ASTON LODGE PRIMARY SCHOOL

Maths Calculation Policy
Quality of Education,
Intent, Implementation, Impact

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Written Calculation Policy
2020- 2021

This policy has been developed in accordance with the National Curriculum 2014 and helps to develop the core aims of Fluency, Reasoning and Problem Solving. It is to ensure that the pupils have a smooth progression of learning through the four operations.

The calculation policy is structured in year groups and is in line with the new National Curriculum. It is important that the pupils are only taught according to the stage they are currently working at only moving on when they are completely secure with the method taught.

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of the calculation and to help them recognise when to use certain operations and methods when faced with problems. This is one of the main aims of the new curriculum so should be given priority in maths lessons.

Aims of the written calculation policy

- To ensure consistency in the teaching of written calculations across school,
- To strengthen continuity and progression in children's understanding of the development of written calculations,
- To form a core set of methods which every child will experience and build upon,
- To build on models and images introduced to promote conceptual understanding,
- To provide guidance on the teaching of calculation skills for teachers, teaching assistants and parents.

Good practice in calculation

- Establish mental methods based on a good understanding of place value in numbers and times tables,
- Show children how to set out written calculations vertically which are initially set out in expanded layouts progressing to more compact methods. The more formal compact methods will be introduced slowly and systematically and when the children are ready.
- Link practical (encourage this in particular in lower school), mental and written methods,
- Make strong links between inverse operations,
- Children need to think
    1. Can I do it in my head?
    2. Could I use some jottings to help me?
    3. Should I use a written methods to work it out?
- Gradually refine the written method into a more compact standard method,
- Extend to larger numbers and decimals.
- Ensure that remainders are taught alongside the division method,
- Keep mental methods sharp by continuing to apply them to appropriate examples,
- Encourage the children to identify the best method and make choices,

Written Calculation Policy
2016-2018

Solving word problems

When teaching children how to solve word problems, the school uses the RUCSAC strategy

R– **Read the question**

U– **Understand the question**

C– **Choose an operation**

S– **Solve the question**

A– **Answer the question**

C– **Check your answer**

This strategy ensures that the children have a consistent approach to problem solving and know how to tackle problems independently.

Process for problem solving

PREPARE

Understanding the language of problems;

Identifying the information crucial to the problem (distilling);

Describing the problem to others (clarifying);

THINK

Using what you know (summoning up relevant knowledge from memory; experiences of similar problems);

Asking the right questions about the problem (questions based on the difference between what you know and what you don't know);

DO

Creating systems – formulating a strategy (in order to be systematic and find all possibilities);

Organising information (representing solutions in an ordered way / creating charts and graphs);

Trial and adjust, retry, reflecting and improving;

PRESENT AND DEPLOY

Communicate new knowledge effectively.

Foundation Maths

No specific methods/strategies but children are exposed to a range of activities that focus on:

- Counting everyday objects,
- Saying and using the number names in order
- Finding one more or less than a number,
- Starting to use the language of addition and subtraction; counting on and back,
- Sorting and matching objects and shapes
- Comparing quantities and shapes
- Finding and recreating simple patterns
- Beginning to do some simple measuring, comparing lengths and quantities
- Talking about things like size, weight, distance, time and money to develop correct vocabulary

YEAR 1
Written Calculation methods/strategies

'Show Pride . Reach for the Stars'

Year 1 Non Negotiable Mental Strategies

Addition/Subtraction Strategies
I can count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
I know number pairs that have a total of 10, e.g. 3 + 7, or what to add to a single-digit number to make 10, e.g. 3 + ▢ = 10
I know addition facts for totals to at least 5, e.g. 2 + 3,   4 + 3
I can identify one more and one less of a given number
I can add doubles up to 5 + 5
I can add or subtract a single-digit number to or from a teens number, e.g. 13 + 5, 17 – 3
I can add or subtract a pair of single-digit numbers, e.g. 4 + 5, 8 – 3
I can add or subtract a single-digit to or from 10, and add a multiple of 10 to a single-digit number, e.g. 10 + 7, 7 + 30
I can add and subtract one-digit and two-digit numbers to 20, including adding zero

Multiplication/Division Strategies
I can count forwards and backwards in multiples of 2s, 5s and 10s from 0

| Other facts that need to be known |
|---|
| I am beginning to know odd and even numbers to 20 |

Addition
YEAR 1

Add with numbers up to 20

Children will:

- mainly use concrete apparatus and practical activities to add; merging sets and then counting the total. They will also count on from as number to find the total.

- Read and write the addition and equals sign within a number sentence,

- Interpret addition number sentences and solve missing box problems using concrete objects and number lines.
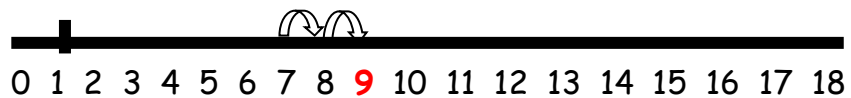
Mostly pictorial representation
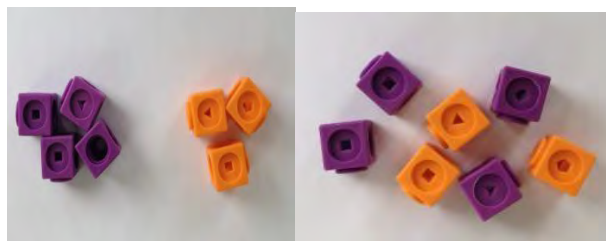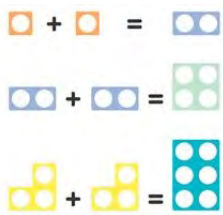
$$4 + 3 = 7$$

$$8 + 1 = 9$$

- Simple number lines can be introduced e.g. 2 more than 7. = 9

0 1 2 3 4 5 6 7 8 **9** 10 11 12 13 14 15 16 17 18

- Use known facts : I know 5 + 5 = 10 so 4 + 5 = 9

Other resources that could be used:

Counters, counting bears, Buttons, Cubes, Pegs, counters, Numicon, Fingers, Number lines and whiteboards , dienes

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Key skills for addition at Year 1

- Read and write numbers to 100 in numerals, including 1-20 in words,

- Recall number bonds to 10, 20, and addition facts within 20,

- Count to and across 100,

- Count in multiples of 1, 2, 5 and 10,

- Solve simple 1 step problems involving addition, using objects, number lines and pictorial representation.

Example questions

There are eight children in a line. Three children left the line. How many children are in the line?

Count 6 pencils. Count 6 pencils. How many altogether?

Vocabulary

How many altogether? And, one more than, count on, and add.

Multiplication

Multiply with objects, arrays and pictorial representations.

At this stage the children will still be doing a lot of concrete work and may also still use pictorial representations. Again, their experience of 'multiplication' still has many connections to repeated addition.

Children will:

- Be given the opportunity to count in equal groups of 2, 5 and 10,

- Practical problems will be introduced to encourage the children to count in equal steps.
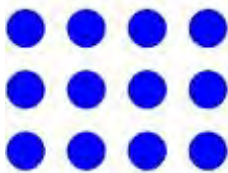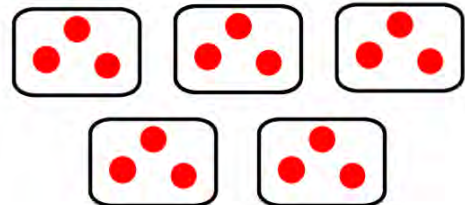
Mostly pictorial representation

How many legs does a money have?

There are 3 coins in a purse. How many coins are there in 5 purses?

2 + 2 + 2 = 6 (repeated addition)

Introduce simple arrays

Other resources that could be used:

Counters, Small toys, Buttons, Cubes, Pegs Pairs of socks, Fingers Songs, white-boards and Numicon

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Key skills for Multiplication at Year 1

- Count in multiples of 2, 5 and 10.
- Solve one-step problems involving multiplication, by calculating the answer using concrete objects,
- pictorial representations and arrays with the support of the teacher.
- Make connections between arrays, number patterns, and counting in twos, fives and tens.
- Begin to understand doubling using concrete objects and pictorial representations.

Example questions

I have 3 pairs of shoes – how many shoes do I have altogether?

What are six lots of 2?

5 multiplied by 2 is …

Vocabulary

Count on, counting in 2s,5s,10s, groups of, lots of, how many altogether? total
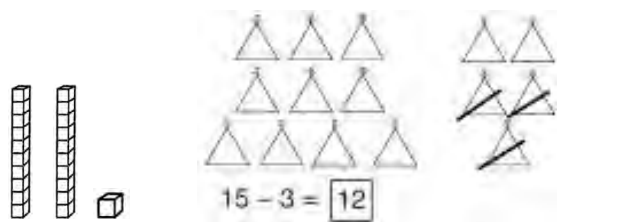
Subtraction

Subtract for numbers up to 20

Children consolidate understanding of subtraction practically, showing subtraction using Numicon using cubes etc. and in familiar contexts, and are introduced to more formal recording using number lines. Children will mainly use concrete apparatus to take a smaller number away from a larger one, then find what is left by counting back from the larger number. Oral countdowns will also be used to aid counting back skills.

Subtraction using Numicon

This will be introduced practically with the language **find the distance between'** and „ **how many more?**⬜ in a range of familiar contexts.
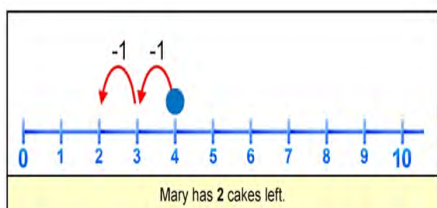
Subtraction on a number line   e.g. 4 - 2

Mary has **2** cakes left.

Subtraction using concrete objects or pictures

Dienes or cubes

$15 - 3 = 12$

$16 - 2 = 14$ $10 - 6 =$

Other resources that could be used:

Counters, Small Toys, Buttons, Cubes, Counters, Coins, Numicon, Number tracks, Number grids etc

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Key skills for subtraction at Year 1

- **Given a number, say one more or one less.**
- **Count to and over 100, forward and back, from any number.**
- **Represent and use subtraction facts to 20 and within 20.**
- **Subtract with one-digit and two-digit numbers to 20, including zero.**
- **Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures, and missing number problems.**
- **Read and write numbers from 0 to 20 in numerals and words.**

Example questions

There are 15 children. One goes to the cinema. How many are left?

We made 7 cakes. We ate 3. How many cakes are left?

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_?

Division YEAR 1

Group and share small quantities

Children will mainly use concrete apparatus and practical activities to divide. They will also use real life and role play sessions to put the meaning across.. Using objects, diagrams and pictorial representations to solve problems including both grouping and sharing.
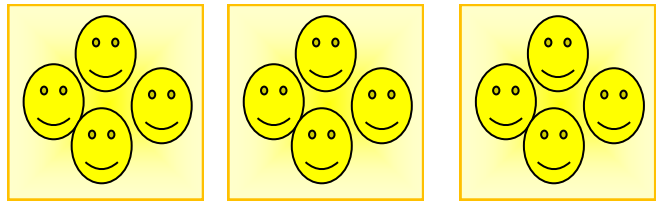
Pupils should :

Grouping:
How many group can be made out of 12 stars?

Sharing
12 shared between 3 is 4

Example division problem in a familiar context:
There are 6 pupils on this table and there are 18 pieces of fruit to share between us. If we share them equally, how many will we each get?
Can they work it out and give a division statement… ?
12 shared between 6 people gives you 2 each.

- use lots of practical apparatus, arrays and picture representations
- Be taught to understand the difference between „grouping☐ objects (How many groups of 2 can you make?) and „sharing☐ (Share these sweets between 2 people)
- βe able to count in multiples of 2s, 5s and 10s.
- Find **half** of a group of objects by sharing into 2 equal groups.

Other resources that could be used:

Counters, Small toys, Buttons, Cubes, Pegs etc. Gloves and socks to pair up.

Division

Key skills for division at Year 1

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

- Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.

- They make connections between arrays, number patterns, and counting in twos, fives and tens.

Example questions

Getting children to share out objects to a group.

e.g. Can we share these cakes out?

Vocabulary

share, share equally, one each, two each…, group, groups of, lots of, array

YEAR 2
Written Calculation methods/strategies

Year 2 Non Negotiable Mental Strategies

Addition/Subtraction Strategies
I can recall and use addition and subtraction facts for all numbers to 20 fluently.
I can derive and use related facts up to 100
I can add or subtract a pair of single-digit numbers, including crossing 10, e.g. 5 + 8, 12 – 7
I know how to add near doubles, e.g. 13 + 14, 39 + 40
I can identify all pairs of multiples of 10 with totals up to 100, e.g. 30 + 70, or 60 + ☐ = 100
I know what must be added to any two-digit number to make the next multiple of 10, e.g. 52 + ☐ = 60
I can add a pair of 2 digit numbers
I can add any single-digit number to or from a multiple of 10, e.g. 60 + 5   subtract any single-digit number from a multiple of 10, e.g. 80 – 7
I can add or subtract a single-digit number to or from a two-digit number, including crossing the tens boundary, e.g. 23 + 5,   57 – 3, then 28 + 5,   52 – 7
I can add 9, 19, 29, … or 11, 21, 31, …
I can halve any multiple of 10 up to 100, e.g. halve 90
I can find half of even numbers to 40
I can count in steps of 2, 3, and 5 from 0, and in 10s from any number, forward and backward
I can add 3 one-digit numbers

Multiplication/Division Strategies
I know the doubles of all numbers to 20, e.g. double 13,
I know the doubles of multiples of 10 to 50, e.g. double 40,
I know the double any multiple of 5 up to 50, e.g. double 35
I know my 2, 5 and 10 times tables and the division facts.

Other facts that need to be known
I know the odd and even numbers to 100

Addition

Add with 2 digit numbers (develop mental fluency with addition and place value involving 2- digit numbers, then establish more formal written methods)

Children are beginning to move on to using simple number lines which allow the children to record their working. These should include calculations where tens boundaries need to be crossed.
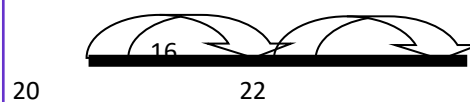
Add 2 digit numbers and tens:

37 + 30 =67

+10   +10   + 10

37
57   67   47

Add 2 digit numbers and units:

16 + 6= 22

+4   +2

16
20   22

Add tens and ones   37 + 13 =   Leading to jumping tens and ones

+ 10   +1 +1 + 1

37   47

48   49   50

42+23=

+20   +3

42   62   65
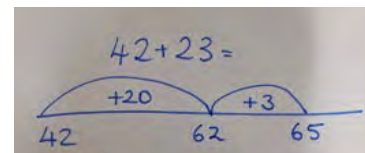
Use empty number lines, Numicon, hundred squares to build confidence and fluency in mental addition skills

Add pairs of 2 digit numbers, moving to the partitioned column method using dienes when secure adding tens and units: 67 + 17   25 + 44:

+10   +7

67   77   84

Tens	Ones
20	5
40	4
60	9
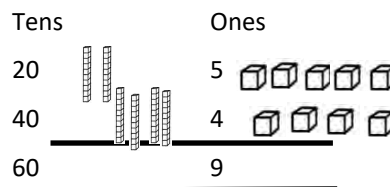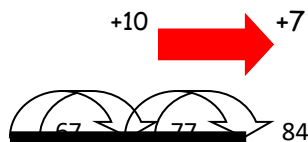
STEP 1: Do not cross the 10s boundary until they are secure with this method.

STEP 2: When children can add multiples of 10 to 2 digit numbers they are ready for adding numbers that cross the tens boundary using expanded form.

23
48 +
11
60
71

HAPS —STEP 3: Children who are confident and accurate with this they can move onto the column addition adding 2 and three digits together.

22

23   Show

21 +   48 +   carries
43   1   above
71   line

Other resources that could be used:

Concrete things if still required (as above) 100 grid (and beyond), Number lines, Number grids, Coins, Whiteboards, Place value counters, Numicon apparatus.

Addition

Key skills for addition for Year 2

- Add a 2-digit number and ones (e.g. 27 + 6)
- Add a 2-digit number and tens (e.g. 23 + 40)
- Add pairs of 2-digit numbers (e.g. 35 + 47)
- Add three single-digit numbers (e.g. 5 + 9 + 7)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using < > and = signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

Example questions

What is the sum of 25 and 16?

Add together 38 and 15

How many is 11 and 35 altogether?

Vocabulary

count on, add, sum, total, how many   altogether? and, how many more? score, +, addition, double, near double, one more, two more, ten more, tens, ones partition, column, tens boundary.
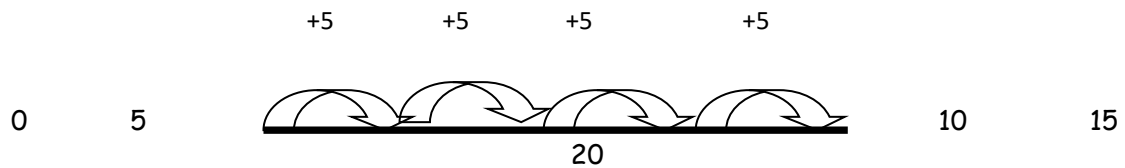
Multiplication

Multiply with objects, arrays and pictorial representations (2's, 5s and 10s).

Children will still use many ideas from the previous stage. They should be introduced to the 'x' symbol for multiplication.. They will also use arrays and understand that multiplication is repeated addition.

Children will:

Repeated addition on a number line:

Using the number line, demonstrate how to jump in equal steps to work out unknown multiplication facts. And write statements using the multiplication and equals sign.

+5   +5   +5   +5

0   5   10   15

20

Use arrays:

$5 \times 3 = 15$

$3 \times 5 = 15$

Use the arrays to teach the children about the commutative law of multiplication and give examples with missing numbers eg
3 + 3 + 3 +3 + 3 = 15
5 + 5 + 5 = 15

Use practical apparatus:

3 × 6 = 18
6 × 3 = 18
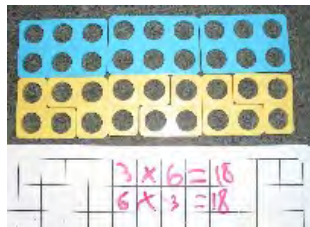
Recalling their tables:

Children should recall their 2, 5 and 10 times tables through counting practice.

Other resources that could be used:

Counters etc, Numicon, number lines, number grids and arrays.

Multiplication YEAR 2

Key skills for multiplication at Year 2

- **Count in steps of 2, 3 and 5 from zero, and in 10s from any number.**
- **Recall and use multiplication facts from the 2, 5 and 10 multiplication tables, including recognising odds and evens.**
- **Write and calculate number statements using the x and = signs.**
- **Show that multiplication can be done in any order (commutative).**
- **Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.**
- **Pupils use a variety of language to discuss and describe multiplication.**

Example questions

How many wheels are there on 3 cars?

What is 5 multiplied by 5?

Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated

addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times, inverse, number sentences and missing numbers
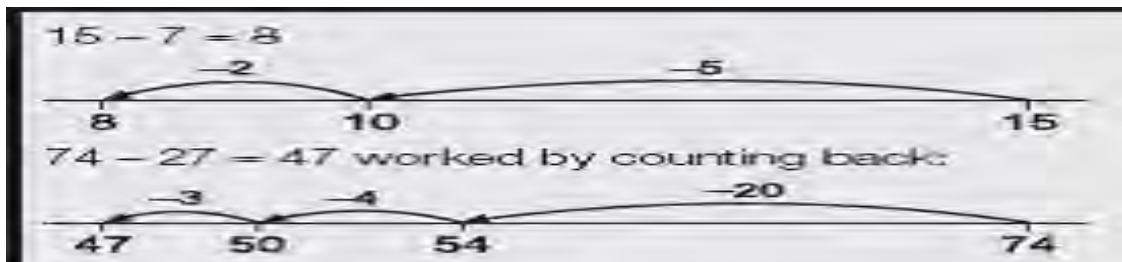
Subtraction YEAR 2

Subtract numbers using concrete objects, pictorial representations, and mentally, including:

a two-digit number and 1s , a two-digit number and 10s and 2 two-digit numbers,

Subtraction using a number line:

Teach the children to subtract the tens and then the ones. Or in the situation of subtracting a single digit number, for example in 15-7, children should partition the 7 into a 5 and a 2 to enable the   children to land on a multiple of 10 as the mid-point. This would avoid the using of fingers and develop the children's mental strategies' too.

Subtraction by finding the difference using a number line

Teach the children to add to the next 10 so that they can become more efficient.   **74—27 =**
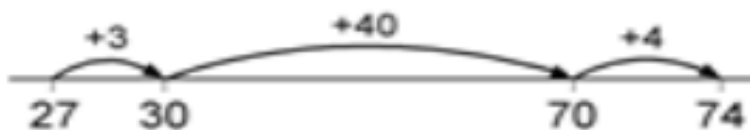
Mental Strategy - subtract number close together mentally

Many strategies are taught for this but it is important to encourage the children to count on mentally when the numbers are close together. In order to do this they need to be clear about the difference between addition and subtraction. **SEE SEPARATE SHEET ON MENTAL SUBTRACTION**

Other resources that could be used:

Counters, Cubes, Counters, Coins, Numicon, Number tracks, Number grids etc

Subtraction

Key skills for subtraction at Year 2

- Recognise the place value of each digit in a two-digit number.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use inverse relationship between addition and subtraction, using this to check calculations and missing number problems.
- Solve simple addition and subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

Example questions

25 take away 8.

63 subtract 45.

10 less than 47.

Find the difference between 23 and 56.

How many less than 28 is 12?

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

Division

## Group and share, using the ÷ and = sign

At this stage the children will still be doing practical work with concrete apparatus and will use more pictorial representations. Questions will be given as real life examples and still include lots of role play. Use objects, arrays, diagrams and pictorial representations, and grouping on a number line.

Pose 12 ÷ 3 as 'How many groups of 3 are in 12?

Arrays:

This represents 12 ÷ 3, posed as how many groups of 3 are in 12?
Pupils should also show that the same array can represent 12 ÷ 4 = 3 if grouped horizontally.
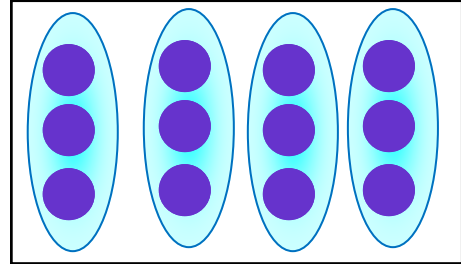
Know and understand **sharing and grouping**

Sharing
6 stars shared between 2 people, how many do they get each?
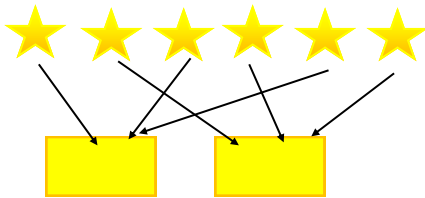
Grouping
There are 6 sweets, how many people can have two sweets each?
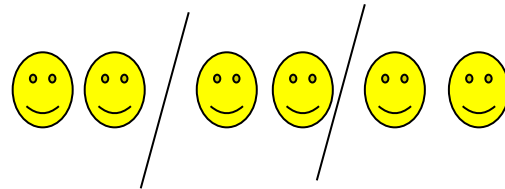
Children should be taught to recognise whether problems require sharing or grouping

Grouping using a number line:

Group from zero in equal jumps of the divisor to find out how many groups of _ in _ ?. Pupils could and using a bead string or practical apparatus to work out problems like „A CD costs £3. How many CDs can I buy with £12? **This is an important method to develop understanding of division as grouping.**

12 ÷ 3 = 4

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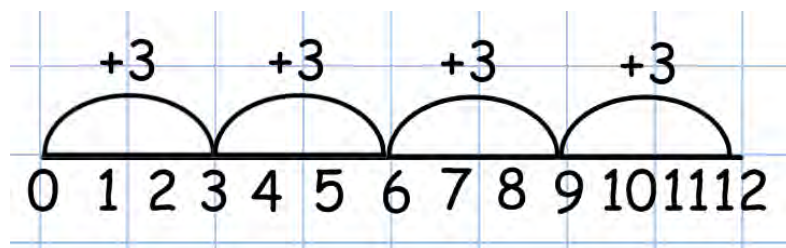
Division

YEAR 2

Other resources that could be used:

Counters, Small toys, Buttons, Cubes, Pegs , Numicon etc. Gloves and socks to pair up.

Key skills for division at Year 2

- Count in steps of 2, 3, and 5 from 0

- 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 x, ÷ and = signs.

- Show that multiplication of two numbers can be done in any order (commutative) and   division of one number by another cannot.

- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Example questions

If I can see 12 wheels, how many bikes are there?

Share 10 carrots between 5 children.

$15 ÷ 3 =$

20 divided by 2 is?

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

YEAR 3
Written Calculation methods/strategies

'Show Pride . Reach for the Stars'

Year 3 Non Negotiable Mental Strategies

Addition/Subtraction Strategies
I know all the facts for numbers up to 20 eg 9+ 8, 17-9 (inverse operations)
I know my number bonds to 100
I can add and subtract groups of small numbers eg 5-3+2
I can add or subtract a two digit number to or from a multiple of 10 eg 50 + 38, 90 -27
I can add or subtract two digit numbers eg 34 + 65, 68 – 35
I can find sums and differences of multiples of 10 eg 50 + 80, 120-90
I can halve any multiple of 10 up to 200, e.g. halve 170
I can count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
I can add and subtract numbers mentally, including: a three-digit number and ones, a three-digit

Multiplication/Division Strategies
I can double any multiple of 5 up to 100, e.g. double 35
I can add near doubles eg 18 +16, 60 +70
I can double multiples of 10 to 100, e.g. double 90, and corresponding halves
I know my 2, 3, 4, 5, 6 and 10 times tables and corresponding division facts.
I can multiply one-digit or two-digit numbers by 10 or 100, e.g. 7 × 100, 46 × 10, 54 x 100

Other facts that need to be known
I can find fractions of numbers and quantities involving halves, thirds, quarters, fifths and tenths

Addition

In order to use this method pupils need to be able to add in columns.

Add numbers with up to 3 digits

The children should begin to partition to add.

Once confident, children can start adding using the following approach:

For example : **246 + 132 = 378**

246 + 67 = 313

$$200 + 40 + 6$$
$$\underline{100 + 30 + 2}$$
$$\underline{300 + 70 + 8} \qquad = \textbf{378}$$

	2	4	6	
		6	7	
		1	3	
	1	0	0	
	2	0	0	
	3	1	3	

If children are ready, move on to the traditional column methods. Introduce this initially with numbers **that do not bridge any boundaries**. It is important children remember that it is three hundred add one hundred, **NOT 3 + 1**. **116**

343 = 459   **343 (put largest amount on top**

+

116 +   but stress ADDITION is

459   commutative)

Other resources that could be used:

Concrete things if still required (as above) 100 grid (and beyond), Number lines, Number grids, Coins, Whiteboards, Place value counters, Numicon apparatus.

Key skills for addition at Year 3

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- Add a three-digit number and ones mentally (175 + 8)
- Add a three-digit number and tens mentally (249 + 50)
- Add a three-digit number and hundreds mentally (381 + 400)
- Estimate answers to calculations, using inverse to check answers.
- Solve problems, including missing number problems, using
- number facts, place value, and more complex addition.
- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones.)
- Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest
- multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.

Example questions

Increase 170 by 47.

What is the total of 227 and 47?

Which 3 numbers could have a total of 450?

Vocabulary

count on, add, sum, total, how many altogether? and, how many more? score, +, addition, double, near double, one more, two more, ten more, tens, ones, partition, column, tens boundary., increase, hundreds boundary,

increase, vertical, expanded, compact

Multiplication YEAR 3

Multiply 2 digits by a single digit number

Children should use doubling strategies and place value facts to help multiply by 10 or 100.

Children will:

- Be introduced to the grid method by multiplying 2 digit by 1 digit numbers,

- The first time the children see the grid method they need to see the array to represent the calculation you are teaching eg using Numicon. Show the relationship between the array and the grid method.
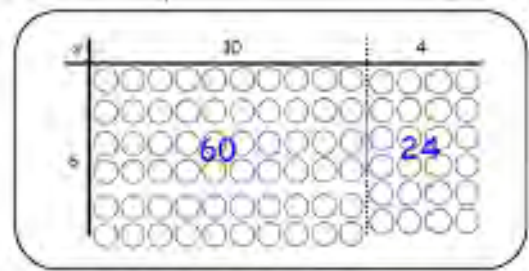
Before children are introduced to this method they must be able to:

- Partition numbers into tens and units

- Multiply multiples of ten by a single digit (e.g. 20 x 4) using their knowledge of multiplication facts and place value

- Recall and work out multiplication facts in the **2, 3, 4, 5, 8 and 10** times tables.

- Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. by commutative law, working out near multiples and adjusting, using doubling etc.) Strategies to support this are repeated addition using a number line, Numicon and arrays:

    9 x 4
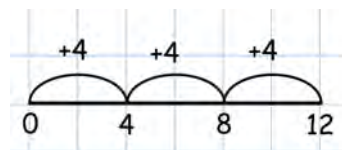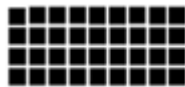
Short Multiplication (ONLY to be introduced in the summer term to children who are secure with partitioned/grid method)

```
    24              24
   2 X             6 X
    8              24
   40             120
   48             144
```

Multiplication

YEAR 3

Key skills for multiplication at Year 3

- Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including 2-digit x single-digit, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g using commutativity (4 x 12 x 5= 4 x 5 x 12= 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g. using commutativity (4 × 12 × 5 =
- 4 × 5 × 12 = 20 × 12 = 240) and for missing number problems x 5 = 20, 3 x = 18, x = 32

Example questions

What is twice 16?

What is the product of 15 and 6?

19 multiplied by 3.

Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition,

column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times...,

partition, grid method, multiple, product, tens, units, value

Subtraction YEAR 3

Subtracting with 2 and 3 digit numbers.

The children will develop this method depending on their level of confidence but should be encouraged to use the most efficient methods.

Partitioned Column subtraction (Step 1)

Introduce this method with examples where no exchanging is   required (2 or 3 digit numbers to start) to introduce the method)

$$69 - 28 = 41$$

$$
\begin{array}{r}
60 + 9 \\
- \quad 20 + 8 \\
\hline
40 + 1
\end{array}
$$

Counting on as a mental strategy for subtraction

Continue to reinforce counting **on** as a strategy for **close-together numbers** (e.g. 121—118), and also for numbers that are nearly multiples of 10, 100, 1000 or £s, which make it easier to count on (e.g. 102-89, 131—79, or calculating change from £1 etc.).

Start at the smaller number and count on in ones first to the next nearest multiple of ten. Then add to the nearest ten and then adjust at the end. Use a visual vertical number line and then encourage the children to visualise this process in their head.

This should not be used as a written method as it is a **jotting**.

Other resources that could be used:

Number lines, Number grids, Numicon, place value cards and counters.

Subtraction

Key skills for subtraction at Year 3

- Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds .

- Estimate answers and use inverse operations to check.

- Solve problems, including missing number problems.

- Find 10 or 100 more or less than a given number.

- Recognise the place value of each digit in a 3-digit number .

- Counting up differences as a mental strategy when numbers are close together or near multiples of 10

- Read and write numbers up to 1000 in numerals and words.

- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

Example questions

Subtract 123 and 87

Take away 65 from 169

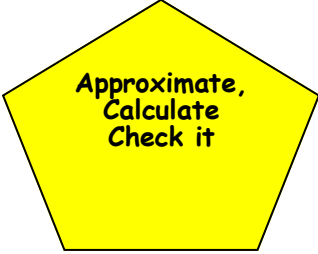Find the difference between 78 and 167

Subtract 234 and 146

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, ons decrease, hundreds, value, digit

Approximate,
Calculate
Check it

Division YEAR 3

1. Divide 2 digit numbers by a single digit (whole number answers)

The number line method should still be the preferred method. Calculations tend to involve **TU ÷ U beyond tables facts**.

2. Short Division (Basic)

Step 1

Limit numbers to **NO** remainders in the answer **OR** carried (each digit must be a multiple of the divisor). Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., **short division** for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array. Example array showing **56 ÷ 7 = 8**
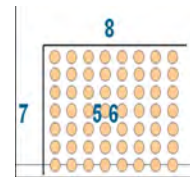
Encourage the children to divide numbers mentally before moving into the formal division method. The children need to be encouraged to think:

1) Can I do it in my head?

2) Do I need jottings?

3) Do I need a written method?

Step 2 Example of jottings (portioning method) 36 ÷ 3 Partition the 36

```
              36
       30  /       \  6
        |            |
       10            2
```

$$30 \div 3 = 10$$
$$6 \div 3 = \underline{\ 2}$$
$$\underline{12}$$

Step 3

96 ÷ 3

Encourage children to make estimations first using their knowledge of table facts ie; 72 ÷ 5 will have a remainder as 72 isn't a multiple of 5. It will be more than 10 as 10x5=50.

Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:
- How many 3's in 9? = 3, and record it above the 9 tens.
- How many 3's in 6? = 2, and record it above the 6 units.

```
    3 2
3 ) 9 6
```

Division YEAR 3

Limit numbers to **NO** remainders in the final answer in the first instance.   Pupils must be secure with the process of short division for dividing 2-digit numbers by a single digit but must understand how to calculate remainders, using this to „carry‟ remainders within the calculation process.

$$4 \overline{) 7\,^{3}2} = 18$$

Other resources that could be used:

Arrays, Multiplication squares, Numicon and Place value equipment

Key skills for division at Year 3

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s).

- 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.

- Solve problems, in contexts, and including missing number problems, involving multiplication and division.

- Pupils develop efficient mental methods, for example, using multiplication and 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 .

Example questions

There are 64 children in Year 4. How many teams of 6 can be made?

I have 62 cakes and 7 boxes. Each box holds 8 cakes. How many boxes can I fill?

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, carry‟, remainder, multiple

YEAR 4
Written Calculations Methods/Strategies

'Show Pride . Reach for the Stars'

Year 4 Non Negotiable Mental Strategies

Addition/Subtraction Strategies
I can add or subtract any pair of 2 digit numbers including crossing the tens and 100 boundary eg 47 + 58, 91 -35
I can add near doubles of 2 digit numbers eg 38 + 37
I can count backwards through zero to include negative numbers
I can find the sums and differences of pairs of multiples of 10,100 and 1000,
I can find what must be added to any 3 digit number to make the next multiple of 100 eg 521 + ___ = 600
I can add or subtract a near multiple of 10, eg 56 + 29, 86 – 38
I can add or subtract 2 digit or three digit multiples of 10 eg 120- 40, 140 + 150, 370 - 180
I can count in multiples of 6, 7, 9, 25 and 1000
I can find 1000 more or less than a given number

Multiplication/Division Strategies
I can double any two-digit number, e.g. double 39
I can halve any even number up to 100 eg 72
I can double any multiple of 10 or 100, e.g. double 340, double 800, and halve the corresponding multiples of 10 and 100
I know all my tables up to 12 by 12 and the related division facts.
I can multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), e.g. 325 × 10, 42 × 100, 120 ÷ 10, 600 ÷ 100, 850 ÷ 10
I can multiply a multiple of 10 to 100 by a single-digit number, e.g. 40 × 3
I can multiply numbers to 20 by a single-digit, e.g. 17 × 3
I can identify the remainder when dividing by 2, 5 or 10
I can identify the factor pair associated with a multiplication fact, e.g. identify that if 2 x 3 = 6 then 6 has the factor pair 2 and 3

Other facts that need to be known
I can identify the fraction and decimal equivalents of one-half, quarters, tenths and hundredths, e.g. 3/10 is 0.3 and 3/100 is 0.03

Addition
YEAR 4

Add numbers with up to 4 digits

Children begin to develop their use of compact column addition. __Children should use the least significant digit first.__ Children should be working with **ThHTU + ThHTU** and decimals.

```
2, 4 6 4
   6 7 7
   1 1 1
3, 1 4 1
```

Reminders:

Remind pupils the value of each digit,

Add the units first,

Carry numbers above the answer.

Carrying

Introduce the **compact column addition** method by asking children to add the two given numbers together using the method that they are familiar with (expanded column addition—see Y3). Teacher models the compact method with carrying, asking children to discuss similarities and differences and establish how it is carried out.

__Apply this method to money and measurement__

Key skills for addition at Year 4

- **Read and write numbers to 1000 in numerals and words.**
- **Add 2-digit numbers mentally, incl. those exceeding 100.**
- **Add a three-digit number and ones mentally (175 + 8)**
- **Add a three-digit number and tens mentally (249 + 50)**
- **Add a three-digit number and hundreds mentally (381 + 400)**
- **Estimate answers to calculations, using inverse to check answers.**
- **Solve problems, including missing number problems, using number facts, place value, and more complex addition.**
- **Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones.)**
- **Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.**

Example questions

Increase 170 by 47.

What is the total of 227 and 47?

Which 3 numbers could have a total of 450?

Vocabulary

count on, add, sum, total, how many altogether? and, how many more? score, +, addition, double, near double, one more, two more, ten more, tens, units, partition, column, tens boundary., increase, hundreds boundary,

increase, vertical, expanded, compact, thousands, hundreds, digits, inverse.

Multiplication YEAR 4

Multiply 2 and 3 digits by a single digit (use all multiplications tables up to 12 by 12)

Children will:

Be *re-introduced* to the grid method by multiplying 2 digit by 1 digit numbers, progressing to three and four digits by one.

613 x 5 =

We partition 613 into 600 and 10 and 3 and put it in a table.

x	600	10	3
5	3000	50	15

```
  3000
    50
    15 +
  3065
```

Before children are *re-introduced* to this method they must be able to:

- **Approximate before they calculate**, and make this a regular part of their calculating, going back to the approximation to check the reasonableness of their answer. e.g: **346 x 9** is approximately 350 x 10 = **3500**

- Record an approximation to check the final answer against.

- Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge.

- Recall times tables **up to 12 x 12**

Short Multiplication (ONLY to be introduced to children who are secure with partitioned/grid method)

```
  TO              TO                 HTO
  23              23                 124
   2 X             6 X                 3 X
  ___             __                  __
   6              18                  12
  40             120                  60
  48             138                 300
                                     372
```

(ensuring the ten from 6 X 3 (18) is "carried" to next column , written in purple pen and then added on to answer to 2 x 6)

Multiplication YEAR 4

Key skills for multiplication at Year 4

- Count in multiples of 6, 7, 9, 25 and 1000

- Recall multiplication facts for all multiplication tables up to 12 x 12.

- Recognise place value of digits in up to 4-digit numbers

- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.

- Use commutativity and other strategies mentally 3 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 7.

- Solve problems with increasingly complex multiplication in a range of contexts.

- Count in multiples of 6, 7, 9, 25 and 1000

- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

Example questions

Double 32.

What is the product of 25 and 4?

Multiply 31 by 8.

Calculate 345 x 9

Vocabulary

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated

addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times… partition, grid method, total, multiple, product, sets of, **inverse**

Subtraction YEAR 4

Subtracting numbers up to four digits

The children will develop this method depending on their level of confidence but should be encouraged to use the most efficient methods.

Partitioned Column subtraction (Step 1)

Introduce 'exchanging' through practical subtraction. Make the larger number with Numicon or cubes and then subtract 47 from it.

Before subtracting the 7 from the 72 cubes they need to exchange a row of 10 for ten units, Then subtract 7, and subtract 4 tens.

$$72 - 47 = 25$$

Partitioned Column subtraction (Step 2)

Once pupils are secure with the understanding of exchanging, they can use the partitioned column method to subtract any 2 and 3-digit numbers.

$$278 - 187 = 91$$

Partitioned Column subtraction (Step 3)

Once pupils are secure with the understanding of exchanging, they can use the partitioned column method to subtract any 2 and 3-digit numbers.

$$2,778 - 1,587 = 1,191$$

Subtracting money is also included in this stage so you need to encourage the children to partition into £1 + 30 + 5 for example. Apply the methods to measures also.

Encourage children to count on to find the difference when numbers are close together,

Other resources that could be used:

Number lines, Number grids, Numicon, place value cards and counters.

Subtraction YEAR 4

Key skills for subtraction at Year 4

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.

- Children select the most appropriate and efficient methods for given subtraction calculations.

- Estimate and use inverse operations to check answers.

- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.

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

- Find 1000 more or less than a given number.

- Count backwards through zero, including negative numbers.

- Recognise place value of each digit in a 4-digit number

- Round any number to the nearest 10, 100 or 1000

- Solve number and practical problems that involve the above, with increasingly large positive numbers.

Example questions

Subtract 123 and 87

Take away 65 from 169

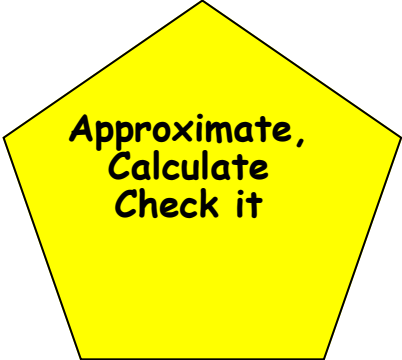Find the difference between 78 and 167

Subtract 234 and 146

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 exchange, decrease, hundreds, value, digit, **inverse**

Approximate, Calculate Check it

Division

Divide up to 3 digit numbers by a single digit

Calculations of the form **TU ÷ U** and **HTU ÷ U**. Use the short division method to demonstrate this. May need cubes to show the carry.

Short division

Start with looking at the mental calculations first and then progress to recording more formally (See Y3 partitioning). The children will have been introduced into basic short division with carrying remainders within the calculation.

Pupils move onto dividing numbers with up to 3-digits by a single digit, however problems and calculations provided should not result in a final answer with remainder at this stage. Children who exceed this expectation may progress to the next step.

$$4 \overline{)8\ 7\ ^3 2} = 2\ 1\ 8$$

Other resources that could be used:

Place value resources

Key skills for division at Year 4

- 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.

Example questions

A train ticket costs £7. I have £240. How many tickets can I buy?

What is 244 ÷ 4?

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 „carry, remainder, multiple, **divisible by, factor**

YEAR 5
Written Calculation
methods/strategies

'Show Pride . Reach for the Stars'

<u>Year 5 Non Negotiable Mental Strategies</u>

Addition/Subtraction Strategies
I can count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000
I know what must be added to a decimal with units and tenths to make the next whole number, e.g. 7.2 + ☐ = 8
I can add or subtract a pair of two-digit numbers or three-digit multiples of 10, e.g. 38 + 86, 620 – 380, 350 + 360
I can identify what must be added to any four-digit number to make the next multiple of 1000, e.g. 4087 + ☐ = 5000
I can add or subtract a near multiple of 10 or 100 to any two-digit or three-digit number, e.g. 235 + 198
I can add or subtract any pairs of decimal fractions each with units and tenths, e.g. 5.7 + 2.5, 6.3 – 4.8
I can find the difference between near multiples of 100, e.g. 607 – 588, or of 1000, e.g. 6070 – 4087

Multiplication/Division Strategies
I can double and halve decimals, e.g. half of 5.6, double 3.4
I can halve any even number up to 200 and odd numbers up to 100
I can multiply two-digit numbers by 5 or 20, e.g. 320 × 5, 14 × 20
I can multiply by 25 or 50, e.g. 48 × 25, 32 × 50
I know squares to 10 × 10
I can find the remainder after dividing a two-digit number by a single-digit number, e.g. 27 ÷ 4 = in the context of a word problem.
I can multiply and divide whole numbers and decimals by 10, 100 or 1000, e.g. 4.3 × 10,   0.75 × 100,   25 ÷ 10,   673 ÷ 100,   74 ÷ 100
I can multiply pairs of multiples of 10, e.g. 60 × 30, and a multiple of 100 by a single digit number, e.g. 900 × 8
I can divide a multiple of 10 by a single-digit number (whole number answers) e.g. 80 ÷ 4, 270 ÷ 3
I can find factor pairs for numbers to 100, e.g. 30 has the factor pairs 1 × 30, 2 × 15, 3 × 10 and 5 × 6
I can establish whether a number up to 100 is prime and recall prime numbers up to 19
I can multiply and divide numbers mentally drawing upon known facts

Other facts that need to be known
I can find percentage equivalents of one-half, one-quarter, three-quarters, tenths and hundredths
I can find fractions of whole numbers or quantities, e.g. 2/3 of 27, 4/5 of 70 kg I can find 50%, 25% or 10% of whole numbers or quantities, e.g. 25% of 20 kg, 10% of £80

Addition YEAR 5

Add numbers with more than 4 digits.

Children begin to develop their use of compact column addition **Children should use the least significant digit first.** Children encouraged to use the compact method of decomposition. Children should be working with **numbers with mixed numbers of digits etc 10ThThHTU + ThHTU; TU.t + U.th.**

The decimal points should be in line in the same way as the other place value columns, and must be in the same column in the answer.

Remember:
Numbers should be beyond 4 digits,
Should be adding more than two values,
Empty decimal places need to be filled with a 0,
Refer to the correct place value,

Key skills for addition at Year 5

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 100 and adjust; use near doubles, inverse, partitioning and re-combining; using number bonds.

- Use rounding to check answers and accuracy.

- Solve multi-step problems in contexts, deciding which operations and methods to use and why.

- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.

- Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.

- Add numbers with more than 4 digits using formal written method of column addition.

Example questions

Increase 170 by 47.

What is the total of 227 and 47?

Which 3 numbers could have a total of 450?

Vocabulary

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

number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary,

increase, carry, expanded, compact , vertical, thousands, hundreds, digits, inverse & decimal places,

decimal point, tenths, hundredths, thousandths

Multiplication YEAR 5

Multiply up to 4 digits by 1 or 2 digits.

Children use the same methods as above. However children should now use the least significant digit first (inline with addition policy). They should be carrying the following types of calculation: **HTU x U.**, TU x TU, ThHTU x U, ThHTU x TU.

- Introduce by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method

- Children need to be taught to approximate first, e.g. for 72 x 38, they will use rounding: 72 x 38 is approximately 70 x 40 = 2800, and use the approximation to check the reasonableness of their answer against.

Short multiplication for multiplying by a single number

Introduce long multiplication for multiplying by 2 digits

18 x 3 on the first row (8 x 3 = 24, carrying the 2 for 20, then 1 x 3)
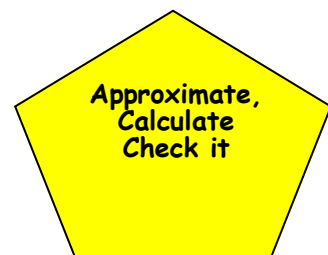18 x 10 on the 2nd row. Put a 0 in units, then say 8 x 1 and 1 x1.

The grid could be used to introduce long multiplication, as the relationship can be seen in the answers in each row.

Moving towards more complex numbers:

1,234 x 6

1,234 x 10

Approximate, Calculate Check it

Multiplication YEAR 5

Other resources that could be used:

Times tables cards if needed, whiteboards and Numicon

Key skills for multiplication at

Year 5

- Identify multiples and factors, using knowledge of multiplication tables to 12x12.

- Solve problems where larger numbers are decomposed into their factors

- Multiply and divide integers and decimals by 10, 100 and 1000

- Recognise and use square and cube numbers and their notation

- Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Example questions

Double 75.

What is the product of 125 and 4?

Calculate 4346 x 9

Vocabulary

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

carry'

Subtraction

Subtract with at least 4 digits

Children can use the same column methods as above but may be encouraged to the more compact method of decomposition if appropriate. Children should be working with **4 digits or more**. The children should also extend these ideas to working with **decimals**

Compact column subtraction (with 'exchanging)

To introduce the compact method, ask children to perform a subtraction calculation with the familiar partitioned column subtraction then display the compact version for the calculation they have done. Ask pupils to consider how it relates to the method they know, what is similar and what is different, to develop an understanding of it

Ensure that this is applied to measures and money.

Subtract with larger integers

```
   2,⁶7̸¹7 8
-  1, 6 8 5
   1, 0 9 3
```

```
   2 ⁶7̸, ¹7 7̸⁸ ¹0
-     1, 8 6 5
   2 5, 9 1 5
```

Sub-with mals

If children are still not secure with number facts and place value, they will need to remain on the partitioned column method until ready for the compact method.

tract deci-

```
   5, ⁴5̸ ¹3 3̸³ 4̸ . ¹7
-     1, 3 7 3 . 8
      4, 1 6 0 . 9
```

Subtract with decimal values, including mixtures of integers and decimals. Make sure they align the decimal points.
Add a zero in any empty decimal place holders.
Ensure that they apply this to measures and money.

Subtraction YEAR 5

Other resources that could be used:

Numicon and place value counters.

Key skills for subtraction at Year 5

- Subtract numbers mentally with increasingly large numbers .

- Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy .

- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.

- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.

- Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.

- Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through 0.

- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and

  100 000.

Example questions
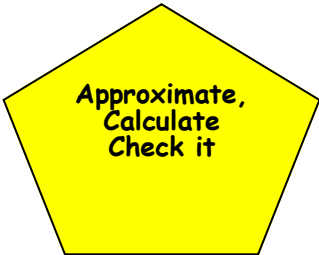
25678 – 7967

12462 – 2300

How much less than 13.2 is 5.83?

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
exchange, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, deci-mal**

Approximate,
Calculate
Check it

Division YEAR 5

Divide up to 4 digits by a single digit, including those with remainders.

Calculations of the form **TU ÷ U** and **HTU ÷ U**. Use short division to demonstrate this.

Step 1– short division

$$0 \; 7 \; 4 \; 9$$
$$9 \overline{) 6 \; {}^{6}7 \; {}^{4}4 \; {}^{8}1}$$

Step 2

Short answer including remainders answers:

Short division with remainders: Now that pupils are in-troduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and how to express it,** ie. as a fraction, a decimal, or as a rounded number or value , depending upon the context of the problem.

$$0 \; 6 \; 6 \; 3 \; r \, 5/8$$
$$8 \overline{) 5 \; {}^{5}3 \; {}^{5}0 \; {}^{2}9}$$

Step 3 (HAP children)

Short answer including remainders answers given in decimals

$$1 \; 1 \; 2 \; 3 \bullet 8 \; 3 \; \cancel{3}$$
$$6 \overline{) 6 \; 7 \; {}^{1}4 \; {}^{2}3 \bullet 0 \; {}^{5}0 \; {}^{2}\cancel{0} \; {}^{2}}$$

This means reoccuring. If the pattern was 0.12341234, the line would go above the repeating pattern. The last set of 4 numbers would not be needed.

Division

YEAR 5

Other resources that could be used:

Times table grids if struggling with tables.

Key skills for division at Year 5

- 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 interpret 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).
- Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.

Example questions
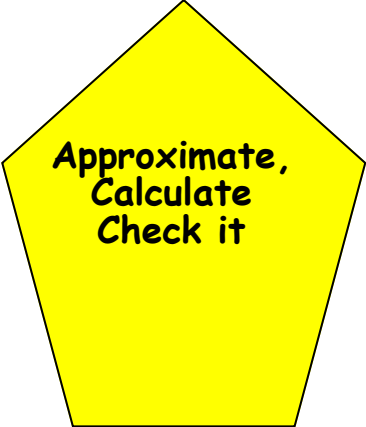
A train ticket costs £7. I have £1240. How many tickets can I buy?

What is 1244 ÷ 9?

1245g ÷ 6?

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, inverse, quotient, prime number, prime factors, composite number (non-prime)

Approximate,
Calculate
Check it

YEAR 6
Written Calculation methods/strategies

'Show Pride . Reach for the Stars'

Year 6 Non Negotiable Mental Strategies

Addition/Subtraction Strategies
I know what must be added to a decimal with units, tenths and hundredths to make the next whole number, e.g. 7.26 + ⬚ = 8
I can add or subtract pairs of decimals with units, tenths or hundredths, e.g. 0.7 + 3.38
I can add near doubles of decimals, e.g. 2.5 + 2.6
I know addition and subtraction facts for multiples of 10 to 1000 and decimal numbers with one decimal place, e.g. 650 + ⬚ = 930, ⬚ – 1.4 = 2.5
I can add or subtract a decimal with units and tenths, that is nearly a whole number, e.g. 4.3 + 2.9, 6.5 – 3.8
I can perform mental calculations, including with mixed operations and large numbers

Multiplication/Division Strategies
I can find doubles of decimals each with units and tenths, e.g. 1.6 + 1.6
I can use my knowledge of the order of operations to carry out calculations involving the four operations
I can perform mental calculations, including with mixed operations and large numbers
I can double decimals with units and tenths, e.g. double 7.6, and find the corresponding halves, e.g. half of 15.2
I can divide by 25 or 50, e.g. 480 ÷ 25, 3200 ÷ 50
I can divide a two-digit number by a single-digit number, e.g. 68 ÷ 4
I can find squares to 12 x 12
I can find prime numbers less than 100
I know squares of the corresponding multiples of 10
I can multiply pairs of two-digit and single-digit numbers, e.g. 28 × 3
I can multiply pairs of multiples of 10 and 100, e.g. 50 × 30, 600 × 20
I can divide multiples of 100 by a multiple of 10 or 100 (whole number answers), e.g. 600 ÷ 20, 800 ÷ 400, 2100 ÷ 300
I can multiply and divide two-digit decimals such as 0.8 × 7, 4.8 ÷ 6

Other facts that need to be known
I can find equivalent fractions, decimals and percentages for hundredths, e.g. 35% is equivalent to 0.35 or 35/100
I can find 10% or multiples of 10%, of whole numbers and quantities, e.g. 30% of 50 ml, 40% of £30, 70% of 200 g
I can simplify fractions by cancelling
I can scale up and down using known facts, e.g. given that three oranges cost 24p, find the cost of four oranges
I can identify numbers with odd and even numbers of factors and no factor pairs other than 1 and themselves

Addition

Add numbers of increasing complexity

Children encouraged to use the compact method of decomposition. Children should be working with **numbers with mixed numbers of digits etc 10ThThHTU + ThHTU; TU.t + U.th.**

```
    3 , 6   7   8
2   5 , 4   6   4
    1 , 6   7   7
2   7 , 1   4   1
    1   1   2   2
5   7 , 9   6   0
```

```
    3 • 6   7   8
2   5 • 4   6   4
    1 • 6   0   0
    0 • 1   0   0
    1   1   1   1
3   0 • 8   4   2
```

- Adding several numbers with different numbers of decimal places (including money and measures):

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

- Zeros could be added into any empty decimal places, to show there is no value to add.

Key skills for addition at Year 6

- **Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies.**

- **Solve multi-step problems in context, deciding which operations and methods to use and why.**

- **Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.**

- **Read, write, order and compare numbers up to 10 million and determine the value of each digit.**

- **Round any whole number to a required degree of accuracy.**

- **Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.**

Example questions

Increase 170 by 47.

What is the total of 227 and 47?

Which 3 numbers could have a total of 450?

Vocabulary

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

Multiplication YEAR 6

Short and long multiplication as in stage 5, and multiply decimals with up to 2 d.p. by a single digit.

Children at S6 should use the methods as those in S5 continuing to use least significant digit first (inline with addition policy) Children should be extended to working with **ThHTU x U** and **TU x TU, HTU x TU**. Extend these ideas to working with decimals. *Continue to develop skills in estimation.* Multiply decimal numbers with up to 2 decimal places by a single or two-digit number.

Remind children:

The single digit belongs in the units column,
Line up the decimal points in the question and answer,
This works well for multiplying money and other measures.

Approximate, Calculate Check it

Children will be able to:

- Use rounding and place value to make approximations before calculating and use these to check answers against.
- Use **short multiplication** (see S5) to multiply numbers with **more than 4-digits by a single digit**; to multiply money and measures, and to **multiply decimals with up to 2d.p. by a single digit**.
- Use **long multiplication** (see S5) to multiply numbers with **at least 4 digits by a 2-digit number**.

Other resources that could be used:

Multiplication cards, arrays (if needed) and whiteboards

Key skills for multiplication at Year 6

- Recall multiplication facts for all times tables up to 12 x 12 (as Y4 and Y5).
- Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication.
- Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
- Estimate answers using round and approximation and determine levels of accuracy.
- Round any integer to a required degree of accuracy.

Example questions

I buy three pairs of shoes for £18.99. How much do I pay at the till?

Multiply 3.17 by 9.

Vocabulary

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

Subtraction

Subtracting with increasingly large and more complex numbers and decimal values

Children encouraged to use the compact method of decomposition. Children should be working with **numbers with mixed numbers of digits etc 100Th10ThThHTU – 10ThThHTU; TU.t – U.th.**

Compact column subtraction (with 'exchanging)

Using more compact column method to subtract more complex integers.

Using the compact column method to subtract money and measures, including decimals with different numbers of decimal places.

Empty place holders need to be filled with a zero to show the place value in each column

Encourage the children to put the decimal points down first to ensure they line their digits up in the right column.

Pupils should be able to apply their knowledge of a range of mental strategies, mental recall skills, and informal and formal written methods when selecting the most appropriate method to work out subtraction problems.

Key skills for subtraction at Year 6

- **Solve addition and subtraction multistep problems in context, deciding which operations and methods to use and why.**
- **Read, write, order and compare numbers up to 10 million and determine the value of each digit**
- **Round any whole number to a required degree of accuracy**
- **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 choosing how to calculate.**

Example questions

125,678 – 17, 967

172,462m – 2309m

£127.56— £17.98

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 exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal

Division YEAR 6

Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities)

Children use the same method as those above but look further at remainders written as fractions and decimals. Use context of money to aid understanding of the decimal element ie if that was £72 divided by 5 each would get £14.40.

Continue Short Division including decimals (single digit)

Short division with remainders: Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.

Calculating a decimal remainder: In this example, rather than expressing the remainder as **r 1**, a decimal point is added after the units because there is still a remainder, and the one remainder is carried onto zeros after the decimal point (to show there was no decimal value in the original number). Keep dividing to an appropriate degree of accuracy for the problem being solved.

$$0\ 8\ 1\ 2\ .\ 1\ 2\ 5$$
$$8\overline{)\ 6\ ^64\ 9\ ^17\ .\ ^10\ ^20\ ^40}$$

Long division (for dividing by 2 digit numbers)

*   Find out "How many 36s are in 972?" by subtracting chunks of 36, until zero is reached (or until there is a remainder).

*   Teach pupils to write a '**useful list**' first at the side that will help them decide what chunks to use, e.g.:

    *   **Useful' list: 2x = 72**
    *   **10x = 360**
    *   **100x = 3600**

*   Introduce the method in a simple way by limiting the choice of chunks to „Can we use 10 lots? Can use 100 lots? As children become confident with the process, encourage more efficient chunks to get to the answer more quickly (e.g. 20x, 5x), and   expand on their „useful" lists.

$$27$$
$$36\overline{)\ 9\ 7\ 2}$$
$$7\ 2\ 0\ (\underline{20}\times 36)$$
$$2\ 5\ 2$$
$$2\ 5\ 2\ (\underline{7}\times 36)$$

Answer = 27

Division YEAR 6

Other Methods for Long Division (by 2 digit)

In the following example the children still 'chunk' amounts to reach the answer but the layout is sometimes considered more user-friendly.

X	1	7		4	9	8								1	7
	2	0		3	4	0	→		1	5	8			3	4
		9		1	5	3	→				5			5	1
														6	8
	2	9		r	5									8	5
												1	0	2
												1	1	9
												1	3	6
												1	5	3

Other resources that could be used:

Times table grids if struggling with tables.

Place value resources

Key skills for division at Year 6

- 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.
- 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.

Example question

It cost £165 for a group to visit the theatre. Tickets cost £15. how many people went to the theatre?

Vocabulary

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

Approximate, Calculate Check it