Mathematics progression skills with reasoning – Power Maths

Year 3
Number: Number and Place Value with Reasoning

COUNTING
Year 3
count from 0 in multiples of 4, 8, 50 and 100; Autumn: Unit: 1
find 10 or 100 more or less than a given number Autumn: Unit: 1

Spot the mistake:
50,100,115,200
What is wrong with this sequence of numbers?

True or False?
38 is a multiple of 8?

What comes next?
936-10= 926
926 -10 = 916
916- 10= 906
…….

COMPARING NUMBERS

compare and order numbers up to 1000	
	Autumn: Unit 1

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.

IDENTIFYING, REPRESENTING AND ESTIMATING NUMBERS

identify, represent and estimate numbers using different representations	
	Autumn: Unit 1

READING AND WRITING NUMBERS (including Roman Numerals

		read and write numbers up to 1000 in numerals and in words			
		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			

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*			

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?

ROUNDING

Children will be introduced to this in Year 4.

PROBLEM SOLVING

solve number problems and practical problems involving these ideas.

Autumn: Unit 1

Number: Addition and Subtraction with Reasoning

NUMBER BONDS

Year 3

KIRFs, Fluent in 5, Manipulating the additive relationship and securing mental calculation.
(NCETM materials)

MENTAL CALCULATION

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

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?

WRITTEN METHODS

add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
Autumn: Units 2 and 3

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.

INVERSE OPERATIONS, ESTIMATING AND CHECKING ANSWERS

estimate the answer to a calculation and use inverse operations to check answers
Autumn: Unit 3

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

PROBLEM SOLVING

solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction
Autumn: Units 2 and 3

Number: Multiplication and Division with Reasoning

MULTIPLICATION & DIVISION FACTS
Year 3

count from 0 in multiples of 4, 8, 50 and 100 (copied from Number and Place Value) Autumn: Unit 1
recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables Autumn: Unit 1

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?

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 a fact

$20 \times 3 = 60$.
Use this fact to work out
$21 \times 3 =$ $22 \times 3 =$
$23 \times 3 =$ $24 \times 3 =$

Making links

$4 \times 6 = 24$

How does this fact help you to solve these calculations?

40 x 6 =

20 x 6 =

24 x 6 =

WRITTEN 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 Mental Methods)

Spring: Unit 5

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?

PROPERTIES OF NUMBERS: MULTIPLES, FACTORS, PRIMES, SQUARE AND CUBE NUMBERS

True or false?

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.

ORDER OF OPERATIONS

This objective is 'met' in year 6. This objective is 'met' in year 6. Children need to be secure in additive and multiplicative relationships as well as the 'why' and 'how' of each operation.

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

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=

PROBLEM SOLVING

solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Autumn: Unit 4

Spring: Unit 5

Number: Fractions (including Decimals and Percentages)

Year 3
COUNTING IN FRACTIONAL STEPS
count up and down in tenths
Spring: Unit 9

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, ….., ….., …..

Reasoning

RECOGNISING FRACTIONS
recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
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

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.	recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators Spring: Units 9 and 10

True or false? 2/10 of 20cm = 2cm 4/10 of 40cm = 4cm 3/5 of 20cm = 12cm

COMPARING FRACTIONS

compare and order unit fractions, and fractions with the same denominators

Summer: Unit 10

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

COMPARING DECIMALS

Children are introduced to this in Year 4.

ROUNDING INCLUDING DECIMALS

Children are introduced to this in Year 4.

EQUIVALENCE (INCLUDING FRACTIONS, DECIMALS AND PERCENTAGES)

recognise and show, using diagrams, equivalent fractions with small denominators

Spring: Unit 10

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?

Ordering

Put these fractions in the correct order, starting with the smallest.
4/8   ¾   1/4

ADDITION AND SUBTRACTION OF FRACTIONS

add and subtract fractions with the same denominator within one whole (e.g. $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$)

Summer: Unit 10

What do you notice?

1/10 + 9/10 = 1
2/10 + 8/10 = 1
3/10 + 7/10 = 1
Continue the pattern

Can you make up a similar pattern for eighths?

The answer is 5/10, what is the question? (involving fractions / operations)

MULTIPLICATION AND DIVISION OF FRACTIONS

Children are introduced to this in Year UK2. Ensure that children are secure in multiplicative relationships so they can apply to fractions.

MULTIPLICATION AND DIVISION OF DECIMALS

Children are introduced to this in Year 4. Ensure that children are secure in multiplicative relationships so they can apply to decimals.

PROBLEM SOLVING

solve problems that involve all of the above

Spring: Unit 9

Summer: Unit 10

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.

Number: Algebra with Reasoning

Year 3

EQUATIONS

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

Connected Calculations

Put the numbers 3, 12, 36 in the boxes to make the number sentences correct.

□ = □ x □

□ = □ ÷ □

Continue to expose children to missing number problems, involving multiplication and division.

True or false?
Explain:
The largest four digit number that can be made from the digits 2, 4, 6 and 8 is 2684. Is this true or false? Explain your thinking.

Measurement with Reasoning

Year 3

COMPARING AND ESTIMATING

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

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compare durations of events, for example to calculate the time taken by particular events or tasks

Summer: Unit 11

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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

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.

MEASURING and CALCULATING

measure, compare, add and subtract: **lengths** (m/cm/mm); **mass** (kg/g); **volume/capacity** (l/ml)

Spring: Unit 8

Summer: Units 13 and 14

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

measure the **perimeter** of simple 2-D shapes

Spring: Unit 8

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

add and subtract amounts of **money** to give change, using both £ and p in practical contexts

Spring: Unit 6

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?

TELLING THE TIME

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

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

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?

9:05   8:55   8:45

CONVERTING

know the number of seconds in a minute and the number of days in each month, year and leap year

Summer: Unit 11

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

Geometry: Properties of Shapes with Reasoning

Year 3

IDENTIFYING SHAPES AND THIER PROPERTIES

What's the same, what's different? What is the same and different about these three 2-D shapes?

Visualising
I am thinking of a 3-dimensional shape which has faces that are triangles and squares. What could my shape be?

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

Other possibilities One face of a 3-D shape looks like this. ▪

What could it be?
Are there any other possibilities?

COMPARING AND CLASSIFYING

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."

ANGLES

recognise angles as a property of shape or a description of a turn

Summer: Unit 12

identify right angles, recognise that two right 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

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.

Geometry: Position and Direction with Reasoning

Year 3
POSITION, DIRECTION AND MOVEMENT

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?

PATTERN
Continue to give children the opportunity to order and arrange combinations of mathematical objects in patterns and sequences.

Statistics with Reasoning

Year 3
INTERPRETING, CONSTRUCTING AND PRESENTING DATA

interpret and present data using bar charts, pictograms and tables

Spring: Unit 7

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.

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

Create a questions Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives.
(see above).