Mathematics progression skills with reasoning – Power Maths

Reception: Early Learning Goal: Number and Space with suggestions

ELG 11: NUMBERS- COUNTING					
Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Autumn: Units 1, 2 3 and 4 Spring: Units 7 and 8 Summer: Unit 14					
Counting: saying number words in sequence: • Sing number rhymes that encourages the children to count forward as well as backwards. • Begin counting from different numbers. • 'Washing line – children pin numbers forwards and backwards in a sequence (**Remember that although counting back is a useful skill, the children might find this challenging due to the demand it places on their working memory)**	**Counting: tagging each object with one number word:** • Provide children with opportunities to count things of different sizes – this helps children to focus on the numerosity of the count • counting things that can't be seen, such as sounds, actions, words • counting things that cannot be moved, such as pictures on a screen, birds at the bird table, faces on a shape. **Use of number:** Provide opportunities for children to understand that numbers are used in many ways, some more mathematical than others E.g.	**Subitising: recognising small quantities without needing to count them all:** • Use dot cards, dominoes and dice as part of a game, including irregularly arranged dots (e.g. stuck on) • 'Dice roll and match – children take turns to roll the dice they then select the corresponding amount of objects • playing hidden object games where objects are revealed for a few seconds; for example, small toys hidden under bowl – shuffle them, lift the bowl briefly and ask how many there were • 'all at once fingers' – show me four fingers…….	**Numeral meanings:** • Use numeral dice in games; matching numerals with varied groups of things •Use 'tidy-up labels' on containers and checking that nothing is missing • Read number books • Put the right number of snacks on a tray for the number of children shown on a card. • 'Place signs for 2 wheels, 3 wheels and 4 wheels. When children 'park' their vehicles, they match their vehicle to the correct bay.	**Conservation: knowing that the number does not change if things are rearranged (as long as none have been added or taken away** • Use of a puppet - correcting a puppet who may say that there are more or fewer objects now, as they have been moved around, e.g. spread out or pushed together • Contexts such as sharing things out (grouping them in different ways) and then the puppet complaining that it is not fair as they have less • Encourage the children to make different patterns with a given number of things.	**Comparison:** involves knowing which numbers are worth more or less than each other. ***More than / less than*:** • Provide collections for children to sort and compare, which include objects which are identical, and which include objects of different kinds or sizes • Provide collections with a large number of things, and collections with a small number of things. ***Identifying groups with the same number of things:*** • Ensure that when providing groups to compare, there are

	George has 5 dinosaurs ***(cardinal)*** Ava-Rose is ***fifth*** in the line today ***(ordinal)*** Numbers on or doors at home, telephone numbers, numbers on Arsenal players' shirt ***(nominal)*** **'**Come to our house at 5 p.m. on the September 5 ***(referential)***				some that have an equal amount • Ask children to convert two unequal groups into two that have the same number, e.g. 'There are 6 apples in one bag and 2 in another bag; can we make the bags equal for the two hungry horses?' ***Comparing numbers and reasoning:*** • Explain unfair sharing - 'This one has more because it has 5 and that one only has 3' • Compare numbers that are far apart, near to, and next to each other. ***Knowing the 'one more than/one less than' relationship between counting numbers:*** • labelling groups with the correct numeral. Do children spot the error if a group is mislabelled? E.g. 'The label on the pot says 4 and we have 5 – what do we need to do?' A child may say, 'We need to take one out because we have one too many.'

					• ensuring children focus on the numerosity of the group by having items in the collection of different kinds and sizes • making predictions about what the outcome will be in stories, rhymes and songs if one is added to, or if one is taken away.

Big Idea – Cardinality and counting: The cardinal value of a number refers to the quantity of things it represents, e.g. the numerosity, 'howmanyness', or 'threeness' of three. When children understand the cardinality of numbers, they know what the numbers mean in terms of knowing how many things they refer to. Counting is one way of establishing how many things are in a group, because the last number you say tells you how many there are. Children enjoy learning the sequence of counting numbers long before they understand the cardinal values of the numbers. Subitising is another way of recognising how many there are, without counting.

Common errors in this area may include:

- missing out an object or counting an object twice
- when asked how many cars are in a group of four, the child simply recount 1, 2, 3, 4, without concluding that there are four cars in the group.
- When asked to 'get five oranges' from the snack bowl, the child just grabs some, or carries on counting past five.
- when objects in a group are rearranged, the child (unnecessarily) recounts them to find how many there are.
- difficulties in counting back
- confusion over the teen numbers - they are hard to learn.
- missing a number like 15 (13 or 15 are commonly missed out) or confusing 'thirteen' with 'thirty'.

What to look out for:

Can the children:

- consistently recite the correct sequence of numbers and cross decade boundaries?
- collect nine from a large pile, e.g. nine pencils from a pot?
- subitise (instantly recognise) a group that contains up to four, then five, in a range of ways, e.g. fingers, dice, random arrangement?
- select a numeral to represent a quantity in a range of fonts, e.g. **4**, 4, 4, *4*?
- correct a puppet who thinks the amount has changed when their collection has been rearranged?

ADDITION AND SUBTRACTION

Using quantities and objects, children add and subtract 2 single-digit numbers and count on or back to find the answer.

Autumn: Units 3 and 4

Spring: Units 8, 9 and 10

Summer: Units 13 and 14

Counting: knowing the last number counted gives the total so far: • Play dice games to collect a number of things • Play track games and counting along the track…. ***Comparison:*** 'I have a handful of raisin; Matthew has a bowlful. Matthew has more!' 'I have 1 pear and 1 banana; you have 2 apples. We have the same number of fruits'. 'Rose has 3 dirty plates and Joshua has 4 dirty bowls. Who has fewer dishes to wash'?	**Part–whole: identifying smaller numbers within a number (conceptual subitising – seeing groups and combining to a total):** • Encourage making arrangements with (e.g.) ten; ensuring the children talk about the different arrangements they can see within the whole.	**A number can be partitioned into different pairs of numbers:** • Numicon towers: layering up Numicon pieces of the same total • Put things into two containers in different ways ***'You had 12 oranges and you gave your friend 5. How many do you have now?*** • Make a number with two different kinds of things. E.g. make a fruit skewer with five pieces of fruit, using bowls of bananas/strawberries to choose from; then ask the children to describe how they have made theirs. They should compare it with a partner's: 'What is the same about your skewers? What is different?' • Play Bunny Ears: using your fingers like bunny ears. 'With two hands, show me five fingers. How many different ways can you show 5 fingers on both hands'? Or, 'Show five fingers altogether with a friend.'	**A number can be partitioned into more than two numbers:** • Role play, e.g. in a toy shop, ten toys need arranging onto the three shelves. How will you organise them? • Have more than two places to sort things into in any given context, e.g. arranging characters in small-world play in different locations • Games such as 'Posh Ducks' (Griffiths, R., Back, J. & Gifford, S. (2016) Making Numbers: Using manipulatives to teach arithmetic, OUP): using a set number of ducks, for example ten in three different locations (nest, water, decking), roll the dice and make one group match the amount shown without adding or taking any away.	**Inverse operations:** • Explore songs; for example, 'Five Currant Buns' – show that the whole is still five, but some are in the shop and some have been taken away; check throughout that there are still five currant buns • Play skittles and looking at how many are standing. How many have fallen over? How many are there altogether? • During physical play, '***You have 2 balls and I have 3 balls how many balls do we have altogether? If three balls rolled away how many balls would we have left'?***	**Number bonds: knowing which pairs make a given number:** • Play hiding games with a number of objects in a box, under a cloth, in a tent, in a cave, etc. • Utilise classroom routines such as tidy-up time to identify how many are still missing from a pot with a number label.

		• Play spill the Beans: using double-sided counters or beans, where one side is coloured, throw the collection and note how many of each type can be seen and how many altogether. • Use six bean bags with different fabric on each side, throw the collection and note how many of each type can be seen.			

Big Idea – Composition and decomposition: Children need opportunities to develop their understanding that sets can be changed by adding items (joining) or by taking away (separating), that sets can be compared using the attribute of numerosity and ordered by more than, less than and equal to, that a quantity (whole) can be decomposed into equal or unequal parts and that the parts can be composed to form the whole. Knowing numbers are made up of two or more other smaller numbers involves 'part–whole' understanding. Learning to 'see' a whole number and its parts at the same time is a key development in children's number understanding. Partitioning numbers into other numbers and putting them back together again underpins understanding of addition and subtraction as inverse operations.

Common errors in this area may include:	**What to look out for:**
• children suggesting that a larger number than the total are hidden.	***Can the children:*** • subitise smaller groups within a larger group? • make a reasonable guess at a hidden number after seeing the whole or a part? • in context, state two groups that make a larger amount. E.g. how might the six bean bags land? Child responds: you could have 3 with the stripes up and 3 with the spots up.

PROBLEM SOLVING – INCLUDING DOUBLING, HAVING AND SHARING

Children solve problems, including doubling, halving and sharing.

Autumn: Units 2 and 3

Spring: Units 6, 8, 9 and 10

Summer: Unit 15

Playing and exploring	**Active Learning:** ***provide a rich context such as a carefully-chosen, inviting set of resources that offer lots of freedom***	**Creating and thinking critically**

Make butterflies and stick dots or craft pom-poms in ones, twos and fours on each wing. Encourage the children to think about where to place the dots/pom-poms • Use NumberBlocks Series 2 Episode 9 (see https://www.ncetm.org.uk/resources/52060 for supporting materials) • Play doubling and halving games with their feet and hands. What do they notice? • Use five and ten frames with double sided counters • Use NRich Packing, Collecting, tidying and Baskets games to develop problem solving	***to play, explore, question and try out ideas. The resources themselves may not be regarded as inherently mathematical.*** • Notice how children doubling in their play e.g. if another child comes to join them when they ae playing alone. • Use NumberBlocks Series 2 Episode 9 (see https://www.ncetm.org.uk/resources/52060 for supporting materials)	• Use NumberBlocks Series 2 Episode 9 (see https://www.ncetm.org.uk/resources/52060 for supporting materials) • Use a six-faced dice labeled with the dice patterns for 1, 2, and 4 (each number appear twice), encourage the children to make up a game that involves finding doubles when rolling the dice. Provide equipment and resources such as empty number tracks, empty 10x10 grids, empty jars and craft pom-poms or counters. Notice the language that the children use when designing and playing the game.

Big Idea – Problem Solving: EYFS children are natural problem solvers. They attain their goals by mimicking others, trying things out, making lots of mistakes, adjusting their strategies accordingly and gradually gaining confidence. For authentic problem solving to take place, there must be an authentic problem – one whose solution is not obvious or predetermined. To nurture, support and further develop problem solving in EYFS, adults need to provide a rich context (with appropriate resources and skilful questioning), provide a 'think follow, support, question stimulating thinking' approach and repeatedly providing children with opportunities to develop key problem solving skills.

Adults need to ensure that:	**What to look out for:**
• children can freely explore to allow them to propose solutions • children are given multiple ways to make sense of problem situations e.g. How many? – by acting it out, making drawings or using manipulatives. • children are given lots of experiences thinking through how relationships between quantities work in real life. • they keep number operations firmly grounded in mathematical problem situations involving the ***changes, comparisons and part/whole relationships.***	***Can the children:*** • spot patterns and relationships? • describe and compare different mathematical aspects of different contexts? • explain why a mathematical answer is true? • Predict what might happen or ask questions to help them visualise a mathematical context? • draw/mark make/symbols to explain their thinking? • recognise that doubling is adding the same number to itself? • recognise that halving is sharing into two equal portions?

ELG 12: SHAPE, SPACE AND MEASURES –MEASURES OVERVIEW

See below for the coverage the various areas in this strand.

Recognising attributes:	**Comparing amounts of continuous quantities:**	**Showing awareness of comparison in estimating and predicting:**	**Recognising the relationship between the size and number of units:**	**Beginning to use time to sequence events:**
• ensuring adults model language which highlights the specific	• encouraging children to compare different attributes in everyday			• un-muddling visual timetables

attribute that is the focus of attention • dough modelling, which can provide a good opportunity to discuss the length of snakes, or the weight of different-sized lumps • water and sand-play, which can provide lots of opportunities to highlight capacity. (Also see **ELG 12: SHAPE, SPACE AND MEASURES- MATHEMATICAL LANGUAGE** for suggestions)	situations: 'I wonder who has the longest snake?' 'I wonder whose pot will hold the most water?' 'I wonder which ball is the heaviest?' • cutting a piece of ribbon as long as a child's arm and encouraging them to find things in the environment that are longer, shorter or the same length • focusing on asking for specific things according to their attributes. For example: 'Please can you pass me a ... that is ... than this one?' • when comparing directly, finding the odd one out, by providing a varied range of container shapes all containing the same amount of liquid except for one. 'Which one do you think is the odd one out? Why? How will we check? Were we right?' • posing see-saw problems, relating to weight: 'What can we do to make this side of the see-saw go down?' • using a simple spring balance to compare the weight of cargo for a toy boat • setting up a 'balancing station' with interesting things to weigh and to balance, indoors and outdoors • comparing different parcels, ensuring some of the smaller parcels are heavy, and some of the larger parcels are light. (Also see **ELG 12: SHAPE, SPACE AND MEASURES-**	• making a bed for a teddy using blocks • selecting a box or container to store a specific item • dressing dolls, and selecting different-sized clothes ~~• finding things that will fit inside a~~ matchbox. **Comparing indirectly:** • making 'Russian doll'-type sets of nesting boxes from a collection • finding ways of seeing if the cupboard or carpet will fit in the role-play area without moving it • finding which of three pairs of shoes is heaviest for packing in a rucksack • packing a shopping bag, making sure the lightest items do not get squashed by heavier things.	• set up an Estimation Station and guessing how many things are in the jar each day • making biscuits from a given amount of dough – choosing cutters to see who will make the most biscuits • choosing from a selection of spoons, ladles, etc, to see who can fill their pot the quickest ~~**Beginning to use units to compare things:**~~ • setting up a 'filling station' with lots of different-sized containers to fill with beads, then comparing capacities • using large bricks to measure the height of individuals • using metre sticks to see if an elephant or dinosaur would fit in the room • measuring the growth of a beanstalk or sunflower with interlocking centimetre cubes • comparing the capacity of different bottles by filling lots of glasses.	• making picture sequences for cooking instructions • describing sequences by re-telling stories • discussing 'o'clock' times at registration, lunchtime, snack time, tidy-up time, etc. • making their own timetable for a day – selecting activities and ordering them. **Beginning to experience specific time durations:** • events on a class calendar to count down to • timers provided for children to set and respond to challenges; e.g. 'I wonder if we can run as fast as a cheetah', 'I wonder how many hops I can do in ten seconds', 'I wonder how many times I can write my name in a minute', etc. • time durations with songs or music.

	MATHEMATICAL LANGUAGE for suggestions)			

Big Idea – Measures: Mathematically, measuring is based on the idea of using numbers of units in order to compare attributes, such as length or capacity. Children need to realise which attribute is being measured, e.g. weight as opposed to size, and the idea of conservation: that the amount stays the same, even if the appearance alters, e.g. if dough is stretched out or in bits. Finally, children need to understand how equal size units are used repeatedly to express an amount as a number. While young children can engage actively in making comparisons and exploring equivalence of length, volume, capacity and weight in different ways, some of these ideas are challenging and will develop later in primary school. Measuring with non-standard units of different sizes in order to appreciate the need for equal units is less effective with younger children, so centimetre cubes are recommended as accessible units. While time is also elusive to measure, young children can sequence events and, for example, count 'sleeps'.

Common errors in this area may include:

- keeping track of events, e.g. 'Have I had my lunch yet?'
- positional language associated with time; muddling the relative terms 'yesterday' and 'tomorrow'
- using 'long' to describe the shape of something (e.g. a block that is much longer than it is wide) rather than to compare lengths
- not taking into account both ends as the starting and stopping point
- not being able to say 'than' in the phrase, 'this is longer than that'
- not understanding that units must cover a complete length, with no gaps or overlaps, demonstrated by thinking that measuring is about counting units placed along something, or putting a ruler alongside and saying a number
- not understanding that units must be equal.

What to look out for:

Can the children:

- find something that is longer, shorter, heavier, lighter (etc.) than a reference item?
- find an appropriate container for a specific item?
- describe the location of something using positional language?
- accurately use the relative terms 'yesterday' and 'tomorrow'?
- order a short sequence of events?

ELG 12: SHAPE, SPACE AND MEASURES- MATHEMATICAL LANGUAGE

Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems.

Autumn: Unit 5

Spring: Units 8 and 11

Summer: Unit 16

Developing spatial and directional vocabulary- *children need opportunities to be exposed to and to use*	**Developing comparative vocabulary -** *children need opportunities to be exposed*	**Developing ordinal vocabulary -** *children need opportunities to be exposed to and use different ways of*	**Developing shape vocabulary** - *children need opportunities to be exposed*	**Developing calculation vocabulary -**	**Developing time vocabulary –** *children need opportunities to be exposed to and use*

the language of position and direction: • hunting for hidden objects, with some prompts, e.g. 'Look behind the bicycle store, take three steps from the front of the art cupboard…' • developing and talking about small-world scenarios, e.g. doll's house, miniature village, play park • acting out their own versions of well-known stories where characters negotiate routes and obstacles, for example 'We're Going on a Bear Hunt' • directing each other as robots. • Any outdoor activity uses directional words especially if using wheeled vehicles or programmable toys. (Also see Problem Solving and **Representing spatial relationships under ELG 12: SHAPE, SPACE AND MEASURES- EXPLORING** for suggestions)	*to and to use the language of comparison:* • comparing weight by handling objects • comparing height or speed through outdoor climbing or running activities • comparing length or distance between objects *Useful vocabulary:* ***small and large, tall and short, fast and slow, heavy and light, hot and cold, high and low, near and far, young and old*** (Also Problem Solving for suggestions)	*describing order and sequence:* • lining up objects such as small cars, farm animals and counters. *Useful vocabulary:* ***first, last, second, third, in front of, end, beginning, before, after*** (Also see Problem Solving for suggestions)	*to and use different ways of describing various shapes:* • What's in my bag shape game – use correct vocabulary to describe a shape children guess what shape it is • make shape monsters with partner – one child uses correct vocabulary to describe the shapes that make up their monster and their partner draws it. • use correct vocabulary to describe a shapes that make up different objects *Useful vocabulary:* ***round, curved, wavy, straight, sloping, corners, pointed, sides, flat, circle, square, triangle*** (Also Problem Solving for suggestions)	*children need opportunities to be exposed to and to use the language of calculation* • *stories as a prompt for creating representations, e.g. how many animals wanted to eat The Gingerbread Man using First, then, next now* (Also see Addition and subtraction and Problem Solving for activities) *Useful vocabulary:* ***more, less, the same, many, lots, fewer, greater than, more than, less than*** (Also Problem Solving for suggestions)	*different ways of describing time* • Using a calendar to mark events and a group diary to record happenings • Using how many days to talk about how many 'sleeps' till your birthday, Christmas, half term etc. • Utilise classroom routines such as registration to talk about yesterday, today, tomorrow • Sing 'days of the week' song *Useful vocabulary:* ***today, tomorrow, yesterday, morning, afternoon, night, the days of the week*** (Also Problem Solving for suggestions)

Big Idea – Vocabulary: Children's mathematical vocabulary is enhanced when the adults who are working alongside them repeat key words in context during play activities, model using new words in commentary, encourage children to use new words through open-ended questioning and invite children to describe what they see, hear or think. Play situations provide a context for using maths vocabulary that makes sense to a child and helps understanding. Many traditional songs, finger plays and rhymes contain themes that focus on maths vocabulary. Children with English as an additional language or those with language

delay will benefit from pictures, models and pantomime to accompany the songs. Children need to be given time to fully explore the activities they are involved in and not be rushed to finish, nor should the focus to be on the finished product.

Common errors in this area may include:	**What to look out for:**
• mistaking a circle for an oval when identifying a shape • mistaking a square for a rectangle when identifying a shape	***Can the children:*** • use the correct mathematical language to describe various shapes? • Differentiate shapes with same/similar properties?

ELG 12: SHAPE, SPACE AND MEASURES- EXPLORING

Children explore characteristics of everyday objects and shapes and use mathematical language to describe them.

Spring: Unit 11

Summer: Unit 12

Developing spatial awareness- experiencing different viewpoints *Children need opportunities to move both themselves and objects around, so they see things from different perspectives. This will support them in visualising how things will appear when turned around and imagining how things might fit together:* • riding trikes around interesting routes • construction activities • printing and making pictures and patterns with shapes • posting boxes • jigsaws • making a complete circuit with a train track • directing a simple robot or remote-controlled toy vehicle along a route	**Shape awareness - developing shape awareness through construction.** *Through play – particularly in construction – children have lots of opportunities to explore shapes, the attributes of particular shapes, and to select shapes to fulfil a particular need.* • construction with structured and unstructured materials • making dens with varied materials outdoors.	**Developing an awareness of relationships between shapes-** *As children become more confident with specific shapes, encourage them to spot shapes within shapes:* • choosing 2D shapes to construct a 3D model, e.g. using triangles and rectangles to make a tent • making decorations by folding and cutting • making 3D shapes using interlocking shapes.	**Representing spatial relationships.** *Small world play and model building provide lots of opportunities for children to describe things being 'in front of', 'behind', 'on top of' etc., and to consider objects from different perspectives:* • designing a plan for a garden or play area, using a small tray with sand, twigs, building bricks, etc • drawing or making a simple map of a route with 'landmarks', e.g. houses and trees • following a simple map of an excursion.	**Identifying similarities between shapes -** *Children need opportunities to construct and create things that represent objects in their environment. As they do this, they should notice shape properties of the object that they want to represent:* • *stories as a prompt for creating representations, e.g. building a house for the three bears* • *making pictures with found materials, as well as structured shapes and blocks.* **Describing properties of shape:** • covering objects in foil and inviting children to justify	**Showing awareness of properties of shape:** • making an insect hotel – selecting tube-like shapes from a collection of varied materials, some not fit for purpose • creating an extended channel for water to flow from a high container to a low one, some distance away • asking questions, for example: 'What shapes can you make with three people inside a loop of string? What about with four people?' 'What is the same and what is different about these?' • making shapes with sticks and with their own bodies • printing with shapes: 'What footprint do you think this cylinder will make? What about if you roll it?'

• tangrams: 'Can you make a person with the shapes?' • with toys in a line: 'Can you say what the teddy on the other side is seeing?'				their guesses about what is inside • making arrangements with a selection of different rectangles, including squares.	

Big Idea – Shape and Space: Mathematically, the areas of shape and space are about developing visualising skills and understanding relationships, such as the effects of movement and combining shapes together, rather than just knowing vocabulary. Spatial skills are important for understanding other areas of maths and children need structured experiences to ensure they develop these. Children begin to recognise that relationships between objects and places can be described with mathematical precision, that spatial relationships can be visualised and manipulated mentally and that our own experiences of space and two dimensional representations of space reflect a specific point of view. They also understand that shapes can be defined by their attributes, that the flat faces of solid (three-dimensional) shapes are two-dimensional shapes and that shapes can be combined and separated (composed and decomposed) to make new shapes. Opportunities should encourage children to actively explore spatial relations and the properties of shapes, in order to develop mathematical thinking (rather than on shape classification, which requires prior knowledge of properties).

Common errors in this area may include:

- children thinking that only regular triangles are triangles, only brick-like rectangles are rectangles (i.e. shapes are defined by their image, not by their properties)
- children thinking that squares are only squares when the bottom is horizontal (i.e. shapes are defined by their orientation).

What to look out for:

Can the children:

- select and rotate shapes to fit into a given space?
- use positional vocabulary, including relative terms, to describe where things are in small-world play?
- show intentionality in selecting shapes for a purpose, such as cylinders to roll?
- make a range of constructions, including enclosures, and talk about the decisions they have made?
- see shapes in different orientations and recognise that they are still that shape?
- recognise a range of triangles and say how they know what they are?

ELG 12: SHAPE, SPACE AND MEASURES- PATTERNS

Children recognise, create and describe patterns.

Summer: Unit 12

Pattern-spotting around us:	**Continuing an AB pattern -**	**Copying an AB pattern**	**Make their own AB pattern:**	**Spotting an error in an AB pattern:**	**Continuing an ABC pattern:**
• exploring patterns in stories, songs and rhymes • where possible, representing these diagrammatically to support	*Children need the opportunity to see a pattern, to talk about what they can see, and to continue a pattern. At first, they will do*	• accessing a range of patterns to copy. For example, using the plastic bears: big, small, big, small, big…	• challenging children to change one element of the pattern they have created, e.g. 'Can you change the red	• presenting patterns with deliberate errors, including extra, missing and swapped items, e.g. red cube, blue	• building towers or trains of different-coloured cubes (continuing patterns horizontally and vertically)

pattern-spotting, and predicting what will happen next, and why • inviting children to spot patterns in the home environment, or bring in examples from home • looking at fabric patterns from different cultural traditions: discussing the patterns in terms of what stays the same and what is different • designing wrapping paper for a specific event that involves creating a pattern which the children can describe. **Symbolising the unit structure:** • including the following phrasing in discussion and dialogue: 'This is a red blue pattern; this/that; I call it an A (one of these) then a B (one of those).' • constructing patterns with actions and developing symbols to show the pattern and to provide 'instructions' for someone else to follow the pattern • inviting friends to copy the pattern from the symbols. **Generalising structures to another context or mode:** • providing a range of experiences where children	*this one item at a time, e.g. red cube, blue cube, red cube…verbalising the pattern helps*. • building towers or trains of different-coloured cubes (continuing patterns horizontally and vertically) • extending patterns using a wide range of identical objects in different colours, e.g. beads; small plastic toys such as bears, dinosaurs, vehicles. Try to avoid interlocking cubes or bead-threading so children can focus on the pattern rather than their coordination skills.	footwear: shoe, welly, shoe, welly..., actions and sounds: jump, twirl, jump, twirl, jump… or clap, stamp, clap, stamp… • collecting things in the outdoors environment: leaf, stick, leaf, stick… **Making a pattern which repeats around a circle** • making circular patterns such as necklaces, circles of linking elephants or camels • using pre-given circles to create a border, such as on or around a paper plate • exploring which patterns work, which don't, and why • offering a unit of the pattern and asking the child if they can include it in their pattern • making patterns around rectangular or other shaped frames. **Making a pattern around a border with a fixed number of spaces:** • creating borders around defined spaces in the learning environment, i.e. a garden for the teddy bears, an outdoor reading area, etc. • encouraging children to predict if the pattern could 'keep going', voting on this and discussing their thoughts and reasons with a partner.	bear to a blue bear? What is the pattern now?' • ensuring that there are numerous opportunities to create patterns – e.g. in the outdoors, using natural materials such as sticks, leaves, stones, pine cones; in craft activities, using stamping, sticking, printing; with musical instruments, using sounds such as drums, shakers, triangles, etc. • working collaboratively with a friend to take turns to create a pattern, e.g. one claps, one stamps, or one gets the red bear, one gets the yellow bear, etc. • challenging a friend to continue or copy their pattern.	cube, red cube, blue cube, red cube, red cube, blue cube – identifying there is an extra item and fixing it by removing the extra red cube, putting in an extra blue cube, or swapping the final cubes • asking the children to make a pattern with a deliberate mistake and challenging a friend to spot it. **Identifying the unit of repeat:** • highlight within a pattern what the unit of repeat is and ask the children to describe it. At this point for pattern novices (children who aren't as experienced as others), it would be good to do this with physical objects so that the unit of repeat can be moved to show how it repeats. Patterns that are printed, stamped or stuck down, and therefore cannot be corrected, are	• extending patterns using a wide range of identical objects in different colours, e.g. beads; small plastic toys such as bears, dinosaurs and vehicles. **N.B. Try to avoid using interlocking cubes or bead-threading, so children can focus on the pattern they are constructing rather than on their coordination skills.** **Continuing a pattern which ends mid-unit:** • providing a range of patterns – physical and on cards – that children can continue • ensuring that the patterns offered have different structures and end after a complete or a partial unit. **Make their own ABB, ABBC patterns:** • utilising a range of items in the environment to create patterns such as interlocking cubes and toys, e.g. links, elephants, camels • exploring and creating patterns on peg boards, with fruit (e.g. fruit kebabs), musical **Spotting an error in an ABB pattern:** • presenting patterns with deliberate errors • once children have fixed the pattern, encouraging

can create a pattern using a coding structure • ensuring children can follow the patterns they have coded.					them to check the 'fix' by tracking the pattern • asking the children to make a pattern with a deliberate mistake and challenging a friend to spot it.

Big Idea – Patterns: Developing an awareness of pattern helps young children to notice and understand mathematical relationships. Seeking and exploring patterns is at the heart of mathematics (Schoenfeld, 1992). Clements and Sarama (2007) identify that patterns may provide the foundations of algebraic thinking, since they provide the opportunity for young children to observe and verbalise generalisations. Children need to recognise and understand that patterns are sequences (repeating or growing) governed by a rule; they exist both in the world and in mathematics, that identifying the rule of a pattern brings predictability and allows us to make generalisations and that the same pattern can be found in many different forms.

Common errors in this area may include:

- not recognising a pattern such as ABBA (e.g. stating that patterns cannot have two of the same colour together)
- when copying or extending a pattern, changing it before making three repeats
- spotting that there is an error but not being able to describe it
- identifying an error but not being able to correct it
- correcting an error by making a 'local correction', which just moves the problem along (e.g. by adding an extra item when colours have been swapped)
- describing the whole pattern instead of identifying the part which repeats, or the unit of repeat.

What to look out for:

Can the children:

- continue, copy and create an AB pattern?
- identify the pattern rule (unit of repeat) in an AB pattern?
- continue, copy and create ABB, ABBC (etc.) patterns?
- identify the pattern rule (unit of repeat) in ABB, ABBC (etc.) patterns?
- spot an error and 'correct' a pattern?
- explain whether a circular pattern is continuous or not?

Number: Number and Place Value with Reasoning

COUNTING					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number Autumn: Units 1 and 6 Spring Unit 9 Summer: Unit 16			count backwards through zero to include negative numbers Autumn: Unit: 2	interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero Autumn: Unit: 2	use negative numbers in context, and calculate intervals across zero Autumn: Unit: 1
count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens Autumn: Unit: 1 Spring: Unit 9 Summer: Units 12, 16 18	count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward Autumn: Units 1 and 2 Spring Unit 9 Summer: Unit 12	count from 0 in multiples of 4, 8, 50 and 100; Autumn: Unit: 1	count in multiples of 6, 7, 9, 25 and 1000 Autumn: Units 1, 2 and 5	count forwards or backwards in steps of powers of 10 for any given number up to 1000 000 Autumn: Unit: 1	
given a number, identify one more and one less Autumn: Units 1 and 6 Spring: Unit: 9 Summer: Unit 16		find 10 or 100 more or less than a given number Autumn: Unit: 1	find 1000 more or less than a given number Autumn: Unit: 2		
Spot the mistake: 5,6,8,9 What is wrong with this sequence of numbers? **True or False?**	**Spot the mistake**: 45,40,35,25 What is wrong with this sequence of numbers? **True or False?**	**Spot the mistake**: 50,100,115,200 What is wrong with this sequence of numbers? **True or False?**	**Spot the mistake**: 950, 975,1000,1250 What is wrong with this sequence of numbers? **True or False?**	**Spot the mistake**: 177000,187000,197000,217000 What is wrong with this sequence of numbers? **True or False?**	**Spot the mistake**: -80,-40,10,50 What is wrong with this sequence of numbers? **True or False?**

I start at 2 and count in twos. I will say 9 **What comes next?** 10+1 = 11 11+1= 12 12+1 = 13 ……..	I start at 3 and count in threes. I will say 13? **What comes next?** 41+5=46 46+5=51 51+5=56 ……	38 is a multiple of 8? **What comes next?** 936-10= 926 926 -10 = 916 916- 10= 906 …….	324 is a multiple of 9? **What comes next?** 6706+ 1000= 7706 7706 + 1000 = 8706 8706 + 1000 = 9706 ……	When I count in 10's I will say the number 10100? **What comes next?** 646000-10000= 636000 636000 –10000 = 626000 626000- 10000 = 616000 …….	When I count backwards in 50s from 10 I will say -200 **True or False?** The temperature is -3. It gets 2 degrees warmer. The new temperature is -5?
COMPARING NUMBERS					
use the language of: equal to, more than, less than (fewer), most, least Autumn: Units 1 and 6 Spring: Unit 9 Summer: Unit 16	compare and order numbers from 0 up to 100; use <, > and = signs Autumn: Unit 1	compare and order numbers up to 1000 Autumn: Unit 1	order and compare numbers beyond 1000 Autumn: Units 1, and 2 *compare numbers with the same number of decimal places up to two decimal places* (copied from Fractions) Spring: Unit: 11	read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit (appears also in Reading and Writing Numbers) Autumn: Units 1, and 2	read, write, order and compare numbers up to 10 000 000 and determine the value of each digit (appears also in Reading and Writing Numbers) Autumn: Unit 1
Do, then explain Look at the objects. (in a collection). Are there more of one type than another? How can you find out?	**Do, then explain** 37 13 73 33 3 If you wrote these numbers in order starting with the smallest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** 835 535 538 388 508 If you wrote these numbers in order starting with the smallest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** 5035 5053 5350 5530 5503 If you wrote these numbers in order starting with the largest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** 747014 774014 747017 774077 744444 If you wrote these numbers in order starting with the smallest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** Find out the populations in five countries. Order the populations starting with the largest. Explain how you ordered the countries and their populations.

IDENTIFYING, REPRESENTING AND ESTIMATING NUMBERS

identify and represent numbers using objects and pictorial representations including the number line Autumn: Units 1 and 6 Spring: Unit: 9 Summer: Unit 16	identify, represent and estimate numbers using different representations, including the number line Autumn: Unit 1	identify, represent and estimate numbers using different representations Autumn: Unit 1	identify, represent and estimate numbers using different representations Autumn: Units 1 and 2		

READING AND WRITING NUMBERS (including Roman Numerals

read and write numbers from 1 to 20 in numerals and words. Autumn: Units 1 and 6	read and write numbers to at least 100 in numerals and in words Autumn: Unit 1	read and write numbers up to 1000 in numerals and in words Autumn: Unit 1	read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value. Autumn: Unit 1	read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit (appears also in Comparing Numbers) Autumn: Units 1, and 2	read, write, order and compare numbers up to 10 000 000 and determine the value of each digit (appears also in Understanding Place Value) Autumn: Unit 1
		tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks (copied from Measurement) Summer: Unit 11		read Roman numerals to 1 000 (M) and recognise years written in Roman numerals. Autumn: Unit 1	

UNDERSTANDING PLACE VALUE

	recognise the place value of each digit in a two-digit number (tens, ones) Autumn: Unit 1	recognise the place value of each digit in a three-digit number (hundreds, tens, ones) Autumn: Unit 1	recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) Autumn: Unit 1 *find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths* (copied from Fractions) Spring: Unit: 10 Summer: Unit 11	read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit (appears also in Reading and Writing Numbers) Autumn: Units 1, and 2 *recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents* (copied from Fractions) Spring: Unit 11	read, write, order and compare numbers up to 10 000 000 and determine the value of each digit (appears also in Reading and Writing Numbers) Autumn: Unit 1 *identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places* (copied from Fractions) Spring: Unit 7
	Do, then explain Show the value of the digit 2 in these numbers? 32 27 92 Explain how you know. **Make up an example** Create numbers where the units digit is one less than the tens digit. What is the largest/smallest number?	**Do, then explain** Show the3 value of the digit 3 in these numbers? 341 503 937 Explain how you know. **Make up an example** Create numbers where the digit sum is three. Eg 120, 300, 210 What is the largest/smallest number?	**Do, then explain** Show the value of the digit 4 in these numbers? 3041 4321 5497 Explain how you know. **Make up an example** Create four digit numbers where the digit sum is four and the tens digit is one. Eg 1210, 2110, 3010 What is the largest/smallest number?	**Do, then explain** Show the value of the digit 5 in these numbers? 350114 567432 985376 Explain how you know. **Make up an example Give further examples** Create six digit numbers where the digit sum is five and the thousands digit is two. Eg 3002000 2102000 What is the largest/smallest number?	**Do, then explain** Show the value of the digit 6 in these numbers? 6787555 95467754 Expalin how you know. **Make up an example** Create seven digit numbers where the digit sum is six and the tens of thousands digit is two. Eg 4020000 What is the largest/smallest number?

ROUNDING

			round any number to the nearest 10, 100 or 1 000 Autumn: Units 1, 2	round any number up to 1 000 000 to the nearest 10, 100, 1 000, 10 000 and 100 000	round any whole number to a required degree of accuracy Autumn: Unit 1
			round decimals with one decimal place to the nearest whole number (copied from Fractions) Summer: Unit 11	*round decimals with two decimal places to the nearest whole number and to one decimal place* (copied from Fractions) Spring: Unit 11	*solve problems which require answers to be rounded to specified degrees of accuracy* (copied from Fractions) Spring: Units 7 and 8
			Possible answers A number rounded to the nearest ten is 540. What is the smallest possible number it could be? **What do you notice?** Round 296 to the nearest 10. Round it to the nearest 100. What do you notice? Can you suggest other numbers like this?	**Possible answers** A number rounded to the nearest thousand is 76000 What is the largest possible number it could be? **What do you notice?** Round 343997 to the nearest 1000. Round it to the nearest 10000. What do you notice? Can you suggest other numbers like this?	**Possible answers** Two numbers each with two decimal places round to 23.1 to one decimal place. The total of the numbers is 46.2. What could the numbers be? **What do you notice?** Give an example of a six digit number which rounds to the same number when rounded to the nearest 10000 and 100000

PROBLEM SOLVING

	use place value and number facts to solve problems Summer: Unit 12	solve number problems and practical problems involving these ideas. Autumn: Unit 1	solve number and practical problems that involve all of the above and with increasingly large positive numbers Autumn: Unit 2	solve number problems and practical problems that involve all of the above Autumn: Unit 2	solve number and practical problems that involve all of the above Autumn: Unit 1 Summer: Unit 14

Number: Addition and Subtraction with Reasoning

NUMBER BONDS

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
represent and use number bonds and related subtraction facts within 20 Autumn: Units 2, 3 and 4 Spring: Units: 7 and 8	recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 Autumn: Unit 2				
Continue the pattern 10 + 8 = 18 11 + 7 = 18 Can you make up a similar pattern for the number 17? How would this pattern look if it included subtraction? **Missing numbers** 9 + ☐ = 10 10 - ☐ = 9 What number goes in the missing box?	**Continue the pattern** 90 = 100 – 10 80 = 100 – 20 Can you make up a similar pattern starting with the numbers 74, 26 and 100? **Missing numbers** 91 + ☐ = 100 100 - ☐ = 89 What number goes in the missing box?				

MENTAL CALCULATION

add and subtract one-digit and two-digit numbers to 20, including zero Autumn: Unit 4, Spring: Unit 7 and 8	add and subtract numbers using concrete objects, pictorial representations, and mentally, including: * a two-digit number and ones * a two-digit number and tens * two two-digit numbers * adding three one-digit numbers Autumn: Units 2, 3 Summer: Unit 12	add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens * a three-digit number and hundreds Autumn: Units 1, 2, 3		add and subtract numbers mentally with increasingly large numbers Autumn: Unit 3	perform mental calculations, including with mixed operations and large numbers Autumn: Unit 3
Working backwards Through practical games on number tracks and lines ask questions such as "where have you landed?" and "what numbers would you need to throw to land on other given numbers?" **What do you notice?** 11 – 1 = 10 11 – 10 = 1 Can you make up some other number sentences like this involving 3 different numbers?	**True or false?** Are these number sentences true or false?73 + 40 = 113 98 – 18 = 70 46 + 77 = 123 92 – 67 = 35 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 23 + 10 = 93 + 10 = 54 + 9 = 54 + 1 = Explain why you think the hard questions are hard? **Other possibilities** □ + □ + □ = 14 What single digit numbers could go in the boxes?	**True or false?** Are these number sentences true or false?597 + 7 = 614 804 – 70 = 744 768 + 140 = 908 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 323 + 10 = 393 + 10 = 454 - 100 = 954 - 120 = Explain why you think the hard questions are hard?	**True or false?** Are these number sentences true or false?6.7 + 0.4 = 6.11 8.1 – 0.9 = 7.2 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 13323 - 70 = 12893 + 300 = 19354 - 500 = 19954 + 100 = Explain why you think the hard questions are hard?	**True or false?** Are these number sentences true or false?6.17 + 0.4 = 6.57 8.12 – 0.9 = 8.3 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 213323 - 70 = 512893 + 300 = 819354 - 500 = 319954 + 100 = Explain why you think the hard questions are hard?	**True or false?** Are these number sentences true or false?6.32 + □ = 8 □ = 1.68 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 213323 - 70 = 512893 + 37 = 8193.54 - 5.9 = Explain why you think the hard questions are hard?

	How many different ways can you do this?				
read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs (appears also in Written Methods) Autumn: Units 2, 3 and 4 Spring: Unit: 8	show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot Autumn: Unit 2 Summer: Unit 12				use their knowledge of the order of operations to carry out calculations involving the four operations Autumn: Units 3 and 5 Summer: Unit 14
Fact families Which four number sentences link these numbers? 12, 15, 3 **What else do you know?** If you know this: 12 – 9 = 3 what other facts do you know? **Missing symbols** Write the missing symbols (+ - =) in these number sentences: 17 ☐ 3 ☐ 20 18 ☐ 20 ☐ 2	**Fact families** Which four number sentences link these numbers? 100, 67, 33 **What else do you know?** If you know this: 87 = 100 – 13 what other facts do you know? **Missing symbols** Write the missing symbols (+ - =) in these number sentences: 80 ☐ 20 ☐ 100 100 ☐ 70 ☐ 30 87 ☐ 13 ☐ 100				**Missing symbols** Write the missing signs (+ - x ÷) in this number sentence: 6 ◯ 12.3 = 61.9 ◯ 11.9 **What else do you know?** If you know this: 86.7 + 13.3 = 100 what other facts do you know?

WRITTEN METHODS

read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs (appears also in Mental Calculation) Autumn: Units 2, 3 and 4 Spring: Unit: 8		add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction Autumn: Units 2 and 3	add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate Autumn: Unit 3	add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) Autumn: Unit 3	read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs (appears also in Mental Calculation) Autumn: Units 2, 3 and 4 Spring: Unit: 8
Convince me In my head I have two odd numbers with a difference of 2. What could they be? Convince me **Missing numbers** Fill in the missing numbers (using a range of practical resources to support) 12 + □ = 19 20 - □ = 3	**Convince me** What digits could go in the boxes? 7 □ - 2 □ = 46 Try to find all of the possible answers. How do you know you have got them all? Convince me	**Convince me** □□ + □□ + □□ The total is 201 Each missing digit is either a 9 or a 1. Write in the missing digits. Is there only one way of doing this or lots of ways? Convince me	**Convince me** □ - 666 = 8□5 What is the largest possible number that will go in the rectangular box? What is the smallest? Convince me	**Convince me** □ + 1475 = 6□24 What numbers go in the boxes? What different answers are there? Convince me	**Convince me** Three four digit numbers total 12435. What could they be? Convince me

INVERSE OPERATIONS, ESTIMATING AND CHECKING ANSWERS

	recognise and use the inverse relationship between addition and subtraction and use this to check calculations and	estimate the answer to a calculation and use inverse operations to check answers Autumn: Unit 3	estimate and use inverse operations to check answers to a calculation Autumn: Unit 3	use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy Autumn: Unit 3	use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

	solve missing number problems. Summer: Unit 12				Summer: Units 14 and 15
Making an estimate Pick (from a selection of number sentences) the ones where the answer is 8 or 9. **Is it true that?** Is it true that 3+4 = 4 + 3?	**Making an estimate** Which of these number sentences have the answer that is between 50 and 60 74 - 13 55 + 17 87 – 34 **Always, sometimes, never** Is it always, sometimes or never true that if you add three numbers less than 10 the answer will be an odd number	**Making an estimate** Which of these number sentences have the answer that is between 50 and 60 174 - 119 333 – 276 932 - 871 **Always, sometimes, never** Is it always, sometimes or never true that if you subtract a multiple of 10 from any number the units digit of that number stays the same. Is it always, sometimes or never true that when you add two numbers together you will get an even number	**Making an estimate** Which of these number sentences have the answer that is between 550 and 600 1174 - 611 3330 – 2779 9326 - 8777 **Always, sometimes, never** Is it always sometimes or never true that the difference between two odd numbers is odd.	**Making an estimate** Which of these number sentences have the answer that is between 0.5 and 0.6 11.74 - 11.18 33.3 – 32.71 **Always, sometimes, never** Is it always, sometimes or never true that the sum of four even numbers is divisible by 4.	**Making an estimate** Circle the number that is the best estimate to 932.6 - 931.05 1.3 1.5 1.7 1.9 **Always, sometimes, never** Is it always, sometimes or never true that the sum of two consecutive triangular numbers is a square number
PROBLEM SOLVING					
solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ - 9 Autumn: Units 3 and 4	solve problems with addition and subtraction: * using concrete objects and pictorial representations, including those involving numbers, quantities and measures	solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction Autumn: Units 2 and 3	solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why Autumn: Unit 2	solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why Autumn: Unit 3	solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why Summer: Unit 14

Spring: Units: 7, 8, 9, 10 and 11 Summer: Units: 12, 13 and 17	* applying their increasing knowledge of mental and written methods Autumn: Units 2, 3 and 4 Spring: Units: 7, 8, 9, 10 and 11 Summer: Units: 12, 13 and 17				
	solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change (copied from Measurement) Autumn: Unit 4				Solve problems involving addition, subtraction, multiplication and division Autumn: Unit 3 Summer: Unit 14

Number: Multiplication and Division with Reasoning

MULTIPLICATION & DIVISION FACTS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
count in multiples of twos, fives and tens (copied from Number and Place Value) Autumn: Unit 1	*count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward* (copied from Number and Place Value) Autumn: Units 1 and 2	*count from 0 in multiples of 4, 8, 50 and 100* (copied from Number and Place Value) Autumn: Unit 1	*count in multiples of 6, 7, 9, 25 and 1 000* (copied from Number and Place Value) Autumn: Units 1 and 2	*count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000* (copied from Number and Place Value) Autumn: Units 1 and 2	
	recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers Autumn: Units 5 and 6	recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables Autumn: Unit 1	recall multiplication and division facts for multiplication tables up to 12 × 12 Autumn: Unit 5		
	Missing numbers 10 = 5 x ☐ What number could be written in the box? **Making links** I have 30p in my pocket in 5p coins. How many coins do I have?	**Missing numbers** 24 = ☐ x ☐ Which pairs of numbers could be written in the boxes? **Making links** Cards come in packs of 4. How many packs do I need to buy to get 32 cards?	**Missing numbers** 72 = ☐ x ☐ Which pairs of numbers could be written in the boxes? **Making links** Eggs are bought in boxes of 12. I need 140 eggs; how many boxes will I need to buy?	**Missing numbers** 6 x 0.9 = ☐ x 0.03 6 x 0.04 = 0.008 x ☐ Which numbers could be written in the boxes? **Making links** Apples weigh about 170 g each. How many apples would	**Missing numbers** 2.4 ÷ 0.3 = ☐ x 1.25 Which number could be written in the box? **Making links**

				you expect to get in a 2 kg bag?	
MENTAL CALCULATION					
		write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Written Methods) Spring: Unit 5	use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers Autumn: Unit 5 Spring: Unit 6	multiply and divide numbers mentally drawing upon known facts Spring: Unit 7	perform mental calculations, including with mixed operations and large numbers Autumn: Unit 3
		Use a fact 20 x 3 = 60. Use this fact to work out 21 x 3 = 22 x 3 = 23 x 3 = 24 x 3 =	**Use a fact** 63 ÷ 9 = 7 Use this fact to work out 126 ÷ 9 = 252 ÷ 7 =	**Use a fact:** 3 x 75 = 225 Use this fact to work out 450 ÷ 6 = 225 ÷ 0.6 = To multiply by 25 you multiply by 100 and then divide by 4. Use this strategy to solve 48 x 25 78 x 25 4.6 x 25	**Use a fact** 12 x 1.1 = 13.2 Use this fact to work out 15.4 ÷ 1.1 = 27.5 ÷ 1.1 =
	show that multiplication of two numbers can be done in any order (commutative) and		recognise and use factor pairs and commutativity in mental calculations (appears also in Properties	multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 Autumn: Unit 5	*associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$)* (copied from Fractions)

	division of one number by another cannot Summer: Unit 12		of Numbers) Spring: Unit 6	Summer: Unit 12	Spring: Unit 7
Making links If one teddy has two apples, how many apples will three teddies have? Here are 10 Lego people If 2 people fit into the train carriage, how many carriages do we need?	**Making links** Write the multiplication number sentences to describe this array X X X X X X What do you notice? Write the division sentences.	**Making links** 4 × 6 = 24 How does this fact help you to solve these calculations? 40 x 6 = 20 x 6 = 24 x 6 =	**Making links** How can you use factor pairs to solve this calculation? 13 x 12 (13 x 3 x 4, 13 x 3 x 2 x 2, 13 x 2 x 6)	**Making links** 7 x 8 = 56 How can you use this fact to solve these calculations? 0.7 x 0.8 = 5.6 ÷ 8 =	**Making links** 0.7 x 8 = 5.6 How can you use this fact to solve these calculations? 0.7 x 0.08 = 0.56 ÷ 8 =
WRITTEN CALCULATION					
	calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs Autumn: Unit 5 Spring: Unit 6 Summer: Unit 12	write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Mental Methods) Spring: Unit 5	multiply two-digit and three-digit numbers by a one-digit number using formal written layout Spring: Units 6 and 7	multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Spring: Units 7	multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication Autumn: Unit 2
				divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders	divide numbers up to 4-digits by a two-digit whole number using the formal written method of short division where appropriate for the context

				appropriately for the context Spring: Units 7	Autumn: Unit 2 divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context Autumn: Unit 2
					use written division methods in cases where the answer has up to two decimal places (copied from Fractions (including decimals) Autumn: Units 5 and 7
Practical If we put two pencils in each pencil pot how many pencils will we need?	**Prove It** Which four number sentences link these numbers? 3, 5, 15? Prove it.	**Prove It** What goes in the missing box? x ? ? 4 80 12 Prove it. **How close can you get?** □□ × □ Using the digits 2, 3 and 4 in the calculation above how close can you get to 100? What is the largest product? What is the smallest product?	**Prove It** What goes in the missing box? 6 □ x 4 = 512 Prove it. **How close can you get?** □□□ X 7 Using the digits 3, 4 and 6 in the calculation above how close can you get to 4500? What is the largest product? What is the smallest product?	**Prove It** What goes in the missing box? 12 □3 ÷ 6 = 212 12 □3 ÷ 7 = 212 22 □3 ÷ 7 = 321 r 6 323 x □1 = 13243 Prove it.	**Prove It** What goes in the missing box? 18 □4 ÷ 12 = 157 38 □5 ÷ 18 = 212.5 33 □2 ÷ 8 = 421.5 38 x □.7 = 178.6 Prove it. **Can you find?** Can you find the smallest number that can be added to or subtracted from 87.6

					to make it exactly divisible by 8/7/18?
PROPERTIES OF NUMBERS: MULTIPLES, FACTORS, PRIMES, SQUARE AND CUBE NUMBERS					
			recognise and use factor pairs and commutativity in mental calculations (repeated) Spring: Unit 6	identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Autumn: Unit 5 know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers Autumn: Unit 5 establish whether a number up to 100 is prime and recall prime numbers up to 19 Autumn: Unit 5	identify common factors, common multiples and prime numbers Autumn: Unit 5 *use common factors to simplify fractions; use common multiples to express fractions in the same denomination* (copied from Fractions) Autumn: Unit 4
				recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) Autumn: Unit 5	*calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3), and extending to other units such as mm^3 and km^3* (copied from Measures) Spring: Unit 11
Spot the mistake	**True or false?**	**True or false?**	**Always, sometimes, never?**	**Always, sometimes, never?**	**Always, sometimes, never?**

Use a puppet to count but make some deliberate mistakes. e.g. 2 4 5 6 10 9 8 6 See if the pupils can spot the deliberate mistake and correct the puppet	When you count up in tens starting at 5 there will always be 5 units.	All the numbers in the two times table are even. There are no numbers in the three times table that are also in the two times table.	Is it always, sometimes or never true that an even number that is divisible by 3 is also divisible by 6. Is it always, sometimes or never true that the sum of four even numbers is divisible by 4.	Is it always, sometimes or never true that multiplying a number always makes it bigger Is it always, sometimes or never true that prime numbers are odd. Is it always, sometimes or never true that when you multiply a whole number by 9, the sum of its digits is also a multiple of 9 Is it always, sometimes or never true that a square number has an even number of factors.	Is it always, sometimes or never true that dividing a whole number by a half makes the answer twice as big. Is it always, sometimes or never true that when you square an even number, the result is divisible by 4 Is it always, sometimes or never true that multiples of 7 are 1 more or 1 less than prime numbers.
ORDER OF OPERATIONS					
					use their knowledge of the order of operations to carry out calculations involving the four operations Autumn: Unit 3 Summer: Unit 14
					Which is correct? Which of these number sentences is correct? 3 + 6 x 2 =15 6 x 5 – 7 x 4 = 92 8 x 20 ÷ 4 x 3 = 37

INVERSE OPERATIONS, ESTIMATING AND CHECKING ANSWERS

		estimate the answer to a calculation and use inverse operations to check answers (copied from Addition and Subtraction) Autumn: Unit 3	*estimate and use inverse operations to check answers to a calculation* (copied from Addition and Subtraction) Autumn: Unit 3		use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy Summer: Units 14 and 15
	Use the inverse Use the inverse to check if the following calculations are correct: 12 ÷ 3 = 4 3 x 5 = 14	**Use the inverse** Use the inverse to check if the following calculations are correct 23 x 4 = 82 117 ÷ 9 = 14 **Size of an answer** Will the answer to the following calculations be greater or less than 80 23 x 3= 32 x 3 = 42 x 3 = 36 x 2=	**Use the inverse** Use the inverse to check if the following calculations are correct: 23 x 4 = 92 117 ÷ 9 = 14 **Size of an answer** Will the answer to the following calculations be greater or less than 300 152 x 2= 78 x 3 = 87 x 3 = 4 x 74 =	**Use the inverse** Use the inverse to check if the following calculations are correct: 4321 x 12 = 51852 507 ÷ 9 = 4563 **Size of an answer** The product of a two digit and three digit number is approximately 6500. What could the numbers be?	**Use the inverse** Use the inverse to check if the following calculations are correct: 2346 x 46 = 332796 27.74 ÷ 19 = 1.46 **Size of an answer** The product of a single digit number and a number with two decimal places is 21.34 What could the numbers be?

PROBLEM SOLVING

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations	solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and	solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence	solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems	solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes Autumn: Unit 5	solve problems involving addition, subtraction, multiplication and division Summer: Unit 14

and arrays with the support of the teacher Summer: Units12 and 13	division facts, including problems in contexts Autumn: Unit 5 Spring: Unit 6 Summer: Unit 12	problems in which n objects are connected to m objects Autumn: Unit 4 Spring: Unit 5	and harder correspondence problems such as n objects are connected to m objects Spring: Unit 6	solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign Spring: Unit 14	
				solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates Spring: Unit 12	*solve problems involving similar shapes where the scale factor is known or can be found* (copied from Ratio and Proportion) Spring: Unit 12

Number: Fractions (including Decimals and Percentages) with Reasoning

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
COUNTING IN FRACTIONAL STEPS					
	Pupils should count in fractions up to 10, starting from any number and using the1/2 and 2/4 equivalence on the number line (Non Statutory Guidance) Spring: Unit 10	count up and down in tenths Spring: Unit 9	count up and down in hundredths Spring: Unit 8		
	Spot the mistake 7, 7 ½ , 8, 9, 10 8 ½, 8, 7, 6 ½, … and correct it **What comes next?** 5 ½, 6 ½ , 7 ½ , …., …. 9 ½, 9, 8 ½, ……, …..	**Spot the mistake** six tenths, seven tenths, eight tenths, nine tenths, eleven tenths … and correct it. **What comes next?** 6/10, 7/10, 8/10, ….., …. 12/10, 11/10, ….., ….., …..	**Spot the mistake** sixty tenths, seventy tenths, eighty tenths, ninety tenths, twenty tenths … and correct it. **What comes next?** 83/100, 82/100, 81/100, ….., ….., ….. 31/100, 41/100, 51/100, ….., …..,	**Spot the mistake** 0.088, 0.089, 1.0 **What comes next?** 1.173, 1.183, 1.193	**Spot the mistake** Identify and explain mistakes when counting in more complex fractional steps
RECOGNISING FRACTIONS					
recognise, find and name a half as one of two equal parts of an object, shape or quantity	recognise, find, name and write fractions $^{1}/_{3}$, $^{1}/_{4}$, $^{2}/_{4}$ and $^{3}/_{4}$ of a	recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators	recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten Spring: Units 8 and 10	recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents	

Summer: Unit 14	length, shape, set of objects or quantity Spring: Unit 10	recognise that tenths arise from dividing an object into 10 equal parts and in dividing one – digit numbers or quantities by 10. Spring: Units 9 and 10		(appears also in Equivalence) Summer: Unit 12	
What do you notice? Choose a number of counters. Place them onto 2 plates so that there is the same number on each half. When can you do this and when can't you? What do you notice?	**What do you notice?** ¼ of 4 = 1 ¼ of 8 = 2 ¼ of 12 = 3 Continue the pattern What do you notice?	**What do you notice?** 1/10 of 10 = 1 2/10 of 10 = 2 3/10 of 10 = 3 Continue the pattern. What do you notice? What about 1/10 of 20? Use this to work out 2/10 of 20, etc.	**What do you notice?** 1/10 of 100 = 10 1/100 of 100 = 1 2/10 of 100 = 20 2/100 of 100 = 2 How can you use this to work out 6/10 of 200? 6/100 of 200?	**What do you notice?** One tenth of £41 One hundredth of £41 One thousandth of £41 Continue the pattern What do you notice? 0.085 + 0.015 = 0.1 0.075 + 0.025 = 0.1 0.065 + 0.035 = 0.1 Continue the pattern for the next five number sentences.	**What do you notice?** One thousandth of my money is 31p. How much do I have?
recognise, find and name a quarter as one of four equal parts of an object, shape or quantity Summer: Unit 14		recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators Spring: Units 9 and 10			
True or false? Sharing 8 apples between 4 children means each child has 1 apple.	**True or false?** Half of 20cm = 5cm ¾ of 12cm = 9cm	**True or false?** 2/10 of 20cm = 2cm 4/10 of 40cm = 4cm 3/5 of 20cm = 12cm	**True or false?** 1/20 of a metre= 20cm 4/100 of 2 metres = 40cm	**True or false?** 0.1 of a kilometre is 1m. 0.2 of 2 kilometres is 2m. 0.3 of 3 Kilometres is 3m 0.25 of 3m is 500cm. 2/5 of £2 is 20p	**True or false?** 25% of 23km is longer than 0.2 of 20km. Convince me.

COMPARING FRACTIONS

		compare and order unit fractions, and fractions with the same denominators Summer: Unit 10		compare and order fractions whose denominators are all multiples of the same number Spring: Unit 8	compare and order fractions, including fractions >1 Autumn: Unit 4 Spring: Unit 8
		Give an example of a fraction that is less than a half. Now another example that no one else will think of. Explain how you know the fraction is less than a half. (draw an image) Ben put these fractions in order starting with the smallest. Are they in the correct order? One fifth, one seventh, one sixth	Give an example of a fraction that is more than a half but less than a whole. Now another example that no one else will think of. Explain how you know the fraction is more than a half but less than a whole. (draw an image)	Give an example of a fraction that is more than three quarters. Now another example that no one else will think of. Explain how you know the fraction is more than three quarters. Imran put these fractions in order starting with the smallest. Are they in the correct order? Two fifths, three tenths, four twentieths How do you know?	Give an example of a **fraction** that is greater than 1.1 and less than 1.5. Now another example that no one will think of. Explain how you know. Sam put these fractions in order starting with the smallest. Are they in the correct order? Thirty-three fifths Twenty-three thirds Forty-five sevenths How do you know?

COMPARING DECIMALS

			compare numbers with the same number of decimal places up to two decimal places Summer: Unit 11	read, write, order and compare numbers with up to three decimal places Spring: Unit 11	identify the value of each digit in numbers given to three decimal places Spring: Unit 7
			Missing symbol Put the correct symbol < or > in each box	**Missing symbol** Put the correct symbol < or > in each box	**True or false?** In all of the numbers below, the digit 6 is

			3.03 ☐ 3.33 0.37 ☐ 0.32 What needs to be added to 3.23 to give 3.53? What needs to be added to 3.16 to give 3.2?	4.627 ☐ 4.06 12.317 ☐ 12.31 What needs to be added to 3.63 to give 3.13? What needs to be added to 4.652 to give 4.1?	worth <u>more than</u> 6 hundredths. 3.6 3.063 3.006 6.23 7.761 3.076 Is this true or false? Change some numbers so that it is true. What needs to be adde3d to 6.543 to give 7? What needs to be added to 3.582 to give 5? Circle the two decimals which are closest in value to each other. 0.9 0.09 0.99 0.1 0.01
ROUNDING INCLUDING DECIMALS					
			round decimals with one decimal place to the nearest whole number Summer: Unit 11	round decimals with two decimal places to the nearest whole number and to one decimal place Spring: Unit 11	solve problems which require answers to be rounded to specified degrees of accuracy Spring: Unit 7
			Do, then explain Circle each decimal which when rounded to the nearest whole number is 5. 5.3 5.7 5.2 5.8 Explain your reasoning **Top tips**	**Do, then explain** Circle each decimal which when rounded to one decimal place is 6.2. 6.32 6.23 6.27 6.17 Explain your reasoning **Top tips**	**Do, then explain** Write the answer of each calculation rounded to the nearest whole number 75.7 × 59 7734 ÷ 60 772.4 × 9.7 20.34 × (7.9 – 5.4)

			Explain how to round numbers to one decimal place? *Also see rounding in place value*	Explain how to round decimal numbers to one decimal place? *Also see rounding in place value*	**What's the same, what's different?** … when you round numbers to one decimal place and two decimal places? *Also see rounding in place value*
EQUIVALENCE (INCLUDING FRACTIONS, DECIMALS AND PERCENTAGES)					
	write simple fractions e.g. $^{1}/_{2}$ of 6 = 3 and recognise the equivalence of $^{2}/_{4}$ and $^{1}/_{2}$. Spring: Unit 11	recognise and show, using diagrams, equivalent fractions with small denominators Spring: Unit 10	recognise and show, using diagrams, families of common equivalent fractions Spring: Unit 8	identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths Spring: Unit 8	use common factors to simplify fractions; use common multiples to express fractions in the same denomination Autumn: Unit 4
	Odd one out. Which is the odd one out in this trio: ½ 2/4 ¼ Why? **What do you notice?** Find ½ of 8. Find 2/4 of 8 What do you notice?	**Odd one out**. Which is the odd one out in each of these trios ½ 3/6 5/8 3/9 2/6 4/9 Why? **What do you notice?** Find 2/5 of 10 Find 4/10 of 10. What do you notice? Can you write any other similar statements?	**Odd one out.** Which is the odd one out in each of these trio s¾ 9/12 4/6 9/12 10/15 2/3 Why? **What do you notice?** Find 4/6 of 24 Find 2/3 of 24 What do you notice? Can you write any other similar statements?	**Odd one out.** Which is the odd one out in each of these collections of 4 fractions 6/10 3/5 18/20 9/15 30/100 3/10 6/20 3/9 Why? **What do you notice?** Find 30/100 of 200 Find 3/10 of 200 What do you notice? Can you write any other similar statements?	**Odd one out**. Which is the odd one out in each of these collections of 4 fraction s¾ 9/12 26/36 18/24 4/20 1/5 6/25 6/30 Why? **What do you notice?** 8/5 of 25 = 40 5/4 of 16 = 20 7/6 of 36 - 42 Can you write similar statements?

<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>recognise and write decimal equivalents of any number of tenths or hundredths
Spring: Unit 10
Summer: Unit 11</td>
<td>read and write decimal numbers as fractions (e.g. 0.71 = $^{71}/_{100}$)
Spring: Unit 11

recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
Summer: Unit 12</td>
<td>associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^{3}/_{8}$)
Spring: Unit 7</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Complete the pattern by filling in the blank cells in this table:
<table><tr><td>$\frac{1}{10}$</td><td>$\frac{2}{10}$</td><td>$\frac{3}{10}$</td><td></td></tr><tr><td>$\frac{10}{100}$</td><td>$\frac{20}{100}$</td><td></td><td>$\frac{40}{100}$</td></tr><tr><td>0.1</td><td></td><td>0.3</td><td></td></tr></table>Another and another
Write a decimal numbers (to one decimal place) which lies between a half and three quarters?
… and another, … and another, …</td>
<td>Complete the pattern
<table><tr><td>$\frac{71}{100}$</td><td>$\frac{??}{100}$</td><td>$\frac{??}{100}$</td><td>$\frac{??}{100}$</td></tr><tr><td>0.71</td><td>0.81</td><td>???</td><td>???</td></tr></table>Complete the table.

Another and another
Write a fraction with a denominator of one hundred which has a value of more than 0.75?
… and another, … and another, …</td>
<td>Complete the pattern
<table><tr><td>$\frac{1}{8}$</td><td>$\frac{2}{8}$</td><td>$\frac{3}{8}$</td><td>$\frac{4}{8}$</td></tr><tr><td>0.375</td><td>???</td><td>???</td><td>???</td></tr></table>Complete the table.

Another and another
Write a unit fraction which has a value of less than 0.5?
… and another, … and another, …</td>
</tr>
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<td></td>
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<td>recognise and write decimal equivalents to $^{1}/_{4}$; $^{1}/_{2}$; $^{3}/_{4}$
Spring: Unit 10</td>
<td>recognise the per cent symbol (%) and understand that per cent relates to “number of parts per hundred”, and write percentages as a fraction with denominator 100 as a decimal fraction
Spring: Unit 11</td>
<td>recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.
Spring: Unit 8
Summer: Unit 14</td>
</tr>
</table>

	Ordering Put these fractions in the correct order, starting with the smallest. ½ ¼ 1/3	**Ordering** Put these fractions in the correct order, starting with the smallest. 4/8 ¾ 1/4	**Ordering** Put these numbers in the correct order, starting with the smallest. ¼ 0.75 5/10 Explain your thinking	**Ordering** Put these numbers in the correct order, starting with the largest. 7/10, 0.73, 7/100, 0.073 71% Explain your thinking Which is more: 20% of 200 or 25% of 180? Explain your reasoning.	**Ordering** Which is larger, $^{1}/_{3}$ or $^{2}/_{5}$? Explain how you know. Put the following amounts in order, starting with the largest. 23%, 5/8, 3/5, 0.8
ADDITION AND SUBTRACTION OF FRACTIONS					
		add and subtract fractions with the same denominator within one whole (e.g. $^{5}/_{7} + ^{1}/_{7} = ^{6}/_{7}$) Summer: Unit 10	add and subtract fractions with the same denominator Spring: Unit 9 Summer: Unit 11	add and subtract fractions with the same denominator and multiples of the same number Spring: Unit 9 recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $^{2}/_{5} + ^{4}/_{5} = ^{6}/_{5} = 1^{1}/_{5}$) Spring: Unit 9	add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions Autumn: Units 4 and 5
		What do you notice? 1/10 + 9/10 = 1 2/10 + 8/10 = 1 3/10 + 7/10 = 1	**What do you notice?** 5/5 – 1/5 = 4/5 4/5 – 1/5 = 3/5 **Continue the pattern**	**What do you notice?** ¾ and ¼ = 4/4 = 1 4/4 and ¼ = 5/4 = 1 ¼ 5/4 and ¼ = 6/4 = 1 ½	**Another and another** Write down two fractions which have a difference of 1 2/… and another, … and another, …

		Continue the pattern Can you make up a similar pattern for eighths? The answer is 5/10, what is the question? (involving fractions / operations)	Can you make up a similar pattern for addition? The answer is 3/5, what is the question? What do you notice? 11/100 + 89/100 = 1 12/100 + 88/100 = 1 13/100 + 87/100 = 1 Continue the pattern for the next five number sentences	Continue the pattern up to the total of 2. Can you make up a similar pattern for subtraction? The answer is 1 2/5 , what is the question	**Another and another** Write down 2 fractionswith a total of 3 4/5. … and another, … and another, …
MULTIPLICATION AND DIVISION OF FRACTIONS					
				multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams Spring: Unit 10	multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $^1/_4 \times {}^1/_2 = {}^1/_8$) multiply one-digit numbers with up to two decimal places by whole numbers Autumn: Unit 5 Spring: Unit 8
					divide proper fractions by whole numbers (e.g. $^1/_3 \div 2 = {}^1/_6$) Autumn: Unit 5
				Continue the pattern ¼ x 3 = ¼ x 4 = ¼ x 5 =	**Continue the pattern** 1/3 ÷ 2 = 1/6 1/6 ÷ 2 = 1/12 1/12 ÷ 2 = 1/24

				Continue the pattern for five more number sentences. How many steps will it take to get to 3? 5/3 of 24 = 40 Write a similar sentence where the answer is 56. The answer is 2 ¼, what is the question Give your top tips for multiplying fractions.	What do you notice? ½ x ¼ = The answer is 1/8 , what is the question (involving fractions / operations) Give your top tips for dividing fractions.
MULTIPLICATION AND DIVISION OF DECIMALS					
					multiply one-digit numbers with up to two decimal places by whole numbers Spring: Unit 7
			find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths Spring: Unit 10 Summer: Unit 11		multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places Spring: Unit 7
					identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100

					and 1000 where the answers are up to three decimal places Spring: Unit 7
					associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$) Spring: Unit 7
					use written division methods in cases where the answer has up to two decimal places Autumn: Unit 5 Spring: Unit 7
			Undoing I divide a number by 100 and the answer is 0.3. What number did I start with? **Another and another** Write down a number with one decimal place which when multiplied by 10 gives an answer between 120 and 130. ... and another, … and another, …	**Undoing** I divide a number by 100 and the answer is 0.33 What number did I start with? **Another and another** Write down a number with two decimal places which when multiplied by 100 gives an answer between 33 and 38. ... and another, … and another, …	**Undoing** I multiply a number with three decimal places by a multiple of 10. The answer is approximately 3.21 What was my number and what did I multiply buy? When I divide a number by 1000 the resulting number has the digit 6 in the units and tenths and the other digits are 3 and 2 in the tens and hundreds columns. What could my number have been?

PROBLEM SOLVING

		solve problems that involve all of the above Spring: Unit 9 Summer: Unit 10	solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number Spring: Units 8 and 9	solve problems involving numbers up to three decimal places Summer: Unit 12	
			solve simple measure and money problems involving fractions and decimals to two decimal places. Spring: Units 10, 11 and 12	solve problems which require knowing percentage and decimal equivalents of $^{1}/_{2}$, $^{1}/_{4}$, $^{1}/_{5}$, $^{2}/_{5}$, $^{4}/_{5}$ and those with a denominator of a multiple of 10 or 25. Spring: Unit 11	

Number: Ratio and Proportion with Reasoning

Statements only appear in Year 6 but should be connected to previous learning, particularly fractions and multiplication and division					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
					solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts Spring: Unit 12; Summer Unit: 14
					What else do you know? In a flower bed a gardener plants 3 red bulbs for every 4 white bulbs. How many red and white bulbs might he plant? If she has 100 white bulbs, how many red bulbs does she need to buy? If she has 75 red bulbs, how many white bulbs does she need to buy? If she wants to plant 140 bulbs altogether, how many of each colour should she buy? **Do, then explain** Purple paint is made from read and blue paint in the ratio of 3:5. To make 40 litres of purple paint how much would I need of each colour? Explain your thinking.
					solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison Spring: Unit 8; Summer: Units 14 and 15
					What else do you know? 88% of a sum of money = £242. Make up some other statements. Write real life problems for your number sentences. **Undoing** I think of a number and then reduce it by 15%. The number I end up with is 306. What was my original number?

					In a sale where everything is reduced by 15% I paid the following prices for three items. £255, £850, £4.25 What was the original selling price?
					solve problems involving similar shapes where the scale factor is known or can be found Spring: Unit 12
					Unpicking A recipe needs to include three times as much apple than peach. The total weight of apples and peaches in a recipe is 700 grams. How much apple do I need?
					solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. Spring: Unit 12; Summer: Unit 14
					Other possibilities A 50 seater coach travels to the match. Most of the seats are taken. Junior tickets cost £13 and Adult tickets cost £23. The only people on the coach are Juniors and Adults. The total amount paid for tickets is approximately £900 How many people on the coach were adults and how many were juniors?

Number: Algebra with Reasoning

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
EQUATIONS					
solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and ***missing number problems*** *such as* $7 = \square - 9$ (copied from Addition and Subtraction) Autumn: Units 3 and 4 Spring: Units 7, 8, 9 and 10 Summer: Unit 17	*recognise and use the inverse relationship between addition and subtraction and use this to check calculations and* ***missing number*** *problems.* (copied from Addition and Subtraction) Summer: Unit 12	solve problems, *including* ***missing number*** *problems, using number facts, place value, and more complex addition and subtraction.* (copied from Addition and Subtraction) Autumn: Units 2 and 3 *solve problems, including* ***missing number*** *problems, involving multiplication and division, including integer scaling* (copied from Multiplication and Division) Autumn: Unit 4 Spring: Unit 5		*use the properties of rectangles to deduce related facts and find* ***missing lengths and angles*** (copied from Geometry: Properties of Shapes) Summer: Units 13 and 14	express missing number problems algebraically Spring: Unit 9
	recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 (copied from Addition and Subtraction) Autumn: Unit 2				find pairs of numbers that satisfy number sentences involving two unknowns Spring: Unit 9
represent and use number bonds and related subtraction facts within 20					enumerate possibilities of combinations of two variables.

(copied from Addition and Subtraction) Autumn: Units 2, 3 and 4 Spring: Units 7, 8 Summer: Unit 16					Spring: Unit 9
Connected Calculations 11 = 3 + 8 12 = 4 + 8 13 = ☐ + 8 14 = ☐ + 8 What numbers go in the boxes? Can you continue this sequence of calculations?	**Connected Calculations** Put the numbers 19, 15 and 4 in the boxes to make the number sentences correct. ☐ = ☐ - ☐ ☐ = ☐ + ☐	**Connected Calculations** Put the numbers 3, 12, 36 in the boxes to make the number sentences correct. ☐ = ☐ x ☐ ☐ = ☐ ÷ ☐	**Connected Calculations** Put the numbers 7.2, 8, 0.9 in the boxes to make the number sentences correct. ☐ = ☐ x ☐ ☐ = ☐ ÷ ☐	**Connected Calculations** The number sentence below represents the angles in degrees of an isosceles triangle. A + B + C = 180 degrees A and B are equal and are multiples of 5. Give an example of what the 3 angles could be. Write down 3 more examples	**Connected Calculations** p and q each stand for whole numbers. p + q = 1000 and p is 150 greater than q. Work out the values of p and q.
FORMULAE					
			Perimeter can be expressed algebraically as 2(a + b) where a and b are the dimensions in the same unit. (Copied from NSG measurement)		use simple formulae Spring: Unit 9 *recognise when it is possible to use **formulae** for area and volume of shapes* (copied from Measurement) Spring: Unit 11
			Undoing If the longer length of a rectangle is 13cm and the perimeter is 36cm, what	**Undoing** The perimeter of a rectangular garden is between 40 and 50 metres.	**Undoing** The diagram below represents two rectangular fields that are next to each other.

			is the length of the shorter side? Explain how you got your answer.	What could the dimensions of the garden be?	<table><tr><td>Field A</td><td>Field B</td></tr></table> Field A is twice as long as field B but their widths are the same and are 7.6 metres. If the perimeter of the small field is 23m what is the perimeter of the entire shape containing both fields? If y stands for a number complete the table below <table><tr><td>*y*</td><td>3*y*</td><td>3*y* + 1</td></tr><tr><td>25</td><td></td><td></td></tr><tr><td></td><td></td><td>28</td></tr></table> What is the largest value of y if the greatest number in the table was 163?
SEQUENCES					
sequence events in chronological order using language such as: before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening (copied from Measurement) Summer: Unit 17	*compare and sequence intervals of time* (copied from Measurement) Summer: Unit 13 *order and arrange combinations of mathematical objects in patterns* (copied from Geometry: position and direction) Spring: Unit 9 Summer: Unit 11				generate and describe linear number sequences Spring: Unit 9

	True or false? Explain The largest three digit number that can be made from the digits 2, 4 and 6 is 264. Is this true or false? Explain your thinking.				**Generalising** Write a formula for the 10th, 100th and nth terms of the sequences below. 4, 8, 12, 16 …… 0.4, 0.8, 1.2, 1.6, ……

Measurement with Reasoning

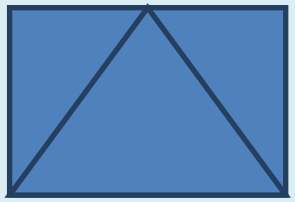
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
COMPARING AND ESTIMATING					
compare, describe and solve practical problems for: * lengths and heights [e.g. long/short, longer/shorter, tall/short, double/half] * mass/weight [e.g. heavy/light, heavier than, lighter than] * capacity and volume [e.g. full/empty, more than, less than, half, half full, quarter] * time [e.g. quicker, slower, earlier, later] Spring: Units 10 and 11 Summer: Unit 17	compare and order lengths, mass, volume/capacity and record the results using >, < and = Spring: Unit 8 Summer: Unit 14		estimate, compare and calculate different measures, including money in pounds and pence (also included in Measuring) Summer: Unit 12	calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes (also included in measuring) Autumn: Unit 6 estimate volume (e.g. using 1 cm^3 blocks to build cubes and cuboids) and capacity (e.g. using water) Summer: Unit 16	calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3), and extending to other units such as mm^3 and km^3.4 Spring: Unit 11

Top tips How do you know that this (object) is heavier / longer / taller than this one? Explain how you know.	**Top tips** Put these measurements in order starting with the smallest. 75 grammes 85 grammes 100 grammes Explain your thinking **Position the symbols** Place the correct symbol between the measurements > or < 36cm ☐ 63cm 130ml ☐ 103ml Explain your thinking	**Top Tips** Put these measurements in order starting with the largest. Half a litre Quarter of a litre 300 ml Explain your thinking **Position the symbols** Place the correct symbol between the measurements > or < 306cm ☐ Half a metre 930 ml ☐ 1 litre Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. Half of three litres Quarter of two litres 300 ml Explain your thinking **Position the symbols** Place the correct symbols between the measurements > or < £23.61 2326p 2623p Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. 130000cm^2 1.2 m^2 13 m^2 Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. 100 cm^3 1000000 mm^3 1 m^3 Explain your thinking
sequence events in chronological order using language [e.g. before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening] Summer: Unit 17	compare and sequence intervals of time Summer: Unit 13	compare durations of events, for example to calculate the time taken by particular events or tasks Summer: Unit 11			
		estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight			

		(appears also in Telling the Time) Summer: Unit 11			
Explain thinking Ask pupils to reason and make statements about to the order of daily routines in school e.g. daily timetable e.g. we go to PE **after** we go to lunch. Is this true or false? What do we do before break time? etc.	**Undoing** The film finishes two hours after it starts. It finishes at 4.30. What time did it start? Draw the clock at the start and the finish of the film. **Explain thinking** The time is 3:15pm. Kate says that in two hours she will be at her football game which starts at 4:15. Is Kate right? Explain why.	**Undoing** A programme lasting 45 minutes finishes at 5.20. At what time did it start? Draw the clock at the start and finish time. **Explain thinking** Salha says that 100 minutes is the same as 1 hour. Is Salha right? Explain why.	**Undoing** Imran's swimming lesson lasts 50 mins and it takes 15 mins to change and get ready for the lesson. What time does Imran need to arrive if his lesson finishes at 6.15pm? **Explain thinking** The time is 10:35 am. Jack says that the time is closer to 11:00am than to 10:00am. Is Jack right? Explain why.	**Undoing** A school play ends at 6.45pm. The play lasted 2 hours and 35 minutes. What time did it start? **Other possibilities** (links with geometry, shape and space) A cuboid is made up of 36 smaller cubes.  If the cuboid has the length of two of its sides the same what could the dimensions be? Convince me	**Undoing** A film lasting 200 minutes finished at 17:45. At what time did it start? **Other possibilities** (links with geometry, shape and space) A cuboid has a volume between 200 and 250 cm cubed. Each edge is at least 4cm long. List four possibilities for the dimensions of the cuboid..
MEASURING and CALCULATING					
measure and begin to record the following: * **lengths and heights** * **mass/weight** * **capacity and volume** * **time** (hours, minutes, seconds**)** Spring: Units 10 and 11 Summer: Unit 17	choose and use appropriate standard units to estimate and measure **length/height** in any direction (m/cm); **mass** (kg/g); **temperature** (°C); **capacity** (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels	measure, compare, add and subtract: **lengths** (m/cm/mm); **mass** (kg/g); **volume/capacity** (l/ml) Spring: Unit 8 Summer: Units 13 and 14	estimate, compare and calculate **different measures,** including **money in pounds and pence** (appears also in Comparing) Spring: Unit 7 Summer: Unit 12	use all four operations to solve problems involving measure (e.g. **length, mass, volume, money**) using decimal notation including scaling. Summer: Unit 16	solve problems involving the calculation and conversion of **units of measure**, using decimal notation up to three decimal places where appropriate (appears also in Converting) Summer: Unit 14

	Spring: Unit 8 Summer: Unit 14				
Application (Can be practical) Which two pieces of string are the same length as this book?	**Application** (Practical) Draw two lines whose lengths differ by 4cm.	**Write more statements** (You may choose to consider this practically) If there are 630ml of water in a jug. How much water do you need to add to end up with a litre of water? What if there was 450 ml to start with? Make up some more questions like this	**Write more statements** One battery weighs the same as 60 paperclips; One pencil sharpener weighs the same as 20 paperclips. Write down some more things you know. How many pencil sharpeners weigh the same as a battery?	**Write more statements** Mr Smith needs to fill buckets of water. A large bucket holds 6 litres and a small bucket holds 4 litres. If a jug holds 250 ml and a bottle holds 500 ml suggest some ways of using the jug and bottle to fill the buckets.	**Write more statements** Chen, Megan and Sam have parcels. Megan's parcel weighs 1.2kg and Chen's parcel is 1500g and Sam's parcel is half the weight of Megan's parcel. Write down some other statements about the parcels. How much heavier is Megan's parcel than Chen's parcel?
		measure the **perimeter** of simple 2-D shapes Spring: Unit 8	measure and calculate the **perimeter** of a rectilinear figure (including squares) in centimetres and metres Autumn: Unit 4	measure and calculate the **perimeter** of composite rectilinear shapes in centimetres and metres Autumn: Unit 6	recognise that shapes with the same areas can have different **perimeters** and vice versa Spring: Unit 11
		Testing conditions A square has sides of a whole number of centimetres. Which of the following measurements could represent its perimeter?8cm 18cm 24cm 25cm	**Testing conditions** If the width of a rectangle is 3 metres less than the length and the perimeter is between 20 and 30 metres, what could the dimensions of the rectangle lobe? Convince me.	**Testing conditions** Shape A is a rectangle that is 4m long and 3m wide. Shape B is a square with sides 3m. The rectangles and squares are put together side by side to make a path which has perimeter between 20 and 30 m. For example 	**Testing conditions** A square has the perimeter of 12 cm. When 4 squares are put together, the perimeter of the new shape can be calculated. For example: 

				Can you draw some other arrangements where the perimeter is between 20 and 30 metres?	What arrangements will give the maximum perimeter?
recognise and know the value of different denominations of **coins and notes** Summer: Unit 18	recognise and use symbols for pounds **(£) and pence (p)**; combine amounts to make a particular value Autumn: Unit 4 find different combinations of coins that equal the same amounts of money Autumn: Unit 4 **solve simple problems** in a practical context involving addition and subtraction of money of the same unit, including giving change Autumn: Unit 4	add and subtract amounts of **money** to give change, using both £ and p in practical contexts Spring: Unit 6			
Possibilities Ella has two silver coins. How much money might she have?	**Possibilities** How many different ways can you make 63p using only 20p, 10p and 1p coins?	**Possibilities** I bought a book which cost between £9 and £10 and I paid with a ten-pound note. My change was between 50p and £1 and was all in silver coins. What price could I have paid?	**Possibilities** Adult tickets cost £8 and Children's tickets cost £4. How many adult and children's tickets could I buy for £100 exactly? Can you find more than one way of doing this?		
			find the area of rectilinear shapes by counting squares	calculate and compare the area of squares and rectangles including using	calculate the area of parallelograms and triangles

			Spring: Unit 7	standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes Autumn: Unit 6 *recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})* (copied from Multiplication and Division) Autumn: Unit 5	Spring: Unit 11 calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [e.g. mm^3 and km^3]. Spring: Unit 11 recognise when it is possible to use formulae for area and volume of shapes Spring: Unit 11
			Always, sometimes, never If you double the area of a rectangle, you double the perimeter. *See also Geometry Properties of Shape*	**Always, sometimes, never** When you cut off a piece of a shape you reduce its area and perimeter. *See also Geometry Properties of Shape*	**Always, sometimes, never** The area of a triangle is half the area of the rectangle that encloses it:  *See also Geometry Properties of Shape*

TELLING THE TIME

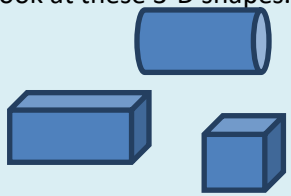
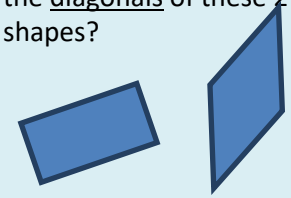
tell the time to the hour and half past the hour and draw the hands on a clock face to show these times. Summer: Unit 17	tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times. Summer: Unit 13	tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks Summer: Unit 11	read, write and convert time between analogue and digital 12 and 24-hour clocks (appears also in Converting) Summer: Unit 13		
recognise and use language relating to dates, including days of the week, weeks, months and years Summer: Unit 17	know the number of minutes in an hour and the number of hours in a day. (appears also in Converting) Summer: Unit 13	estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight (appears also in Comparing and Estimating) Summer: Unit 11			
			solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days (appears also in Converting) Summer: Unit 13	solve problems involving converting between units of time Summer: Unit 16	
	Working backwards Draw hands on the clock faces to show when break started and when it	**Working backwards** Tom's bus journey takes half an hour. He arrives at his destination at 9:25. At what time did his bus leave?	**Working backwards** Put these times of the day in order, starting with the earliest time. A: Quarter to four in the afternoon	**Working backwards** Put these lengths of time in order starting with the longest time. 105 minutes	

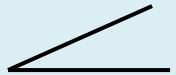
	finished 15 minutes later at 10:35.	9:05 8:55 8:45	B: 07:56 C: six minutes to nine in the evening D: 14:36	1 hour 51 minutes 6360 seconds	
CONVERTING					
	know the number of minutes in an hour and the number of hours in a day. (appears also in Telling the Time) Summer: Unit 13	know the number of seconds in a minute and the number of days in each month, year and leap year Summer: Unit 11	convert between different units of measure (e.g. kilometre to metre; hour to minute) Summer: Unit 13	convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) Summer: Unit 16	use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places Spring: Units 10 and 14
			read, write and convert time between analogue and digital 12 and 24-hour clocks (appears also in Telling the time) Summer: Unit 13	solve problems involving converting between units of time Summer: Unit 16	solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate (appears also in Measuring and Calculating) Spring: Unit14
			solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days (appears also in Telling the Time) Summer: Unit 13	understand and use equivalences between metric units and common imperial units such as inches, pounds and pints Summer: Unit 16	convert between miles and kilometres Spring: Unit10

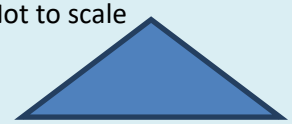
	The answer is …. 3 hours What is the question? **What do you notice?** What do you notice? 1 hour = 60 minutes ½ hour = 30 minutes ¼ hour = 15 minutes Write down some more time facts like these	**The answer is ….** 25 minutes What is the question? **What do you notice?** What do you notice? 1 minute = 60 seconds 2 minutes = 120 seconds Continue the pattern Write down some more time facts like these	**The answer is ….** 225 metres What is the question? **What do you notice?** What do you notice? 1:00pm = 13:00 2:00pm = 14:00 Continue the pattern	**The answer is ….** 0.3km What is the question? **What do you notice?**What do you notice? 1 minute = 60 seconds 60 minutes = ☐ seconds Fill in the missing number of seconds down some more time facts like this.	**The answer is ….** 24 metres cubed What is the question? **What do you notice?**8 km = 5 miles 16km = ☐ miles 4 km = ☐ miles Fill in the missing number of miles. Write down some more facts connecting kilometres and miles.

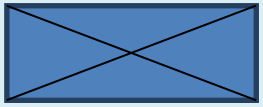
Geometry: Properties of Shapes with Reasoning

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
IDENTIFYING SHAPES AND THIER PROPERTIES					
recognise and name common 2-D and 3-D shapes, including: * 2-D shapes [e.g. rectangles (including squares), circles and triangles] * 3-D shapes [e.g. cuboids (including cubes), pyramids and spheres].	identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line Spring: Unit 9 identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces Spring: Unit 9		identify lines of symmetry in 2-D shapes presented in different orientations Summer: Unit 15	identify 3-D shapes, including cubes and other cuboids, from 2-D representations Summer: Unit 14	recognise, describe and build simple 3-D shapes, including making nets (appears also in Drawing and Constructing) Summer: Unit 13 illustrate and name parts of circles, including radius, diameter and circumference and know

Autumn: Unit 5	identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid] Spring: Unit 9				that the diameter is twice the radius Summer: Unit 13
What's the same, what's different? Find a rectangle and a triangle in this set of shapes. Tell me one thing that's the same about them. Tell me one thing that is different about them. **Visualising** Put some shapes in a bag. Find me a shape that has more than three edges.	**What's the same, what's different?** Pick up and look at these 3-D shapes.  Do they all have straight edges and flat faces? What is the same and what is different about these shapes? **Visualising** In your head picture a rectangle that is twice as long as it is wide. What could its measurements be?	**What's the same, what's different?** What is the same and different about these three2-D shapes?  **Visualising** I am thinking of a 3-dimensional shape which has faces that are triangles and squares. What could my shape be?	**What's the same, what's different?** What is the same and what is different about the <u>diagonals</u> of these 2-D shapes?  **Visualising** Imagine a square cut along the diagonal to make two triangles. Describe the triangles. Join the triangles on different sides to make new shapes. Describe them. (you could sketch them) Are any of the shapes symmetrical? Convince me.	**What's the same, what's different?** What is the same and what is different about the net of a cube and the net of a cuboid? **Visualising** I look at a large cube which is made up of smaller cubes.  If the larger cube is made up of between 50 and 200 smaller cubes what might it look like?	**What's the same, what's different?** What is the same and what is different about the nets of a triangular prism and a square based pyramid? **Visualising** Jess has 24 cubes which she builds to make a cuboid. Write the dimensions of cuboids that she could make. List all the possibilities.
DRAWING AND CONSTRUCTING					

		draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them Summer: Unit 12	complete a simple symmetric figure with respect to a specific line of symmetry Summer: Unit 15	draw given angles, and measure them in degrees (°) Summer: Units 13 and 14	draw 2-D shapes using given dimensions and angles Summer: Unit 13 recognise, describe and build simple 3-D shapes, including making nets (appears also in Identifying Shapes and Their Properties) Summer: Unit 13
		Other possibilities One face of a 3-D shape looks like this.  What could it be? Are there any other possibilities?	**Other possibilities** Can you draw a non-right angled triangle with a line of symmetry? Are there other possibilities.	**Other possibilities** Here is one angle of an isosceles triangle. You will need to measure the angle accurately. What could the other angles of the triangle be? Are there any other possibilities? 	**Other possibilities** If one angle of an isosceles triangle is 36 degrees. What could the triangle look like – draw it. Are there other possibilities . Draw a net for a cuboid that has a volume of 24 cm^3.
COMPARING AND CLASSIFYING					
	compare and sort common 2-D and 3-D shapes and everyday objects Spring: Unit 9		compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes Summer: Unit 15	use the properties of rectangles to deduce related facts and find missing lengths and angles Summer: Units 13 and 14	compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons

				distinguish between regular and irregular polygons based on reasoning about equal sides and angles Summer: Unit 14	Summer: Unit 13
True or false? All 2-D shapes have at least 4 sides **Other possibilities** Can you find shapes that can go with the set with this label? "Have straight sides"	**Always, sometimes, never** Is it always, sometimes or nerver true that when you fold a square in half you get a rectangle. **Other possibilities** Can you find shapes that can go with the set with this label? "Have straight sides and all sides are the same length"	**Always, sometimes, never** Is it always, sometimes or never that all sides of a hexagon are the same length. **Other possibilities** Can you find shapes that can go with the set with this label? "Have straight sides that are different lengths."	**Always, sometimes, never** Is it always, sometimes or never true that the two diagonals of a rectangle meet at right angles. **Other possibilities** Can you show or draw a polygon that fits both of these criteria? What do you look for? "Has exactly two equal sides." "Has exactly two parallel sides."	**Always, sometimes, never** Is it always, sometimes or never true that the number of lines of reflective symmetry in a regular polygon is equal to the number of its sides n. **Other possibilities** A rectangular field has a perimeter between 14 and 20 meters. What could its dimensions be?	**Always, sometimes, never** Is it always, sometimes or never true that, in a polyhedron, the number of vertices plus the number of faces equals the number of edges. **Other possibilities** Not to scale  The angle at the top of this isosceles triangle is 110 degrees. What are the other angles in the triangle?
ANGLES					
		recognise angles as a property of shape or a description of a turn Summer: Unit 12		know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles Summer: Unit 13	
		identify right angles, recognise that two right	identify acute and obtuse angles and compare and	identify:	recognise angles where they meet at a point, are

		angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle Summer: Unit 12	order angles up to two right angles by size Summer: Unit 15	* angles at a point and one whole turn (total 360°) * angles at a point on a straight line and ½ a turn (total 180°) * other multiples of 90° Summer: Units 13 and 14	on a straight line, or are vertically opposite, and find missing angles Summer: Units 13 and 14
		identify horizontal and vertical lines and pairs of perpendicular and parallel lines Summer: Unit 12			
		Convince me Which capital letters have perpendicular and / or parallel lines? Convince me.	**Convince me** Joshua says that he can draw a right angled triangle which has another angle which is obtuse. Is he right? Explain why.	**Convince me** What is the angle between the hands of a clock at four o clock? At what other times is the angle between the hands the same? Convince me	**Convince me**  One angle at the point where the diagonals of a rectangle meet is 36 degrees. What could the other angles be? Convince me

Geometry: Position and Direction with Reasoning

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
POSITION, DIRECTION AND MOVEMENT					
describe position, direction and movement, including half, quarter and three-quarter turns. Summer: Unit 15	use mathematical vocabulary to describe position, direction and movement including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise) Summer: Unit 11		describe positions on a 2-D grid as coordinates in the first quadrant Summer: Unit 16 describe movements between positions as translations of a given unit to the left/right and up/down Summer: Unit 16	identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed Summer: Unit 15	describe positions on the full coordinate grid (all four quadrants) Autumn: Unit 6 Summer: Unit 14 draw and translate simple shapes on the coordinate plane, and reflect them in the axes. Autumn: Unit 6
			plot specified points and draw sides to complete a given polygon Summer: Unit 16		
Working backwards The shape below was turned three quarter of a full turn and ended up looking like this. 	**Working backwards** If I face forwards and turn three quarter turns clockwise then a quarter turn anti-clockwise describe my finishing position.	**Working backwards** If I make the two opposite sides of a square 5 cm longer the new lengths of those sides are 27cm. What was the size of my original square? What is the name and size of my new shape?	**Working backwards** Here are the co-ordinates of corners of a rectangle which has width of 5. (7, 3) and (27, 3) What are the other two co-ordinates?	**Working backwards** A square is translated 3 squares down and one square to the right. Three of the coordinates of the translated square are: (3, 6) (8, 11) (8, 6)	**Working backwards** Two triangles have the following co-ordinates: Triangle A: (3, 5) (7, 5) (4, 7) Triangle B: (3, 1) (7, 1) (4, 3)

What did it look like when it started? (practical)				What are the co-ordinates of the original square?	Describe the translation of triangle A to B and then from B to A.
PATTERN					
	order and arrange combinations of mathematical objects in patterns and sequences Spring: Unit 9 Summer: Unit 11				
	What comes next?  **Explain why**				

Statistics with Reasoning

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
INTERPRETING, CONSTRUCTING AND PRESENTING DATA					
	interpret and construct simple pictograms, tally charts, block diagrams and simple tables Spring: Unit 7	interpret and present data using bar charts, pictograms and tables Spring: Unit 7	interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs Summer: Unit 14	complete, read and interpret information in tables, including timetables Autumn: Unit 4 Summer: Unit 16	interpret and construct pie charts and line graphs and use these to solve problems Summer: Unit 15
	ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity Spring: Unit 7				
	ask and answer questions about totalling and comparing categorical data Spring: Unit 7				
	True or false? (Looking at a simple pictogram) "More people travel to work in a car than on a bicycle". **Is this true or false? Convince me.**	**True or false?** (Looking at a bar chart) "Twice as many people like strawberry than lime". **Is this true or false? Convince me.** Make up your own 'true/false' statement about the bar chart.	**True or false?** (Looking at a graph showing how the class sunflower is growing over time) "Our sunflower grew the fastest in July". **Is this true or false? Convince me.**	**True or false?** (Looking at a train time table) "If I want to get to Exeter by 4 o'clock this afternoon, I will need to get to Taunton station before midday". **Is this true or false? Convince me.**	**True or false?** (Looking at a pie chart) "More than twice the number of people say their favourite type of T.V. programme is soaps than any other" **Is this true or false?**

	Make up you own 'true/false' statement about the pictogram **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	**What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	Make up your own 'true/false' statement about the graph. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	Make up your own 'true/false' statement about a journey using the timetable. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	**Convince me.** Make up your own 'true/false' statement about the pie chart. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other
SOLVING PROBLEMS					
		solve one-step and two-step questions [e.g. 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables. Spring: Unit 7	solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs. Summer: Unit 14	solve comparison, sum and difference problems using information presented in a line graph Autumn: Unit 4	calculate and interpret the mean as an average Summer: Unit 15
	Create a questions Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives.	**Create a questions** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives. (see above)	**Create a questions** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives. (see above)	**Create a questions** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives. (see above)	**Create a questions** Make up a set of five numbers with a mean of 2.7 **Missing information** The mean score in six test papers in a spelling test of 20 questions is 15.Five of the scores were 13 12 17 18 16 What was the missing score?