# Waverley Junior Academy

# Calculation Policy

# EYFS and Key Stages 1 - 2

| Early Years and Foundation Stage<br>Overview | |
|---|---|
| **Numbers** | **Shape, Pattern and Measures (Numerical Patterns)** |
| • To have a deep understanding of numbers to 10 and the composition of each number<br>• To confidently recall facts including number bonds, doubles and odd & even numbers<br>• To recognise, write and order numbers 0 to 20 | • To use mathematical vocabulary to describe shape, pattern and measures<br>• Verbally count beyond 20, recognising the pattern of the counting system<br>• Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity<br>• Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. |

Exemplification materials –

Case study 2 - https://youtu.be/Du9qAsOOs_Y

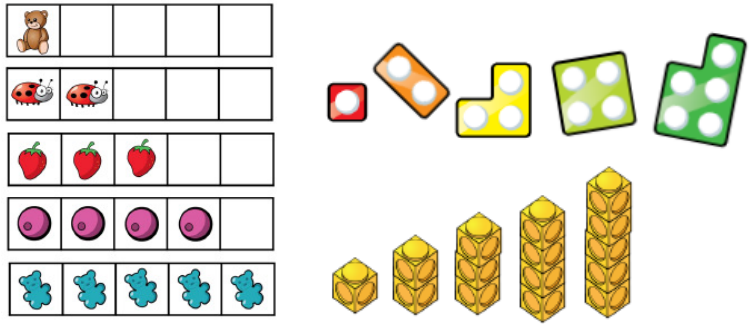
Case study 3 - https://youtu.be/q5FmcQ5iJs4 /

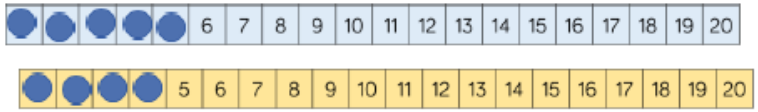
# Early Years and Foundation Stage

Overview

## Numbers

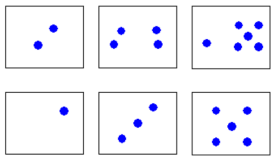
**Count with numbers from 1 to 20**






**Recognise and write numbers 0 to 20**

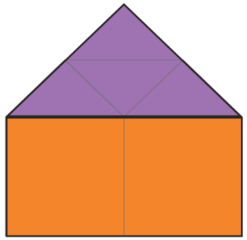
**Order numbers 1 - 20**



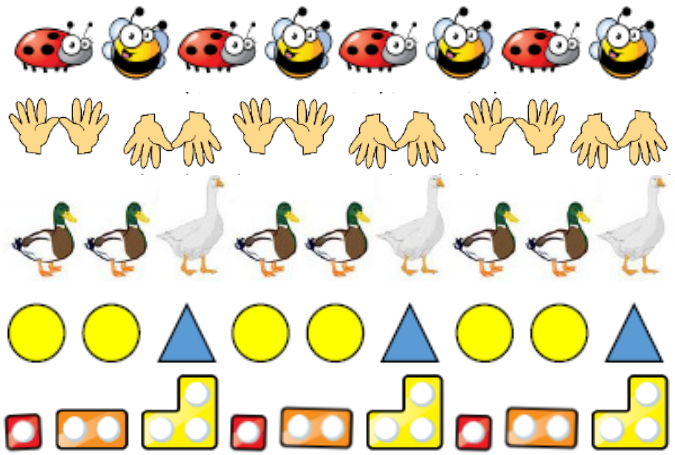
## Shape, Pattern and Measures (Numerical Patterns)

**Morning Routine**

**To compose and decompose 2D shapes**



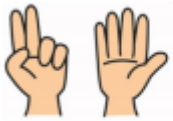
**To copy and create repeating patterns (AB/ ABB/ ABBC)**

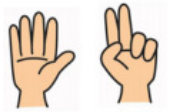


**Say which number is one more or one less (with numbers from 1 to 20)**

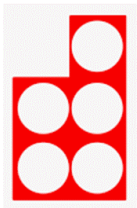
**Passengers on the bus.** **Musical chairs.**

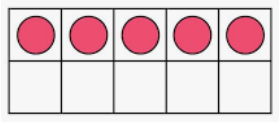
**Using quantities and objects, add and subtract two single-digit numbers and count on or back**



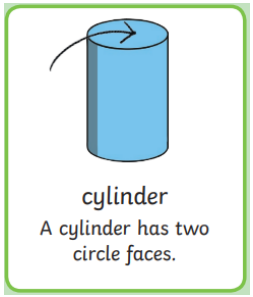


**Subitise with numbers 1 to 10**

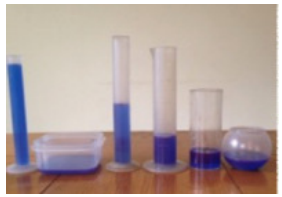




**To compose and decompose 3D shapes**




**To compare length, weight and capacity**



**Use everyday language to solve problems**.
Support pupils through choice of task, the structuring the stages of the problem-solving process (where appropriate) and through explicitly and repeatedly providing pupils with opportunities to develop key problem-solving skills.

Skills include

| | | |
|---|---|---|
| sorting | comparing | arranging |
| matching | trial and improvement | systematic / ordered working |

**Shoe Detectives**

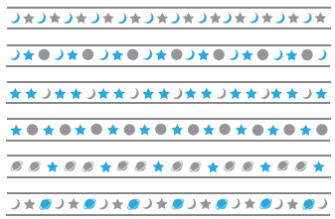
Different shoes

**Role Play**

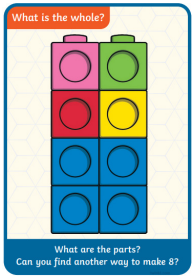
In the café

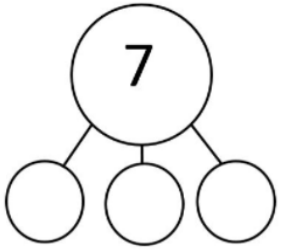
**Designers**

Repeating patterns

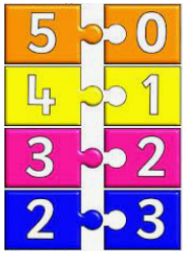


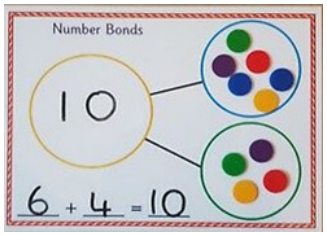
**To understand the composition of number 1 to 10**

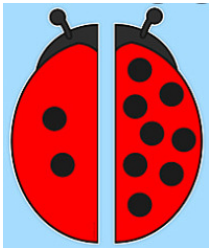



**To recall number bonds for numbers 1 to 5 and 10**



## Key Vocabulary

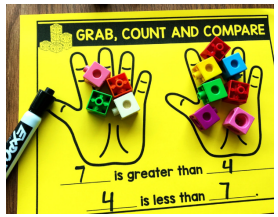
° add, more, plus, makes, total, altogether, score, double, one more, two more, ten more how many more to make…? how many more is … than …?
° take, take away, leave, subtract, minus, equals, number sentence, count back, one less, two less, ten less how many are left / left over? how many have gone? how many fewer is … than …?
° lots of, groups of, double, combine, odd, even,
° halve, share, share equally, one each, two each, three each, group in pairs / threes / tens, equal groups of, in equal parts, left, left over
° part, whole, compose, subitise, number bond

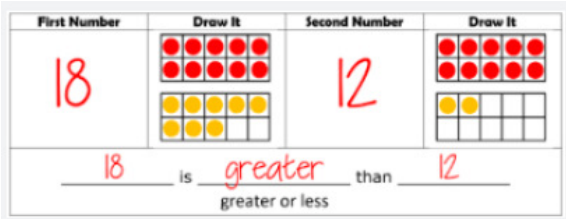
**Verbally count beyond 20, recognising the pattern of the counting system**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

**To recall number facts including doubles to 10 and odd and even numbers to 20**

To compare quantities up to 10 in different contexts




## Key Vocabulary

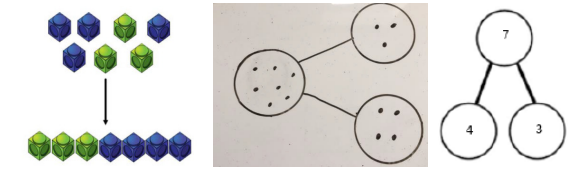
° measure, size, compare, guess, estimate, nearly, close to, about the same as, just over, just under enough, not enough, too much, too little, too many, too few
° length, height, width, long, short, tall, longer, shorter, shortest, tallest, narrow, thick, thin
° weigh, balances, heavy, light, heavier than, lighter than, full, empty, holds
° position, over, under, above, below, top, bottom, side, on, in, outside, inside, around, front, behind, back, beside, next to, opposite, between, middle, edge, corner
° direction, left, right, up, down, forwards, backwards, sideways, across, next to, close, near, far, along, through, to, from, towards, away from
° size, compare, guess, estimate, days of the week (Monday, Tuesday etc.) day, week, month, year birthday, holiday, morning, afternoon, evening, night, bedtime, dinner time, playtime, snack time today, yesterday, tomorrow, before, after, now, soon, early, late, quick, slow, old, new,
° money, coin, penny, pence, pound price, cost, buy, sell, spend, spent, pay, change
° symmetrical, recognise, describe, make, build, draw, compare
° 2D shapes, rectangle (including square), circle, triangle corner, side
° 3D shapes, cube, pyramid, sphere, cone, face, edge, flat, curved, round, straight, solid, hollow

| National Curriculum - Addition | | |
|---|---|---|
| **Year 1** | **Year 2** | **Year 3** |
| Pupils should be taught to:<br><br>• read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs<br><br>• represent and use number bonds and related subtraction facts within 20<br><br>• add and subtract one-digit and two-digit numbers to 20, including zero<br><br>• solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = [ ] - 9. | Pupils should be taught to:<br><br>• solve problems with addition and subtraction:<br><br>- using concrete objects and pictorial representations, including those involving numbers, quantities and measures<br><br>- applying their increasing knowledge of mental and written methods<br><br>• recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100<br><br>• add and subtract numbers using concrete objects, pictorial representations, and mentally, including:<br><br>- a two-digit number and ones<br><br>- a two-digit number and tens<br><br>- two two-digit numbers<br><br>- adding three one-digit numbers<br><br>• show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot<br><br>• recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. | Pupils should be taught to:<br><br>• add and subtract numbers mentally, including:<br><br>- a three-digit number and ones<br><br>- a three-digit number and tens<br><br>- a three-digit number and hundreds<br><br>• add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction<br><br>• estimate the answer to a calculation and use inverse operations to check answers<br><br>• solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. |

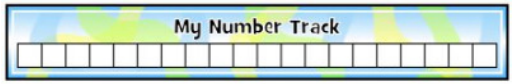
# Addition

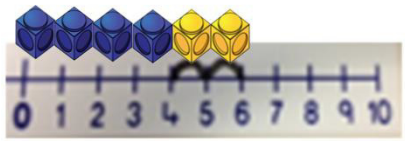
## Year 1

**Two parts make a whole**

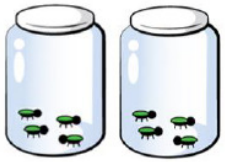


**Count on to find an answer**

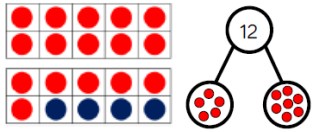



**Doubling**



**Add 1 and 2 digit numbers to 20, including zero**




**Equal sign / Equality / Missing number problems**

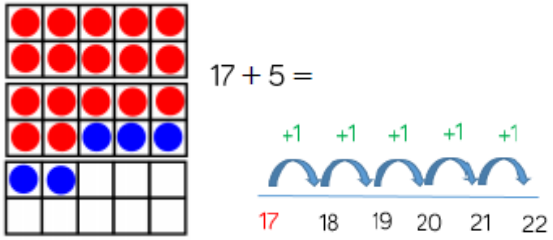
$6 + \square = 11$ $\quad 12 = 12 + 0$

$6 + 5 = 5 + \square$ $\quad 12 = 11 + ___$

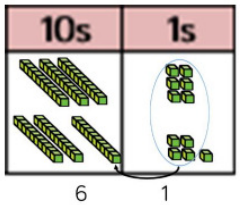
$6 + 5 = \square + 4$ $\quad 12 = 10 + ___$

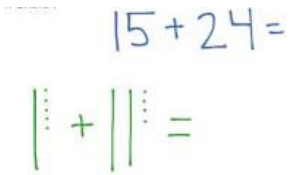
## Year 2

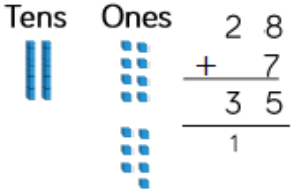
**Add using concrete objects and pictorial representations**




**Recording addition in columns supports place value and prepares for formal written methods**

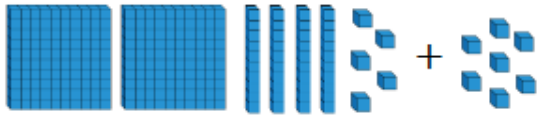


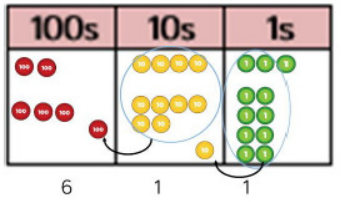

## Year 3

**Add numbers with up to 3 digits**




**Formal methods**

$$\begin{array}{r} 73 \\ +\ 431 \\ \hline 11 \end{array}$$

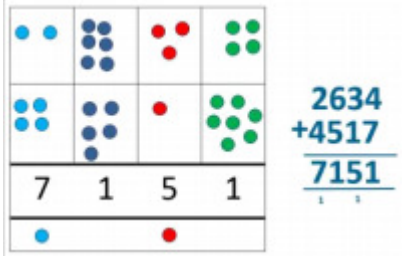
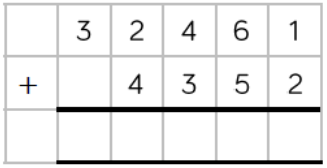
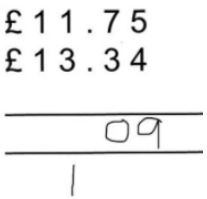
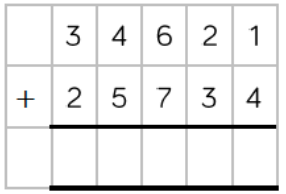



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

789 + 642 becomes

$$\begin{array}{rrr} 7 & 8 & 9 \\ +\ 6 & 4 & 2 \\ \hline 1 & 4 & 3 & 1 \\ \hline & 1 & 1 & \end{array}$$

| National Curriculum - Addition | | |
|---|---|---|
| **Year 4** | **Year 5** | **Year 6** |
| Pupils should be taught to:<br><br>• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate<br><br>• estimate and use inverse operations to check answers to a calculation<br><br>• solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. | Pupils should be taught to:<br><br>• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)<br><br>• add and subtract numbers mentally with increasingly large numbers<br><br>• use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy<br><br>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. | Pupils should be taught to:<br><br>• perform mental calculations, including with mixed operations and large numbers.<br><br>• use their knowledge of the order of operations to carry out calculations involving the four operations<br><br>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why<br><br>• solve problems involving addition, subtraction, multiplication and division<br><br>• use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. |

| Addition | | |
|---|---|---|
| Year 4 | Year 5 | Year 6 |
| | | |
| **Add numbers with up to 4 digits**<br>  <br><br><br><br>3587 + 675 = 4262<br><br>3587<br>+ 675<br>4262<br>111<br><br>**Begin to extend to decimal numbers**<br>£ 2.50 + £ 1.75 = £ 4.25<br><br>£ 2.50<br>+ £ 1.75<br>£ 4.25<br>1 | ***Practise* formal methods with increasingly large numbers (more than 4 digits)**<br>  <br><br>**Extend to decimal numbers**<br>  <br> | ***Practise* formal methods**<br>  <br><br>Apply using numbers with any number of digits and decimals with 1 and 2 decimal places.<br>124.9 + 117.25 = 242.15<br><br>124.9<br>+ 117.25<br>242.15<br>11 |

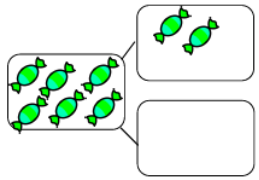
| National Curriculum - Subtraction | | |
|---|---|---|
| **Year 1** | **Year 2** | **Year 3** |
| Pupils should be taught to:<br><br>• read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs<br><br>• represent and use number bonds and related subtraction facts within 20<br><br>• add and subtract one-digit and two-digit numbers to 20, including zero<br><br>• solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = [ ] - 9. | Pupils should be taught to:<br><br>• solve problems with addition and subtraction:<br><br>• using concrete objects and pictorial representations, including those involving numbers, quantities and measures<br><br>• applying their increasing knowledge of mental and written methods<br><br>• recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100<br><br>• add and subtract numbers using concrete objects, pictorial representations, and mentally, including:<br><br>- a two-digit number and ones<br><br>- a two-digit number and tens<br><br>- two two-digit numbers<br><br>- adding three one-digit numbers<br><br>• show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot<br><br>• recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. | Pupils should be taught to:<br><br>• add and subtract numbers mentally, including:<br><br>- a three-digit number and ones<br><br>- a three-digit number and tens<br><br>- a three-digit number and hundreds<br><br>• add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction<br><br>• estimate the answer to a calculation and use inverse operations to check answers<br><br>• solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. |

# Subtraction

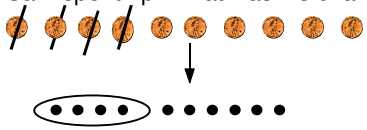
## Year 1

**Concrete objects and pictorial**

At first there were ___ apples.
Then ___ were eaten.
Now there are ___ apples.



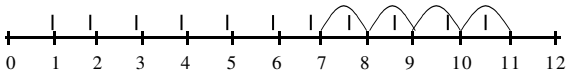
Sam spent 4p. What was his change from 10p?



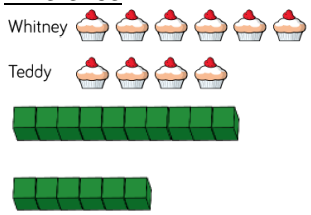
**Signs and missing numbers**

7 - 3 = = 7 - 3
7 - = 4 4 = - 3
- 3 = 4 4 = 7 -
- ∇ = 4 4 = - ∇

**Counting back and on**



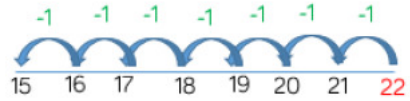

**Difference**

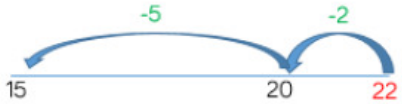


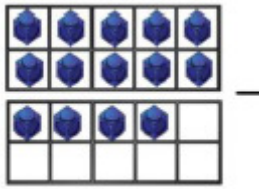

## Year 2

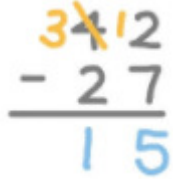
**Concrete objects and pictorial**

22 – 7 =



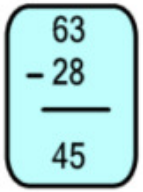


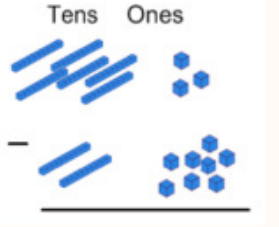

**Without regrouping**

43—21 = 22

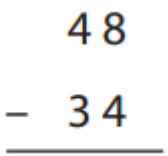
## Year 3

**Subtract numbers with up to 3 digits**

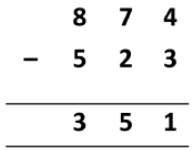


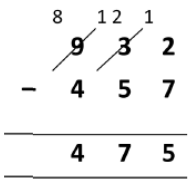
**Formal method**




874 – 523 becomes




932 – 457 becomes



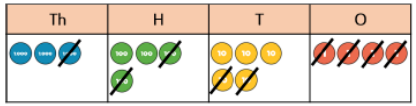
| National Curriculum - Subtraction | | |
|---|---|---|
| **Year 4** | **Year 5** | **Year 6** |
| Pupils should be taught to:<br><br>• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate<br><br>• estimate and use inverse operations to check answers to a calculation<br><br>• solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. | Pupils should be taught to:<br><br>• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)<br><br>• add and subtract numbers mentally with increasingly large numbers<br><br>• use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy<br><br>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. | Pupils should be taught to:<br><br>• perform mental calculations, including with mixed operations and large numbers.<br><br>• use their knowledge of the order of operations to carry out calculations involving the four operations<br><br>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why<br><br>• solve problems involving addition, subtraction, multiplication and division<br><br>• use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. |

# Subtraction

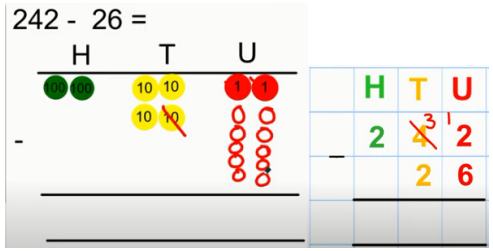
## Year 4

**Subtract numbers with up to 4 digits**

3,454 – 1,224




| | Th | H | T | O |
|---|---|---|---|---|
| | 3 | 4 | 5 | 4 |
| – | 1 | 2 | 2 | 4 |
| | 2 | 2 | 3 | 0 |



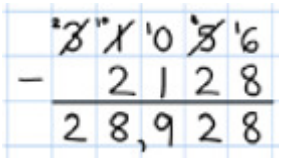

6 14 1
X54
- 286

**Begin to extend to decimal numbers**

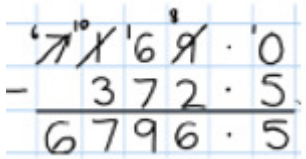
£6.78
- £2.56
£ .

## Year 5

***Practise*** **formal methods with increasingly large numbers (more than 4 digits)**




**Extend to decimal numbers**

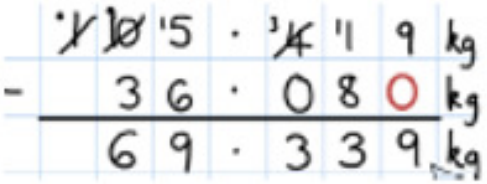



## Year 6

***Practise*** **formal methods**

| | | | | | |
|---|---|---|---|---|---|
| | 3 | 4 | 6 | 2 | 1 |
| + | 2 | 5 | 7 | 3 | 4 |
| | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 4 | 7 | 6 | 1 | 3 | 2 | 5 |
| – | | 9 | 3 | 8 | 0 | 5 | 2 |
| | | | | | | | |



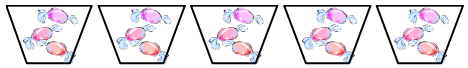
| National Curriculum - Multiplication | | |
|---|---|---|
| **Year 1** | **Year 2** | **Year 3** |
| Pupils should be taught to:<br><br>• solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. | Pupils should be taught to:<br><br>• recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers<br><br>• calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs<br><br>• show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot<br><br>• solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | Pupils should be taught to:<br><br>• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables<br><br>• 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<br><br>• solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects. |

# Multiplication

## Year 1

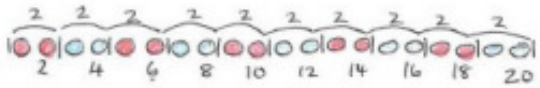
**Concrete and pictorial**

There are 3 sweets in one bag.
How many sweets are there in 5 bags?

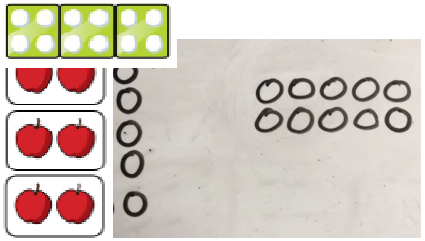


**Groups of and repeated addition**

There are ___ groups of ___ pencils.

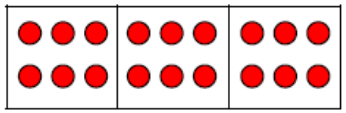



**Arrays**



## Year 2

**Multiplication symbol**

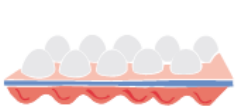


___ + ___ + ___ = 18

___ × ___ = 18

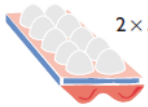
How is 3 x 6 the same as 6 + 6 + 6?

**Multiplication is commutative**



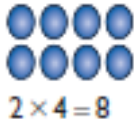
5 × 2 = 10

2 × 5 = 10



2 × 5 = 10

5 × 2 = 10

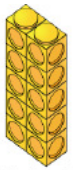


4 × 2 = 8

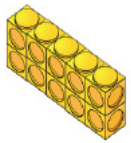
2 × 4 = 8

2 × 4 = 8

4 × 2 = 8



2 lots of 5



5 lots of 2

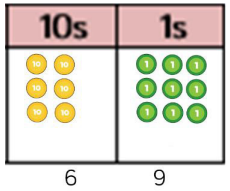
10 = 2 × 5
5 × 2 = 10
2 + 2 + 2 + 2 + 2 = 10
10 = 5 + 5

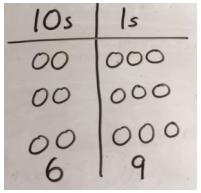
## Year 3

**Progressing to formal method of Short Multiplication**

Apparatus and supports can used

3 × 23




$$\begin{array}{r} 23 \\ \times\ 3 \\ \hline 69 \end{array}$$

24 × 6 becomes

$$\begin{array}{r} 2\ 4 \\ \times\ \ 6 \\ \hline 1\ 4\ 4 \\ \hline 2 \end{array}$$

| National Curriculum - Multiplication | | |
|---|---|---|
| **Year 4** | **Year 5** | **Year 6** |
| Pupils should be taught to:<br><br>• recall multiplication and division facts for multiplication tables up to 12 × 12<br><br>• use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers<br><br>• recognise and use factor pairs and commutativity in mental calculations<br><br>• multiply two-digit and three-digit numbers by a one-digit number using formal written layout<br><br>• solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. | Pupils should be taught to:<br><br>• identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers<br>• know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br>• establish whether a number up to 100 is prime and recall prime numbers up to 19<br>• multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers<br>• multiply and divide numbers mentally drawing upon known facts<br>• 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<br>• multiply and divide whole numbers and those involving decimals by 10, 100 and 1000<br>• recognise and use square numbers and cube numbers, and the notation for squared ($^2$) and cubed ($^3$)<br>• solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes<br>• solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign<br>• solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. | Pupils should be taught to:<br><br>• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br><br>• perform mental calculations, including with mixed operations and large numbers<br><br>• identify common factors, common multiples and prime numbers<br><br>• use their knowledge of the order of operations to carry out calculations involving the four operations<br><br>• solve problems involving addition, subtraction, multiplication and division<br><br>• use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.<br><br>• multiply one-digit numbers with up to two decimal places by whole numbers |

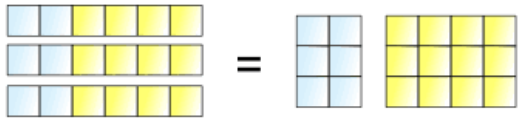
# Multiplication

## Year 4

**Distributive Law**

Multiplying a number by a group of numbers added together is the same as doing each multiplication separately.

$3 \times (2 + 4) = 3 \times 2 + 3 \times 4$



3 x (2+4) 3x2 + 3x4

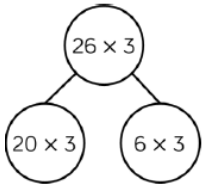
**Developing efficient methods**

$25 \times 8 = 20 \times 8 + 5 \times 8$

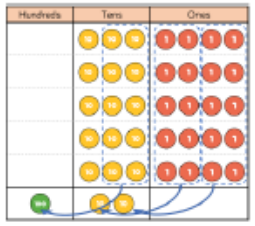
$25 \times 8 = 5 \times 5 \times 8$

$25 \times 8 = 25 \times 10 - 25 \times 2$

$25 \times 8 = 50 \times 8 \div 2$




**Formal method**



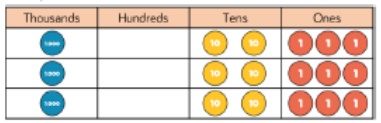

| | H | T | O | |
|---|---|---|---|---|
| | | 3 | 4 | |
| × | | | 5 | |
| | | 2 | 0 | (5 × 4) |
| + | 1 | 5 | 0 | (5 × 30) |
| | 1 | 7 | 0 | |

342 × 7 becomes

| | 3 | 4 | 2 |
|---|---|---|---|
| × | | | 7 |
| 2 | 3 | 9 | 4 |
| | 2 | 1 | |

## Year 5

**Formal methods**




| | Th | H | T | O |
|---|---|---|---|---|
| | 1 | 0 | 2 | 3 |
| × | | | | 3 |
| | | | | |

2741 × 6 becomes

| | 2 | 7 | 4 | 1 |
|---|---|---|---|---|
| × | | | | 6 |
| 1 | 6 | 4 | 4 | 6 |
| | 4 | 2 | | |

**Importance of place holder in Long Multiplication**

| | | 2 | 3 | |
|---|---|---|---|---|
| × | | 1 | 4 | |
| | | 9 | 2 | (23 × 4) |
| | 2 | 3 | 0 | (23 × 10) |
| | | | | |

| | | 1 | 3 | 2 | |
|---|---|---|---|---|---|
| × | | | 1 | 4 | |
| | | 5 | 2 | 8 | (132 × 4) |
| | 1 | 3 | 2 | 0 | (132 × 10) |
| | | | | | |

| | | 3 | 2 | 5 | 0 | |
|---|---|---|---|---|---|---|
| × | | | | 2 | 6 | |
| | 1 | 9 | 5 | 0 | 0 | (3,250 × 6) |
| | 6 | 5 | 0 | 0 | 0 | (3,250 × 20) |
| | 8 | 4 | 5 | 0 | 0 | |

## Year 6

**Formal methods**

| | 4 | 2 | 6 | 7 |
|---|---|---|---|---|
| × | | | 3 | 4 |
| | | | | |

**Multiply one-digit numbers with up to two decimal places by whole numbers**

Find the product without the decimal point and put the point in the answer afterwards.

5.36 x 8 becomes

536
x 8
4288
24

Since, 5.36 had two decimal places when we started, 5.36 × 8 will also have two decimal places in its answer.

Therefore, 5.36 × 8 = 42.88

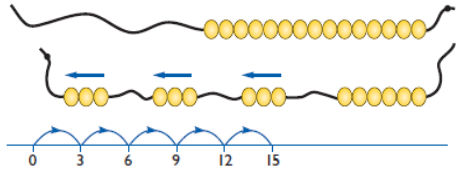
| National Curriculum - Division | | |
|---|---|---|
| **Year 1** | **Year 2** | **Year 3** |
| Pupils should be taught to:<br><br>• solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. | Pupils should be taught to:<br><br>• recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers<br><br>• calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs<br><br>• show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot<br><br>• solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | Pupils should be taught to:<br><br>• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables<br><br>• 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<br><br>• solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects. |

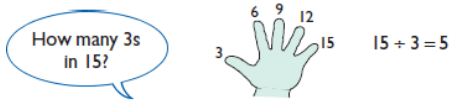
# Division

## Year 1

**Concrete and pictorial**

**Equal grouping**

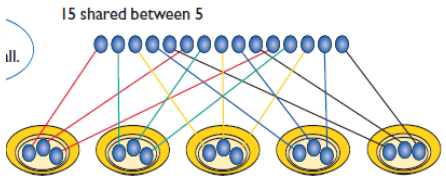


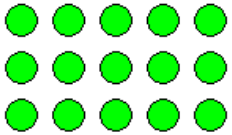

12 pupils get into teams of 4 to play a game. How many teams are there?

**Sharing**

___ cakes shared equally between 2 is ___




**Arrays**

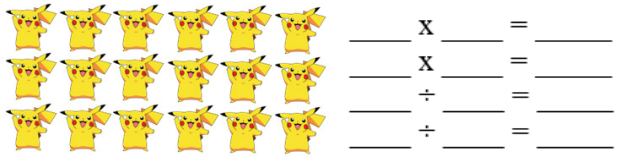


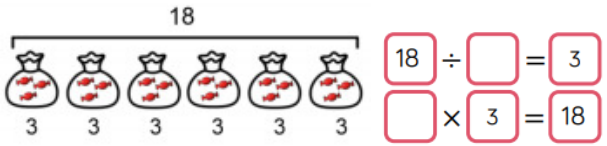
15 ÷ 3 = 5
15 ÷ 5 = 3

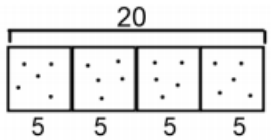
## Year 2

**Division symbol**

**Fact Families**




What number sentences can you create for this model?

1/5 is one part. 2/5 is two parts. Etc.

12 ÷ 2 =

15 ÷ 3 =

20 ÷ 4 =

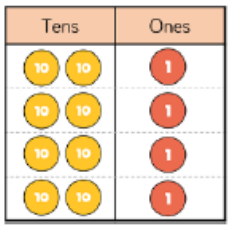
40 ÷ 5 =

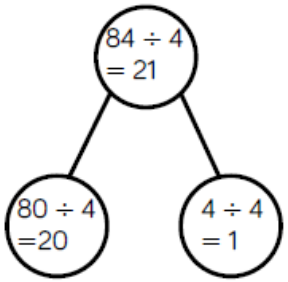
60 ÷ 10 =

## Year 3

**Practise and consolidate**

Miss West needs 28 paper cups. She has to buy them in packs of 6.
How many packs does she have to buy?



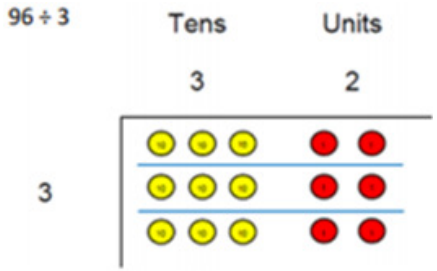



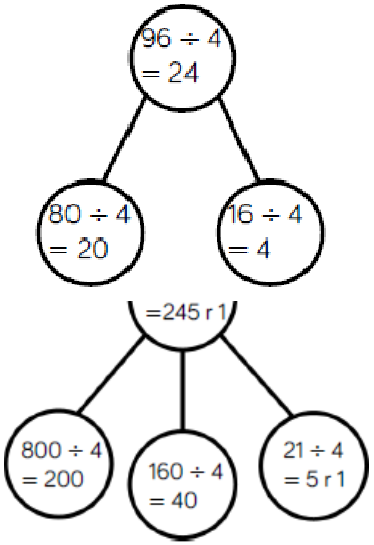
| National Curriculum - Division | | |
|---|---|---|
| **Year 4** | **Year 5** | **Year 6** |
| Pupils should be taught to:<br><br>• recall multiplication and division facts for multiplication tables up to 12 × 12<br><br>• use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers<br><br>• recognise and use factor pairs and commutativity in mental calculations<br><br>• solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects | Pupils should be taught to:<br><br>• identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers<br>• know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br>• establish whether a number up to 100 is prime and recall prime numbers up to 19<br>• know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br>• establish whether a number up to 100 is prime and recall prime numbers up to 19<br>• multiply and divide numbers mentally drawing upon known facts<br>• 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<br>• multiply and divide whole numbers and those involving decimals by 10, 100 and 1000<br>• solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes<br>• solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign<br>• solve problems involving multiplication and division | Pupils should be taught to:<br><br>• 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<br><br>• divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context<br><br>• perform mental calculations, including with mixed operations and large numbers<br><br>• identify common factors, common multiples and prime numbers<br><br>• use their knowledge of the order of operations to carry out calculations involving the four operations<br><br>• solve problems involving addition, subtraction, multiplication and division<br><br>• use estimation to check answers to calculations and determine<br><br>• use written division methods in cases where the answer has up to two decimal places |

# Division

## Year 4

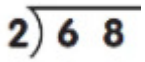
**Practise and consolidate**




**Progress to early formal written layout**

**Short Division – no remainders**

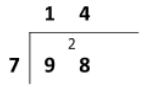



## Year 5

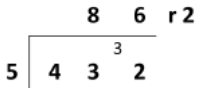
**Progress to formal written layout**

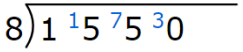
**Short Division**

98 ÷ 7 becomes




432 ÷ 5 becomes




**Remainders**

Pupils interpret remainders appropriately for the given context.

Biscuits are retailed in boxes of nine. How many complete boxes can be sold if we have 3291 biscuits?

280 people are to be seated in rows of 9 at the cinema. How many rows are needed?

## Year 6

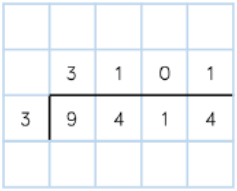
**Remainders**

Quotients expressed as fractions or decimal fractions
676 ÷ 8 = 84 ½ OR 84.5

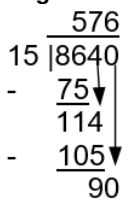
A DJ has two different sized storage boxes for her CDs. Small boxes hold 15 CDs. Large boxes hold 28 CDs. The DJ has 411 CDs. How could the DJ pack her CDs?

**Formal methods**

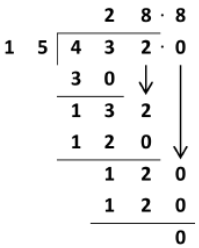
**Short Division**




**Long Division**




432 ÷ 15 becomes




**Pupils are introduced to the division of decimal numbers by one-digit whole numbers.**

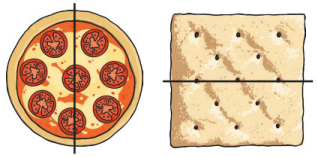
£28.75 ÷ 5

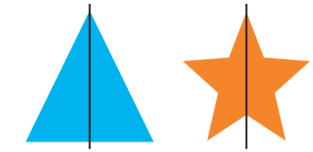
| National Curriculum - Calculating with Fractions | |
|---|---|
| **Year 1** | **Year 2** |
| Pupils should be taught to<br>• recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity<br>• recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity | Pupils should be taught to:<br>• recognise, find, name and write fractions 1/3, ¼, 2/4, 3/4 of a length, shape, set of objects or quantity<br>• write simple fractions, for example ½ of 6 = 3 and recognise the equivalence of 2/4 and ½ |

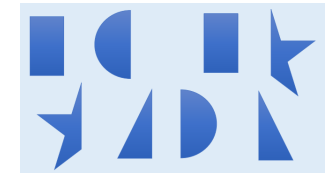
# Calculating with Fractions

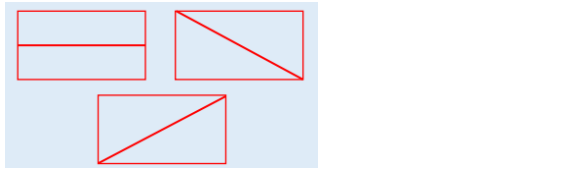
## Year 1

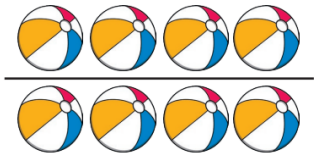
**Recognising and finding half of an object shape or quantity**
**Understanding a half is 1 of 2 equal parts**

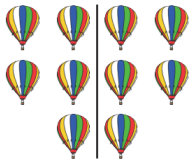


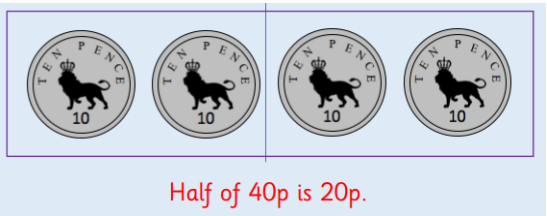












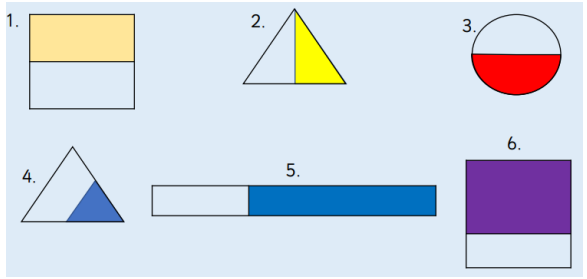

Half of 40p is 20p.

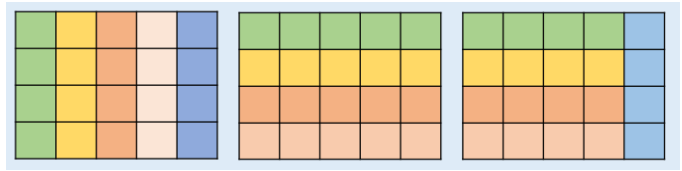
There are 4 sweets.

Half of 4 is 2.

## Year 2

**Recognise, find, name and write fractions 1/3, ¼, 2/4, 3/4 of a length, shape, set of objects or quantity**



Which shapes represent one third?

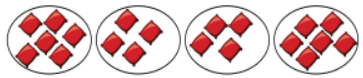
There are 9 cubes altogether.

One third of 9 is 3.

$\frac{1}{3}$ of 9 is 3.

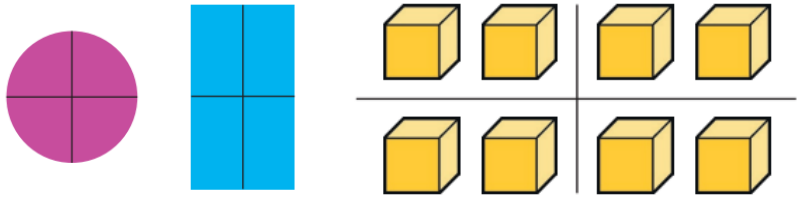
Amir is using beanbags and hoops to find three quarters of 20

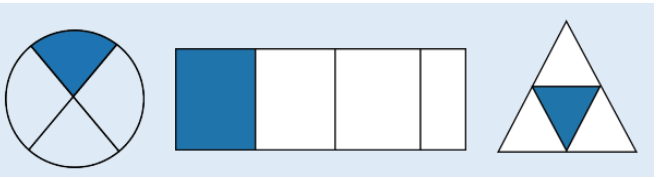
Can you spot his mistake?

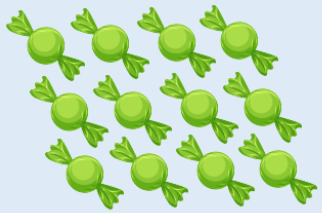


$\frac{3}{4}$ of 20 = 14

**Recognising and finding half of an object shape or quantity**
**Understanding a half is 1 of 2 equal parts**







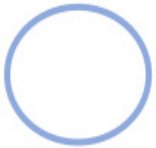
There are ___ sweets.

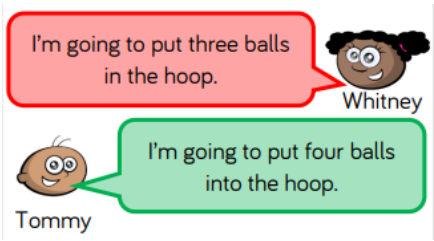
There are ___ sweets in each quarter.

A quarter of ___ is ___.

Two cubes are a quarter, what could the whole look like?

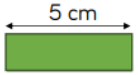
Mr. White has asked his class to put one quarter of the balls into the hoop.





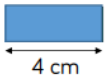

Mo has two ribbons. He cuts $\frac{1}{4}$ from each ribbon.

$\frac{1}{4}$ of ribbon A




How long were Mo's whole pieces of ribbon?

$\frac{1}{4}$ of ribbon B




Which ribbon was the longest? How much longer?

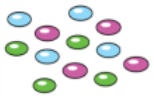
**write simple fractions, for example ½ of 6 = 3 and recognise the equivalence of 2/4 and ½**

$\frac{1}{2}$ of 4 = ☐

$\frac{1}{2}$ of 6 = ☐

$\frac{1}{2}$ of 8 = ☐

Share the smarties equally between 4 people.

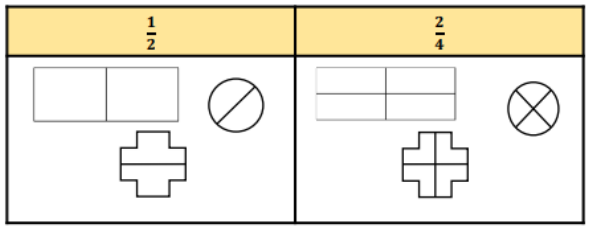


The smarties are split into ___ equal parts.

Each part is worth a _____ .

This can be written as ☐/☐

Shade one half and two quarters of each shape.




Tommy has a jar of 12 cookies. He gives half of them to Alex, and $\frac{2}{4}$ of them to Mo.

Who gets the most cookies?

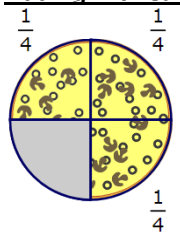
| National Curriculum - Calculating with Fractions | | |
|---|---|---|
| **Year 3 and Year 4** | **Year 5** | **Year 6** |
| **Year 3**<br><br>Pupils should be taught to:<br><br>• add and subtract fractions with the same denominator within one whole (e.g. 5/7 + 1/7 = 6/7)<br><br>**Year 4**<br><br>Pupils should be taught to:<br><br>• add and subtract fractions with the same denominator | Pupils should be taught to:<br><br>• add and subtract fractions with the same denominator and denominators that are multiples of the same number<br><br>• multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams | Pupils should be taught to:<br><br>• add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions<br><br>• multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. 1/4 × 1/2 = 1/8)<br><br>• divide proper fractions by whole numbers (e.g. 1/3 ÷ 2 = 1/6 ) |

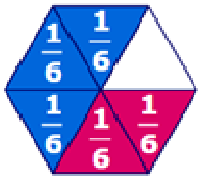
# Calculating with Fractions

## Year 3 and Year 4

### Year 3

**Adding with same denominator within one whole**



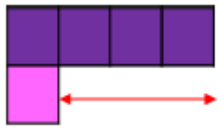


$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$

$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$

**Subtracting with same denominator within one whole**

$\frac{5}{5} - \frac{1}{5} = \frac{4}{5}$



$\frac{4}{8} - \frac{\square}{8} = \frac{\square}{8}$

### Year4

**Adding and subtracting with the same denominator**

$\frac{3}{5} + \frac{4}{5}$

$\frac{6}{7} - \frac{2}{7}$

$\frac{3}{7} + \frac{6}{7}$

$\frac{7}{9} + \frac{4}{9}$

$\frac{25}{21} + \frac{4}{21} = \frac{29}{21}$

$\frac{16}{8} - \frac{9}{8} =$

$\frac{13}{8} - \frac{\square}{8} = \frac{7}{8}$

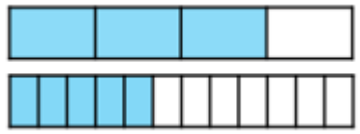
$\frac{28}{21} - \frac{23}{21} = \frac{5}{21}$

## Year 5

**Add and subtract with the same denominator or denominators that are multiples of the same number**

$\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = 1\frac{2}{5}$

$\frac{2}{5} + \frac{3}{7} = \frac{14}{35} + \frac{15}{35} =$



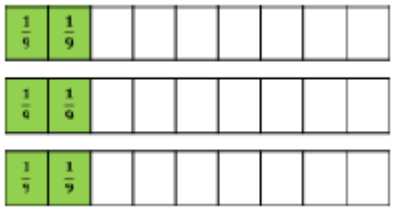
3/4 - 5/12

$\frac{7}{10} - \frac{8}{15}$ $3\frac{3}{4} + 1\frac{2}{3}$ $4\frac{1}{7} - 1\frac{1}{2}$

**Multiplying proper fractions and mixed numbers by whole numbers (supported by materials and diagrams )**

**Proper fraction by a whole number.**

$3 \times \frac{2}{9}$



$2\frac{2}{3} \times 4 = 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} = 8\frac{8}{3} = 10\frac{2}{3}$

$\frac{2}{3} \times 5$

## Year 6

**Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions**

$\frac{1}{3} + \frac{1}{6}$

× 2

$\frac{1}{3} = \frac{2}{6}$

× 2

$\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$

$\frac{1}{2} - \frac{1}{6}$

× 3

$\frac{1}{2} = \frac{3}{6}$

× 3

$\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

Adding mixed numbers

$1\frac{1}{2} + 2\frac{1}{6} = 1\frac{3}{6} + 2\frac{1}{6} = 3\frac{4}{6} = 3\frac{2}{3}$

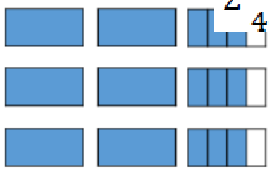
Subtracting mixed numbers

$3\frac{2}{5} - 1\frac{7}{10}$

Make 5 into $\frac{5}{1}$

$$\frac{2}{3} \times \frac{5}{1} = \frac{2 \times 5}{3 \times 1} = \frac{10}{3}$$

**Mixed number by a whole number.**



$$2\frac{3}{4} \times 3 = 6$$

$$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$$

$$6 + 2\frac{1}{4} = 8\frac{1}{4}$$

$$1\frac{3}{8} \times 3$$

$$1\frac{3}{8} \times 3 = \frac{11}{8} \times \frac{3}{1} = \frac{33}{8} = 4\frac{1}{8}$$

$$3\frac{2}{5} - 1\frac{7}{10} = \frac{17}{5} - \frac{17}{10} = \frac{34}{10} - \frac{17}{10} = \frac{17}{10} = 1\frac{7}{10}$$

$$2\frac{1}{4} - 1\frac{2}{3}$$

$$\frac{27}{12} - \frac{20}{12} = \frac{7}{12}$$

**Multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. 1/4 × 1/2 = 1/8)**

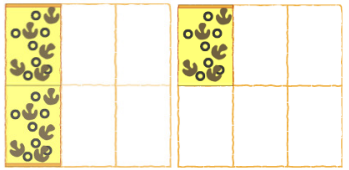
$$\frac{1}{2} \times \frac{2}{5} = \frac{1 \times 2}{2 \times 5} = \frac{2}{10} = \frac{1}{5}$$

$$\frac{2}{3} \times \frac{3}{5} = \frac{2 \times 3}{3 \times 5} = \frac{6}{15}$$

which simplifies to $\frac{2}{5}$

**Divide proper fractions by whole numbers (e.g. 1/3 ÷ 2 = 1/6 )**

$\frac{1}{3} \div 2$ **means divide the 1/3 into two equal pieces**



$$\frac{1}{3} \div 2 = \frac{1}{2} \text{ of } \frac{1}{3} = \frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} = \mathbf{\frac{1}{6}}$$

$$\frac{2}{5} \div 4$$

$$\frac{2}{5 \times 4} = \frac{2}{20} = \frac{1}{10}$$