Mathematics progression skills with reasoning – Power Maths

Year 4

Number: Number and Place Value with Reasoning

COUNTING
Year 4
count backwards through zero to include negative numbers Autumn: Unit: 2
count in multiples of 6, 7, 9, 25 and 1000 Autumn: Units 1, 2 and 5
find 1000 more or less than a given number Autumn: Unit: 2
Spot the mistake: 950, 975,1000,1250 What is wrong with this sequence of numbers? **True or False?** 324 is a multiple of 9? **What comes next?** 6706+ 1000= 7706 7706 + 1000 = 8706 8706 + 1000 = 9706 ……

COMPARING NUMBERS

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

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.

IDENTIFYING, REPRESENTING AND ESTIMATING NUMBERS

identify, represent and estimate numbers using different representations

Autumn: Units 1 and 2

READING AND WRITING NUMBERS (including Roman Numerals

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

UNDERSTANDING PLACE VALUE

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

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?

ROUNDING

round any number to the nearest 10, 100 or 1 000

Autumn: Units 1, 2

round decimals with one decimal place to the nearest whole number
(copied from Fractions)

Summer: Unit 11

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?

PROBLEM SOLVING

solve number and practical problems that involve all of the above and with increasingly large positive numbers

Autumn: Unit 2

Number: Addition and Subtraction with Reasoning

NUMBER BONDS

Year 4

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

MENTAL CALCULATION

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?

WRITTEN METHODS

add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate

Autumn: Unit 3

Convince me

 - 666 = 8  5

What is the largest possible number that will go in the rectangular box?
What is the smallest?
Convince me

INVERSE OPERATIONS, ESTIMATING AND CHECKING ANSWERS

estimate and use inverse operations to check answers to a calculation

Autumn: Unit 3

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.

MULTIPLICATION & DIVISION FACTS

Year 4

count in multiples of 6, 7, 9, 25 and 1 000
(copied from Number and Place Value)

Autumn: Units 1 and 2

recall multiplication and division facts for multiplication tables up to 12 × 12

Autumn: Unit 5

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?

PROBLEM SOLVING

solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

Autumn: Unit 2

Number: Multiplication and Division with Reasoning

MENTAL CALCULATION

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

Use a fact

63 ÷ 9 = 7
Use this fact to work out
126 ÷ 9 =
252 ÷ 7 =

recognise and use factor pairs and commutativity in mental calculations (appears also in Properties of Numbers)

Spring: Unit 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)

WRITTEN CALCULATION

multiply two-digit and three-digit numbers by a one-digit number using formal written layout

Spring: Units 6 and 7

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?

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

recognise and use factor pairs and commutativity in mental calculations (repeated)

Spring: Unit 6

Always, sometimes, never?

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.

ORDER OF OPERATIONS

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 and use inverse operations to check answers to a calculation
(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 = 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 =

PROBLEM SOLVING

solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

Spring: Unit 6

Number: Fractions (including Decimals and Percentages)

Year 4

COUNTING IN FRACTIONAL STEPS

count up and down in hundredths

Spring: Unit 8

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, ….., …..,

Reasoning

RECOGNISING FRACTIONS

recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten

Spring: Units 8 and 10

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?

True or false?
1/20 of a metre= 20cm
4/100 of 2 metres = 40cm

COMPARING FRACTIONS

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)

COMPARING DECIMALS

compare numbers with the same number of decimal places up to two decimal places

Summer: Unit 11

Missing symbol
Put the correct symbol < or > in each box
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?

ROUNDING INCLUDING DECIMALS

round decimals with one decimal place to the nearest whole number

Summer: Unit 11

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

Explain how to round numbers to one decimal place? *Also see rounding in place value*

EQUIVALENCE (INCLUDING FRACTIONS, DECIMALS AND PERCENTAGES)

recognise and show, using diagrams, families of common equivalent fractions

Spring: Unit 8

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?

recognise and write decimal equivalents of any number of tenths or hundredths

Spring: Unit 10

Summer: Unit 11

Complete the pattern by filling in the blank cells in this table:

$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	
$\frac{10}{100}$	$\frac{20}{100}$		$\frac{40}{100}$
0.1		0.3	

Another and another
Write a decimal numbers (to one decimal place) which lies between a half and three quarters?
… and another, … and another, …

recognise and write decimal equivalents to $^{1}/_{4}$; $^{1}/_{2}$; $^{3}/_{4}$

Spring: Unit 10

Ordering
Put these numbers in the correct order, starting with the smallest.
¼ 0.75 5/10
Explain your thinking

ADDITION AND SUBTRACTION OF FRACTIONS

add and subtract fractions with the same denominator

Spring: Unit 9
Summer: Unit 11

What do you notice?

5/5 – 1/5 = 4/5
4/5 – 1/5 = 3/5
Continue the pattern

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

MULTIPLICATION AND DIVISION OF FRACTIONS

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

MULTIPLICATION AND DIVISION OF DECIMALS

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

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, …

PROBLEM SOLVING

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 simple measure and money problems involving fractions and decimals to two decimal places.

Spring: Units 10, 11 and 12

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 4

EQUATIONS

Connected Calculations

Put the numbers 7.2, 8, 0.9 in the boxes to make the number sentences correct.

□ = □ x □

□ = □ ÷ □

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)

Undoing

If the longer length of a rectangle is 13cm and the perimeter is 36cm, what is the length of the shorter side?
Explain how you got your answer.

SEQUENCES

NRICH Count the digits

Measurement with Reasoning

Year 4

COMPARING AND ESTIMATING

estimate, compare and calculate different measures, including money in pounds and pence
(also included in Measuring)

Summer: Unit 12

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

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.

MEASURING and CALCULATING

estimate, compare and calculate **different measures,** including **money in pounds and pence** (appears also in Comparing)

Spring: Unit 7

Summer: Unit 12
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?
measure and calculate the **perimeter** of a rectilinear figure (including squares) in centimetres and metres Autumn: Unit 4
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.
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
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 Spring: Unit 7
Always, sometimes, never If you double the area of a rectangle, you double the perimeter. *See also Geometry Properties of Shape*
TELLING THE TIME
read, write and convert time between analogue and digital 12 and 24-hour clocks (appears also in Converting) Summer: Unit 13
solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days (appears also in Converting) Summer: Unit 13
Working backwards

Put these times of the day in order, starting with the earliest time.
A: Quarter to four in the afternoon
B: 07:56
C: six minutes to nine in the evening
D: 14:36

CONVERTING

convert between different units of measure (e.g. kilometre to metre; hour to minute)

Summer: Unit 13

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 from hours to minutes; minutes to seconds; years to months; weeks to days
(appears also in Telling the Time)

Summer: Unit 13

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

Geometry: Properties of Shapes with Reasoning

Year 4

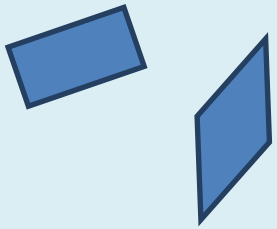
IDENTIFYING SHAPES AND THIER PROPERTIES

identify lines of symmetry in 2-D shapes presented in different orientations

Summer: Unit 15

What's the same, what's different?

What is the same and what is different about the diagonals 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.

DRAWING AND CONSTRUCTING

complete a simple symmetric figure with respect to a specific line of symmetry

Summer: Unit 15

Other possibilities Can you draw a non-right angled triangle with a line of symmetry?

Are there other possibilities.

COMPARING AND CLASSIFYING

compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

Summer: Unit 15

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.”

ANGLES

identify acute and obtuse angles and compare and order angles up to two right angles by size

Summer: Unit 15

Convince me

Joshua says that he can draw a right angled triangle which has another angle which is obtuse.
Is he right?
Explain why.

Geometry: Position and Direction with Reasoning

Year 4

POSITION, DIRECTION AND MOVEMENT

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
plot specified points and draw sides to complete a given polygon Summer: Unit 16	
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?	

PATTERN

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

Statistics with Reasoning

Year 4

INTERPRETING, CONSTRUCTING AND PRESENTING DATA

interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs

Summer: Unit 14

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.
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

SOLVING PROBLEMS

solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

Summer: Unit 14

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