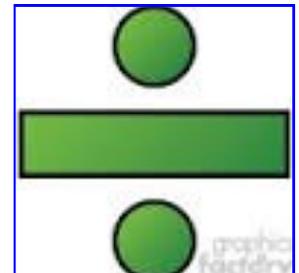
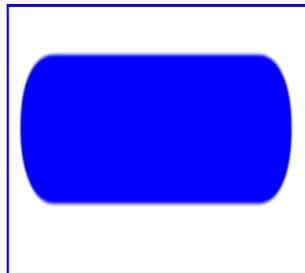
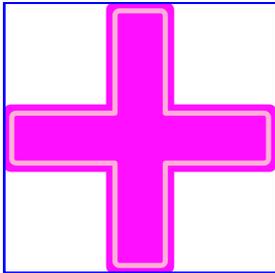




EGLOSKERRY SCHOOL CALCULATION POLICY



This calculation policy has been written to meet the expectations of the 2014 national curriculum alongside the learning needs of our children at Egloskerry school. The calculation methods used relate to those in the national curriculum but have also been developed to match the learning styles of our children and show the progression between years.

January 2016



Our Calculation Policy at Egloskerry School

Age expectations

This policy has been organised by year groups, considering the national curriculum 2014 expectations. The new curriculum focuses on skills and mastery and is not about moving children on to the next method as soon as they can do the one before. Working on more complex and richer problems rather than moving on to new methods will support 'mastery' of maths which leads to a greater breadth and depth of understanding. There are some children who will be working at levels above their age and will require the introduction of new methods.

Mental methods

The written methods in this document are important but must be used alongside the mental methods developed in the school. It is essential for children to develop skills in representing mathematical thinking in many forms such as writing an explanation, drawing a representation and manipulating resources. As children become more mature and confident with their calculation, they need to start thinking about the four steps outlined below when approaching a maths problem:

1. Can I solve it in my head and use a mental method?

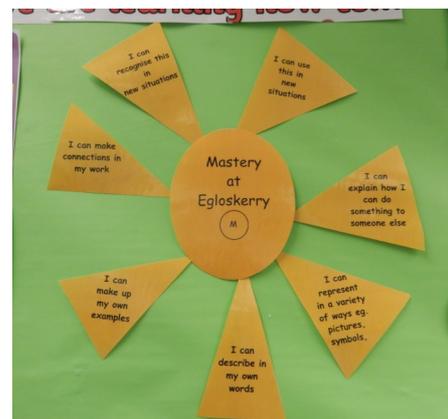
2. Do I need to use some written jottings to help me?

3. Do I need to use a written method to solve this problem?

4. Do I need to use a calculator to get an answer?



Working wall in Class 1



Mastery key



Addition



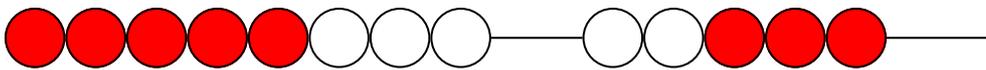
Focus: Adding with numbers up to 20

Year 1 children should use number lines and number squares to add by counting in units/ones.



As well as using a number line and number square, children in Y1 need to:

- Use a variety of equipment to solve addition problems, including counting equipment, everyday objects, bar models etc.
- Read and write the addition (+) and equals (=) sign and use them in number sentences.
- Solve addition number sentences and missing number problems: $7 + 4 = ?$, $1 + 2 + 1 = ?$, $? + ? = 9$ etc
- Use bead strings or Diennes to visualise bridging through 10s eg. $8 + 5 =$ can be solved by adding on 2 then adding on 3.



Key Vocabulary

Add, more, more than, larger, plus, and make, altogether, total, equal to, equals, the same as, double, most, count on, number line.

Key Skills

- Reading and writing numbers to 100 in numerals.
- Writing numbers to 20 in words including correct spelling.
- Represent and use addition facts to 20 and within 20.
- Add with 1 digit and 2 digit numbers to 20, including zero.
- Counting to and across 100 in ones/units.
- Counting in multiples of 2, 5, 10
- Solving simple one step addition problems: using objects, number lines and images to support.

Year One



Addition

Focus: Adding with 2 digit numbers
Year 2 children should explore and understand how to use blank numberlines and other representations to add using their knowledge of place value and how to partition numbers in different ways. When confident written methods are

$16 + 7$ 16 20 23		$27 + 30$ 27 37 47 57		$63 + 16$ 63 73 79	Adding two 2 digit numbers
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$24 + 35 = \square$ $20 + 30 = 50$ $4 + 5 = 9$ $50 + 9 = 59$	$53 + 48 = \square$ $50 + 40 = 90$ $3 + 8 = 11$ $90 + 11 = 101$	$68 + 57 = \square$ $60 + 50 = 110$ $8 + 7 = 15$ $110 + 15 = 125$	$\begin{array}{r} 24 \\ + 35 \\ \hline 9 \\ \hline 50 \\ \hline 59 \end{array}$
Partitioning should be started with 2 digit numbers that do not bridge the tens or hundreds so children are confident with the method	Once children are confident they can start using the partitioning method to add numbers that bridge the tens and hundreds	Children also begin to use the expanded column addition method adding the units first	

Key Vocabulary

Add, more, more than, larger, plus, and make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, ones, partition, addition, column, estimate

Key Skills

- Add a 2 digit number and units and a 2 digit number and 10s.
- Add pairs of 2 digit numbers.
- Add 3 single digit numbers.
- Know and show that adding can be done in any order (commutative law).
- Recall bonds to 20 and multiples of 10 bonds to 100.
- Count in steps of 2,3 and 5 from 0 and count in 10s from any number.
- Recognise the place value of 2 digit numbers (tens and units/ones).
- Compare and order numbers to 100 using < > and = symbols.
- Read and write numbers to at least 100 in numerals and words.
- Solve addition problems in a variety of contexts to develop fluency.

Year Two



Addition



Focus: Adding with numbers up to 3 digits

In Year 3, we move on to the traditional column method, this is first applied by using partitioning skills to the partitioning column method.

$$235 + 124 = 359$$

$$200 + 30 + 5$$

$$\underline{100 + 20 + 4}$$

$$300 + 50 + 9 = 359$$

Introduce the partitioning column method with numbers that do not bridge so children become confident with the method first.

$$346 + 168 = 514$$

$$300 + 40 + 6$$

$$\underline{100 + 60 + 8}$$

$$400 + 100 + 14 = 514$$

When confident, children can start using the partitioning column method to solve problems that bridge the tens and hundreds.

$$\begin{array}{r} 68 \\ + 35 \\ \hline 13 \\ \hline 90 \\ 103 \end{array}$$

Children continue to use the expanded column addition method which then moves on to the 'carrying' method.

$$125 + 361 = 486$$

$$\begin{array}{r} 125 \\ + 361 \\ \hline 486 \end{array}$$

Now children are ready to move on to the traditional column method using 3 digits. Begin with numbers that do not bridge units or tens.

$$165 + 83 = 248$$

$$\begin{array}{r} 165 \\ + 83 \\ \hline 248 \\ 1 \end{array}$$

Once the method is secure children are now ready to 'carry' when bridging into the hundreds column. Remember to add the units first.

Key Vocabulary

Add, more, more than, larger, plus, and make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, ones, partition, addition, column, increase, vertical, carry, expanded, estimate, operations, operator

Key Skills

- Read and write numbers to 1000 in numerals and words.
- Add 2 digit numbers mentally including those that bridge 100.
- Add a 3 digit number and ones, a 3 digit number and 10s and a 3 digit number and 100s mentally.
- Check answers using estimation and the inverse operation.
- Solve problems, including missing number problems using number facts and place value.
- Recognise the place value of each digit in a 3 digit number (hundreds, tens and units).
- Continue to practice a range of mental addition strategies including adding to the nearest multiple of 10, 100, 1000 and adjusting, using number bonds, using near doubles, partitioning and recombining etc.

Year Three



Addition



Focus: Adding with numbers up to 4 digits

In Year 4 children will consolidate their use of the traditional column method and will be able to use it confidently to add numbers up to 4 digits.

$$4356 + 1478 = 5834$$

$$\begin{array}{r} 4356 \\ + 1478 \\ \hline 5834 \\ \small{11} \end{array}$$

Children should already be familiar with the column method from previous years, it is very important to go over the method ensuring children understand why they start by adding the units, how to carry a number etc.

Reminder

The units must be added first.
'Carry' numbers should be smaller sized in the correct column.
Reinforce the place value. It is not 5 add 7, it is 5 tens add 7 tens

Key Vocabulary

Add, more, more than, larger, plus, and make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, ones, partition, addition, column, increase, vertical, carry, expanded, estimate, operations, operator, *thousands, hundreds, digits, inverse*

Key Skills

- Select most appropriate method: mental, jottings or written and explain why.
- Recognise the place value of every digit in a 4 digit number.
- Round any number to the nearest 10, 100, 1000.
- Estimate and use inverse operations to check answers.
- Solve 2 step problems in different contexts, selecting the correct operation.
- Find 100 more or less than a number.
- Continue to use a wide range of mental addition methods.
- Add numbers with up to 4 digits using column addition.

Year Four



Addition



Focus: Adding with more than 4 digits

In Year 5 children will use the column method to add decimal numbers in the context of money and measures. Understanding of place value beyond 4 digits is important and understanding of what a decimal number represents.

$$\begin{array}{r} \text{£}24.67 \\ + \text{£}8.45 \\ \hline \text{£}33.12 \\ \hline 1 \quad 1 \end{array}$$

The decimal point needs to be lined up just like all other place value columns and must be remembered in the answer column. It is important children understand this.

Children should be working with numbers greater than 4 digits including numbers in the ten thousands and hundred thousands.

$$\begin{array}{r} 25,372 \\ + 1,453 \\ \hline 26,825 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 18.03 \\ 5.45 \\ + 0.70 \\ \hline 24.18 \\ \hline 1 \quad 1 \end{array}$$

Children now start using the column method to add more than two values, still remembering place value.

Reminder
It is important that children say 4 tenths add 7 tenths so they understand they are adding part of a whole number
Empty places should be filled with a zero to show the value of that place.

Key Vocabulary

Add, more, more than, larger, plus, and make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, ones, partition, addition, column, increase, vertical, carry, expanded, estimate, operations, operator, thousands, hundreds, digits, inverse, *decimal place*, *decimal point*, *tenths*, *hundredths*, *thousandths*, *rounding*

Key Skills

- Add increasingly large numbers mentally using an expanding range of strategies.
- Use rounding to check answers and make estimates.
- Understand the place value of tenths and hundredths.
- Solve multi-step problems in different contexts, deciding which operations and methods to use and explaining why.
- Read, write, order and compare numbers to 1 million.
- Round any number to 1 million to the nearest 10, 100, 1,000, 10,000 or 100,000.
- Add numbers with more than 4 digits using column addition.

Year Five



Addition



Focus: Adding several numbers with an increasing level of complexity

In Year 6 children need to use all the previous adding skills developed to add several numbers with a variety of different decimal places. These will often be in the context of money or measures.

$$\begin{array}{r} 25.462 \\ 8.070 \\ 47.650 \\ \underline{2.300} \\ 72.432 \\ \small{211} \end{array}$$

Children need to use their knowledge of the decimal point to line up their amounts in the correct column. Zero should be added to show place value, indicating that no value is added.

$$\begin{array}{r} 72,068 \\ 3,567 \\ 14,402 \\ \underline{30,321} \\ 120,358 \\ \small{111} \end{array}$$

Children should also continue to add multiple integers with 4 digits or more.

Key Vocabulary

Add, more, more than, larger, plus, and make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, ones, partition, addition, column, increase, vertical, carry, expanded, estimate, operations, operator, thousands, hundreds, digits, inverse, decimal place, decimal point, tenths, hundredths, thousandths, rounding, *integer*

Key Skills

- Solve problems mentally, including those with mixed operations and large numbers, using all the mental strategies learnt in previous years.
- Solve multi-step problems in context, deciding which operations and methods to use.
- Use estimation to check answers to calculations.
- Read, write, order and compare numbers to 10 million and understand the value of each digit.
- Round any whole number to the nearest 10, 100, 1,000, 10,000, 100,000, 1,000,000 or 10,000,000.
- Round decimal numbers to the nearest whole number.

Year Six



Subtraction

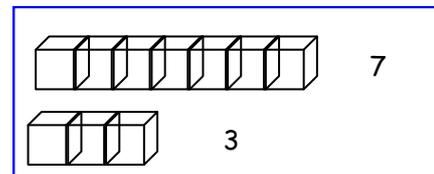
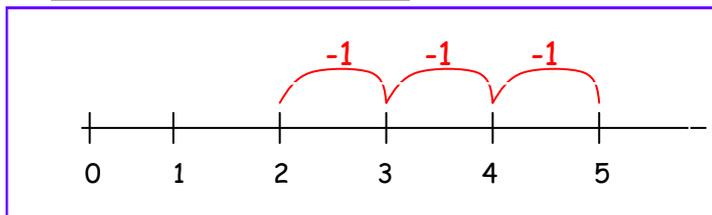


Focus: Subtracting from numbers up to 20

In Year 1 children will use number lines, number squares, objects and visual models to understand subtraction as taking away and also as the difference between two numbers.

For 5 take away 3, the child would start on the number line at 5 and count back in units. The answer is 2.

Hundred squares, counting objects, counters and real life objects should all be used as well to explore subtraction in a variety of practical contexts.



Mental subtraction is important and children should practice recalling subtraction facts up to and within 10 and 20 including subtracting zero.

To answer how many more is 7 than 3 or what is the difference between 7 and 3 – cubes can be used so children can see the problem visually.

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer, how many less, less than, least, count back, how may left?, how much less is ...?, half, halve

Key Skills

- From a given number, say one more or one less.
- Count to and over 100, forward and back from any number in 1s.
- Represent and use subtraction facts to 20 and within 20.
- Subtract with one digit and 2 digit numbers including zero.
- Solve one step problems that involve subtraction using objects, pictures, number lines and number squares.
- Read and write numbers to 100 in numerals.
- Write numbers in words to 20.

Year One

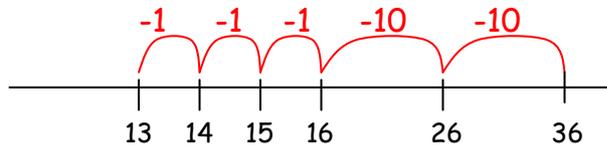


Subtraction



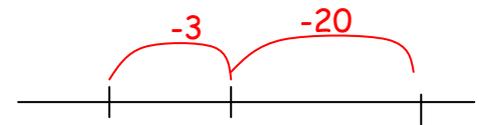
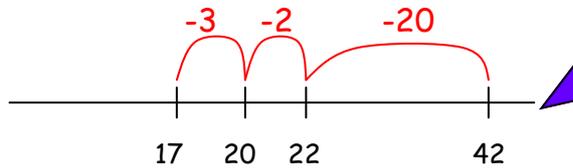
Focus: Subtracting with 2 digit numbers

In Year 2 children will begin to use blank number lines to subtract by counting back which supports the development of mental subtraction skills.



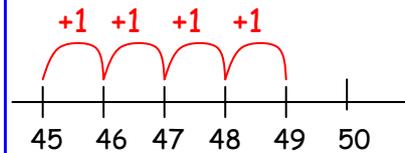
For $36-23$, children should start by partitioning the tens number and subtracting that first by counting back in tens. They will then subtract the units number and subtract that by counting in 1s.

When they become confident with efficient jumps, children are ready to subtract by bridging through 10. Partitioning is very important here and the children will need to be confident with partitioning in different ways.



As children become confident in counting back, they will be able to select more efficient jumps to solve a problem and will not have to partition the tens and units numbers separately.

Counting on as a mental method
Counting on is a great method. It is very useful for finding the difference problems and numbers that are close together. It is important that children understand that although they are counting on, they are finding the difference which is subtraction. This shows $49-4 = 45$



Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer, how many less, less than, least, count back, how may left?, how much less is ...?, half, halve, count on, strategy, partition, tens, units

Key Skills

- Recognise the place value of each digit in a 2 digit number
- Recall and use subtraction facts to 20 fluently and use to derive related facts to 100.
- Subtracting using objects, images, number squares and mentally including a two digit number and units, a two digit number and 10s and two 2 digit numbers.
- Understand and show that subtraction calculations cannot be done in any order.
- Use the inverse relationship between + and - to check calculations and solve missing number problems.
- Solve simple subtraction problems in context using written and mental methods.
- Read and write numbers to at least 100 in numerals and words.

Year Two

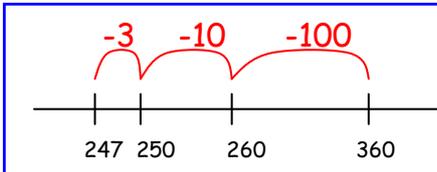


Subtraction



Focus: Subtracting with 2 and 3 digit numbers

Year 3 children will consolidate their understanding of counting back and counting on using a blank number line to subtract, using written and mental methods. When fully confident they will be ready to use the partitioning column method.



Children will continue to subtract on a number line using efficient jumps and now apply these to 3 digit number problems. Here is an efficient example of $360 - 113 = 247$.

$$\begin{array}{r} 70 + 8 \\ - 20 + 3 \\ \hline 50 + 5 \end{array}$$

When they become confident with efficient jumps, children are ready to subtract by bridging through 10. Partitioning is very important here and the children will need to be confident with partitioning in different ways.

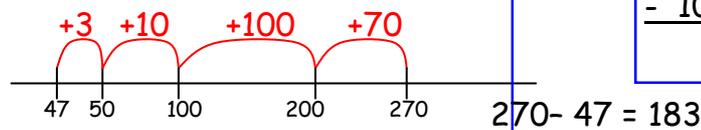
Children now have the mental skills required to approach the partitioning column method of subtraction. At first this should be where no exchanging is required, always starting with the units column. This shows $78 - 23 = 55$.

Through practical subtraction children should be introduced to exchanging. Base 10 and counters are excellent ways of demonstrating partitioning in different ways. It is very important that children know the value has not changed, it is just partitioning in a different way. As you see $63 - 37$, before subtracting 7 units a tens row will need to be exchanged for 10 units

$$\begin{array}{r} 50 \quad 1 \\ \cancel{60} + 3 \\ - 30 + 7 \\ \hline 20 + 6 = 26 \end{array}$$

Children who are secure with the concept of 'exchanging' should now be able to use the partitioning column method to subtract any 2 numbers.

Counting on will also be used for problems greater than 100 using efficient jumps.



$$\begin{array}{r} 257 - 163 \\ 100 \quad 1 \\ \cancel{200} + 50 + 7 \\ - 100 + 60 + 3 \\ \hline 0 + 90 + 4 = 94 \end{array}$$

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer, how many less, less than, least, count back, how many left?, how much less is ...?, half, halve, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit

Key Skills

- Subtract mentally—a 3 digit number and 1s, a 3 digit number and 10s and a 3 digit number and 100s.
- Estimate answers and use the inverse to check.
- Solve problems in different contexts, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value in a 3 digit number, 100s, 10s and 1s.
- Solve finding the difference problems using counting on.
- Read and write numbers up to 1,000 in numerals and words.
- Practise and develop mental strategies including subtracting near multiples of 10 and adjusting, counting on etc.

Year Three



Subtraction



Focus: Subtracting with numbers up to 4 digits

Year 4 children will consolidate their understanding of the partitioning column method for subtraction with 4 digit numbers including those where exchanging is required. When secure, they will move on to the compact method.

Children will consolidate their learning of the partitioning method of subtraction and exchanging by solving calculations with more complex numbers. Place value counters are very helpful here when building children's confidence.

Money can also be partitioned for subtraction
eg $\pounds 1 + 20\text{p} + 5\text{p} - \pounds 1 + 10\text{p} + 1\text{p} = 14\text{p}$

$$2648 - 1356 = 1292$$

$$\begin{array}{r}
 2000 + \overset{500}{\cancel{600}} + 40 + 8 \\
 - 1000 + 300 + 50 + 6 \\
 \hline
 1000 + 200 + 90 + 2
 \end{array}$$



When confident children are ready to move on to the compact method of subtraction. Although this is seen as the easiest method, it does not mean it is necessarily the best method so children still need to carefully select the best method for the problem they are solving.

$$\begin{array}{r}
 71 \\
 \cancel{2}863 \\
 - 1382 \\
 \hline
 1481
 \end{array}$$

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer, how many less, less than, least, count back, how many left?, how much less is ...?, half, halve, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, *inverse*

Key Skills

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc
- Children can select a mental, written or jotting method depending on what the problem requires.
- Children estimate and use the inverse operation to check a problem.
- Children solve 2 step problems involving + and - , choosing the correct operation and method.
- Children solve simple money and measure problems with fractions and decimals.
- Find 1,000 more or 1,000 less than a given number.
- Count backwards through zero including negative numbers.
- Recognise the place value of each digit in a 4 digit number.
- Round any number to the nearest 10, 100 or 1,000.
- Solve number and practical problems that involve increasingly large positive integers.

Year Four



Subtraction



Focus: Subtracting with numbers beyond 4 digits including decimals

Children in year 5 will continue to use the compact column method of subtraction to solve problems including those where exchanging is required. They will subtract larger integers and begin to subtract decimal amounts.

Children will come across problems where exchanging will need to take place several times to complete the problem.

$$\begin{array}{r} 26,048 - 2,759 = \\ \begin{array}{r} 53 \\ 2\cancel{6},048 \\ - 2,759 \\ \hline 23,309 \end{array} \end{array}$$

When confident with large integers, children will now be ready to move onto decimal numbers including questions in the context of measures and money. It is important that the children line up the decimal point and understand why they are doing it.

$$\begin{array}{r} 7 \\ 6,158.0 \\ - 382.4 \\ \hline 5,775.6 \end{array}$$

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer, how many less, less than, least, count back, how many left?, how much less is ...?, half, halve, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal place, decimal.

Key Skills

- Subtract mentally with increasingly large numbers.
- Use rounding and estimation to check answers to calculations.
- Solve addition and subtraction multi-step problems, deciding which operations to use and why.
- Read, write, order and compare numbers to at least 1 million and understand the value of each digit.
- Count forwards or backwards in steps of powers of 10 up to 1 million.
- Understand negative numbers in context and count forwards and backwards through 0.
- Round any number up to 1 million to the nearest 10, 100, 1,000, 10,000

Year Five



Subtraction



Focus: Subtracting with increasingly complex numbers including decimals

In year 6 children need to use mental methods and the compact column method of subtraction to solve an increasingly complex range of calculations including those with integers, those with decimals and those with mixed numbers.

$$\begin{array}{r} 13 \ 19 \ 1 \\ \cancel{1}40,588 \\ - \quad 79,838 \\ \hline 60,750 \end{array}$$

Children will use the compact method to solve problems involving integers up to 6 digits and beyond and solve problems where they will need to use exchanging several times.

Children will also solve problems in context involving increasingly large decimals. They will need to continue using this knowledge of decimal points to line up their numbers and use zero as a place holder so they understand the value of that column.

$$\begin{array}{r} 9 \ 0 \ 1 \ 2 \ 1 \\ \cancel{1}04.318 \\ - \quad 35.070 \\ \hline 69.248 \end{array}$$

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer, how many less, less than, least, count back, how many left?, how much less is ...?, half, halve, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal place, decimal.

Key Skills

- Solve addition and subtraction multi-step problems in context, deciding which operations to use and why.
- Read, write, order and compare numbers to at least 10 million and understand the value of each digit.
- Round any whole number up to 10 million to the nearest 10, 100, 1,000, 10,000, 100,000 or 1 million.
- Use negative numbers in context and calculate intervals across zero.
- Look at a calculation and decide whether you need to use a mental method, a jotting, a written method or a calculator to solve it.

Year Six



Multiplication



Focus: Repeated addition with objects, arrays and pictorial representations

In Year 1 children will experience many different multiplication based activities in a variety of contexts. Much of this will be repeated addition activities or be linked with counting in 2s, 5s or 10s.

How many legs will 2 dogs have?

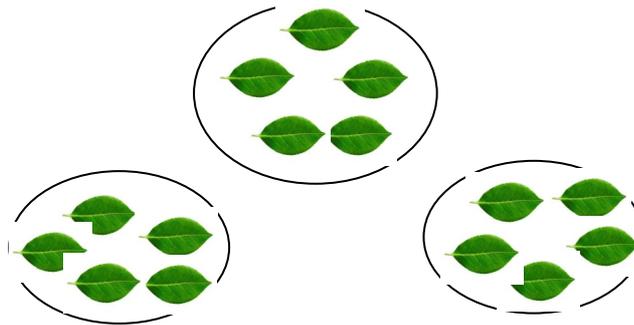


$$4 + 4 = 8$$

Children use images and pictorial representations to solve problems that involve repeated addition. They may want to use the picture to support or other resources. Adult support is likely to be needed.

Some children may start to see the link between the problem below and counting in 5s and be able to use mental skills to solve problems

There are 5 leaves in each pile. How many leaves in 3 piles?



Key Vocabulary

Groups of, lots of, times, array, altogether, multiply, count

Key Skills

- Count in multiples of 2, 5 and 10.
- Solve 1 step problems involving multiplication using objects, arrays or pictures with support.
- Make connections between arrays and counting in 2s, 5s and 10s.
- Begin to understand doubling using objects and pictorial representations.
- Solve practical problem solving activities counting equal sets or groups.
- Practice counting and grouping objects into 2s, 5s and 10s.

Year One

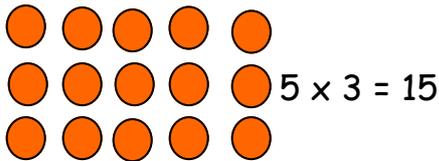


Multiplication



Focus: Repeated addition with objects, arrays and pictorial representations

In Year 2 children will be aware of simple arrays and pictorial representations and understand what they mean. They will develop their knowledge of how to make their own arrays to solve a problem and also how repeated addition on a number line can get them to an answer.

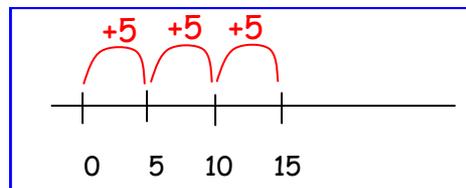


Arrays are great for children to solve the answer to simple problems. They are also good for showing children the commutative law, eg. If you turned this array for $3 \times 5 = 15$ sideways you would see that 5×3 also equals 15.

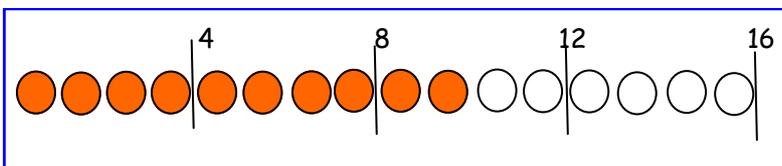
$$3 \times 5 = 15$$

$$3 \times 5 = 5 + 5 + 5 = 15$$

$$5 \times 3 = 3 + 3 + 3 + 3 + 3 = 15$$



Repeated addition is a good progression from arrays. It encourages children to use addition facts on a blank number line and count up to their answer as shown on the example above which models $3 \times 5 = 15$.



Mental methods and practical resources are still very important at this stage. Visual image such as a bead string or counters that demonstrate $4 \times 4 = 16$ will support children's visualization of multiplication and allow them to develop stronger mental skills.

Key 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, repeat

Key Skills

- Count in steps of 2, 3 and 5 from zero and in 10s from any number.
- Recall and use multiplication facts for the 2, 5 and 10 times tables.
- Recognise odd and even numbers.
- Write and calculate number statements using the x and = signs.
- Show that multiplication can be done in any order (commutative law).
- Solve a range of multiplication problems using objects, arrays, repeated addition, mental methods and multiplication facts.

Year Two



Multiplication



Focus: Multiplying 2 digit numbers by 1 digit numbers

In Year 3 children will move on from arrays and start using the grid method of multiplication. It is very important that before they move onto the grid method they are confident with all the previous methods and have a solid grounding with mental methods and partitioning.

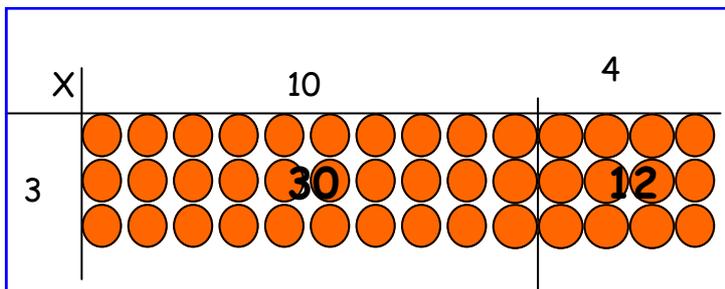
Before moving on to grid multiplication, children need to be able to:

Partition numbers into tens and units.

Multiply single digit numbers by multiples of 10 eg $4 \times 30 = 120$.

Quickly recall multiplication facts for the 2, 3, 4, 5, 6 and 10 x tables.

Use any previous method to work out unknown multiplication facts, quickly and accurately.



The grid method should be introduced using an arrays model such as the one on the left for 14×3 . Children need to use their partitioning skills to partition the two digit number and then use their existing knowledge of arrays to come to an answer with minimal support.

Multiplication grid method requires good organisation but also a solid understanding of partitioning and multiplication facts, as you can see in the example on the right for 24×6 . The children need to remember that once they have multiplied the partitioned parts of the number, they then need to add the two.

X	20	4
6	120	24

$$120 + 24 = 144$$

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

Key Skills

- Recall and use multiplication facts for the 2, 3, 4, 5, 6 and 10 multiplication tables and multiply multiples of 10.
- Write and calculate number sentences using known x tables.
- Answer 2 digit x 1 digit problems using mental and written methods
- Solve multiplication problems in context including missing number problems.
- Develop mental strategies using commutativity eg $4 \times 11 \times 5 = 4 \times 5 \times 11 = 20 \times 11 = 220$ and for missing number problems.

Year Three



Multiplication



Focus: Multiplying 2 and 3 digit numbers by 1 digit numbers

In Year 4 children need to use the grid method confidently to solve problems where a 2 or 3 digit number is multiplied by a 1 digit number. They need to move on to the use of short multiplication to solve 3 digit numbers multiplied by 1 digit problems.

X	400	10	5
6	2,400	60	35

Add up 2,400, 60 and 35 to make 2395

$$415 \times 6 = 2,395$$

The grid method is extended in Year 4 so children will now multiply 3 digit numbers. When adding the 3 answers up to create a total, column addition could be used to be sure of accuracy, especially when bridging is needed.

The compact 'short multiplication' method is tricky and needs clear explanation. At first children should solve a problem using the grid method and then observe the teacher solve a problem using short multiplication and make comparisons. How are they similar. Children need to go through it slowly, unpicking each step until they are confident. This can be demonstrated with counters.

$$\begin{array}{r} 374 \\ \times 8 \\ \hline 2992 \\ 53 \end{array}$$

It is at this stage that approximation and estimation should become a regular part of classroom practice. Children should approximate and answer before using a method so they know if their answer is accurate or not.
 163×9 is approximately $150 \times 10 = 1,500$

Key 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, repeat, partition, grid method, multiple, product, tens, units, value, *inverse*

Key Skills

- Count in multiples of 6, 7, 8, 9, 25 and 1,000.
- Recall multiplication facts for all multiplication tables up to 12×12 .
- Recognise place value of digits in up to 4 digit numbers.
- Multiply large numbers and multiple values mentally using place value, known facts and derived facts.
- Use commutativity mentally to solve problems.
- Solve problems in a range of contexts that are increasingly complex.

Year Four



Multiplication



Focus: Multiplying up to 4 digit numbers by 1 and 2 digit numbers

In Year 5 children will continue to use short multiplication to solve increasingly deeper problems that involve multiplying by a 1 digit number. They will then move on to long multiplication for problems that involve multiplying by 2 digit numbers. Approximation is important with children making approximations before using long multiplication to help check their answer is correct.

$$\begin{array}{r}
 3,742 \\
 \times 7 \\
 \hline
 26,194 \\
 521
 \end{array}$$

Children will use short multiplication in a range of increasingly challenging problems. Solving using the grid method and then comparing to the short multiplication method will help cement the children's understanding of the short method.

x	10	6
10	60	36
5	50	30

When multiplying by more than 1 digit, children need to use long multiplication. As with short multiplication, they will solve the problem using the grid method first and then make comparisons until their understanding is secure. In the example below, the top row shows 16×10 and the bottom row shows 16×5 . The final row shows the total of both calculations.

$$\begin{array}{r}
 1,345 \\
 \times 14 \\
 \hline
 5,380 \\
 112 \\
 \hline
 13450 \\
 18830 \\
 \hline
 1
 \end{array}$$

Once long multiplication methods are secure, children are ready to move on to more challenging problems which require greater levels of mental calculation. The problem to the left shows 1345×14 on the top line and 1345×10 on the bottom line and the total of both calculations on the final row.

$$\begin{array}{r}
 15 \\
 \times 13 \\
 \hline
 45 \\
 1 \\
 \hline
 150 \\
 195 \\
 \hline
 \end{array}$$

Key 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, repeat, partition, grid method, multiple, product, tens, units, value, inverse, square, factor, integer, decimal, short/long multiplication, carry

Key Skills

- Identify multiples and factors, using secure \times table facts to 12×12 .
- Solve problems where larger numbers are decomposed into their factors.
- Multiply and divide integers and decimals by 10, 100 and 1,000.
- Recognise and use square and cube numbers and their notation.
- Solve problems that have different combinations of operations, picking the most useful methods.

Year Five



Multiplication



Focus: Consolidating short and long multiplication, multiplying decimals by 1 digit

In Year 6 children will consolidate all they know about short and long multiplication before they go to Secondary school. They will also learn the new skill of using short multiplication to multiply decimal numbers to 2 decimal places.

$$\begin{array}{r} 3.74 \\ \times \quad 8 \\ \hline 29.92 \\ 53 \end{array}$$

When multiplying decimals it is important to remember that the digit you are multiplying by needs to be lined up with the ones digits.

Key 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, repeat, partition, grid method, multiple, product, tens, units, value, inverse, square, factor, integer, decimal, short/long multiplication, carry, tenths, hundredths, decimals

Key Skills

- Multiply up to 4 digits by 2 digits using long multiplication.
- Solve mixed operations and large number problems using mental methods.
- Solve multi step problems involving a range of operations.
- Estimate and approximate answers of problems to improve accuracy.
- Round any integer to the determined level of accuracy.

Year Six



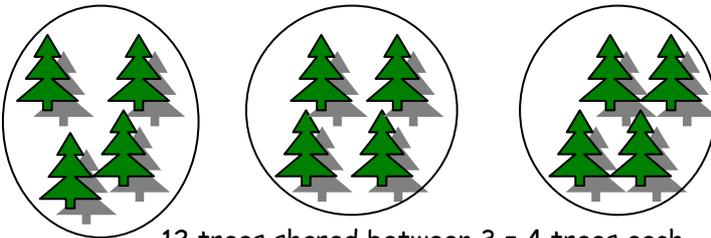
Division



Focus: Grouping and sharing small quantities without remainders

As an introduction to division, children in Year 1 will solve problems in familiar and relevant contexts where they have to group and share. They will use objects and pictorial representations to solve problems and they will begin to use counting in 2s, 5s and 10s to support their problem solving.

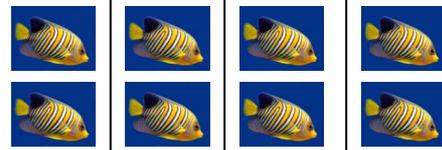
A gardener has 12 trees and shares them between 3 friends. How many trees do they each get?



12 trees shared between 3 = 4 trees each

Children need to learn grouping and sharing alongside each other so they understand how they are linked. Grouping will also help children understand how multiplication can be used to solve division problems. Contextual problems will strengthen children's understanding of division.

Fish swim in pairs. How many groups of 2 will there be if there are 8 fish? 4 groups.



Also, 8 fish shared into groups of 2 = 2 fish in each group.

Key Vocabulary

Share, share equally, one each, two each ..., groups, groups of, lots of, array

- Solve one step problems involving multiplication and division using concrete objects with support from adults.
- Children use grouping and sharing to understand division and to begin to understand finding simple fractions.
- Children make connections between arrays and counting in 2s, 5s and 10s.
- Children use halving and understand that this is the same as sharing into 2 equal groups.

Year One



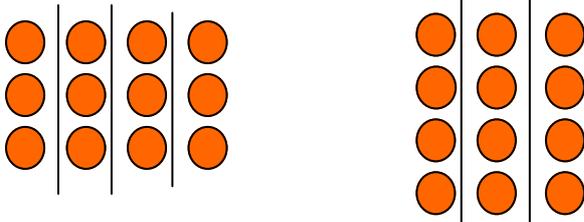
Division



Focus: Grouping and sharing larger quantities using written methods and symbols

Year 2 will continue to use the methods of sharing and grouping in division with objects to support their understanding of arrays for sharing and grouping and the division number line for grouping.

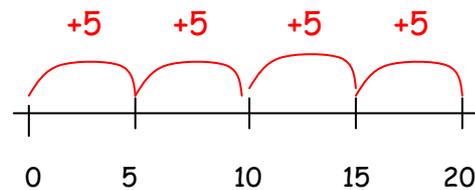
To solve problems such as $12 \div 4 =$, children will share 12 objects into 4 groups as in the first array or make groups of 4 until they get to 12, as in the second image.



Completing **both** of these processes will help children see the link between sharing and grouping but also the link between $12 \div 4 = 3$ and $12 \div 3 = 4$.

The difference between grouping and sharing should be discussed regularly and visual models and diagrams are very important. Children should solve a variety of contextual problems that will require them to group or share.

Children will start to group on a number line which will help cement their understanding of division as grouping. When grouping on a number line, children will start with zero at the beginning and will write the dividend at the end of the line, they will then jump in steps of the divisor. The example to the right shows a number line for the calculation $20 \div 4 = 5$ as there were 4 jumps of 4 to get to 20.



Key Vocabulary

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

- Count in steps of 2, 3 and 5 from 0.
- Recall and use \times and \div facts for the 2, 5 and 10 times tables.
- Solve division problems and write division number sentences for problems eg. $\frac{12}{3} = 12 \div 3$
- Understand that division is not commutative.
- Solve increasingly challenging division problems using concrete objects, arrays and written methods such as grouping on a number line.

Year Two

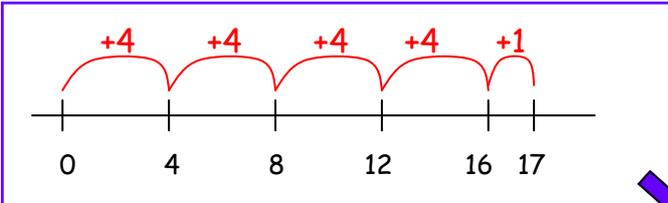


Division



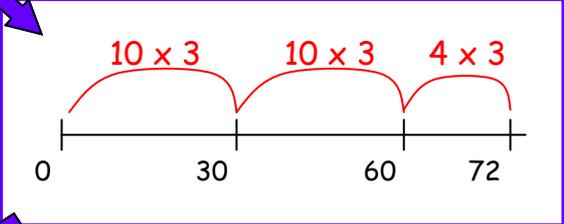
Focus: Dividing 2 digit numbers by 1 digit numbers moving from number line methods to short division

Children in Year 3 will continue to use a number line to solve division problems and will begin to jump more than one step at a time in the style of 'chunking'. Once confident they will move on to short division without any remainders.



Children will begin to use the grouping number line method to solve problems with remainders. They will start at zero and write the dividend at the end of their number line. They will jump in steps of the divisor until they get as close to the end as possible. Whatever is left over is the remainder using cubes, counters or arrays alongside the number line they will consolidate understanding.

When confident, children will begin to solve problems on a grouping number line involving bigger numbers. To solve effectively they will need to subtract chunks of the divisor. As you see in the example image for $72 \div 3$, a step of 10 groups of 3 has been jumped, followed by another step of 10 jumps, followed by a step of 4 jumps of 3. This means that in total 3 was jumped 24 times making 24 the answer.



Initially children will start with simple problems where each digit is a multiple of the divisor.

$$\begin{array}{r} 31 \\ 3 \overline{) 93} \\ \underline{93} \\ 0 \end{array}$$

$93 \div 3 = 31$

$$\begin{array}{r} 93 \\ 3 \overline{) 93} \\ \underline{93} \\ 0 \end{array}$$

Once children are confident with number line methods they should start work on short division. First of all arrays should be used to show a division calculation, the same calculation should then be shown in the short multiplication method. Place value should be regularly discussed so children realise that they are partitioning the dividend and dividing the units then tens by the divisor.

Key Vocabulary

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

- Recall and use \div facts for the 2, 3, 4, 5, 6, 8 and 10 x tables (using doubling to connect the 2, 4 and 8 x tables)
- Solving division problems where a 2 digit number is divided by a 1 digit number using mental and written
- Solve problems in a variety of contexts including missing number problems.
- Pupils begin to derive related facts eg $8 \div 2 = 4$ means $80 \div 2 = 40$ or $80 \div 20 = 4$.
- Pupils develop confidence in written methods, moving from number lines to short division.

Year Three



Division



Focus: Extending use of short multiplication to 4 digits and remainders

Children in Year 4 will use short division to solve problems. They will begin to work on remainders, including problems where there are remainders in the first numbers but not in the final answer.

$$\begin{array}{r} 12 \\ 7 \overline{) 814} \end{array}$$

Once confident with the method of short division, children will move on to problems where the first digit of the dividend is not a multiple of the divisor and therefore a remainder will need to be carried. Children may need to use other equipment (including counters) to calculate the division and multiplication facts required.

Children who can use short multiplication problems with remainders (but not those in the final answer) are now ready to work on 3 digit problems. Again, there should be remainders in the calculation but never in the final answer.

$$\begin{array}{r} 218 \\ 3 \overline{) 6524} \end{array}$$

$$\begin{array}{r} 038 \\ 4 \overline{) 11532} \end{array}$$

Once children are confident at dividing with 3 digits, they need to attempt problems where the answer in the first column (hundreds) is a zero. At first, they may record the hundred as this will help them remember its place and the number value.

Key Vocabulary

Share, share equally, one each, two each ..., groups, 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*

- Recall multiplication and division facts for all numbers up to 12×12 .
- Use place value and known facts to derive facts mentally—including multiplying and dividing by 100, 10 and 1.
- Practise mental methods and extend this to three digit numbers using derived facts eg $80 \div 4 = 20$ so $20 \times 4 = 80$.
- Solve two step problems with increasingly harder numbers in a range of contexts, using language to identify the correct operation.
- Reasoning problems should be introduced eg. 4 buns are shared between 10 children. If 1 boy has 3 cats how many cats do 4 boys have? etc

Year Four



Division



Focus: Extending use of short multiplication to 4 digits and remainders

Children in Year 5 will use short division to solve problems up to 4 digits long. For the first time they will use short division to solve problems that have a remainder in the final answer.

$$\begin{array}{r} 0679r2 \\ 7 \overline{) 442065} \end{array}$$

In Year 5 children will begin to solve division problems where a number up to 4 digits is divided by a single digit number including answers with remainders. These division problems need to be contextual so the children learn how to express the remainder—as a number, a fraction, a decimal, rounded up or rounded down.

Key Vocabulary

Share, share equally, one each, two each ..., groups, 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 factor*, *composite number (non-prime)*

- Multiply and divide numbers mentally, using known facts.
- Identify multiples and factors, including all factor pairs of a number and common factors between 2 numbers.
- Solve \times and \div problems where larger numbers are decomposed into their factors.
- Multiply and divide whole numbers and decimals by 10, 100 and 1,000.
- Use vocabulary of prime numbers, prime factors and composite numbers,
- Work out whether a number up to 100 is prime and know all prime numbers to 30.
- Use and understand multiplication and division as inverses.
- Present division with remainders answers differently, showing the remainder as a fraction, decimal or whole number by rounding.
- Solve problems with a combination of all four operations including fraction scaling problems and problems involving simple rates.

Year Five



Division



Focus: Using short division to divide 4 digit numbers and express remainders as decimals and long division for dividing 2 digit numbers

In Year 6, children will use short division to divide decimal numbers by single digit numbers. The final step of division will be long division which will be used to divide

$$\begin{array}{r}
 0679r2 \\
 7 \overline{) 442065}
 \end{array}$$

The focus in year 6 is not so much the method of short division but how the remainders are expressed—children need to express remainders as decimals and fractions—depending on the context of the question.

Divide:

$$\begin{array}{r}
 2 \\
 4 \overline{) 96} \\
 \underline{8} \\
 16
 \end{array}$$

4 goes into 9 2 times... with some extra

Multiply:

$$\begin{array}{r}
 2 \\
 4 \overline{) 96} \\
 \underline{8} \\
 16
 \end{array}$$

$2 \times 4 = 8$

Subtract:

$$\begin{array}{r}
 2 \\
 4 \overline{) 96} \\
 \underline{-8} \\
 16
 \end{array}$$

$9 - 8 = 1$

Bring down:

$$\begin{array}{r}
 2 \\
 4 \overline{) 96} \\
 \underline{-8} \\
 16
 \end{array}$$

Repeat :

$$\begin{array}{r}
 24 \\
 4 \overline{) 96} \\
 \underline{-8} \\
 16 \\
 \underline{-16} \\
 0
 \end{array}$$

$16 \div 4 = 4$
 $4 \times 4 = 16$

The remainder in this answer would have been 1 but it has been expressed as a decimal. To do this, children will need to insert a decimal point next to the units and carry the remainder over the decimal point. Zeroes are inserted to the right of the decimals point to show that there was no value.

$$\begin{array}{r}
 291 \\
 45 \overline{) 13095} \\
 \underline{90} \\
 409 \\
 \underline{405} \\
 45 \\
 \underline{45} \\
 0
 \end{array}$$

To divide by 2 digit numbers, the children will use the method of long division. The method to the right clearly shows the method in the 'Burger' steps, where as the example to the left shows what a completed method would look like. Any remainders would need to be expressed in a way that matched the context of the problem.

Key Vocabulary

Share, share equally, one each, two each ..., groups, 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

Key Skills

- Use multiplication and division facts up to 12 x 12 to solve more complex problems.
- Decide when to use short or long division and interpret remainders in a way that is appropriate to the problem.
- Perform mental calculations for problems involving large numbers and mixed calculations.
- Identify common factors, common multiples and prime numbers.
- Use estimation to check answers to calculations and determine accuracy.
- Use written methods of division to solve decimal problems up to 2 decimal places.
- Solve problems which require rounding to 10, 100 and 1,000 and beyond.

Year Six