

Kingsthorne Primary School

Progression in calculations and mental strategies

Reception to Year 6

Guidance

This policy is to align the teaching of written methods of calculations in line with the current national curriculum, and provide a guide to teachers, parents and all stake-holders within Kingsthorne Primary School.

This policy addresses the Key Stage 2 written methods, as well as providing Key Stage 1 strategies so that progression through the methods is clear.

The document is organised according to age related expectation, however it may be necessary for teachers to consult with lower year groups for children in order to meet their needs at the stage these children are working at.

The new National Curriculum 2014 states the emphasis on **fluency**, **reasoning** and **problem-solving**, and, wherever possible, it is important for teachers to create real life contexts for learning in mathematics. Children should be taught to use written methods along side their mental recall of number facts and multiplication and related divisions facts, as well as informal jottings, diagrams and drawings.

As part of a child's learning in calculation, they need to be taught how to select the **most efficient** method of calculation. The hierarchy of thinking should be:

- Can I complete this mentally?
- Can I make sense of the question using jottings, drawings, diagrams or a part-whole model?
- Do I need to complete a written strategy?

Mental maths strategies at Kingsthorne

We believe that mental maths should:

- \cdot Mean more than just mental calculation
- \cdot Be taught during lessons during the appropriate number and calculation strategy, giving children a range of practical opportunities to develop key skills
- · Include reasoning and communicating

The overall aim is that when children leave our school they:

- · Have a secure knowledge of number facts
- · Are able to solve appropriate problems mentally, selecting an efficient strategy from a range of known approaches
- \cdot Make use of diagrams and informal notes to help record steps when using mental methods that generate more information than can be kept in their heads and reduce cognitive load

 \cdot Can quickly identify when a mental strategy is not appropriate and in these cases have an efficient, reliable written method which they can turn to.

EYFS

Counting & Number

- · Count reliably 20 objects
- \cdot Can say which number is 1 more or less than any number to 20
- \cdot Can find the total number of items in two groups by counting all of them
- · Begin to count up and back to 50

Addition & Subtraction

- · Using quantities and objects, they add and subtract two single-digit numbers and count on and back to find the answer
- · Begin to recall all the addition and subtraction facts to 10 (the story of each number)

Multiplication & Division

 \cdot They use practical resources to solve multiplication and division problems e.g. How many wheels are on 3 cars? Share these 6 sweets between 3 people.



Number fluency

- · All pairs of numbers with a total of 10, e.g. 3+7
- · Addition and subtraction facts for all numbers to at least 5; Work out the corresponding subtraction facts
- \cdot Doubles of all numbers to at least 10 and the corresponding halves

Counting & Number

- · Count reliably 20 objects
- · Position numbers to 20 on a number line
- · Count on and back in 1's, 2's, 5's and 10's and use this to derive the multiples of 2, 5 and 10 to the tenth multiple

Addition & Subtraction

- · Reorder numbers in a calculation
- \cdot Relate addition to counting on
- \cdot Understand that addition can be done in any order
- \cdot Begin to bridge through 10, and later 20, when adding a single digit number
- \cdot Use known number facts and place value to add and subtract pairs of single digit numbers
- \cdot Add 9 to single digit numbers by adding 10 then subtracting 1
- · Understand subtraction as take away
- \cdot Find the difference by counting back

- \cdot Double units
- · Identify near doubles, using doubles already known
- · Children will experience equal groups of objects, and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Rapid Recall

- · Addition and subtraction facts for all numbers to at least 10
- · All pairs of numbers with a total of 20, eg 13+7
- \cdot All pairs of multiples of 10 with a total of 100, eg 30+70
- \cdot Multiplication facts for the 2, 5 and 10 times tables and corresponding division facts;

Counting & Number

- \cdot Count on and back in 10, 5, 2s and 1s to at least 100
- · Count up to 100 objects by grouping
- · Know the value of each digit in 2-digit numbers including where '0' is a place holder
- · Partition two-digit numbers in different ways:
- \cdot Use knowledge of number facts and operations to estimate and calculate
- \cdot Recognise odd and even numbers
- · Order a set of 2-digit numbers and position them on a number line · Round 2-digit numbers to the nearest 10

Addition & Subtraction

- · Find a difference by counting up from the smaller to the larger number
- \cdot Solve addition by counting on in tens and units 34 + 23 = 57

- \cdot Use knowledge of number facts and place value to multiply or divide by 2,5 or 10
- \cdot Recognise multiples of 2, 5 and 10 up to 100
- · Begin to double 2-digit numbers by +10 +10 +3 partitioning, doubling tens, doubling units and recombining. Doubles and 34 44 54 57
- · Add or subtract 9, 19, 11 or 21 by rounding and compensating;
- · Add/subtract mentally a 1-digit number or multiple of 10 to or from any 2 digit number
- \cdot Add three small numbers by putting the largest number first and/or find a pair totalling 10
- \cdot Reorder numbers in a calculation, and find three corresponding facts ('switchers') for any given addition / subtraction fact, eg: 16 + 5 = 21 So 5 + 16 = 21 21 5 = 16 21 16 = 5
- · Say or write a subtraction statement corresponding to a given addition statement halves of numbers to 20 should be secure. 217 200 10 7 400 20 14 434
- · Recognise repeated addition as multiplication
- \cdot Find 1/2, 1/4 and 3/4 of shapes and sets of objects



Rapid Recall

- · Addition and subtraction facts for all numbers to 20
- · Number bonds to 100
- \cdot All pairs of multiples of 100 with a total of 1000
- · Multiplication facts for the 2, 3, 4, 5, 6 and 10 times-tables and corresponding division facts

Counting & Number

- \cdot Count on or back to zero in single digit or multiples of 10;
- · Read, write and order whole numbers to at least 1000, and position them on a number line
- · Partition 3-digit numbers into multiples of 100, 10 & 1.
- · Round 3-digit numbers to the nearest 10
- · Use knowledge of number operations and corresponding inverses, including doubling and halving, to estimate and check calculations

Addition & Subtraction

- · Add three or four small numbers by putting the largest number first and/ or by finding pairs totalling 9, 10 or 11
- Partition into tens and units then recombine 24 + 63 = 20 + 60 4 + 3 80 7 87
- · Find a small difference by counting up from the smaller to the larger number
- · Bridge through a multiple of 10, then adjust
- \cdot Use knowledge of number facts and place value to add or subtract pairs of numbers
- · Add or subtract combinations of one digit and 2 digit numbers
- · Add or subtract mentally a 'near multiple of 10' to or from a two-digit number;

- · Recognise multiples of 2, 5 or 10 up to 1000
- · Double and halve 2-digit numbers
- \cdot Multiply any two-digit number by 10 or 100.
- \cdot Use knowledge of number facts and place value to multiply or divide by 2, 5, 10 or 100
- · Recognise the relationship between multiplication and division
- \cdot Find three corresponding facts ('switchers') for any given x / \div fact, eg: 6 x 11 = 66 So 11 + 6 = 66 66 \div 11 = 6 66 \div 6 = 11
- · Find unit fractions of numbers and quantities (1/2, ¼, 1/3, & 1/6)

<u>Year 4</u>

Rapid Recall

- · Know by heart all multiplication facts up to 12 x 12; and derive quickly all corresponding division facts
- \cdot Use tables facts to quickly multiply multiples of 10
- \cdot Know that 1/2 = 0.5, 1/4 = 0.25 and 1/10 = 0.1

Counting & Number

- · Count back in repeated steps of 1, 10 and 100;
- · Count through the nearest multiple of 10, 100 or 1000
- · Round to the nearest 10, 100 or 1000
- · Partition 4-digit numbers
- · Partition one-place decimals
- · Position negative numbers on a number line
- · Recognise and continue number sequences (counting on and back in steps of constant size)
- \cdot Use knowledge of rounding, number operations and inverses to estimate and check calculations

Addition & Subtraction

- \cdot Select an appropriate strategy to add or subtract mentally pairs of 2 digit whole numbers
- \cdot Add two 2-digit numbers by partitioning in to tens and units, adding the tens first
- · Add or subtract 9,19,29,11,21 or 31 by rounding and compensating
- \cdot Add or subtract the nearest multiple of 10, then adjust
- Use counting-on and counting-back to solve subtraction problems (using blank number line for jottings where necessary) 84 56 = 4 + 20 + 4 = 28 + 20 56 60 80 84
- · Add three 2-digit multiples of 10;
- · Use knowledge of addition and subtraction facts and place value to derive sums and differences of pairs of multiples of 10, 100 or 1000

- · Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves
- · Double any two-digit number by partitioning, doubling tens and units, then recombining. Use this to double multiples of 10 and 100 to 1000
- \cdot Multiply or divide numbers to 1000 by 10 and then 100 (whole number answers), eg: 45 x 100 =
- \cdot Partition to carry out multiplication, eg: 23 x 4 = 20 x 4 + 3 x 4 = 80 + 12 = 92
- · Use closely related facts to carry out multiplication and division · Find fractions of numbers, quantities or shapes (e.g 1/2, 3/8)
- \cdot Identify pairs of fractions that total 1

<u>Year 5</u>

Rapid Recall

- \cdot Know multiplication facts to 12 x 12 and use these to multiply pairs of multiples of 10, 100
- Division facts corresponding to tables up to 12 x 12
- \cdot Know that 1/2 = 0.5, 1/4 = 0.25, 3/4 = 0.75, 1/10 = 0.1, 2/10 = 0.2 etc
- Know one-place decimal bonds to 1 and 10.

Counting & Number

- \cdot Count from any given number in whole number and decimal steps. Extend beyond zero when counting backwards. Relate these numbers to their position on a number line.
- \cdot Order decimals with one or two places
- \cdot Count through the next multiple of 10, 100 or 1000
- \cdot Partition 2-place decimals and integers to 1 000 000
- · Round to the nearest 1000, 1000, 10 or whole number
- Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations 3 4 7.3 4 300 40 7 0.3 0.04 +500 -6

Addition & Subtraction

- · Partition into hundreds, tens, units, tenths, adding the most significant digit first
- · Add or subtract the nearest multiple of 10 or 100 then adjust, eg: 273 + 494 = 767

- · Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9) 3 273 767 773
- · Count on or back, using a blank number line and bridging to the nearest whole number where necessary
- · Add several small numbers;
- · Partition to carry out multiplication and use to solve TU x U mentally
- · Multiply and divide decimals by 10 or 100 and integers by 1000, explain the effect.
- · Double and halve three-digit numbers and one-place decimals by partitioning and recombining
- · Use knowledge of number facts and place value to multiply or divide eg solve 189 ÷ 9 by counting up or down

<u>Year 6</u>

Rapid Recall

 \cdot Use knowledge of place value and multiplication facts to 12 x 12 to derive related multiplication and division facts involving decimals (e.g. 0.08 x 7, 40 x 0.6)

 \cdot Use knowledge of multiplication facts to derive quickly squares of numbers to 12 12 and the corresponding squares of multiples of 10

 \cdot Know that 1/2 = 0.5 = 50%, 1/4 = 0.25 = 25%, 3/4 = 0.75 = 75%, 1/10 = 0.1 = 10%, 2/10 = 0.2 = 20% etc, 1/5 = 0.2 = 20%, 2/5 = 0.4 = 40% etc.

Counting & Number

- · Partition 3-place decimals
- \cdot Round and order decimals with up to 3 places and position them on a number line
- · Recognise that prime numbers have only two factors, identify prime numbers less than 100
- · Find the prime factors of two-digit numbers
- \cdot Use approximations, inverse operations and tests of divisibility to estimate and check results

Addition & Subtraction

- Be able to select efficiently from a range of known strategies to solve addition and subtraction problems this list should include: counting on; counting back; near doubles; rounding and adjusting; related facts.
- · Find the difference between a positive and negative integer or 2 negative integers

Multiplication & Division

• Be able to select sensibly from a range of known strategies to solve multiplication and division problems - this list should include: partitioning; doubling and halving; known facts and place value; relationship between multiplication and division; near-multiples of 10 & adjusting.

- · Calculate TU multiplied/divided by U U.t multiplied/divided by U
- · Know tests of divisibility for 2, 3, 4, 5, 6, 9, 10 and use these to identify primes to 100
- \cdot Multiply and divide any integer or two place decimal by 10, 100 or 100

• Use place value and known division facts to find simple fractions and percentages of numbers and amounts (eg. 1%, 5%, 10%, 25%, 50%)

Key Stage 1

Vocabulary

Additio

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary

Children should:

- have access to a range of equipment eg. Number lines, counting apparatus, Numicon, 100, squares, bead strings etc
- be shown numbers in a range of contexts
- read and write number sentences using the = and + signs
- interpret number sentences including missing number problems e.g. $3 + \Box = 8$

Written methods



<u>Single digits</u> - Number line - children count in jumps of one

<u>Two digit and one digit</u> - Number line children use a blank number line, bridging through 10s by partitioning 8

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line.

read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signsrepresent and use number bonds and related subtraction facts within 20add and subtract one-digit and two-digit numbers to 20, including 0solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and

missing number problems such as 7 = ? - 9.



1. Following from the end of reception, children use a number line with given numbers to add single digits.



2. Using a blank number line, children add increasingly larger numbers, up to 2-digit and one digit.



3. Alongside pictorial representations children add 2-digit and 2digit numbers up to
50, using partitioned
10s and 1s.

4. Using more abstract calculations, children record using partitioned tens and ones



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add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line.

solve problems with addition and subtraction:

using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- a two-digit number and 1s
- a two-digit number and 10s
- 2 two-digit numbers
- adding 3 one-digit numbers

show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot



1. Following from the end of Year 1, children use increasingly abstract calculations, partitioning in tens and ones to recombine for the answer.







3. Expanded column addition with partitioning of carried tens instead of carry-ing into the next column.

2. With partitioning and recombining of tens numbers when added from two single digits.

Vocabulary

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact

Written methods

Add numbers with up to 3 digits. Use partitioning method for addition to add two or three 3-digit numbers or three 2-



Partitioning of hundreds, tens and ones. Recombining the partitioned additions to find the answer.



Moving on to compact columnar methods of addition at the end of Year 3, including 'carrying' digits into the next place value column.

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Vocabulary

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse

Written methods

Add numbers with up to 4 digits Continue to use the compact column method, adding units first and carrying underneath the calculation. Also include money and measures contexts.



Compact column

Add ones first, 'carrying' digits into next place value column.



Compact column with 'carrying'.

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Vocabulary

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths.

Written methods

Add numbers with more than 4 digits including money, measure and decimals with different numbers of decimal places.



Addition

Vocabulary

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths.

Written methods

Add several numbers of increasing complexity including money, measure and decimals with different numbers of decimal places.

Tenths, hundredths and thousandths should be correctly aligned, with the decimal point aligned vertically, including in the answer.



Use compact column method to add in context of money, measures, including decimals with different numbers of decimal places. Pupils should apply their knowledge of a range of mental strategies, mental recall skills, informal and formal written methods when selecting the **appropriate and most efficient** method to work out addition problems. Opportunities to discuss the appropriateness of methods need to be planned for.

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Reception

Vocabulary

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is..., difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds

Children should:

Nursery Before subtraction can be introduced, children need to have a secure knowledge of number. In Nursery, children are introduced to the concept of counting backwards. This is taught through child initiated games indoors and outdoors such as acting out counting songs and running races (children shouting "5,4,3,2,1,0 - GO!"). Reception Before subtraction can be introduced, children in Reception build on concepts taught in Nursery by working through the number objectives in the 40 – 60 month band of Development Matters. Children need to have a secure knowledge of number in order to begin subtraction. Children are then introduced to the concept of subtraction through practical games and activities. Children act out subtractions to physically subtract a number of objects from a group. Children use arm gestures to represent the signs - and =. This is reinforced by opportunities provided in the outdoor area for the children to count e.g. counting building blocks, twigs etc. Children build on their previous knowledge by learning that subtracting means taking away a certain number of objects from a group (leaving them with fewer objects). Adults model subtraction vocabulary supported by age appropriate definition. An example of this is "subtraction means we take away objects from a group / we have 11 fewer objects now. Equals means we find out how many we have got left. Wow! We have only got 3 left!" Adults support children in recording their subtractions in the written form on whiteboards and in their books.











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Written methods

Alongside concrete resources, children should be taught to use pictures and numerals to record their calculations.

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Vocabulary

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is..., difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds

Children should:

read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs

represent and use number bonds and related subtraction facts within 20

add and subtract one-digit and two-digit numbers to 20, including 0

solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? - 9.



1. Following reception, cross out using pictorial counters



 Using a number line with given numbers, children count backwards with TO - O



3. Children use a blank number line to take tens and ones

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equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is..., difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds

Children should:

solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- a two-digit number and 1s •
- a two-digit number and 10s ٠
- 2 two-digit numbers
- adding 3 one-digit numbers

show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot





3. Expanded column subtraction without exchanging tens.

Children should be taught the + sign between partitioned numbers means 'and'.

Year 3 - Subtract with 2 and 3-digit numbers

Vocabulary

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is...

Children should:

- have access to a range of equipment e.g. number lines, counting apparatus, Numicon, 100, squares, bead strings etc.
- be shown numbers in a range of contexts
- read and write number sentences using the = and signs
- interpret number sentences including missing number problems eg. 18 \square = 5

Written methods - Children should understand when to count back where appropriate, using place value or number facts. This skill should be reinforced through mental work.







Model 'take and make' with Numicon or Diennes, before exchanging.



Compact column. End of year expectations.



Year 4 - Subtract with up to 4-digit numbers

Vocabulary

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/ less than, most, least count back, how many left, how much less is..., difference, count on, strategy, partition, tens units, 'take and make', exchange, digit, value, hundreds, inverse

Children should:

- Mentally subtract any pair of two digit numbers.
- Subtract 3 digit numbers from 3 digit numbers using counting on, e.g. 426 278 by jumping along a line from 278 to 426
- Practise mental subtraction strategies, e.g. round and adjust (37-9), using place value
- Use counting on in the context of money and also when subtracting from numbers ending in zeros eg 4000-372
- Count backwards through zero, using negative numbers

Written methods



Model 'take and make' with Numicon or Diennes, before exchanging.





as an empty number line, partitioning pounds and pence.

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Year 5 - Subtract with at least 4-digit numbers

Vocabulary

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/ less than, most, least count back, how many left, how much less is..., difference, count on, strategy, partition, tens units, 'take and make', exchange, digit, value, hundreds, inverse

Children should:

- Count backwards through zero, using negative numbers
- Add or subtract 0.1 or 0.01 to/from any decimal number with confidence, e.g. 5.83 + 0.01 or 4.83 0.1
- Children need to utilise and consider a range of subtraction strategies, jottings and written methods before choosing how to calculate
- Subtract larger numbers using column subtraction or by counting up
- Begin to subtract decimal numbers using counting up: 6.2 3.5
- Decide which mental methods to use and explain why

<u>Written methods</u>

210 4 31,0516 2128 28,928

Use compact column subtraction to subtract numbers with up to 5 digits.



value of each column

Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal point

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Year 6 - Subtracting with increasingly large and more complex numbers and decimal values. **Vocabulary**

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/ less than, most, least count back, how many left, how much less is..., difference, count on, strategy, partition, tens units, 'take and make', exchange, digit, value, hundreds, inverse, tenths, hundredths, decimal point, decimal

Children should:

- Subtract mentally with confidence where the numbers are less than 100 or the calculation relies upon simple subtraction and place value. Examples include: 6,723 400, 72 46, 100 64
- Subtract large numbers using column subtraction or counting up, e.g. 1323 758
- Subtract decimal numbers using counting up
- Use negative numbers in context and calculate intervals across zero
- Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before deciding how to calculate
- Decide which methods to use and explain why

Written methods



subtract more complex numbers. Use compact column method to subtract in context of money, measures, including decimals with different numbers of decimal places.

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Reception

Vocabulary

Doubles, groups of, counting in

Children should:

Nursery and Reception By the end of Reception, children are expected to understand the concept of doubling and to be able to double a number up to 10. Before doubling can be introduced, children need to have a secure knowledge of counting, number facts and addition in order to double. Children are then introduced to the concept of doubling through practical games and activities, including the use of the outdoor areas. Children act out 'doubling' by physically add two equal groups together to find out the 'doubles' answer .









Written methods

Children should be able to fill in reasoning problems such as this with the use of adult support and/or physical manipulatives.

Vocabulary

Doubles, groups of, counting in

Children should:

recall and use multiplication and division facts for the 2 and 10 multiplication tables, including recognising odd and even numbers

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.



1. using concrete, physical objects, children group and count the groups by adding here of the same number.



2. Children can use a number line to show their counting in groups of the same number.



3. Children know that repeatedly adding the same number is a multiplication. They can recognise the 2 and 10 times table and remember the related facts,

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Year 2

Vocabulary

Doubles, groups of, counting in

5

Children should:

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot

1. From year 1 children know tht repeatedly adding the same number is a multiplication. They can recognise the 2 and 10 times table and remember the related facts,



2. Children know the commutative property of multiplication and can show an understanding of this using arrays, missing numbers and related facts

Year 3 - multiply 2-digit numbers by a single digit number

Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value Children should:

160 + 24 = 184

- Understand that multiplication is commutative, e.g. 4 x 8 is the same as 8 x 4
- Know the 2x, 3x, 5x and 10x times tables. All tables need to be learned to 12th multiple
- Multiply any 2-digit number by 10 or a single-digit number by 100
- Understand the effect of multiplying whole numbers by 10 and 100
- Multiply a 1 digit number by a 2 digit number starting to use the grid method
- Solve multiplication problems involving missing numbers

Written methods

Children MUST be able to do the following before moving onto grid method:

- Partition numbers into tens and units
- Multiply multiples of ten by a single digit using their knowledge of multiplication facts and times tables.
- Recall and work out multiplication facts in the 2,3,4,5,8 and 10 times tables.

Partitioning numbers into tens and ones. **Recombining** partitioned answers.

Grid method

23x8

y 20

Year 4 - Multiply 2 and 3 digits by a single digit using all multiplication tables up to 12 x 12 Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value, inverse Children should:

- Multiply 1 and 2 digit numbers by 10, 100 and 1000; to understand place value in decimal numbers with one place
- Know and recite 2x, 3x, 4x, 5x, 9x, 10x times tables up to 12th multiple; include multiplying by 0 (e.g. $5 \times 0 = 0$, $7 \times 0 = 0$) or by 1 (e.g. 5×1 $= 5, \frac{1}{2} \times 1 = \frac{1}{2}$
- Multiply 1- digit numbers by 2-digit or friendly 3-digit numbers using grid method
- Find doubles to double 100 and beyond, using partitioning
- Begin to double amounts of money
- Use doubling as strategy for multiplying by 2, 4, 8
- Count in multiples of 6, 7, 9, 25 and 1000



Year 5 - Multiply up to 4 digits by 1 or 2 digits. Introducing column multiplication

Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry'

Children should:

- Know and recite all times tables including division facts.
- Multiply 2- and 3-digit numbers by numbers ≤12 using grid method; multiply 2-digit by 2-digit numbers using grid method.
- Identify multiples and factors, using knowledge of multiplication tables up to 12 x 12
- Scale up or down by a factor of 2, 5 or 10
- Multiply integers and decimals by 10, 100, 1000
- Recognise and use squared, cubes and their notations

E=140x5=700

<u>Written methods</u>

136×5

Short multiplication, including

appropriate.

'carrying'. With estimation where

Multiplications up to 19. e.g. one multiple of 10 and one multiple 0-9.

> Short multiplication, including 'carrying'



Long multiplication

by partitioning only.

(10 x

Year 6 - Short and long multiplication, as in Year 5, and multiply decimals with up to 2 decimal places by a single digit.

Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry' tenths, hundredths, decimal.

Children should:

- Recall multiplication facts up to 12 x 12
- Use short multiplication to multiply a 1-digit number by a number with up to 4 digits
- Use long multiplication to multiply a 2-digit by a number with up to 4 digits
- Use short multiplication to multiply a 1-digit number by a number with one or two decimal places, including amounts of money
- Multiply fractions and mixed numbers by whole numbers
- Multiply fractions by proper fractions.
- Use percentages for comparison and calculate simple percentages
- Estimate answers using rounding and approximation

Written methods



Children should:

- Use rounding and place value to make approximations before calculating and use these to check validity of answers.
 - Use short multiplication (see Y5) to multiply numbers with more than 4 digits by a single digit; to multiply money and measures; and to multiply decimals up to 2 decimal places by a single digit.
- Use long multiplication (see Y5) to multiply numbers with at least 4 digits by a 2-digit number.

Reception

Vocabulary

Half, share equally, one each, two each..., group, equal groups of, lots of,

Children should:

Division Nursery and Reception By the end of Reception, children are expected to understand the concept of halving and sharing. Before this can be introduced, children need to have a secure knowledge of counting backwards, number facts and subtraction in order to halve and share. Children are then introduced to the concept of halving and sharing through practical games and activities. They act out 'halving and sharing' through activities such as sharing food for their Teddy Bear's Picnic, sharing resources equally to play a game. This is reinforced by opportunities provided in the outdoor area for the children to halve and share out objects such as building blocks, twigs etc.











Vocabulary

share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line

Children should:

recall and use multiplication and division facts for the 2 and 10 multiplication tables, including recognising odd and even numbers

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.



1. Children know that dividing can be sharing into equal groups, or finding how many groups of the divisor are in the number.





Alongside all their calculation education, children should practice their multiplication and related division facts.

IVISI

Vocabulary

share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot



From year 1 children will know the difference between grouping and sharing within division.



1. Children use a blank number line to show grouping by repeated subtraction

2. Once children are confident with place value and known facts, children partition larger numbers to divide, and then recombine.

partitioning with known

facts

3

3

1 =

=

=

=

3

1

3

0

-

• 1 •

93

90÷3

3

30+

Tens

Ones



Alongside all their calculation education, children should practice their multiplication and related division facts.

(9+3=3 x 10)

Year 3 - Divide 2-digit numbers by a single digit

Vocabulary

share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple

Children should:

- Recall and use division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables
- Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one digit
- Solve problems, in contexts, and including missing number problems, involving division
- Pupils develop efficient mental methods, for example, using division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3)
- Pupils develop reliable written methods for division, starting with calculations of 2- digit numbers by 1-digit numbers using an empty number line.
- Halve even numbers up to 50 and multiples of ten to 100
- Perform divisions within the tables including those with remainders, e.g. 38 ÷ 5

Written methods



Using a number line. Model first using Dienes, then using bead bar to show link to ENL

Year 4 - Divide up to 3-digit numbers by a single digit.

Vocabulary

share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple divisible by, factor

Children should:

- Use a written method to divide a 2-digit or a 3-digit number by a single-digit number.
- Give remainders as whole numbers.
- Recall multiplication and division facts for all numbers up to 12 x 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example 200 × 3 = 600 so
 600 ÷ 3 = 200
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Written methods

Link back to Y3 and taking away multiples. Model using counters, Diennes and a bead string.



 126÷7
 70
 =18

 35
 109mus
 109mus

 0
 21
 56
 126

 Start to chunk on a number line, taking groups of a divisor away, and then counting how many groups were taken away-ikintegral ne Primary School
 away-ikintegral ne Primary School



underline the multiples of the divisor.

Σ

Year 5 - Divide up to 4 digits by a single digit or to 12, including answers with remainders. <u>Vocabulary</u>

share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple divisible by, factor, quotient, prime number, prime factors, composite number (non-prime) Children should:

- Recall multiplication and division facts for all numbers up to 12 x 12 (as in Y4)
- Multiply and divide numbers mentally, drawing upon known facts
- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number
- Solve problems involving multiplication and division where larger numbers are decomposed into their factors
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- Work out whether a number up to 100 is prime, and recall prime numbers to 19 🛛 Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and inter-pret remainders appropriately for the context
- Use multiplication and division as inverses. Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. 98 ÷ 4 = 24 r 2 = 241/2 = 24.5 ≈ 25)

Written methods





Short division, with remainders. Interpreting remainders as fractions.

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Year 6 - Divide at least 4-digit numbers by single and 2-digit numbers (including decimals). <u>Vocabulary</u>

share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple divisible by, factor, quotient, prime number, prime factors, composite number (non-prime), common factor

Children should:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- 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. Use short division where appropriate
- Perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- Solve problems involving all 4 operations. I Use estimation to check answers to calculations and determine accuracy, in the context of a problem
- Use written division methods in cases where the answer has up to two decimal places
- Solve problems which require answers to be rounded to specified degrees of accuracy

Written methods

