subitising familiar small quantities and begin to use known groupings to recognise or compare quantities • counting forwards and backwards within 10, maintaining the number sequence and counting collections reliably • matching numerals to corresponding quantities and recognising and using numbers in familiar everyday contexts • comparing quantities using language such as more than, less than and equal to, explaining or showing how they know • estimating small quantities and check estimates by counting, matching, subitising or using an appropriate representation	• recognising, talking about and using cardinal, ordinal and nominal numbers, and write numerals from 0 to 10 with growing confidence. • counting forwards and backwards from different starting points, count sets beyond 10 reliably and spot and correct counting errors. • comparing objects, numbers and quantities using more than, less than and equal to, and explain simple comparisons. • estimating quantities, compare estimates with actual amounts and use conceptual subitising to support comparison. • predicting and describing how a quantity changes when objects are added or

	• creating and tinkering with small sets of objects, trying different ways of making, combining or separating quantities • making sensible guesses about small quantities and checking them by counting, matching or rearranging • describing what happens to a quantity when objects are added, taken away, grouped or shared • representing and communicating number ideas using objects, images, movement, talk, digital representations or other accessible modes • able to double small quantities of objects by making two equal groups and halve small quantities by sharing them into two equal groups • recognising that money is used in exchange for goods or services and use coins,	• finding one more and one less for quantities up to 10 and describing how adding to or taking away changes a set • inventing and representing different ways of making a total by combining or separating small groups • using manipulatives, images and age-appropriate digital representations to show and communicate number relationships • able to share small quantities into equal groups, halve quantities practically and begin to connect doubling with making two equal groups • recognising and naming familiar coins, use coins or tokens in simple buying situations and compare prices or amounts to decide whether there is enough	taken away, finding totals by counting and beginning to count on from a known quantity where appropriate. • able to group and share small quantities equally, recognise fair and unfair sharing and explain or correct a sharing arrangement. • recognising and using the relationship between doubling and halving in practical grouping and sharing situations. • using and beginning to select objects, drawings, talk or other appropriate representations to show and explain number ideas and relationships. • recognising that coins have different values, use money in simple transactions and understand that change

	counters or tokens meaningfully in familiar role-play situations		may be received when more money is given than is needed.

Progression step 1 - Algebra

Algebra uses symbols and systems to express the structure of mathematical relationships.

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learning experiences should include:	• noticing repeating patterns in colours, shapes, sounds, movements and familiar routines • copying and matching simple patterns using objects, actions, sounds, pictures and other accessible representations • describing what is noticed in a pattern using simple words, gestures, movement or visual representations • creating simple repeating patterns by arranging and rearranging everyday objects and manipulatives • sorting objects by visible or tangible attributes such as size, colour or type and	• continuing repeating patterns by identifying what comes next and exploring missing elements • creating repeating patterns with two or more elements using objects, sounds, movements, images and other representations • opportunities to predict, describe and explain why a pattern repeats, including tinkering with a pattern to see what changes and what stays the same • using manipulatives and age-appropriate digital tools to make, extend and	• identifying repeating patterns in the environment and exploring how they repeat or change • copying, extending and completing repeating patterns using objects, colours, sounds, actions and other accessible representations • opportunities to predict missing parts of a pattern, create their own patterns and begin to explain the rule that makes a pattern work • using words, simple symbols, manipulatives and age-appropriate digital representations to describe,

	comparing the resulting groups • lining up or matching objects one-to-one to explore whether two collections contain the same amount • practical sharing and grouping situations that invite learners to notice when amounts are the same or different and whether a sharing arrangement is fair • age-appropriate digital pattern experiences where these extend opportunities to copy, continue or create patterns rather than replace physical exploration	communicate patterns in different ways • comparing groups of objects using the language of same, equal, more and less • adjusting collections by adding, removing or rearranging objects to explore equality and inequality • matching and rearranging collections to explore the idea that a change in arrangement does not necessarily change the total • fair-sharing and grouping situations that invite learners to explain how they know two amounts are or are not equal	make and communicate patterns • using objects, pictures and one-to-one matching to explore when two groups are equal or not equal • creating equal and unequal sets and comparing them by counting, matching or rearranging objects • fair-sharing and grouping situations that require learners to compare amounts and explain why two groups are or are not equal

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learners are confidently and reliably:	• recognising and copying simple repeating patterns in familiar contexts • able to describe a simple pattern using words, actions, sounds, objects or pictures • matching objects or pictures that follow the same simple pattern • able to create a simple repeating pattern using familiar materials • sorting objects into groups using a noticeable characteristic and describe a simple reason for the grouping • able to compare two small collections and recognise when one has more, fewer or the same amount	• able to continue a repeating pattern and predict what comes next or what is missing • able to create a repeating pattern with two or more elements and describe its repeating structure • able to explain a simple prediction about a pattern using words, actions, objects or another appropriate representation • using different materials or age-appropriate digital representations to make and communicate a pattern • recognising when two groups contain the same number and when they do not • using language such as same, equal, more and less when comparing collections	• able to identify and extend familiar repeating patterns and describe what repeats or changes • able to predict and complete a missing part of a simple repeating pattern • able to create a repeating pattern and begin to explain the rule using words, objects, actions or simple symbols • using objects or pictures to show when two groups are equal and when they are not equal • able to explain why two sets are equal or not equal by counting, matching or comparing them • able to create equal and unequal sets using counters, blocks, pictures or other appropriate representations

	• able to match objects one-to-one to check whether two groups contain the same number • able to recognise in practical situations when sharing gives each person the same amount and when it does not	• able to adjust a collection to make it equal to another and explain or show what was changed • able to recognise that rearranging the objects in a collection does not change how many there are	• using ideas of equality in simple sharing and grouping situations, explaining or showing when a sharing arrangement is fair

Progression step 1 - Geometry

Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world.

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learning experiences should include:	• using everyday events and routines to explore before and after and to notice significant moments that organise the day • comparing length directly and measuring informally with familiar repeated objects, attending to placing units without gaps • comparing how heavy objects feel and exploring balance scales and repeated non-standard units to investigate mass • comparing how much containers hold by filling, emptying and using cups, spoons or other repeated non-standard units	• using time to organise familiar routines and talking about events as past, present and future • estimating and measuring length with consistent non-standard units, alongside early use of rulers or tapes in centimetres and metres • estimating and measuring mass with non-standard units and balance scales, with purposeful encounters with grams and kilograms • estimating and measuring capacity with repeated non-standard units,	• using familiar routines and practical activities to estimate and compare how long everyday events take, and discussing how time can be measured • comparing, estimating and measuring length, mass and capacity with consistent non-standard units, while giving particular attention to capacity through filling, emptying and repeated units such as cups or scoops • exploring the transition from informal measurement towards

	• estimating before measuring and using comparative language such as longer/shorter, heavier/lighter, full/empty and more/less exploring 2-D and 3-D shapes through play, noticing similarities and differences, sorting and positioning shapes, and building with familiar objects • exploring movement and direction through practical activity, following simple instructions and using positional language • using mirrors, folding, construction materials and other manipulatives where they help learners notice spatial and measurement relationships	alongside measuring jugs or cylinders and early encounters with millilitres and litres • choosing between familiar measuring tools and discussing why a suitable starting point and consistent unit matter • identifying, naming and describing basic 2-D and 3-D shapes in varied orientations and contexts, including shape patterns and constructions • describing positions more precisely, placing and arranging objects to instructions, and following or giving simple directions • exploring reflective symmetry with mirrors, folding and real-world objects, and using practical or digital representations where these add mathematical value	suitable standard tools and units, discussing why consistent units, no gaps and sensible starting points matter • handling, building with and comparing 2-D and 3-D shapes, distinguishing flat shapes from objects that occupy space and beginning to identify and describe familiar 3-D shapes • finding 2-D and 3-D shapes in varied orientations and real-world contexts, using construction materials and other manipulatives to test what different shapes can do • describing position and movement with increasingly precise spatial language and following or giving simple directions in familiar spaces • using simple maps, paths, models, pictures and

			movement to represent routes and relative positions • exploring reflective symmetry in shapes and real-world objects through mirrors, folding, matching and other practical representations • opportunities to visualise and predict before building, moving or rearranging objects, then compare the result with the prediction and explain what has changed and what has stayed the same

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learners are confidently and reliably:	• using before and after to describe the order of familiar events and recognise significant moments as markers within the day • able to compare two lengths and describe one as longer or shorter, recognising that an object's length is unchanged when it is moved • able to compare objects as heavier or lighter and use a balance scale with non-standard units to investigate mass • able to compare containers by capacity and use full, empty, more than and less than appropriately in practical contexts • using repeated informal units to make and discuss simple measurements of length, mass and capacity,	• using past, present and future language to organise familiar events and routines • able to compare, estimate and measure length using repeated non-standard units and begin to use centimetres and metres with an appropriate tool • able to compare and estimate mass and use a balance or scale to investigate which objects are heavier or lighter • able to compare, estimate and measure liquid capacity using suitable practical measuring equipment • able to explain in simple terms why measurement depends on using a consistent unit and an appropriate starting point • able to identify and describe familiar 2-D and	• able to estimate and compare the duration of familiar activities and talk about how their duration might be checked or measured • able to compare and measure length, mass and capacity with repeated non-standard units, using appropriate comparative language and showing particular security with practical capacity measures • able to choose a suitable familiar measuring tool or repeated unit and attend to consistent units, gaps and starting points • able to distinguish between familiar 2-D and 3-D shapes and identify, name or describe common examples in everyday contexts

	with emerging attention to consistency • able to notice, sort and describe familiar shapes and use them purposefully in play and construction • able to move and position themselves or objects in response to simple directional and positional instructions • show emerging spatial reasoning by copying movements, arrangements or simple patterns and talking about what they notice	3-D shapes, recognise them in the environment and use relevant mathematical language • able to describe relative position and follow or give simple multi-step directions using increasingly precise positional language • able to recognise reflective symmetry in familiar objects and shapes and test ideas using mirrors or folding	• using 3-D shapes purposefully when building and begin to explain why particular shapes are suitable • able to describe where an object or person is relative to another and follow or give simple positional and directional instructions • able to follow a simple route or path and use words, movement, objects or pictures to communicate position and direction • able to recognise reflective symmetry in familiar shapes or objects and test it using mirrors, folding or matching • using practical representations and spatial language to explain simple observations about shape, measure, position or symmetry

Progression step 1 - Statistics

Statistics represent data, probability models chance, and both support informed inferences and decisions.

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learning experiences should include:	• noticing and talking about information in the immediate environment, such as colours, shapes, sizes and everyday preferences • sorting and matching familiar objects in different ways, comparing groupings and discussing simple reasons why an item does or does not belong • asking or responding to simple questions that can be answered by observing or counting • helping to collect simple information and representing findings with objects, drawings, marks or other concrete records	• collecting simple data by observing or asking questions, trying more than one way of grouping familiar information and comparing what each grouping shows • sorting the same set in more than one way and explaining choices using everyday causal language such as because • organising findings with tally marks, drawings, simple tables or concrete graphs • creating simple charts or pictograms with support and comparing groups within them	• posing simple questions and deciding what information needs to be collected through observation, counting or surveys • grouping objects, pictures or numbers by clear rules, generating examples that do and do not satisfy a rule and noticing when an item can belong to more than one group • recording findings using tally marks, simple tables, pictograms or block graphs • comparing categories using more, fewer, most, least and same and discussing simple patterns or trends

	• talking about what simple pictures, object graphs or displays show, including which groups have more or fewer	• opportunities to notice patterns, ask what a display shows and hear different interpretations of the same information	• using talk, objects and pictures to explain how data was grouped and what a display shows

Progression step 1	Indicative planning reference: Early PS1	Indicative planning reference: Middle PS1/nursery class	Indicative planning reference: Late PS1/reception class
Learners are confidently and reliably:	• able to notice and describe simple categories of information in familiar contexts • able to sort or match objects by one obvious characteristic and give a simple reason for the grouping • able to answer simple questions by observing, counting or comparing • able to contribute to recording information using objects, drawings or simple marks • using words such as more, fewer, same, most or least when talking about simple information	• able to collect simple information through observation or questions and organise it into familiar categories • able to sort the same objects in more than one way and explain the chosen rule in simple terms • using simple tallies, drawings, tables or object graphs to record findings • able to identify the most, least or equal groups in a simple display • talking about a simple chart or pictogram and describe something noticed in the data	• able to ask or respond to a simple data question and help decide what information is needed • able to group items by a clear rule and explain the rule, recognising that some items can belong to more than one group • recording simple data using tallies, tables or charts • able to compare categories and identify most, least or equal frequencies • able to describe a simple pattern or finding shown by collected data

Progression step 2

Introduction – the developing learner

In early progression step 2 practitioners should expect learners to think more deliberately, be able to choose among familiar approaches and to extend ideas beyond the immediate example. They should be able to use connections to make sense of new situations and begin to recognise that the same mathematical relationship can appear in different forms. We can expect learners to compare approaches, ask what happens if something changes and reflect on the results, extending patterns or methods when this is useful. They should be able to move between familiar representations and describe what each show, using increasingly purposeful mathematical language and symbols. Conceptual understanding and fluency become more closely coordinated, with reasoning and strategic competence beginning to shape how familiar mathematics is approached. Learners should be able to check results against expectations, reconsider methods and revise an approach when a different representation or calculation gives stronger evidence.

In middle progression step 2 of the learning journey, practitioners should expect learners to work increasingly independently, explaining choices and using familiar algorithms with understanding rather than as isolated routines. They should be able to recognise pattern and structure and begin to use these deliberately to organise, calculate and make sense of mathematics. Learners should plan, test, check and revise, looking for examples and exceptions and beginning to distinguish a convincing pattern from a claim that needs further evidence. They can select representations purposefully and they begin to explain why a particular object, diagram, symbol or digital form helps. Reasoning and strategic choice join increasingly fluent work, with the five proficiencies supporting one another more consistently. Learners should be checking methods as well as answers and they begin to use errors, unexpected results and alternative examples to improve their reasoning.

By late progression step 2, practitioners should expect learners to demonstrate how they organise thinking and adapt familiar approaches, showing increasing independence when a problem is not immediately routine. They make purposeful connections and begin to abstract from examples, noticing when a relationship may extend beyond the cases already considered. Learners should be able to investigate, predict and conjecture, refining ideas in response to evidence and using purposeful calculation to test what they think. They can combine representations and use increasingly precise mathematical language to explain and justify thinking. The five proficiencies interact more often as learners coordinate understanding, fluency, reasoning, communication and strategy within the same activity. Learners should be able to refine ideas in response to evidence, explain what changed and increasingly regard error as information that can improve a mathematical argument.

What can practitioners do to support that change?

The Mathematics and Numeracy Area of Learning and Experience: Progression step 2 playlists - Resources offer practitioners, supporting learners to develop at progression step 2, advice on:

- the 5 mathematical proficiencies
- granular detail of the descriptions of learning
- key vocabulary
- questions for mathematical thinking
- teaching notes
- considerations for lesson planning

Progression step 2 - Number

The number system is used to represent and compare relationships between numbers and quantities.

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learning experiences should include:	• counting, recognising, writing and ordering numbers beyond 10, including grouping objects into tens and matching numerals with number words • estimating quantities and positions on blank number lines, comparing numbers and using place value to reason about number order • counting forwards and backwards from different starting points within 100, including grouping and counting in 2s, 5s and 10s and noticing odd/even patterns	• representing, comparing and partitioning numbers up to 100 in different ways, testing claims about digit value using number lines, hundred squares, place-value charts and manipulatives • rounding and estimation in meaningful contexts, including rounding to the nearest 10, beginning to round to 100 and checking whether answers are reasonable • counting in steps of 2, 3, 5 and 10 beyond 100, exploring doubling and halving patterns and counting with simple fractions such as halves and quarters	• counting forwards and backwards in varied step sizes, extending and explaining regular number sequences and using simple fractions in counting • representing and comparing unit fractions using fraction walls, number lines, diagrams and manipulatives, with attention to part–whole relationships. • comparing and ordering numbers through place value, estimating positions on blank number lines and rounding in meaningful contexts

	• practical fraction experiences comparing examples and non-examples of equal parts, sharing, unit fractions and different representations of the same whole, with emerging fraction notation • addition and subtraction through real-life objects, part-whole models, number bonds and simple number sentences, including exploring the commutative nature of addition • multiplication and division through equal groups, doubles, repeated addition, sharing and grouping, using objects, drawings and appropriate mathematical language • using manipulatives and visual representations to tinker with number relationships, make predictions and explain patterns or different ways of forming a quantity	• fraction experiences that connect shapes and quantities, numerator and denominator, comparison of fractions and positioning fractions on number lines • addition and subtraction using pictures, number lines, tens frames, bead strings, part-whole models and place-value manipulatives, including regrouping and inverse relationships • multiplication and division through repeated addition, arrays, skip counting, sharing and grouping, including links between the two operations • using manipulatives and visual representations to explore, test and explain number patterns, equivalence and operation relationships	• addition and subtraction with increasingly large whole numbers using place-value manipulatives, bar models, mental strategies and informal or formal written methods • multiplication and division through known and derived facts, arrays, grouping, sharing, inverse relationships and multiplicative comparisons such as twice or half as many, including interpreting remainders in context • opportunities to estimate before calculating, use inverse operations and related facts to check results, and explain why an answer is reasonable • using manipulatives, drawings and age-appropriate digital representations to explore number relationships, test conjectures and compare strategies

	• practical money experiences involving recognising, comparing and ordering coins and notes, grouping coins and matching equivalent values • opportunities to explain, compare and justify different representations and approaches when solving number problems	• practical money experiences involving combining coins to make amounts up to £1, exchanging equivalent values and finding different ways to make the same total • opportunities to predict, check and explain solutions, including using inverse relationships and alternative representations	• practical money problems involving combining amounts, comparing values and making or checking simple transactions •

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learners are confidently and reliably:	• able to count, recognise and write numbers beyond 10, order numbers to at least 20 and use grouping in tens to begin to explain place value • able to estimate quantities and positions on number lines, compare numbers and use place value to explain which numbers are greater or less • able to count forwards and backwards from different starting points within 100 and recognise patterns when counting in 2s, 5s and 10s • able to describe and represent unit fractions in everyday contexts, recognise equal and unequal parts and use emerging fraction notation and language	• able to count, read, write and order numbers up to 100, partition two-digit numbers into tens and ones and explain how digit position affects value • able to round numbers to the nearest 10 and use estimation to check whether an answer makes sense • counting forwards and backwards in different step sizes, recognise doubling and halving patterns and use halves and quarters in counting activities • able to represent and compare simple fractions of shapes and quantities, explain the roles of numerator and denominator and place fractions on a number line	• able to extend and explain regular number sequences, count in different step sizes and identify odd and even numbers within sequences • able to represent, compare and order unit fractions using fraction walls, number lines and visual models, explaining their relationship to the whole • able to compare and order numbers using place value, estimate positions on number lines and round numbers to the nearest 100 • able to add and subtract whole numbers using appropriate mental and written strategies, explaining how place value supports the method

	• able to combine and separate sets using number bonds and part-whole relationships, increasingly counting on or back rather than recounting all, and represent the relationships with objects, pictures or symbols • able to recognise doubles as two equal groups, use repeated addition for equal groups and solve simple sharing and grouping problems • using manipulatives, drawings and other representations to describe number relationships, notice patterns and explain how an answer was found • able to recognise and compare common coins and notes, group coins of the same value and match different coins that represent equivalent values	• adding and subtracting using number bonds, counting on/back and place-value understanding, deriving less familiar facts from known facts and selecting from visual, mental and emerging written methods • able to represent multiplication using repeated addition and arrays, use skip counting to find totals and solve simple multiplication problems • able to represent division through sharing and grouping, explain its relationship with multiplication and use that inverse relationship to check or solve missing-number problems • using manipulatives and representations strategically to expose number relationships, test ideas and explain patterns or equivalence	• able to use known multiplication and division facts, doubling, halving and inverse relationships to derive unfamiliar facts and solve problems, representing division as sharing or grouping • able to interpret simple remainders in context and use multiplication and division as inverse operations to check or solve problems • able to estimate outcomes before calculating, recognise unreasonable answers and refine calculations using inverse or closely related facts. • able to select from manipulatives, diagrams, number lines and digital representations to show number relationships and explain a chosen approach

	• able to explain mathematical thinking using appropriate number language and compare more than one way of representing or solving a problem	• able to combine and exchange coins to make amounts up to £1, use different combinations to make the same value and carry out simple role-play transactions	

Progression step 2 - Algebra

Algebra uses symbols and systems to express the structure of mathematical relationships.

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learning experiences should include:	• identifying, copying and continuing repeating patterns in objects, colours and movements, including completing missing parts • sorting and arranging objects by shared attributes to create and compare repeating patterns • describing repeating structure using increasingly precise words, actions, objects, pictures or simple symbols • using objects and pictures to compare sets, with opportunities to explain equality and inequality using same, equal, more than and less than	• extending repeating patterns by identifying and following the rule and exploring simple growing patterns in numbers and shapes • using number patterns to count forwards and backwards and noticing how a sequence changes from one term to the next • sorting and grouping objects in different ways to create and compare patterns such as ABBA or ABC structures	• identifying, describing and creating repeating and growing patterns in numbers and shapes, with opportunities to state and test the rule being followed • exploring numerical sequences including odd, even and step-based patterns, and predicting subsequent or missing terms • using patterns and sequences to solve simple mathematical problems and explain how one term changes to the next

	• matching, rearranging and comparing groups to test whether equality is preserved when appearances change, including discussing examples that look different but contain the same amount • comparing two sets and beginning to represent equality through matching, pictures and simple number relationships • opportunities to notice that different arrangements or expressions can represent the same amount, laying foundations for equivalence • using manipulatives and age-appropriate digital pattern tools to test predictions, alter patterns and communicate what has been noticed	• comparing small numbers and real-life quantities, including fair-sharing contexts, and using = and ≠ to explore equality as a relationship between two sides rather than as a signal that “the answer comes next” • finding missing numbers in simple addition sequences by using patterns, number bonds and addition/subtraction fact families • opportunities to invent, test and explain rules for simple numerical or visual patterns, including checking a prediction against further terms • using manipulatives, diagrams and age-appropriate digital representations to expose pattern structure and support explanation	• constructing and comparing true and false statements using =, > and <, including differently arranged number sentences, and explaining what each symbol says about the relationship between the two sides • exploring commutativity in multiplication by rearranging groups, arrays or other representations, comparing equivalent number sentences and contrasting these with examples where changing order does change the result • finding missing numbers in arithmetic sequences and multiplication or division problems by drawing on known multiplication facts and fact families • using objects, arrays, diagrams and other manipulatives to compare expressions, test equality and make number relationships visible

		• problems in which learners move between a concrete or pictorial relationship and a simple number sentence containing a missing value	• opportunities to explain why two differently written number sentences can describe the same mathematical situation

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learners are confidently and reliably:	• able to identify, copy, continue and complete simple repeating patterns and describe their repeating structure • able to sort objects by a chosen attribute and use the sorting to create or explain a pattern • using words, objects, pictures or simple symbols to communicate how a pattern is organised • able to use objects to show when two sets have the same amount and when they do not • able to explain equality or inequality by counting, comparing or matching groups • using language such as same, equal, more than and less than accurately when comparing sets	• able to extend a repeating pattern by identifying and following its rule and recognise simple growing patterns • able to use familiar number patterns to count forwards and backwards and explain how a simple sequence changes • able to create and compare patterns with different repeating structures and describe the rule used • able to compare small numbers and quantities and begin to use = and ≠ appropriately when representing whether values are equal or not equal • able to find missing numbers in simple addition and subtraction sequences using number bonds and related facts	• able to identify, describe, extend and create repeating and growing patterns in numbers and shapes and explain the rule used • able to recognise odd, even and step-based numerical patterns and predict or find missing terms. • able to use a simple pattern or sequence to solve a problem and explain how the sequence changes • using =, > and < appropriately in number sentences and able to explain what each comparison means • recognising that changing the order of factors does not change a product and using this to identify equivalent multiplication statements

	• recognising that rearranging a set does not change its total and use this idea when judging equality • able to compare two representations of the same quantity and explain or show why they are equivalent	• able to explain how a missing number can be found using an addition/subtraction fact family or another known number relationship • able to predict a later or missing term in a simple pattern and test the prediction by continuing the sequence • using objects, diagrams or digital representations to show a pattern or missing-number relationship and able to explain the reasoning	• using known multiplication and division facts to find missing numbers and able to explain the related fact family • able to compare two number sentences or expressions and decide whether they are equivalent, using objects, diagrams or known facts to justify the decision • able to communicate algebraic thinking through words, number sentences, diagrams and manipulatives, choosing a representation that makes the relationship clear

Progression step 2 - Geometry

Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world.

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learning experiences should include:	• sequencing days, months and seasons and using calendars, timelines, timetables and schedules to represent the passing of time • exploring analogue clocks by identifying their main parts, telling o'clock times and connecting clock movement with the measurement of time • estimating and measuring length with non-standard units before developing purposeful use of rulers and tapes in centimetres and metres, including attention to starting from zero • generating, sorting and comparing examples and non-examples of 2-D and	• telling time to the nearest five minutes on analogue and digital clocks, connecting minute movement with the circular structure of the clock face and using simple timetables or schedules • estimating and measuring mass with non-standard units and balance scales before developing purposeful use of grams and kilograms and choosing an appropriate unit for the object • sorting and constructing 2-D and 3-D shapes under different property	• telling time to the nearest minute and solving simple start, finish and duration problems using timetables, schedules and calendars • comparing, estimating and measuring capacity/volume, moving from non-standard units to millilitres and litres and reading measuring jugs or cylinders • drawing, making and combining 2-D and 3-D shapes, generating examples that satisfy given properties and comparing classifications when shapes are shown in unfamiliar orientations • comparing and classifying shapes by their lines of

	3-D shapes, distinguishing representations from actual objects and discussing defining features such as polygons, prisms and nested classifications • using shapes in different orientations and contexts so that classification depends on properties rather than appearance alone. • exploring reflective symmetry as a property of shapes and images through mirrors, folding and matching, including comparing examples and near-misses and explaining why a proposed line is or is not a line of symmetry • using left, right, above, below, forwards and backwards to describe positions and follow or construct simple routes on grids or maps • exploring full, half, quarter and three-quarter turns	constraints, distinguishing regular and irregular polygons and exploring which polygons can be joined or folded to form particular 3-D shapes • investigating lines of symmetry in 2-D shapes, including vertical and horizontal symmetry, and completing or creating symmetrical images on grids • using a wider range of positional language, including in front of, behind, on and under, and combining terms to describe locations precisely • following, describing and constructing multi-step routes on maps or grids using linear movement together with turns • using clockwise and anticlockwise and the size of a turn to describe or plan rotations, comparing	symmetry and exploring symmetry in design, art and the environment • identifying, drawing and describing horizontal, vertical, parallel and perpendicular lines in shapes and everyday contexts • exploring right angles as quarter turns, generating and comparing examples in varied orientations, and deciding whether other angles are smaller than, equal to or greater than a right angle with reasons • using construction materials, mirrors, grids and appropriate digital tools to visualise, test and explain shape, symmetry and angle relationships

	through physical movement, shapes and compass directions • using manipulatives, drawings and age-appropriate digital representations to visualise, test and communicate ideas about measurement, shape, symmetry, position and turn	alternative instruction sequences and checking whether they produce the same final position or orientation • exploring relationships between shape, symmetry, position and movement by building, drawing, folding, rotating and rearranging representations • opportunities to make spatial predictions, test them with manipulatives or appropriate digital tools, and explain what the representation shows	

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learners are confidently and reliably:	• able to sequence and name familiar units and cycles of time and use simple calendars, timelines or schedules to locate or organise events • able to identify the main parts of an analogue clock and represent and read o'clock times in words, numbers or on a clock face • able to estimate and measure lengths using suitable informal units and begin to use centimetres and metres accurately with a ruler or tape • able to recognise, name and describe familiar 2-D and 3-D shapes and explain in simple terms what makes a shape two- or three-dimensional	• able to read and represent analogue and digital times to the nearest five minutes and use simple timetable or schedule information • able to estimate, compare and measure mass, selecting grams or kilograms appropriately in familiar contexts and using a balance or scale accurately • able to describe and sort 2-D and 3-D shapes by relevant properties, distinguish regular from irregular polygons and connect some 2-D shapes with the 3-D forms they can make • able to identify and draw vertical or horizontal lines of symmetry and complete a simple symmetrical figure	• able to tell time to the nearest minute and calculate straightforward durations, start times or finish times within a day • able to estimate and measure liquid capacity in millilitres and litres and read scales on suitable measuring equipment • able to draw, make and describe familiar 2-D and 3-D shapes and begin to classify them using relevant properties. • able to classify simple shapes by the number of lines of symmetry and explain a symmetry observation • able to identify and draw horizontal, vertical, parallel and perpendicular lines in familiar contexts

	• able to classify familiar shapes using noticeable properties and recognise examples when their size or orientation changes • able to recognise and test reflective symmetry in familiar shapes, images and real-world objects • using positional and directional language accurately enough to describe or follow a simple route • able to recognise and describe full, half, quarter and three-quarter turns and connect these with physical movement or compass directions • able to select from objects, drawings, movement, models or simple digital representations to show and explain a spatial or measurement idea	• using a wider range of positional language accurately and able to combine terms to describe where something is • able to follow, describe and create multi-step routes on a simple map or grid using movement and turning instructions • able to use clockwise and anticlockwise with full, half, quarter or three-quarter turns to describe and predict rotations • able to compare spatial representations and explain how shape, orientation, symmetry or position has changed or remained invariant • using physical, pictorial or digital representations to test a spatial prediction and communicate the resulting reasoning	• able to identify right angles, relate them to quarter turns and order or compare angles by reference to a right angle • using practical, pictorial or digital representations to test and communicate a geometrical idea

Progression step 2 - Statistics

Statistics represent data, probability models chance, and both support informed inferences and decisions.

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learning experiences should include:	• deciding questions that can be answered with data and collecting information by observation, counting or asking • sorting a data set by a chosen characteristic and comparing alternative ways of grouping the same set • using tally marks and tables to organise counts and creating block graphs with provided scales and labelled axes • creating and interpreting pictograms, comparing correct and misleading examples and discussing why the value represented by each symbol must be used consistently	• organising data in tables, pictograms or block diagrams and comparing more than one data set • sorting according to two characteristics, imposing different criteria and using simple diagrams or tables to test where items can, cannot or may belong • using tally charts to collect data systematically and converting tallies into block or simple bar charts • reading and interpreting pictograms and block charts and posing or answering questions about them • comparing two displays and explaining similarities, differences or simple trends	• planning a simple data investigation by posing a question, comparing possible collection methods, collecting and representing the data, then using the results to answer the question and reflect on the method • using Venn and Carroll diagrams to classify data by two or more characteristics and explaining overlapping categories • recording frequencies in tally charts and frequency tables and constructing bar charts using provided scales and labelled axes, including diagnosing displays where labels, scales or bar heights do not match the data

	• describing simple patterns and most/least common categories using evidence from learner-collected data		• comparing data presented in tables, bar charts, pictograms and block graphs and describing trends or patterns. • using evidence from collected data to draw basic conclusions and beginning to evaluate how well the collection or representation method worked

Progression step 2	Indicative planning reference: Early PS2/Year 1	Indicative planning reference: Middle PS2/Year 2	Indicative planning reference: Late PS2/Year 3
Learners are confidently and reliably:	• able to identify a simple question that can be answered by collecting data • able to sort data by one characteristic and explain the grouping rule • able to use tallies and simple tables to organise collected values • able construct a block graph with a supplied scale and labelled axes and interpret a simple pictogram • able to describe a simple pattern or category comparison using data as evidence	• able to organise data clearly and compare two sets using words, numbers or simple charts • able to sort items using two criteria and recognise when an item belongs to more than one group • able to collect data using tallies and represent frequencies in a block or simple bar chart • able to interpret pictograms and block charts and identify most/least common categories • able to compare simple data displays and explain a pattern or difference	• able to plan and carry out a simple data collection that addresses a stated question • able to use Venn or Carroll diagrams to classify data by more than one criterion and justify placements • able to record frequencies in tally charts and tables and construct a bar chart using an appropriate supplied scale • able to interpret and compare simple data displays and describe trends or patterns • able to draw a basic conclusion from data, cite evidence and suggest a simple improvement to the method

Progression step 3

Introduction – the developing learner

In early progression step 3 practitioners should expect learners to be able to explain and compare ideas using increasingly precise mathematical language and choose representations that make important relationships visible. They act purposefully, beginning to select tools and representations rather than simply using those provided. Learners deliberately notice pattern, structure and proportional relationships, using abstraction to connect examples and make sense of unfamiliar features. They conjecture from patterns and test whether claims continue to hold, using examples and counterexamples to strengthen or revise an idea. The mathematical proficiencies are visibly interconnected as learners solve, explain and extend, with strategic competence increasingly influencing how they proceed. Learners test claims, use counterexamples and revise them, beginning to distinguish between evidence that suggests a relationship and reasoning that establishes it.

In middle progression step 3 of the learning journey, practitioners should expect learners to make mathematical decisions, compare possible approaches and increasingly judge which representation or strategy is informative or efficient. They seek connections across representations, attending to change and invariance and moving among mathematical languages to expose relationships. Learners investigate systematically, varying conditions and noticing what changes and what remains invariant rather than testing cases at random. They use representations to deepen understanding, explaining how physical, visual, symbolic or digital forms express related mathematical ideas. Learners draw on an increasingly coordinated repertoire of proficiencies, selecting among approaches and making their reasoning more explicit. They respond to contradictory evidence by investigating why it occurred, refining methods or conjectures rather than treating an unexpected result as merely a mistake.

By late progression step 3, practitioners should expect learners to approach unfamiliarity with growing independence and resourcefulness, selecting and adapting tools, representations and strategies. They transfer structure across contexts, attend to systems, change and invariance and move increasingly confidently between mathematical languages. Learners sustain enquiry, moving between experiment, representation and emerging generalisation and recognising when a useful pattern may express a broader relationship. They coordinate physical, visual, symbolic and digital representations and explain how moving between them can reveal different aspects of the same mathematics. The proficiencies form an increasingly integrated repertoire that supports transfer, generalisation and strategic choice. Learners use contradiction or anomalous results to redirect an enquiry, checking assumptions and representations rather than merely correcting an answer.

What can practitioners do to support that change?

The Mathematics and Numeracy Area of Learning and Experience: Progression step 3 playlists - Resources offers practitioners, supporting learners to develop at progression step 3, advice on:

- the 5 mathematical proficiencies
- granular detail of the descriptions of learning
- key vocabulary
- questions for mathematical thinking
- teaching notes
- considerations for lesson planning

Progression step 3 - Number

The number system is used to represent and compare relationships between numbers and quantities.

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learning experiences should include:	• exploring fractions beyond unit fractions, including comparing fractions, finding equivalent fractions and connecting sharing with division • using place-value representations and number lines to compare and order numbers, round to 10 and 100, and investigate tenths as fractions and decimals • addition and subtraction problems that require selecting among mental, informal and formal written strategies and checking with inverse operations	• representing, comparing and ordering fractions greater than one, mixed numbers and improper fractions using concrete, pictorial and number-line representations • exploring equivalent fractions through multiplicative relationships, including converting between mixed numbers and improper fractions • connecting tenths and hundredths with decimal notation and place value, including comparing and rounding decimal quantities.	• connecting fractions, decimals and percentages as different representations of the same value, using number lines, diagrams, fraction walls and place-value representations • comparing and ordering positive and negative numbers, decimals and fractions, including using negative values in meaningful real-life contexts • exploring equivalent fractions through multiplication and division and using fraction equivalence in increasingly complex calculations and problems

	• multiplication and division problems using known facts, partitioning and place value, including multiplying or dividing by 10 and 100 and interpreting remainders • generating examples and non-examples of equivalent fractions using fraction walls, manipulatives and diagrams, making conjectures and explaining why fractions can be equal in value without looking the same • estimating and approximating before calculation, comparing methods and using errors or unexpected results to reconsider an approach	• addition and subtraction of whole numbers and decimals through mental and written strategies, including checking through estimation and inverse reasoning • comparing efficient multiplication and division strategies and testing claims about multiplying or dividing by 10, 100 and 1,000, using place value to explain how digit values change • multi-step problems involving the four operations, with opportunities to compare strategies and begin to consider order of operations • using manipulatives such as fraction models and place-value resources, alongside digital tools, to expose structure, test equivalence and move between representations	• calculation with whole numbers and decimals using the four operations, including efficient mental and written strategies, order of operations and the properties of operations • estimation, rounding and approximation used deliberately before and after calculation to predict outcomes, judge reasonableness and diagnose errors • problems that require learners to compare representations, test claims that invite whole-number misconceptions in decimal or fraction contexts, identify useful structure and explain why one approach is more effective • purposeful use of calculators and other digital tools to investigate patterns, test conjectures, check complex calculations and interpret numerical outputs critically

		• financial and other real-life contexts that require decimal calculation, estimation, comparison and interpretation	• using manipulatives and visual models, including fraction and place-value resources, where they continue to illuminate structure rather than being abandoned simply because the mathematics is more advanced

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learners are confidently and reliably:	• able to compare and order fractions and identify simple equivalent fractions, using diagrams, fraction walls or number lines to justify comparisons • able to connect fractions with sharing and division and use fraction equivalence to solve simple problems • able to compare and order numbers using place value and round whole numbers to the nearest 10 and 100, explaining the reasoning • able to add and subtract whole numbers accurately using a range of mental and written strategies and select an approach appropriate to the numbers involved	• able to represent, compare and order proper and improper fractions and mixed numbers, and convert between mixed and improper forms using models and division • able to find and explain equivalent fractions using multiplicative relationships and use them to compare or solve problems • able to read, compare and round decimal quantities using place-value understanding and connect tenths and hundredths with fractional representations • able to add and subtract whole numbers and decimals accurately using efficient mental and written strategies, checking through estimation and inverse operations	• able to compare and order integers, decimals and fractions, including negative values, and position them accurately on number lines using appropriate benchmarks • able to recognise and explain connections among common fractions, decimals and percentages and move between representations where appropriate • using equivalent fractions and multiplicative relationships to compare fractions and support calculation or problem solving • able to add, subtract, multiply and divide whole numbers and decimals efficiently, selecting appropriate mental or written strategies and applying place-value understanding

	• using multiplication and division facts and place-value understanding to calculate mentally and with written methods, including multiplying and dividing by powers of 10 in familiar cases • able to interpret remainders appropriately and use inverse operations, estimation and related facts to verify calculations • able to explain and justify calculation strategies using mathematical language, representations and reasoning • using manipulatives and digital tools purposefully to test number relationships or check results, while interpreting rather than merely accepting the output	• able to multiply and divide whole numbers using appropriate mental and written methods and use place value to multiply or divide by 10, 100 and 1,000 • able to interpret division as grouping or sharing, explain remainders and use multiplication and division interchangeably to verify calculations • able to solve multi-step number problems, begin to apply the order of operations and explain why a chosen strategy is efficient • able to select and connect manipulatives, diagrams, written methods and digital tools to reveal number structure, test conjectures and communicate reasoning	• able to apply the associative, distributive and commutative properties and an emerging understanding of order of operations to simplify or organise calculations • able to estimate, round and approximate strategically, using inverse operations and related facts to verify results and identify when an answer is unreasonable • solving multi-step number problems, explaining and justifying methods and adapting an approach when evidence or an error suggests that they should • able to select among manipulatives, visual models, written representations and digital tools according to mathematical purpose, explaining how the representation or tool supports the reasoning

Progression step 3 - Algebra

Algebra uses symbols and systems to express the structure of mathematical relationships.

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learning experiences should include:	• recognising, extending and creating more complex repeating and growing patterns in numbers and shapes, including symmetrical and tessellating patterns • following a given rule to extend numerical sequences and predicting or describing missing elements • comparing differently ordered expressions to decide when commutativity preserves value and when reordering does not, using examples and non-examples to explain the distinction • using commutativity to rewrite number sentences	• demonstrating, describing and explaining rules behind number and shape patterns and investigating how sequences change • representing simple sequence rules using words and emerging mathematical notation, including making sequential and more global observations from tables • using repeated operations such as doubling or halving to predict subsequent terms and test whether a proposed rule continues to hold • exploring associativity by regrouping numbers, using	• describing and explaining numerical patterns using objects, diagrams, words and simple notation, including repeating, growing and symmetrical patterns • creating and exploring patterns with a range of materials and representations, then predicting, testing and refining rules for how they develop • exploring distributivity through diagrams and decompositions, comparing correct and incorrect expansions and explaining why the distributive structure preserves equivalence • comparing expressions using equality and

	in ways that support efficient calculation • finding missing numbers in addition, subtraction, multiplication and division statements using number bonds, known facts and inverse operations • comparing possible inverse-operation steps when finding or checking a missing value, including explaining why a chosen inverse is valid and identifying a step that would not preserve the relationship • recognising that a symbol or letter can stand for an unknown value and beginning to match verbal descriptions with simple algebraic representations • using materials, drawings and other representations to test conjectures about patterns, equality and missing values	brackets and comparing examples and non-examples to decide when regrouping preserves value and why • using function machines to explore input, rule and output, including explaining how an input is transformed • generating and sorting examples and non-examples of expressions, equations and formulae, using the equals sign and equivalence to explain the distinctions • forming equations or expressions from words or problem situations, using objects, symbols or letters to stand for unknown values • using substitution in simple expressions and real-life problems, supported where useful by tables, diagrams or other representations	inequality signs and explaining why two forms do or do not represent the same value • using inverse operations to find missing inputs or rules in function machines and applying two-step rules systematically • using function machines and other representations to model and solve simple real-life investigations involving input, rule and output • solving simple algebraic problems by representing unknowns, applying inverse operations and connecting equations with real-world situations • opportunities to compare proposed solutions or transformations, identify where an inconsistency or misconception has entered the reasoning, and refine the method accordingly

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learners are confidently and reliably:	• able to recognise and extend more complex repeating and growing patterns and describe the rule that generates them • able to predict and determine missing elements in numerical, symmetrical or tessellating patterns • able to explain that addition and multiplication are commutative and use this property to recognise equivalent expressions • able to rewrite a simple calculation using commutativity when doing so makes the structure or calculation clearer • able to find missing numbers in all four operations using known facts and inverse relationships	• able to describe, continue and find missing terms in a range of numerical and visual sequences, explaining the rule involved • using words, tables and simple notation to communicate how a sequence changes and making predictions beyond the immediately visible terms • able to use repeated operations to predict later terms and check whether a proposed sequence rule is consistent • recognising that regrouping does not change the total or product in appropriate calculations and using brackets to show different groupings	• able to describe and explain numerical and visual patterns using words and simple notation and predict how a pattern will continue • able to create a pattern from a stated rule, test it across several terms and refine the rule if the evidence does not fit • able to use distributive reasoning to decompose multiplication calculations and recognise equivalent expressions produced by the decomposition • able to compare expressions using equality or inequality and justify the comparison using structure, calculation or an appropriate representation • using inverse operations to find missing inputs or rules in one- and two-step function machines

	• able to use an inverse operation to check a result and explain why the check is valid • recognising that a letter or symbol may represent an unknown value in a number relationship and able to interpret simple examples • using objects, diagrams or symbols to test and explain whether two expressions or relationships are equivalent	• able to explain how a function machine transforms an input using a rule and determine straightforward outputs • able to distinguish an expression, equation and formula in familiar examples and explain the role of the equals sign where it occurs • able to represent a simple problem using an expression or equation containing an unknown symbol or letter • able to substitute a value into a simple expression or test whether a value satisfies a simple equation and interpret the result in context	• able to apply a function-machine rule systematically to generate outputs and explain the relationship between input, rule and output • able to represent a simple problem with an equation containing an unknown and use inverse operations to find and check the unknown value • able to explain how an equation represents a real situation and assess whether a calculated solution makes sense in that context

Progression step 3 - Geometry

Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world.

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learning experiences should include:	• estimating, comparing and calculating time intervals using a broad range of time units, calendars and timetables • estimating and measuring length, mass, capacity and temperature accurately, selecting suitable metric units and including positive and negative temperatures • classifying triangles by their properties, generating examples and non-examples under given constraints, and using accurate notation for equal sides and angles in varied orientations • finding all lines of symmetry in regular and non-regular polygons	• reading analogue and digital times to the nearest minute, using am/pm and moving flexibly between numerical and spoken forms • converting between metric units of length, choosing appropriate units and discussing commonly used imperial measures • classifying quadrilaterals by properties, generating examples that satisfy more than one classification and explaining nested relationships rather than relying on appearance • reflecting shapes in horizontal, vertical and diagonal mirror lines, including coordinate-grid reflections	• converting fluently among analogue, 12-hour and 24-hour time formats, including Roman-numeral clock faces • converting between metric units of mass and capacity, selecting appropriate units and recognising commonly used imperial measures • classifying regular and irregular polygons, recognising similar and congruent shapes and identifying radius, diameter, centre and circumference of a circle

	• describing and classifying 3-D shapes using faces, edges and vertices and distinguishing flat and curved surfaces • developing area as the number of square units covering a 2-D region, comparing different coverings and arrangements and explaining why gaps, overlaps or changed unit size affect the measure before moving to repeated addition or multiplication • opportunities to estimate first, measure or calculate, then compare the result with the estimate and explain any discrepancy	• identifying 3-D shapes from properties, interpreting simple isometric drawings and exploring how surfaces unfold into nets • deriving and using area formulae for rectangles and squares and finding areas of composite rectangular shapes, including simple fractional or decimal dimensions • using drawings, models and digital representations to construct and compare alternative transformations, including incorrect or incomplete examples, and explain which properties are invariant and why	• investigating rotational symmetry and its relationship with reflective symmetry by generating and comparing shapes with specified symmetry constraints and explaining what is possible or impossible • deriving and using the volume formula for cubes and cuboids, estimating volumes, finding missing dimensions and connecting solids with their nets • comparing different partitions and rearrangements to derive areas of triangles, parallelograms and other rectilinear shapes, explaining why the resulting formulae remain valid rather than memorising disconnected rules • using manipulatives or dynamic geometry where they expose the structure behind area, volume, congruence, similarity or symmetry

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learners are confidently and reliably:	• able to select appropriate time units, convert among familiar units and solve simple duration, start-time and finish-time problems • able to estimate and measure length, mass, capacity and temperature using appropriate metric units and interpret temperatures above and below zero • able to classify and describe common triangles using defining properties and appropriate geometrical notation • able to identify all lines of symmetry in familiar regular and irregular polygons • able to describe and classify common 3-D shapes by faces, edges, vertices and curved surfaces	• reading and expressing time to the nearest minute using analogue, digital, spoken and am/pm forms • able to convert among metric units of length and choose units suited to the context • able to classify common quadrilaterals and justify classifications using their properties rather than appearance • able to reflect shapes accurately in horizontal, vertical and diagonal mirror lines, including on coordinate grids • able to identify and compare 3-D shapes, interpret simple isometric drawings and connect solids with their 2-D surfaces or nets	• able to convert accurately among analogue, 12-hour and 24-hour time representations • able to convert among metric units of mass and capacity and choose suitable units for a context • able to classify polygons using properties, distinguish similarity from congruence in familiar cases and name key parts of a circle • able to identify orders of rotational symmetry and compare rotational with reflective symmetry • able to calculate volumes of cubes and cuboids, find missing dimensions in accessible cases and use correct cubic units

	• able to find areas by counting square units and use repeated addition or multiplication to make the process more efficient • checking geometrical or measurement results against estimates and explaining whether an answer is reasonable	• able to calculate the area of rectangles, squares and simple composite rectangular shapes and convert appropriate area units • able to use representations to explain what changes and what remains invariant in a reflection or geometrical construction	• able to derive and use area relationships for triangles, parallelograms and rectilinear composite shapes by partitioning or rearranging • able to select a practical or digital representation that reveals geometrical structure and explain why it is useful

Progression step 3 - Statistics

Statistics represent data, probability models chance, and both support informed inferences and decisions.

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learning experiences should include:	• choosing relevant data for a question and collecting it using surveys, observations or measurements • using Carroll, Venn and two-way tables to organise or extract information with increasing independence • recording data independently in tallies and frequency tables and constructing bar graphs with provided scales • comparing pictograms, bar graphs and simple line graphs, explaining increases, decreases and category comparisons and checking whether the representation supports a proposed statement	• comparing candidate data sets and deciding which evidence is relevant to a question before drawing a justified conclusion • choosing among pictograms, bar graphs and simple line graphs according to the type of information and using appropriate axes and scales • comparing graphs of the same or similar data drawn with different scales, explaining how scale can change visual impression without changing the underlying data • exploring line graphs as representations of change over time and pie charts as representations of simple fractional proportions	• identifying questions that can be answered with data and choosing suitable collection methods such as observations, surveys or measurements • creating and selecting among tally charts, frequency tables, bar graphs and line graphs, including purposeful use of software • interpreting bar graphs, frequency tables and simple pie charts across different scales and explaining proportions using fractions or percentages • using the mean to find totals or missing values and evaluating when mean, median or mode may better describe a data set

	• exploring chance through certain, likely, unlikely and impossible events, generating examples and non-examples and comparing predictions with observed outcomes	• developing the mean through equal sharing, varying individual values while holding or changing the mean, and comparing the mean with what seems typical when anomalies are present • representing simple probabilities numerically with familiar fractions such as 0, 1/4, 1/2 and 1 and comparing likelihoods	• conducting simple probability experiments, predicting and recording results, comparing expected with observed outcomes and discussing why short runs need not match expectation exactly • completing short investigative cycles in which learners ask a question, collect data, compare representations or measures, draw a conclusion and refine the method or display in the light of what it reveals

Progression step 3	Indicative planning reference: Early PS3/Year 4	Indicative planning reference: Middle PS3/Year 5	Indicative planning reference: Late PS3/Year 6
Learners are confidently and reliably:	• able to choose data relevant to a question and explain why it is needed • able to extract or organise information using Carroll, Venn and simple two-way tables • able to record frequencies independently and construct or interpret straightforward bar graphs • reading simple line graphs and describing changes or comparisons using data as evidence • using probability language such as certain, likely, unlikely and impossible to compare simple events	• able to select relevant data and draw a simple conclusion supported by evidence • able to choose a suitable familiar representation and use scales and axes appropriately • able to interpret graphs with different scales and explain how scale influences what is seen • reading simple line graphs and pie charts and describing trends or fractional proportions • able to calculate or interpret a simple mean and recognise when an anomalous value may affect it • able to represent familiar probabilities numerically and compare the likelihood of events	• able to choose a suitable data-collection method for a question and identify relevant information • able to select and construct an appropriate familiar chart or graph, including with digital tools where useful • able to interpret varied scales and simple pie-chart proportions accurately • able to use the mean to reason about totals or missing values and judge whether mean, median or mode is appropriate in familiar cases • able to represent probability with fractions or percentages and compare experimental with expected outcomes • able to justify a statistical conclusion or

			representational choice using evidence

Progression step 4

Introduction – the developing learner

In early progression step 4 practitioners should expect learners to act with agency, selecting and adapting strategies and recognising that a productive mathematical viewpoint may not be the first one tried. They connect particular cases with emerging general relationships, using multiple viewpoints to reveal structure and decide what may be worth generalising. Learners investigate with discipline, form conjectures and deliberately compare viewpoints, examples and representations rather than relying on a single line of attack. Learners construct explanations, justify choices and engage with alternative representations, using increasingly precise notation and mathematical language. The proficiencies are purposefully coordinated in less familiar situations, supporting strategic decisions as well as accurate and fluent work. Learners expose assumptions, check whether conclusions depend on them and increasingly use examples, counterexamples and logical reasoning to test the strength of a claim.

In middle progression step 4 of the learning journey, practitioners should expect learners to be able to interrogate mathematics and deliberately shift viewpoint when a different representation, system or relationship may expose more useful structure. They reveal deeper structure by attending to systems, relationships, change and invariance and by connecting different representations of dependence and relationship. Learners ask why, whether and when, varying conditions deliberately and using multiple viewpoints to test the scope of a conjecture. They move fluently among mathematical languages and use representation not only to communicate but to change how a problem can be seen. Fluency, understanding, reasoning and strategy are coordinated to examine mathematics from several viewpoints and choose productive routes. Learners test the limits of claims and distinguish experimental or numerical evidence from proof, using counterexamples to expose overgeneralisation.

By late progression step 4, practitioners should expect learners to trust their capacity to reason, adapt and sustain an enquiry, including when progress requires a change of method or a more general viewpoint. They connect structures across domains and move deliberately between particular and general, recognising when apparently different situations share mathematical form. Learners combine experiment and deduction, testing the limits of conjectures and using evidence to decide what requires proof, refinement or rejection. They construct and critique arguments using precise representations and notation, choosing mathematical language to make dependencies and assumptions visible. The proficiencies support critical argument as learners coordinate conceptual understanding, fluency, strategic competence, communication and logical reasoning. Learners use error and counterexample to reveal structure, strengthen arguments and distinguish a local failure from a deeper limitation in a conjecture, model or method.

What can practitioners do to support that change?

The Mathematics and Numeracy Area of Learning and Experience: Progression step 4 playlists - Resources offer practitioners, supporting learners to develop at progression step 4, advice on:

- the 5 mathematical proficiencies
- granular detail of the descriptions of learning
- key vocabulary
- questions for mathematical thinking
- teaching notes
- considerations for lesson planning

Progression step 4 - Number

The number system is used to represent and compare relationships between numbers and quantities.

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learning experiences should include:	• comparing and ordering integers, decimals and fractions on number lines, including directed numbers and choosing useful benchmarks • converting between familiar fractions, decimals and percentages and using equivalence to compare quantities and solve contextual problems • exploring why some decimals terminate or recur, using fraction decomposition and numerical representations to make the relationships visible • calculation with integers, decimals and fractions using the four operations, with deliberate attention to order of operations,	• coordinating fractions, decimals, percentages and ratio across problems, including values greater than one and situations where more than one representation is useful • comparing rational and irrational numbers, estimating irrational values and locating them approximately on number lines • exploring recurring decimals and their fractional representations, including reasoning about what makes a number rational • calculations involving directed numbers, fractions and decimals where learners must choose efficient strategies, justify	• investigating the structure of the real number system through rational and irrational numbers, recurring decimals, roots and surds, with attention to exact and approximate forms • simplifying and manipulating surds in supported cases and comparing exact forms with decimal approximations to understand what information each representation preserves • using powers and index notation to represent repeated multiplication, generating examples and counterexamples to test the laws of indices and expose overgeneralisations, including zero and negative integer exponents

	estimation and inverse checking • investigating factors, multiples, prime, square and cube numbers so that multiplicative structure becomes a tool for reasoning rather than a list of facts • comparing additive and multiplicative relationships in practical contexts, using ratio language, scaling and unitary reasoning to decide when a situation involves direct proportion and explain why • percentage problems involving quantities, discounts, increases and reductions, with opportunities to estimate first and to explain the multiplicative relationship • purposeful use of visual models, manipulatives and digital tools to test constraints, conjectures, expose structure, compare	order of operations and diagnose errors • using factors, multiples, powers and roots to reveal number structure and support increasingly efficient calculation and reasoning • proportional reasoning problems that vary scale, rates and percentage multipliers, generating examples to test claims about repeated multiplicative change and explicitly comparing methods • financial contexts such as budgeting, exchange rates, profit and loss, interest or taxation where percentage and ratio calculations have authentic constraints and consequences • using calculators and other digital tools critically to investigate patterns, compare numerical models, test conjectures and decide	• investigating the need for standard index form notation to represent large and small numbers • multi-step calculations with integers, decimals and fractions in which efficient use of properties, order of operations, approximation and inverse reasoning is expected • proportional reasoning involving direct and inverse proportion, repeated and reverse percentage change and contexts where learners must decide which relationship is operating • financial modelling involving percentage increase/decrease, profit and loss, taxation, interest, exchange rates or depreciation, with critical comparison of outcomes • investigations that require moving between particular examples and general numerical claims, exposing

	strategies and check numerical results	whether outputs are plausible	misconceptions, seeking counterexamples and refining conjectures when evidence conflicts • strategic use of calculators, spreadsheets or other digital tools to explore number patterns, model proportional change, test generalisations and compare exact with approximate results

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learners are confidently and reliably:	• able to compare and order integers, decimals and fractions, including negative numbers, and place them accurately on a number line • able to convert between common fractions, decimals and percentages and use equivalence to compare or interpret quantities • able to explain, using examples and representations, why some decimal representations terminate while others recur • able to calculate accurately with integers, decimals and fractions, applying an appropriate order of operations and checking through estimation or inverse reasoning • able to identify and use factors, multiples, primes, square and cube numbers to solve problems and explain numerical structure	• able to move flexibly among fractions, decimals, percentages and ratio, selecting a representation that clarifies the relationship in a given problem • able to distinguish rational from irrational numbers in familiar cases, estimate irrational values and position them appropriately on a number line • able to recognise recurring decimal patterns and connect recurring decimals with rational fractional representations • able to calculate confidently with directed numbers, fractions and decimals, explaining the effect of operation order and checking the plausibility of results	• able to distinguish rational and irrational numbers and compare or order fractions, decimals, percentages and selected surds using exact or approximate values appropriately • able to convert recurring decimals to fractions in accessible cases and explain why terminating and recurring decimals are rational • able to simplify selected surds and use exact forms where these communicate a value more precisely than a decimal approximation • able to use index notation confidently and apply core laws of indices with positive, zero and negative integer exponents in numerical expressions • able to use standard index form to represent large and

	• able to use ratio notation, scaling and unitary methods to solve straightforward direct-proportion problems • able to calculate percentages of quantities and simple percentage changes in real-life and financial contexts • selecting representations and digital tools according to mathematical purpose, using them to test, verify and communicate reasoning rather than simply obtain an answer	• able to use factors, multiples, powers and roots to simplify calculations, recognise structure and justify numerical claims • able to solve proportional problems involving scale, rates and percentage change using scaling or unitary reasoning and explain why the method works • able to apply percentage and ratio reasoning to financial situations such as discounts, profit and loss, budgets, interest or exchange rates • able to interrogate calculator or digital outputs, using estimation, structure and alternative representations to identify errors or limitations	small numbers, performing calculations in context • able to carry out multi-step calculations with integers, decimals and fractions accurately, choosing efficient structures and justifying the order and method used • able to recognise and solve direct and inverse proportion problems, including repeated multiplicative and reverse percentage relationships • able to apply percentage and ratio reasoning to increasingly complex financial contexts and evaluate the reasonableness and implications of calculated outcomes • able to use examples, counterexamples, estimation and digital evidence to test numerical conjectures, refine claims

			and communicate a justified conclusion

Progression step 4 - Algebra

Algebra uses symbols and systems to express the structure of mathematical relationships.

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learning experiences should include:	• generating and extending linear sequences using consistent additive or subtractive rules, and representing them through tables, graphs and visual patterns • exploring the relationship between position and term in a linear sequence, including finding and using a general (nth) term to predict terms • comparing different simplifications of algebraic expressions, using substitution, diagrams or other representations to test which terms can legitimately be combined and why • using the distributive property to rewrite	• recognising sequences that are not generated by a constant additive change, including patterns involving multiplication, division or powers • comparing linear and non-linear sequences through objects, tables, graphs and diagrams and explaining how their growth differs • substituting numbers into algebraic expressions and simplifying expressions involving several terms and operations • factorising expressions by identifying and extracting a single common factor, then expanding to check the factorisation and compare it	• generating and extending both linear and non-linear sequences, describing their growth in words and symbols and predicting future terms using rules or general formulae • using objects, tables, graphs and diagrams to compare linear and non-linear sequences and investigate spatial patterns • factorising expressions with a range of terms and structures by identifying and extracting the greatest common factor • comparing and constructing multi-step transformations involving expansion and simplification, including deciding whether two resulting forms are always,

	expressions and beginning to expand a single bracket • using letters or symbols to represent unknown values and solving one- and two-step equations through inverse operations • using function machines, diagrams and tables to connect rules, expressions, equations and missing values • plotting points as ordered pairs and creating tables of values for simple linear relationships • using manipulatives, diagrams and digital tools where they expose structure, support conjecture or make algebraic relationships easier to test	with plausible but incorrect alternatives • solving and comparing multi-step equations, including examples involving brackets, fractions, negative numbers or unknowns on both sides, with attention to transformations that preserve equality and to common misuse of inverse operations • using inequality symbols to represent relationships, solving simple inequalities and displaying solution sets on a number line • plotting graphs of linear equations from tables of values and comparing straight-line graphs • using graphing or other dynamic digital tools to test how changing algebraic values affects representations and to check conjectures	sometimes or never equivalent and explaining why • forming and solving equations and inequalities to model contextual problems, then interpreting and checking the solutions • using tables, graphs and diagrams to represent and analyse mathematical relationships and to connect algebraic and graphical forms • varying one coefficient or constant at a time in linear equations, predicting and then checking how the corresponding graph changes and what remains invariant • using dynamic software strategically to vary parameters, test predictions and make connections among equations, graphs and geometric representation

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learners are confidently and reliably:	• able to generate, extend and compare linear sequences and explain the consistent rule that produces them • able to relate the position of a term to its value and use a general rule or nth term to predict terms in a linear sequence • able to collect like terms and substitute numerical values into simple algebraic expressions accurately • able to use distributive reasoning to rewrite an expression and expand a simple single bracket, explaining or showing why the two forms are equivalent • able to represent an unknown with a letter or symbol and solve one- and two-step equations using inverse operations	• identifying whether a sequence is linear or non-linear in familiar cases and explaining the evidence used • able to generate and compare sequences involving additive, multiplicative or power-based change using tables, graphs or diagrams • able substitute into and simplify algebraic expressions involving multiple terms and operations • able to factorise an expression by extracting a common factor and recognise the equivalence of the expanded and factorised forms • able to solve multi-step linear equations, including equations with unknowns on both sides, and check solutions by substitution	• able to generate and compare linear and non-linear sequences and use a rule or general formula to predict terms • able to explain, using words, symbols, tables or graphs, how different sequences grow or shrink • able to factorise expressions by extracting an appropriate greatest common factor and justify the chosen factorisation • able to expand, simplify and otherwise manipulate expressions across multiple steps while recognising and explaining equivalent forms • able to construct and solve linear equations or inequalities for a contextual problem and judge whether the solution is reasonable

	• able to check a solution by substitution and explain whether it satisfies the original equation • able to use tables, function machines or diagrams to represent a rule and determine missing values • able to plot ordered pairs and use patterns in a table to predict values in a simple linear relationship	• able to form or solve a simple inequality and represent its solutions appropriately on a number line • able to plot a straight-line graph from an equation or table of values and describe key features of the resulting line • able to compare algebraic and graphical representations of a linear relationship and explain how they communicate the same structure	• able to use tables, graphs and diagrams to analyse a mathematical relationship and explain what a solution means in context • able to plot and interpret a linear equation graphically and describe how changes to a coefficient or constant affect the line • able to move between algebraic, graphical and other representations to test a conjecture, explain a relationship or justify a conclusion

Progression step 4 - Geometry

Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world.

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learning experiences should include:	• solving multi-stage time problems involving fractional or decimal seconds, time zones, GMT/BST and the base-60 structure of time • drawing, comparing and describing translations and reflections on grids and coordinate planes, including working backwards from image to original, identifying invariants and diagnosing incorrect transformation descriptions • approximating area and perimeter of irregular or curved shapes using grids, string, overestimates and underestimates, and explaining how unit size affects accuracy	• working with compound measures centred on speed, including distance–time relationships, average speed, unit conversion and using units to check calculations • drawing and comparing rotations and enlargements with specified centres, angles, directions and positive integer or fractional scale factors, varying one condition at a time to investigate what changes and what remains invariant • deriving and applying circumference and area formulae for circles, interpreting π exactly and approximately, and solving area/perimeter problems involving circles and trapezia	• extending compound-measure reasoning from speed to density, including rearranging relationships, converting compound units and interpreting values in scientific and real-world contexts • combining transformations in multi-step problems, predicting whether images will be congruent, similar or neither, then testing and refining the prediction by analysing the component transformations • finding areas and perimeters of compound shapes containing whole or part circles and calculating surface area of simple prisms

	• modelling volume with unit cubes, deriving and using the cuboid-volume relationship, finding missing dimensions and distinguishing volume from surface area • developing Pythagoras' theorem from areas of squares on right-angled triangles and using examples and non-examples to establish when it applies • constructing and comparing solutions to angle problems using triangle and quadrilateral facts and supplementary interior/exterior angle pairs, deciding which facts are sufficient and explaining why each step follows • using diagrams, manipulatives and dynamic geometry to test conjectures and move from measurement-based evidence towards structured geometrical reasoning	• recognising prisms through constant cross-section, deriving and using the general prism-volume relationship, including triangular prisms and cylinders • extending Pythagoras' theorem to missing shorter sides, the converse, coordinate distance and embedded right-angled triangles in 2-D and accessible 3-D contexts • classifying congruent and similar shapes after transformations, comparing plausible but incorrect classifications, and using corresponding sides, angles, ratios and scale factors to justify decisions and find missing measures • using calculators, diagrams and dynamic geometry strategically to check units, investigate invariance and justify geometrical relationships	• calculating volumes of composite solids by decomposing them into prisms, converting between cubic and capacity units and explaining connections among volume, capacity and surface area • using Pythagoras repeatedly in composite 2-D and 3-D configurations and distinguishing line length from gradient on coordinate grids • comparing different decompositions of demanding angle and shape problems, identifying sufficient and redundant information and making the logical dependencies in a solution explicit • using algebraic expressions, accurate diagrams and dynamic geometry where appropriate to generalise, test and communicate geometrical relationships

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learners are confidently and reliably:	• able to solve time calculations involving complex durations and time-zone changes and explain relevant unit conversions • able to translate and reflect shapes accurately and describe transformations using coordinate and positional language • able to approximate curved or irregular areas and perimeters, refine estimates and explain why exact calculation may not be possible • able to calculate cuboid volumes and missing dimensions and distinguish volume from surface area • able to state and explain Pythagoras' theorem, identify the hypotenuse and apply it in straightforward right-angled-triangle and diagonal problems	• able to solve speed, distance and time problems, rearrange the relationship and convert relevant units appropriately • able to perform and describe rotations and enlargements accurately and identify whether size is increased, decreased or preserved • able to use circle and trapezium area/perimeter formulae accurately, giving exact or approximate answers appropriately • able to calculate volumes of prisms, including cylinders, and solve accessible missing-dimension problems • able to apply Pythagoras' theorem and its converse in 2-D, coordinate and accessible 3-D contexts, checking units and reasonableness	• able to apply density and other compound-measure reasoning reliably and use units to validate a calculation • able to combine transformations and justify whether resulting figures are congruent, similar or neither • able to calculate areas, perimeters and surface areas of compound figures containing straight and curved components • calculating volumes of composite prism-based solids and explaining connections among volume, capacity and surface area • able to select and apply Pythagoras in multi-step 2-D and 3-D problems and distinguish line length from gradient

	• using known angle and shape facts to determine missing angles and justifying each step • able to use diagrams or dynamic geometry to test a geometrical claim and distinguish experimental evidence from a reasoned conclusion	• able to determine whether shapes are congruent or similar and use corresponding sides, angles and scale factors to find missing measures • able to select and interpret digital or non-digital representations to verify and communicate geometrical reasoning	• able to solve demanding angle problems by coordinating several known facts and making the justification explicit • able to express or test geometrical relationships using algebraic, diagrammatic or dynamic representations and communicate a reasoned conclusion

Progression step 4 - Statistics

Statistics represent data, probability models chance, and both support informed inferences and decisions.

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learning experiences should include:	• investigating questions involving qualitative and quantitative data, comparing how data type affects collection and representation and following the investigation through to interpretation and conclusion • selecting and comparing bar graphs, line graphs, frequency tables and simple pie charts for a purpose, including using a spreadsheet or other data tool to vary scales or representations and discuss advantages, limitations and possible misleading impressions • calculating and comparing mean, median and mode and considering when each provides a useful summary	• formulating questions and hypotheses that combine qualitative and quantitative data, making predictions before collection and carrying the investigation through representation, analysis, conclusion and evaluation • representing discrete and continuous data in frequency tables and constructing and interpreting frequency diagrams and frequency polygons, including with software • comparing data sets using mean, median, mode and range, including values obtained from frequency tables and considering limitations of a single average	• planning and carrying out hypothesis-driven investigations with relevant qualitative and quantitative data, recognising variables and moving through collection, representation, analysis, conclusion and refinement • comparing and choosing data representations for different audiences and purposes, including with spreadsheets or other data tools, and analysing how scale, grouping, emphasis or outliers can alter the story a display appears to tell • estimating and comparing mean, median and mode for grouped data and discussing how grouping and outliers affect accuracy and usefulness

	• using range alongside measures of central tendency to compare data sets and explore anomalies • drawing and checking conclusions about an idea or hypothesis by coordinating charts, averages, spread and outliers, then considering what further data or refinement might strengthen the investigation • representing single-event probabilities using fractions, decimals and percentages and listing outcome spaces systematically	• using scatter plots to investigate relationships between two variables, comparing patterns with different strengths or directions and testing claims that correlation necessarily implies causation • comparing alternative data-collection methods, charts or statistical measures for the same question, identifying limitations or misleading choices and refining the investigation accordingly • systematically representing combined outcomes with lists, tables or tree diagrams and distinguishing independent from dependent events in accessible cases • using digital tools to explore data dynamically, test patterns and communicate statistical reasoning	• constructing and comparing scatter graphs, drawing and critiquing plausible lines of best fit, estimating values and diagnosing claims that confuse correlation with causation • critically evaluating collection and analysis methods, bias, limitations and alternative approaches, including work with larger data sets • using tree diagrams, grids or systematic lists for successive independent and mutually exclusive events • using statistical evidence, digital tools and precise language to communicate, critique and refine conclusions

Progression step 4	Indicative planning reference: Early PS4/Year 7	Indicative planning reference: Middle PS4/Year 8	Indicative planning reference: Late PS4/Year 9
Learners are confidently and reliably:	• able to distinguish qualitative from quantitative data and select an appropriate representation for each in familiar cases • able to choose a suitable chart and scale and explain a basic advantage or limitation of the representation • able to calculate and compare mean, median and mode and justify a suitable average for a context • able to use range with an average to compare two data sets and discuss anomalies • able to draw a conclusion from data and explain whether it supports or contradicts a simple hypothesis	• able to form a workable hypothesis and organise qualitative and quantitative data to test it • able to construct and interpret frequency diagrams or polygons and distinguish discrete from continuous data • able to calculate and compare averages and range from raw or frequency data and explain limitations of a chosen summary • able to construct or interpret scatter plots and describe positive, negative, no or non-linear correlation without assuming causation • able to identify limitations in data collection or representation and explain how they affect conclusions	• able to design a hypothesis-driven investigation and identify relevant variables and data • able to choose and justify a data representation according to dataset, purpose and audience • able to estimate and compare averages for grouped data and explain effects of grouping and outliers • able to draw and interpret a line of best fit, estimate values and distinguish correlation from causation • able to critique the validity of a statistical conclusion by identifying bias, limitations or methodological weaknesses

	• able to represent single-event probabilities numerically and list all outcomes of a simple event systematically	• able to list outcomes of combined events systematically and recognise whether one event may affect another • using software purposefully to analyse a data set and explaining what the digital representation reveals	• able to calculate probabilities for successive independent or mutually exclusive events using systematic representations • able to communicate and refine statistical conclusions using appropriate evidence, terminology and digital analysis

Progression step 5

Introduction – the developing learner

In early progression step 5 practitioners should expect learners to work with increasing autonomy across unfamiliar mathematics, evaluating strategic choices and deliberately shifting perspective when another route, representation or technology may be more informative. They see mathematics as interconnected, recognise recurring structures and use these to generalise, model and move efficiently between contexts. Learners use examples, counterexamples and deduction to interrogate unfamiliar mathematics, generating and testing cases while recognising the limits of experimental evidence. They sustain precise reasoning across symbolic, graphical, numerical, spatial and digital forms and judge which representation best serves the mathematical purpose. The proficiencies operate as an integrated repertoire in unfamiliar and interconnected mathematics, supporting efficiency without allowing fluency to substitute for understanding or justification. Learners challenge conjectures, models and representations, evaluate their limitations and use stronger evidence or reasoning to refine a position.

By late progression step 5, practitioners should expect learners to act as an independent, critical and resourceful mathematicians, coordinating a full repertoire of strategies, representations and tools and judging when a change of viewpoint is needed. They exploit deep structural relationships, generalise across contexts and move flexibly between particular and general, attending to systems, change, invariance and recurring mathematical forms. Learners exercise critical mathematical judgement by coordinating conjecture, experiment and deduction, deciding what evidence is relevant and what level of justification a claim requires. They communicate flexibly, precisely and critically, choosing and, where necessary, extending or adapting mathematical language and representation so that complex reasoning can be scrutinised by others. The five proficiencies are coordinated flexibly and critically: the learner judges efficiency, validity and limitations while retaining conceptual meaning and strategic purpose. Learners revise positions through stronger evidence or reasoning, critique the validity of arguments and models and recognise that mathematical certainty depends on the assumptions, definitions and logic on which an argument rests.

What can practitioners do to support that change?

The Mathematics and Numeracy Area of Learning and Experience: Progression step 5 playlists - Resources offer practitioners, supporting learners to develop at progression step 5, advice on:

- the 5 mathematical proficiencies
- granular detail of the descriptions of learning
- key vocabulary
- questions for mathematical thinking
- teaching notes
- considerations for lesson planning

Progression step 5 - Number

The number system is used to represent and compare relationships between numbers and quantities.

Progression step 5	Indicative planning reference: Early PS5/Year 10	Indicative planning reference: Late PS5/Year 11
Learning experiences should include:	• comparing plausible and misleading claims about approximation and precision through significant figures, rounding, estimation and error intervals, including whether greater displayed precision is meaningful in context • distinguishing rational and irrational numbers, explaining terminating and recurring decimals, estimating irrational values and beginning to work with surds as exact representations • extending index laws from positive integer powers to zero, negative and fractional indices, making explicit connections between powers and roots	• consolidating bounds and measurement uncertainty through more demanding problems involving tolerances, accumulated error and real consequences and the effect of bounds on calculated results • manipulating surds more fluently, including simplifying exact forms and rationalising denominators, and connecting recurring decimals with rational representations • using fractional indices fluently with powers and roots and applying index laws across integer, negative and fractional exponents

	• comparing proportional quantities and solving direct- and inverse-proportion problems using ratio notation, scaling, unitary methods and equations where appropriate • financial problems involving percentage increase and decrease, simple and compound interest, exchange rates, budgeting, loans and savings, with comparison of alternative scenarios • taxation contexts involving gross and net income, deductions, progressive tax bands, allowances and devolved taxation in Wales, interpreted through proportional reasoning • introducing upper and lower bounds and tolerance through rounded measurements, inequality notation and practical measurement uncertainty	• problems involving repeated proportional relationships, including successive percentage change and direct or inverse proportion involving powers and roots • comparing financial products where a lower periodic payment or advertised rate may not mean lower overall cost, using AER, APR, compounding, fees and borrowing costs to explain why • applying Welsh rates of income tax and considering how allowances, deductions and devolved taxes affect financial decisions • using calculators, spreadsheets and other digital tools strategically to compare repeated-change or financial models, test assumptions and communicate justified conclusions

	• using calculators and spreadsheets to compare financial or proportional scenarios, vary assumptions and check the plausibility and precision of results • opportunities to choose between exact and approximate forms, test numerical claims and contextually justify the degree of accuracy or representation used	

Progression step 5	Indicative planning reference: Early PS5/Year 10	Indicative planning reference: Late PS5/Year 11
Learners are confidently and reliably:	• able to round and estimate to an appropriate degree of accuracy and represent simple error intervals for rounded values • able to distinguish rational and irrational numbers, convert recurring decimals in accessible cases and use or estimate surds appropriately • able to apply index laws with zero, negative and simple fractional indices and explain their relationship with roots • able to solve direct- and inverse-proportion problems and explain the multiplicative relationship between the quantities • able to compare financial scenarios involving percentage change, interest, exchange rates, loans, savings and budgets	• able to use bounds, tolerances and error margins to determine and interpret the limits of calculated results • able to simplify and manipulate surds, rationalise denominators in appropriate cases and convert recurring decimals to fractions • able to evaluate and simplify expressions involving fractional indices and justify equivalent forms using powers and roots • able to solve repeated proportional-reasoning problems, including models involving successive change, powers or roots • able to calculate and compare AER and APR and use them to evaluate borrowing and saving products

	• able to calculate and interpret income tax and other deductions, including progressive bands and relevant Welsh taxation contexts • able to calculate and interpret upper and lower bounds in accessible measurement contexts • using calculators or spreadsheets to model numerical scenarios while checking assumptions, accuracy and reasonableness • able to select and justify exact or approximate numerical methods and representations according to purpose	• able to apply Welsh income-tax rates and interpret the implications of taxation, allowances and deductions in financial contexts • able to interrogate numerical and financial models critically, varying assumptions and explaining the limitations of conclusions

Progression step 5 - Algebra

Algebra uses symbols and systems to express the structure of mathematical relationships.

Progression step 5	Indicative planning reference: Early PS5/Year 10	Indicative planning reference: Late PS5/Year 11
Learning experiences should include:	• recognising and comparing linear and non-linear sequences, including simple quadratic or geometric patterns, using tables, graphs, diagrams and rules • comparing equations and identities through examples, non-examples and transformations, using algebraic, geometric or graphical representations to explain when equality holds for particular values and when it holds generally • expanding and simplifying expressions involving single and double brackets and substituting values into algebraic expressions	• consolidating factorisation and extending manipulation to algebraic fractions, comparing valid and invalid cancellations and explaining why only common factors may be cancelled • solving trigonometric equations involving sine, cosine and tangent within given intervals and developing understanding of multiple and general solutions through trigonometric graphs • rearranging equations and complex formulae where the subject appears in more than one term, comparing possible transformation routes and checking that each step preserves equivalence

	• factorising expressions, including simple quadratic expressions and appropriate quadratics with a coefficient greater than 1, connecting factorised and expanded forms • comparing substitution, elimination and graphical methods for simultaneous equations with two variables, deciding which is efficient in different cases • solving quadratic equations by factorisation and extending to the quadratic formula, linking solutions with roots and x-intercepts 1. compare substitution, deletion and graphical methods for synchronous equations with two variables, determine which one is efficient in different cases 2. solve quadratic equations by factorising and extending to the quadratic formula, linking solutions to suborders and intersections x	• investigating cubic and reciprocal graphs alongside quadratic graphs, comparing characteristic features, asymptotes, turning points and the effects of coefficients and constants • using equations, inequalities and relevant graphs to model exponential growth and decay and to compare linear and exponential behaviour in context • investigating area under graphs in real-life contexts and connecting graphical area with accumulated quantities where appropriate • using dynamic software strategically to compare non-linear models, explore trigonometric or other graph families, test predictions and connect algebraic and graphical reasoning

	• constructing, comparing and solving equations or inequalities for real-life situations, including direct and inverse proportion, and using graphs to connect multiplicative scaling with the resulting functional relationships • investigating quadratic graphs, their roots, turning points and axes of symmetry, and exploring how coefficients affect their shape • determining or approximating rate of change from graphs, including gradients of tangents to curves and comparison of rates in linear and non-linear situations • using dynamic graphing software and other digital tools to vary coefficients, visualise intersections, test conjectures and connect	

	symbolic and graphical solutions	
Progression step 5	**Indicative planning reference: Early PS5/Year 10**	**Indicative planning reference: Late PS5/Year 11**
Learners are confidently and reliably:	• able to generate and compare linear and non-linear sequences and explain how their rules or growth differ • able to distinguish equations from identities and justify equivalence using algebraic or graphical structure • able to expand and simplify single and double brackets and substitute accurately into expressions • able to factorise appropriate quadratic expressions and recognise equivalence between factorised and expanded forms • able to solve simultaneous equations algebraically or graphically, including appropriate graphical cases involving a quadratic	• able to simplify algebraic fractions and combine expansion, factorisation and simplification fluently within multi-step problems • able to solve trigonometric equations within specified intervals and connect solutions with trigonometric graphs and general solution structure • able to rearrange formulae systematically when the subject occurs in more than one term and verify the resulting form • able to recognise, sketch and interpret quadratic, cubic and reciprocal graphs and compare their characteristic behaviour • able to construct and interpret algebraic or graphical models of

	equation, and interpret solutions as intersections • able to solve quadratic equations using appropriate methods and connect solutions with roots or x-intercepts • able to form and solve equations or inequalities for contextual and proportional problems and interpret solutions meaningfully • able to plot and interpret quadratic graphs and explain how coefficients affect key features • able to estimate or interpret rates of change from graphs, including gradients of tangents in accessible cases	exponential growth and decay and explain their implications in context • able to approximate and interpret area under a graph in appropriate real-life situations • able to move strategically among symbolic, graphical, numerical and digital representations to test, explain and justify conclusions

Progression step 5 - Geometry

Geometry focuses on relationships involving shape, space and position, and measurement focuses on quantifying phenomena in the physical world.

Progression step 5	Indicative planning reference: Early PS5/Year 10	Indicative planning reference: Late PS5/Year 11
Learning experiences should include:	• analysing congruence, similarity and transformations through invariance of length, angle, orientation and ratio, and generalising how linear scale factors affect perimeter, area, surface area and volume • deriving and comparing methods for arc lengths, sector areas, segment areas and compound circle measures from fractional parts of a circle, including checking plausible incorrect methods against the geometry • developing right-angled trigonometric ratios from similarity, using sine, cosine and tangent to find unknown side lengths and modelling	• applying similarity, congruence and scale reasoning in multi-step 2-D and 3-D contexts, comparing alternative approaches and evaluating incorrect arguments, especially where linear, area and volume scale factors are confused • calculating volumes of standard and compound 3-D shapes, including cylinders, cones, spheres, pyramids and prisms, with estimation and reasonableness checks • using inverse trigonometric ratios to find unknown angles, calculating the area of any triangle and combining trigonometry with Pythagoras in 3-D

	angles of elevation and depression • constructing and describing loci under fixed-distance, equidistance, boundary and inequality constraints, varying conditions to determine how the feasible region changes and explaining why • deriving and using interior and exterior polygon-angle relationships and solving non-routine polygon problems with proof-style justification • identifying and applying key circle theorems to find unknown angles, using accurate diagrams or dynamic geometry to explore validity but structured reasoning to justify conclusions • connecting nets with surface area and calculating surface areas of familiar 3-D shapes, including appropriate curved-surface formulae	• constructing loci equidistant from parallel or intersecting lines and solving multiple-loci problems involving boundaries, inequalities and practical constraints • applying tangent-based circle theorems, including the alternate segment theorem, in multi-step problems that combine circle, polygon, Pythagorean and trigonometric reasoning • constructing and critiquing proof-style diagrams and structured arguments that coordinate several geometrical facts, identifying assumptions, testing dependencies and locating errors or unjustified steps • using dynamic geometry selectively to interrogate difficult configurations and compare experimental evidence with deductive proof

	• using transformations, diagrams and digital tools to test conjectures, identify invariants and connect numerical, algebraic and geometrical reasoning	
Progression step 5	**Indicative planning reference: Early PS5/Year 10**	**Indicative planning reference: Late PS5/Year 11**
Learners are confidently and reliably:	• able to justify whether figures are congruent, similar or neither and use linear, area and volume scale-factor relationships	• able to solve complex similarity and scaling problems in 2-D and 3-D and identify errors in scale reasoning

	• able to calculate arcs, sectors, segments and compound circle measures accurately • able to use sine, cosine and tangent to calculate unknown sides in right-angled triangles and solve elevation/depression problems • able to construct and describe fixed-distance and basic equidistance loci and interpret bounded or inequality conditions • able to derive and apply polygon-angle relationships and justify non-routine solutions coherently • able to select and apply appropriate circle theorems to determine unknown angles and justify linked steps	• able to calculate volumes of standard and compound solids and judge the reasonableness of results • able to find unknown angles with inverse trigonometry, and solve 3-D or general-triangle problems using appropriate trigonometric methods • able to construct and combine loci involving equidistance, inequalities and multiple constraints and interpret the feasible region • able to apply tangent and other circle theorems in multi-step geometric arguments and combine them with other relevant facts • able to construct a coherent proof-style geometrical argument, annotating diagrams and checking each dependency • able to use digital geometry strategically to test cases, expose structure and

	• able to calculate surface areas from nets or formulae for familiar 3-D shapes • able to use accurate or dynamic representations to test, refine and communicate geometrical conclusions	support—not replace—deductive justification

Progression step 5 - Statistics

Statistics represent data, probability models chance, and both support informed inferences and decisions.

Progression step 5	**Indicative planning reference: Early PS5/Year 10**	**Indicative planning reference: Late PS5/Year 11**

Learning experiences should include:	• designing and comparing investigations using primary or secondary data and different sampling choices, predicting how representativeness, sample size or bias may affect conclusions and refining the design • comparing random, systematic and stratified sampling, selecting and justifying sampling methods for particular populations or questions • constructing and comparing histograms, including unequal class widths and frequency density, and diagnosing the misconception that bar height rather than area necessarily represents frequency • constructing cumulative frequency tables and curves to estimate medians and quartiles and using range and IQR to compare distributions	• comparing complete investigative designs using random, systematic or stratified sampling, tracing how sample size, representativeness and bias affect analysis and conclusions and refining methodological choices • constructing and comparing box plots and other summaries, using cumulative frequency, quartiles and IQR to test competing claims about distributions rather than relying on a single average • interrogating competing statistical claims by tracing the full chain from question and sample design through representation and measures to conclusion, identifying anomalies, potential manipulation and plausible alternative interpretations • using probability models—including tree diagrams, Venn diagrams and tables—to solve problems

	• comparing accurate and misleading versions of charts or graphs and explaining how scale, labels, omitted information, source and purpose can influence interpretation without changing the underlying data • calculating probabilities of mutually exclusive and independent events using addition or multiplication rules and representing outcomes with tables or tree diagrams • developing dependent-event probability with tree diagrams and comparing independent and dependent situations • conducting and simulating probability experiments, varying trial size and comparing relative frequency with theoretical probability to challenge the expectation that experimental results must	involving mutually exclusive, independent and dependent events • using experimental results to estimate probability, comparing expected and actual outcomes across different trial sizes and judging whether discrepancies reflect ordinary variation or evidence strong enough to affect a decision • applying probability models to real-world risk/reward decisions and critiquing assumptions, limitations and potential errors in probabilistic arguments • using software or digital tools strategically to compare distributions, explore probability models and communicate evidence-based conclusions

	match theoretical values exactly • constructing probabilistic arguments and using expected values to justify decisions while recognising probability as likelihood rather than certainty	
Progression step 5	**Indicative planning reference: Early PS5/Year 10**	**Indicative planning reference: Late PS5/Year 11**
Learners are confidently and reliably:	• able to distinguish primary and secondary data and evaluate basic data-collection and sampling	• able to evaluate and select sampling methods with explicit reference to

	choices for representativeness and reliability • able to apply and justify random, systematic or stratified sampling in appropriate contexts • able to construct and interpret histograms using frequency density where class intervals are unequal • able to use cumulative frequency to estimate medians and quartiles and compare spread using range or IQR • able to identify misleading statistical representations and explain how design choices can distort interpretation • able to calculate probabilities of mutually exclusive and independent events and represent successive outcomes systematically	representativeness, bias, sample size and reliability • able to construct and compare box plots and use central tendency, and IQR appropriately when comparing distributions • able to critique a statistical claim by identifying weaknesses in collection, representation, analysis or interpretation and considering alternative perspectives • able to solve combined-event problems using appropriate probability models and rules for mutually exclusive, independent and dependent events • able to use experimental probability to make predictions and judge the reliability of conclusions against expected outcomes • able to evaluate a probabilistic argument or

	• able to use tree diagrams for accessible dependent events and explain how dependency changes probabilities • able to compare relative frequency with theoretical probability and explain why larger trials tend to give more stable results • able to use probability rules or expected values to construct and justify a decision	real-world decision by weighing likelihood, consequences, assumptions and limitations • able to select and interpret digital statistical tools critically and communicate a justified conclusion