Big Ideas of Mathematics, EYFS

Number	To learn the procedure for counting children have to coordinate specific skills (number sequences, 1:1 correspondence, counting each object only once, knowing the final number in the count represents the quantity for the set). Counting allows us to overcome perceptually misleading information e.g. comparing a set of 4 large objects with a set of 5 small objects; knowing that rearranging objects to cover a bigger space doesn't change the quantity of the set. Different counting experiences strengthen understanding of quantity e.g. counting out from a larger set; know when there is a mistake in a count the final number is **not** the quantity for the set; know when a set is counted backwards, the **first** number is the quantity for the set. The count sequence represents numbers that are one more/one less than each other. Small quantities can be subitized (recognised without counting) - irregular arrangements of 1-3 items are generally subitized as one group; irregular arrangements of 4-5 items are generally subitized by combining two visual sub-groups. Larger quantities can be subitized if they are presented in regular arrangements e.g. in 10-frames, with fingers, using dice patterns. In a context, the whole can be discerned from a sub-group e.g. there are more flowers than roses in the picture; there are 5 people in the room and 3 of them are girls. A quantity can be recognised by visualising two parts, e.g. there are 6 counters: 4 are red and 2 are yellow.
Pattern	Make, copy and continue different patterns using a range of resources (e.g. with counters: red, green, red, green… or actions (clap, jump…) Spot and correct mistakes in patterns. Know the **unit of repeat** in a pattern e.g. red, blue, red, blue... is a 'red, blue' pattern. Extend this concept by making circular patterns. Replicate patterns using different equipment e.g. red, blue, blue, red, blue, blue… represented by stick, acorn, acorn, stick, acorn, acorn… A range of different patterns can be found in the environment.
Measures	The length/weight/capacity of objects can be compared as appropriate to the context e.g. straightening two pieces of string to compare length, holding weighs and comparing downwards pull, pouring between containers to identify larger/smaller. Estimations and deductions are made relating to measures e.g. a child chooses a box is the right size for the doll's cot; the jar can hold more cubes than balls because cubes are smaller. Children consider the size of the object being measured before choosing the non-standard units to measure with. Exploration of time draws attention to different units of time e.g. how many laps of the track can you do in a minute? How many sleeps until your birthday?
Shape and Space	We can visualise and explore how things will appear when they are turned or how they might look when they are fitted together. To extend this concept, different shapes can be made by combining shapes or folding/cutting shapes. Drawings can represent imagined representations, using different perspectives or viewpoints e.g. a plan for a play area, a map. Shape properties are described and shapes are selected to fulfil a specific need e.g. in construction, children describe why shapes are used. Know there are different versions of the same shape e.g. different triangles and the same shape can be orientated differently.

Big Ideas of Mathematics, Year 1

Number and place value	The quantity for a set can be known despite irregularities in a counting procedure. Examples: if there has been **only one error** in a count the quantity is one more/less; when a set is counted backwards, the **first** number is the quantity; when the items in a set are rearranged, the quantity is the same. Quantities 1-5 shown in irregular arrangements can be subitized (recognised without counting); larger quantities shown in regular arrangements can also be subitized e.g. in a 10-frame, using dice patterns. There are parts within whole quantities e.g. there are more people than children in a school; a number can be represented by 2-colour counters. Ten is made of ten 1s, e.g. 15 is one 10 and 5 ones; it is also 15 ones. Number names don't always show place value or can be misleading, e.g. fourteen and forty-one; twelve doesn't indicate ten and two.
Number: + and -	Addition and subtraction are inverse operations. Explore context questions where different unknowns are given e.g. Kim has ____ grapes, Beth has ____ grapes, they have ____ grapes in total. Practically explore the effect of adding and then subtracting the same quantity from a set. Different addition and subtraction number sentences can be derived from the same part-whole relationship. This can be explored through a picture e.g. of 4 boys and 2 girls. Different context questions lead to different thought processes, calculation strategies and levels of challenge. Examples: Tim has 7 sweets. He eats 4 sweets. How many left? (counting back). Tim has 7 sweets. Jack has 4 sweets. How many more does Tim have? (comparison of two sets). A new number fact can be derived from a known fact, e.g. use knowledge of 4+4=8 to derive 4+5=9 When a quantity is split into two groups, there are different possible quantities in each group. When the number in group A is known, the number in the group B can be calculated. Example: there are 6 counters put into 2 pots. 'How many in the blue pot?' 'There could be…' [show 5 counters in yellow pot] 'How many in the blue pot now?' 'There are definitely…'
Number: × and ÷	Contexts used lead to a one-to-many thought-process e.g. counting 5p coins; show picture of 4 tents, '2 people per tent - how many campers in total?' Multiplicative contexts can be discerned from additive contexts e.g. 3 seeds in each pot, 5 pots, how many seeds in total?; Amy has 3 seeds, Tom has 5 seeds, how many seeds in total? Multiplication and division are inverse operations, explored through contexts e.g. ____ grapes shared between 4 children, ____ grapes each. Multiplication is commutative, explored practically e.g. 2 pots, 5 seeds per pot compared with 5 pots, 2 seeds per pot.
Fractions	A whole can have parts e.g. a piece of carrot is a part, a large carrot is a whole, small carrot is also a whole. We can estimate or describe whether a fraction is more or less that one-half by comparing the part and the whole. Example contexts: a banana cut in two pieces; the fraction of people in the room who are children; the classroom as a fraction of the school. Fractions are used for division contexts where the outcome is not a whole number. Explore practically e.g. ask 4 children to share 2 pieces of toast.
Measures	To measure, non-standard units are chosen that are appropriate to the property being measured (e.g. length/capacity) and the size of the object being measured. Extensions of measurement challenge: measuring a length with only a few of the units of measure; measuring with a torn-off ruler which does not start from 0. Deductions are made relating to measures e.g. an object is equivalent to more smaller units and fewer larger units; a toy car weigh the same as 5 cubes and a toy dinosaur weighs the same as 5 cubes. This means a toy dinosaur is heavier than a toy car.
Geometry	Shapes have defining characteristics e.g. number of sides and non-defining characteristics e.g. size, colour. It is possible to mentally visualise shapes being rotated, new shapes being made by combining shapes or to recognise the 2d faces on 3D shapes. Spatial words used to describe position relative to the child's viewpoint will be different from different people's perspectives e.g. behind, left, close.

Big Ideas of Mathematics, Year 2

Number: Place Value	Ten is made of ten 1s, e.g. 23 is two 10s and 3 ones; it is one 10 and 13 ones; it is 23 ones. One hundred is made of ten 10s. The position of a digit in a number determines its value, e.g. 21 is more than 12. Spatial reasoning is used to position numbers on number lines with accuracy e.g. on a 0-10 number line, 7 is after half-way but nearer to 5 than 10.
Number: + and -	Addition and subtraction are inverse operations. Explore context questions where different unknowns are given e.g. Tom has ____ cherries, Sam has ____ cherries, in total they have ____ cherries. Practically explore the effect of adding and then subtracting the same quantity from a set and slight variations, leading into questions of the form 5 + 3 - 3 = ____ and 8 + 6 - 5 = ____ Different context questions lead to different thought processes, calculation strategies and levels of challenge. Examples: Jen and Lisa are together. Jen walks 3m forwards, Lisa walks 4m backwards - how far apart are they? Tim has 7 sweets. Jack has 4 sweets. How many more does Tim have? Subtraction can be done by counting up to find the difference (e.g. for 9-7), by counting back (e.g. for 9-2) or by using number bonds (e.g. for 9-5). Numbers can be added in any order; changing the order can make calculation easier, e.g. 5+4+5 is the same as 5+5+4 Numbers can be broken down to calculate; this can make calculation easier e.g. 8+7 is the same as 8+2+5 A new number fact can be derived from a known fact, e.g. 29+8 is one less than 30+8 When a quantity is split into two groups, there are different possible quantities in each group. When the number in group A is known, the number in the group B can be calculated (e.g. 12 counters put into 2 pots. How many in the blue pot? There could be… there are definitely…)
Number: × and ÷	Contexts used lead to one-to-many calculation e.g. counting 5p coins; 3 people per tent, 4 tents, how many people in total? Multiplicative contexts can be discerned from additive contexts e.g. 3 seeds in each pot, 5 pots, how many seeds in total?; Amy has 3 seeds, Tom has 5 seeds, how many seeds in total? Multiplication and division are inverse operations, explored through arrays and context questions (e.g. ____ seeds, ____ pots, ____ seeds per pot). There are connections between multiplication facts, e.g. the 10x table is double the 5x table.
Fractions	We can estimate or describe whether a fraction is relatively big or small, with possible reference to one-half, by comparing the part and the whole. Example contexts: a banana cut in two pieces; the fraction of people in the room who are adults; the classroom as a fraction of the school. Fractions are used for division contexts where the outcome is not a whole number. Explore practically e.g. ask 6 children to share 4 pieces of toast.
Measures	Standard units of measure, and different sized measures, allow us to measure with more accuracy than non-standard measures would allow. Deductions are made relating to measures e.g. John is taller than Lee, Lee is taller than Kam, therefore John is taller than Kam. One end of a pencil is lined up on a ruler at 5cm, the other end of the pencil is lined up at 12cm, the pencil is 7cm long. On an analogue clock the hour hand shows the approximate time in the day and the minute hand adds precision. Read the approximate time or predict the position of the minute hand when looking at a clock which has the minute hand removed.
Geometry	Shapes are sorted or categorised based on defining characteristics e.g. number of faces or sides rather than perceptual cues e.g. size, colour. It is possible to mentally visualise shapes being rotated, new shapes being made by combining shapes or shapes being made by splitting a shape.
Statistics	Contexts used for data collection have a specific purpose in mind, e.g. which areas of the playground are most popular? A class set of wellies are being bought. Which shoe sizes are needed? Tally charts are used to collect data that is recorded over time, e.g. number of days it rains this month.

Big Ideas of Mathematics, Year 3

Number: Place Value	10 tens is the same as one hundred, e.g. 210 can be made with 2 hundreds and 1 ten; 210 can be made with 21 tens. The position of a digit in a number determines its value, e.g. 210 is more than 120, 120 is more than 102. Spatial reasoning is used to position numbers on number lines with accuracy (e.g. on a 0-100 line, 67 is after half-way but nearer to 50 than 100).
Number: + and -	Addition and subtraction are inverse operations. This can be explored through context questions where different unknowns are given e.g. There are ____ stickers in total. Zack has ____ stickers, Tim has ____ stickers, Abe has ____ stickers. Different context questions lead to different thought processes, calculation strategies and levels of challenge. Examples: Jen and Lisa start together. Jen walks 3km east, Lisa walks 5km east - how far apart are they? Tim has 4 more sweets than Jack. They have 10 sweets in total. How many each? When subtracting we can choose to count up (e.g. 12-9), count back (e.g. 50-3) or manipulate a known addition fact (e.g. 20-11). Numbers can be adjusted so that calculations can be done mentally e.g. 40+20=60 so 39+18 is 3 less than 60. For other questions, written methods are used to make calculation errors less likely. = means 'the same as', e.g. 160=120+40 and 14+6=30-10 In an additive question where there is more than one unknown, there can be an infinite number of possible answers e.g. 34 + ____ = 27 + ____ or there may be multiple possible answers e.g. 34 - ____ = 27 + ____
Number: × and ÷	Multiplicative contexts can be discerned from additive contexts e.g. Tom earns £6 per hour. He works for 5 hours. How much does he earn in total? Multiplication and division are inverse operations, explored through arrays and context questions e.g. ____ seeds, ____ pots, ____ seeds per pot. Times tables facts are related e.g. 6×4 is double the 3×4; 3×3 + 3×2 = 3×5; 5×3 is used to calculate 50×3. Division can be done by sharing (e.g. 80÷4), grouping (e.g. 26÷13) or manipulating times tables facts (e.g. 24÷8).
Fractions	Fractions are numbers that can be positioned on the number line; they are used when whole-numbers can't represent a scenario appropriately e.g. describing a young child's age. We can estimate or describe the size of a fraction without using numbers by comparing the relative size of the part and the whole. Examples: the cloakroom is a small fraction of the school building; the hall is a larger part but still less than half of the school building. Increasing the numerator makes a fraction larger. Increasing the denominator makes a fraction smaller. Explore through sharing scenarios e.g. 8 cookies shared between 6 people (increase the number of cookies = more cookie each, increase the number of people = less cookie each).
Measures	Benchmark measures help when estimating e.g. I am 120cm tall so my brother is about… a bag of sugar is 1kg so… Time is displayed or communicated in different ways depending on the context e.g. explain why train times are always displayed in 24-hour. On an analogue clock the hour hand shows the approximate time in the day and the minute hand shows a more exact time.
Geometry	Shapes have a range of defining characteristics e.g. number of sides, types of angles, symmetry. Some characteristics change how shapes appear but are non-defining features e.g. size of shape, orientation. It is possible to mentally visualise shapes being rotated, new shapes being made by combining shapes or shapes being made by splitting a shape.
Statistics	Data is collected with a specific purpose in mind, e.g. which areas of the playground are most popular? Tally charts are used to collect data that is recorded over time, e.g. types of vehicles that drive past school.

Big Ideas of Mathematics, Year 4

Number: Place Value	Numbers can be broken down in different ways, e.g. 532 into 500+30+2 or 400+130+2 (ten tens is equal to one hundred). Spatial reasoning is used to position numbers on number lines with accuracy. Larger numbers are further right, including for negative numbers. In our number system the position of a digit in a number determines its value, unlike many historic number systems. Rounding presents a quantity to the appropriate degree of accuracy e.g. the number of people watching the F.A. Cup Final is presented as an approximate figure; we generally explain the number of miles our car has driven to the nearest 1000 miles.
Number: + and -	Addition and subtraction are inverse operations. This can be explored through context questions where different unknowns are given e.g. Rob, Sam and Jim have 60 stickers in total. Rob has 34 stickers. Sam has 17 stickers. How many stickers does Jim have? Different context questions lead to different thought processes, calculation strategies and levels of challenge. Examples: Jen and Lisa start together. Jen walks 3km east, Lisa walks 5km west - how far apart are they? Tim has 4 more sweets than Jack. They have 14 sweets in total. How many each? Subtraction can be done mentally by counting up (e.g. 41-37), counting back (e.g. 50-6) or manipulating addition facts (e.g. 101-50). Number facts can be approximated or calculated by adjusting numbers e.g. 398+195 using 400+200. The most appropriate calculation method can differ depending on the numbers involved and using different methods reduces the likelihood of errors. = means 'the same as' e.g. 460=220+240 and 34+16=60-10
Number: × and ÷	Some questions require multiplicative reasoning, some require additive reasoning and some require both forms of reasoning. Examples: Dan has 6 shirts and 4 pairs of trousers - how many outfits? (multiplicative); Tennis balls cost £5 for four or £1.50 each. How much do 18 tennis balls cost? (both). Numbers can be partitioned in different ways to multiply, e.g. 16×5 = 10×5 + 6×5 **or** 8×5 + 8×5 **or** 16×4 + 16. Numbers can be adjusted to calculate or make approximations is 6 less than 20×6 Division can be done by sharing (e.g. 600÷4), grouping (e.g. 90÷30) or manipulating times tables facts (e.g. 24÷8). The position of the same digits in a calculation affects the size of the product e.g. 43×2 < 32×4
Fractions	Fractions are numbers that can be positioned on the number line; they are used when whole-numbers can't represent a scenario appropriately e.g. describing a young child's age, estimating the length or width of a table in metres. We can estimate or describe the size of a fraction without using numbers by comparing the relative size of the part and the whole. Examples: Wales is a small fraction of Europe; the school field is more than half the area of the school grounds. Increasing the numerator makes a fraction larger. Increasing the denominator makes a fraction smaller. Explore through sharing scenarios e.g. 8 cookies shared between 6 people (increase the number of cookies = more cookie each, increase the number of people = less cookie each).
Measures	Benchmark measures help when estimating e.g. I am 120cm tall so my brother is about… a bag of sugar is 1kg so… Perimeter is a measurement of length whereas area is a measurement of space, therefore square units represent area visually. Conversion between units of time are more difficult than conversions between metric units because of the difference in the time number system.
Geometry	Shapes have a range of defining characteristics e.g. number of sides, types of angles, symmetry. Some characteristics change how shapes appear but are non-defining features e.g. size of shape, orientation. It is possible to mentally visualise shapes being rotated, new shapes being made by combining shapes or shapes being made by splitting a shape.
Statistics	Graphs are used to communicate information effectively, helping us to make deductions. Explore by analysing the same information presented in a table and then presented in a graph. Also, look at graphs that have been constructed for a specific purpose e.g. to analyse a football player. The type of graph used will depend on the type of data being shown e.g. bar charts can be used for discrete data (information counted in set groups); line graphs can be used to show continuous data (information measured where 'in-between' values exist).

Big Ideas of Mathematics, Year 5

Number: Place Value	Numbers can be broken down in different ways, e.g. 4000 can be described as 4 thousands or 40 hundreds or 400 tens. Spatial reasoning is used to position numbers on number lines with accuracy. Larger numbers are further right, including for negative numbers. In our number system the position of a digit in a number determines its value, unlike many historic number systems. Large quantities are hard to imagine or estimate - benchmarks can help e.g. 60 000 people went to the match; 3 million people live in Wales. Numbers with a smaller digit sum can be larger than numbers with a bigger digit sum e.g. 103: digit sum = 4 compared with 79: digit sum = 16
Number: + and -	Number facts can be approximated or calculated by adjusting numbers (e.g. 3415-2998 is equivalent to 3417-3000). The most appropriate calculation method can differ depending on the calculation itself. Subtraction can be done by counting up (e.g. 403-370), counting back (e.g. 500-6) or manipulating addition facts (e.g. 101-50). = means 'the same as' e.g. 460=220+240 and 34+16=60-10
Number: × and ÷	Some questions require multiplicative reasoning, some require additive reasoning and some require both forms of reasoning. Examples: Dan has 6 shirts and 4 pairs of trousers - how many outfits? (multiplicative); scaling up the quantities in a recipe for 4 people so it can serve 14 people (both). = means 'the same as' e.g. 8×4 = 320÷10 Division can be done by sharing (e.g. 600÷4), grouping (e.g. 100÷30) or manipulating times tables facts (e.g. 240÷8). The position of the same digits in a calculation affects the size of the product. Example 1: 43×2 < 32×4 Example 2: 52×43 > 53×42
Fractions	Increasing the numerator makes a fraction larger, including contexts where the numerator is more than the denominator. Explore through multiplicative scenarios e.g. each child will eat 3/4 of a pizza. ____ pizzas are needed for ____ children. The same digits appear in fraction-decimal equivalence for tenths and hundredths because we have a base-10 number system (e.g. 3/10 = 0.3). This is not true for other fractions (e.g. 1/4 ≠ 0.4). This can be explored by folding decimal number lines. Fractions can be estimated or compared using benchmarks e.g. 7/16 is less than 3/6 (relation to 1/2), 3/4 is less than 4/5 (relation to 1).
Measures	Being able to estimate in different measures allows us to spot errors when converting between units, e.g. 500m is less than 5km. Perimeter is a measurement of length whereas area is a measurement of space, therefore square units represent area visually. Conversion between units of time are more difficult than conversions between metric units because of the difference in the time number system. The relationship between the area and perimeter of a shape is complex e.g. doubling the area doesn't double the perimeter.
Geometry	Different shapes can share many characteristics e.g. a rectangle and a parallelogram. Shapes can belong to more than one classification e.g. a square is a rhombus and a rectangle. Properties of shapes are interdependent e.g. a rectangle has parallel lines because it has four right-angles.
Statistics	Graphs can be used to make inferences and deductions as well as for retrieving information. Examples: 'This graph shows that the KS1 sports clubs have the best attendance. It also shows that the school need more after-school sports clubs that KS2 boys would like to join.' The type of graph used will depend on the type of data being shown e.g. bar charts can be used for discrete data (information counted in set groups); line graphs can be used to show continuous data (information measured where 'in-between' values exist).

Big Ideas of Mathematics, Year 6

Number: Place Value	Numbers can be broken down in different ways, e.g. 4000 can be described as 4 thousands or 40 hundreds or 400 tens. Spatial reasoning is used to position numbers on number lines with accuracy. Larger numbers are further right, including for negative numbers. In our number system the position of a digit in a number determines its value, unlike many historic number systems. Rounding presents a quantity to the required degree of accuracy e.g. the number of people watching the World Cup Final or to give an answer that is appropriate to the context. Numbers are not always rounded to powers of 10 e.g. 374 rounded to the nearest 50 is 350. Large quantities are hard to imagine or estimate - benchmarks can help e.g. 60 000 people went to the match; 3 million people live in Wales. Numbers with a smaller digit sum can be larger than numbers with a bigger digit sum e.g. 103: digit sum = 4 compared with 79: digit sum = 16
Number: + and -	Number facts can be approximated or calculated by adjusting numbers (e.g. 3415-2998 is equivalent to 3417-3000). The most appropriate calculation method can differ depending on the numbers involved and using different methods reduces the likelihood of errors. Subtraction can be done mentally by counting up (e.g. 403-370), counting back (e.g. 403-7) or manipulating addition facts (e.g. 1001-500).
Number: × and ÷	Some questions require multiplicative and additive reasoning, e.g. apples cost 18p each. I buy 6 6 apples. How much change do I get from £2? Or scaling up the quantities in a recipe for 4 people so it can serve 14 people. = means 'the same as' e.g. $8 \times 4 = 320 \div 10$ Multiplication and division can be done mentally using known-fact and derived fact knowledge e.g. 120÷4=30, 116÷4=29. For some calculations, using a written method will improve make mistakes less likely.
Fractions	Increasing the numerator makes a fraction larger, including contexts where the numerator is more than the denominator. Explore through multiplicative scenarios e.g. each child will eat 3/4 of a pizza. ____ pizzas are needed for ____ children. The same context could be described as multiplying by a fraction or dividing by a whole number e.g. one-third of a pizza shared by 4 people. Fractions can be estimated or compared using benchmarks e.g. 7/16 is less than 3/6 (relation to 1/2), 3/4 is less than 4/5 (relation to 1).
Algebra	Algebra is used to explain a general relationship. Explore using context questions with number removed where children generate different possible answers, e.g. it costs £8 plus £5 per hour to hire a bike. Kate hires a bike for ____ hours. It costs her ____ in total. Some equations have one possible solution e.g. $40 - a = 23$. Some equations have multiple possible whole-number solutions e.g. $24 \div b > 4$. Some equations have an infinite number of possible solutions e.g. $c \div 4 > 20$.
Measures	Being able to estimate in different measures allows us to spot errors when converting between units, e.g. 50mm is less than 500cm. Conversion between units of time are more difficult than conversions between metric units because of the difference in the time number system. The relationship between the area and perimeter of a shape is complex e.g. doubling the area doesn't double the perimeter; the perimeter of two shapes can be identical but the areas can be significantly different. Similarly, doubling all the dimensions of a cuboid more than doubles its volume.
Geometry	Different shapes can share many characteristics e.g. a rectangle and a parallelogram. Shapes can belong to more than one classification e.g. a square is a rhombus and a rectangle.
Statistics	Graphs can be used to make inferences and deductions as well as for retrieving information. Examples: 'This graph shows that the KS1 sports clubs have the best attendance. It also shows that the school need more after-school sports clubs that KS2 boys would like to join.' When showing discrete data, bar graphs show the quantity of each group; pie charts place a greater emphasis on the relative quantities. Context for bar graphs: number of children attending each school club. Context for pie chart: blood groups for the population.