



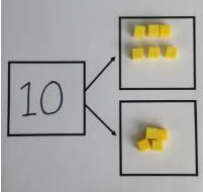
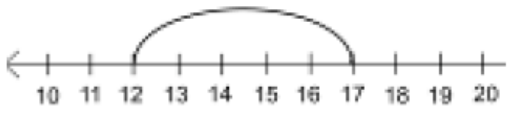
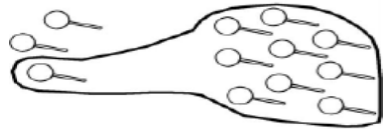
Calculation Policy to Mathematics Curriculum: September 2020

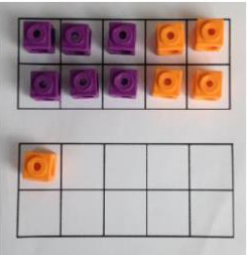
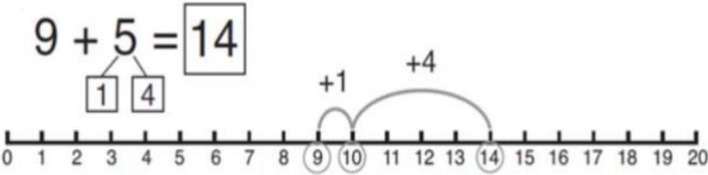
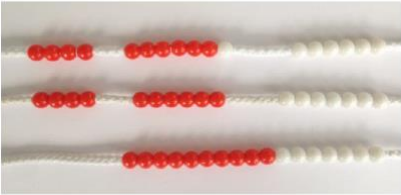
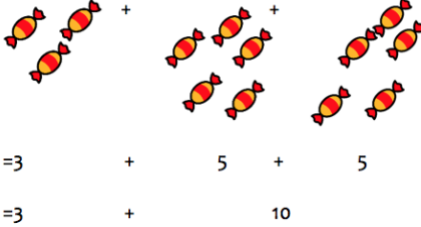
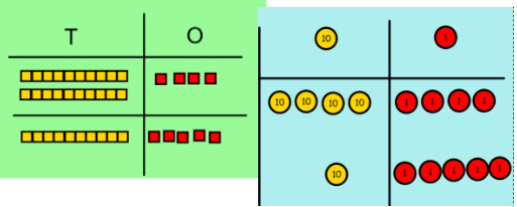
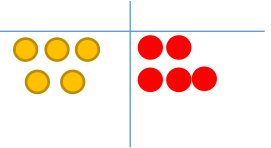
(Adapted from White Rose Maths Hub)

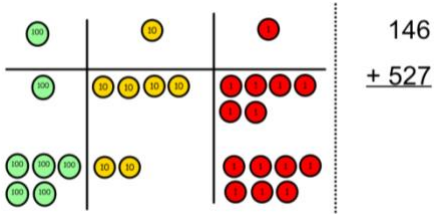
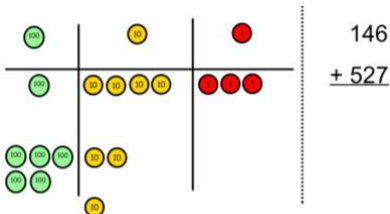
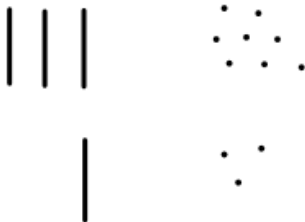
Rationale: Our aim is to provide our learners with the mathematical skills and knowledge to be able to reason and problem solve effectively. Across the school crossover of strategies across year groups will occur as skills develop and understanding deepens. Some arithmetic strategies are year group specific whilst this policy also allows for increase in pace of learning where appropriate. The most early arithmetic strategies seen earlier in the school still hold weight as the children move through the national curriculum; developing understanding of number requires children to move between concrete, pictorial and abstract representations.

Addition

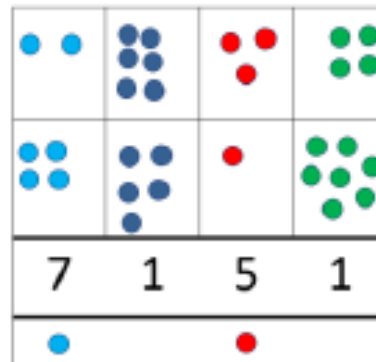
Objective and Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model/bar model Vocab: Part, Whole, plus, add, and, bigger, larger, join, combine greatest, least, biggest, smallest.		Combining images to show how they can be joined to make a larger number.	$4 + 3 = 7$ $10 = 6 + 4$ Number sentences to represent the combination, including starting with the whole.

	 Combining objects to show how they can be joined to make a larger number. Part+Part=Whole.		Part+Part=Whole Whole=Part+Part
Starting at the bigger number and counting on Vocab: Number, larger, smaller, count, jump, greatest, least, biggest, smallest	 Starting with the larger number and counting on the smaller number, one by one.	$12 + 5 = 17$  Starting with the larger number and counting on the smaller number, with ones or larger groups.	$5 + 12 = 17$ Hold the larger number in your head, counting on the smaller number.
Regrouping to make 10. Vocab: Ten, ones, part, whole, more, above, bigger, greatest, least, biggest, smallest	 $6 + 5 = 11$	 $3 + 9 =$	$7 + 4 = 11$ Mentally, starting with the larger number add on the smaller number (in this instance, 4.) Add the 3 to make 10 then the remaining 1.

	 Use of tens frames to show how a number can be bigger than ten. Ten plus some more.	Using a number line, starting with the largest number add on the smaller number (in this instance, 5.) Add 1 to 9 to make 10 and then the remaining 4. $9 + 5 = 14$ 	
Adding three single digits Vocab: part, whole, more, above, biggest, smallest, combine, greatest, least	$4+7+6=17$ Put 4 and 6 together to make 10. Then add the 7. 	$3+5+5=13$. Using objects, Start by adding the bigger numbers to make 10 (5+5) then add the 3 to make 13. 	$4 + 7 + 6 = 10 + 7 = 17$ Mentally, add the pair that make 10. Then add the remaining 7 to make 17.
Column method- no regrouping (Y2+) Vocab: exchange, total, altogether ones, tens, hundreds, thousands, tens of thousands, hundreds of thousands, millions, tens of millions, tenths, hundredths, thousandths, total, remaining (left over), place holder, decimal, represent, greatest, least	Using objects, layer the first number with sticks of ten and ones/place values. $24+15=39$ $44+15=59$ 	$34+22=56$ $32+23=56$  Draw sticks of ten and ones/place value counters. Start by adding the tens followed by adding the ones.	Each child must know the value of each digit and what each number represents. As a start point before the column method is used, the columnar method is used to demonstrate the composition of numbers. Teachers move onto the column method once children know the value of each digit in their calculation. 52+ 33 $50 + 2$ $30 + 3$ $80 + 5 = 85$

			Calculations $21 + 42 =$ $\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$ Start with the ones, and then the tens, total each column but ensure that children aware that the 2 in 21 represents twenty.
Column method-regrouping (Y2+) Vocab: exchange, total, altogether ones, tens, hundreds, thousands, tens of thousands, hundreds of thousands, millions, tens of millions, tenths, hundredths, thousandths, total, remaining (left over), place holder, decimal, represent, carry, greatest, least, biggest, smallest	 146 $+ 527$ Place the counters onto a place value grid. Start by adding the ones, tens then hundreds.  146 $+ 527$ In this case $6+7=13$. Exchange 10 of the ones for a ten leaving 3 remaining. Using place value counters, or sticks of diennes set out on pre-drawn place value grids. Works with money and decimals and other units.	$38+13$  Start with drawing 10s and ones.  Add the ones then tens. 	Each child must know the value of each digit and what each number represents. As a start point before the column method is used, the columnar method is used to demonstrate the composition of numbers. Teachers move onto the column method once children know the value of each digit in their calculation. $\begin{array}{r} 20 + 5 \\ 40 + 8 \\ 60 + 13 = 73 \end{array}$

Count the ones. There is more than 10. Exchange ten ones for one ten. Count the 5 tens=50. Count the ones=1 left = 51. Draw place value grids with counters. Add the ones first, carrying below, in this case 4+7=11, and then work the way through the columns right to left.



Add each column in turn starting with right most column. Carry below when 10 is reached or passed. Add zeroes as place value holders after the decimal place where required ensuring decimals are lined up first.

$$\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 11 \end{array}$$

$$\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$$

Adding fractions (Y3-6)

Vocab:

Add, plus, altogether, total, numerator, denominator, convert, mixed number, improper.

Same denominators:

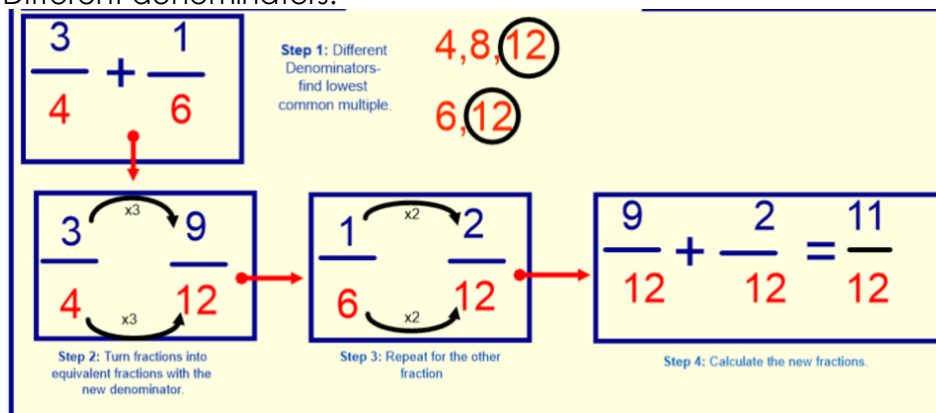
$$\frac{3}{6} + \frac{1}{6} = \frac{4}{6}$$

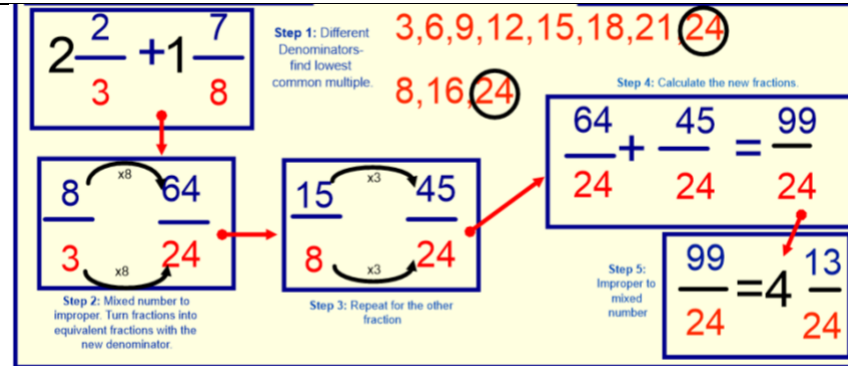
Denominators to stay the same, add the top numbers to create new fraction.

If the numbers create an improper fraction then the fraction can be converted back to mixed number.

In this circumstance, children can simplify the end result. In this circumstance: $\frac{2}{3}$.

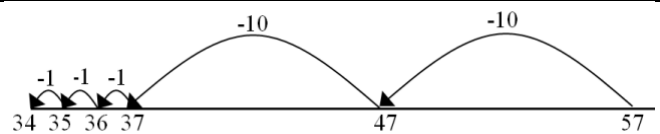
Different denominators:





Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones Vocab: Take away, subtract, minus, less than, difference, jump, tens, ones, greatest, least	Use physical objects, counters, cubes etc to show how objects can be physically taken away.	Cross out drawn objects to show what has been taken away. Draw a line, from the number, smaller by back in number starting biggest jump the number jumping ones If subtracting a 2 digit number, subtract the tens then the ones.	$18 - 3 = 15$ $8 - 2 = 6$ Hold a number in your head and count back in ones. Use fingers to support mental calculation.

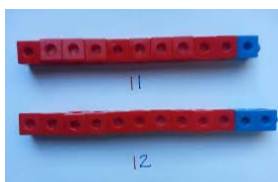


Find the difference

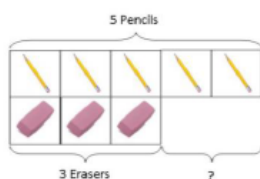
Vocab:

Take away, subtract, minus, less than, fewer than, more than, greater than, difference, jump, tens, ones, bigger, smaller, biggest, smallest, greatest, least

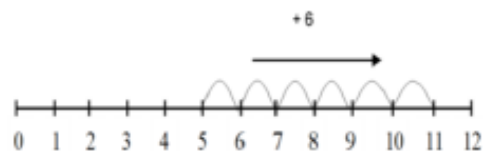
Compare amounts and objects to find the difference.



Use cubes to build towers or make bars to find the difference



Use basic bar models with items to find the difference

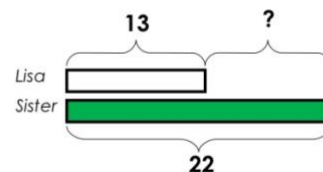


Count on to find the difference.

Draw bars to find the difference between 2 numbers.

Comparison Bar Models

Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.



Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.

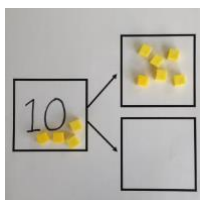
Hold numbers mentally, count on from 15 to 23, or back 15 from 23.

Part Part Whole Model

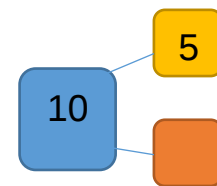
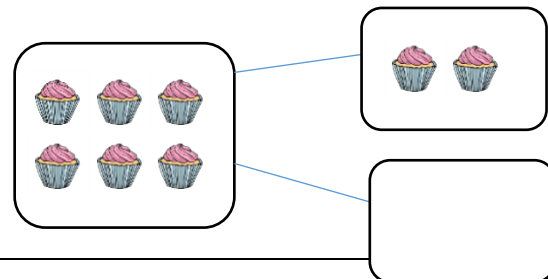
Vocab:

Whole, Part, Take away, subtract, minus, less than, fewer than, more than, greater

Pre-drawn part part whole. Link to addition-use the part whole model to help explain the inverse between addition and subtraction.



Draw out part part whole: use a pictorial representation of objects to show the part part whole model.



Move to using numbers within the part whole model.

than, difference, jump, tens, ones, bigger, smaller, biggest, smallest, greatest, least

If 10 is the whole and 6 is one of the parts. What is the other part?

We know that $6+4$ and $4+6=10$.

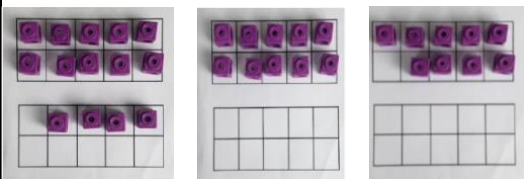
$$10 - 6 =$$

Make 10

Vocab:

Take away, subtract, minus, less than, fewer than, more than, greater than, difference, jump, tens, ones, bigger, smaller, biggest, smallest, greatest, least

$$14 - 5 =$$

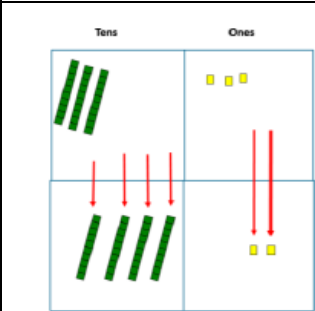


Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.

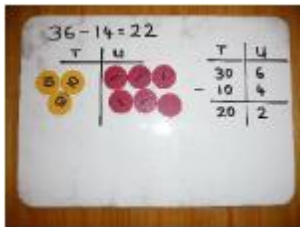
Column method without regrouping (y2+)

Vocab:

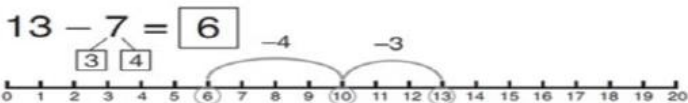
Take away, subtract, minus, less than, fewer than, more than, greater than, difference, jump, thousands, hundreds, tens, ones, bigger, smaller, biggest, smallest, partition, greatest, least, tens of thousands, hundreds



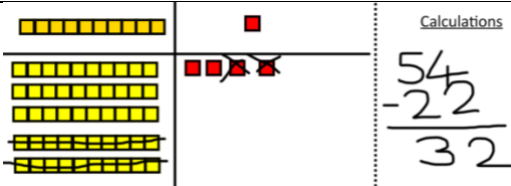
Show how you partition numbers to subtract. Again make the larger number first.



Use Base 10 to make the bigger number then take the smaller number away.



Draw a number line. Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.



$$34-21$$



Draw bigger number with sticks of 10 and ones. Subtract ones then tens leaving you with 13.

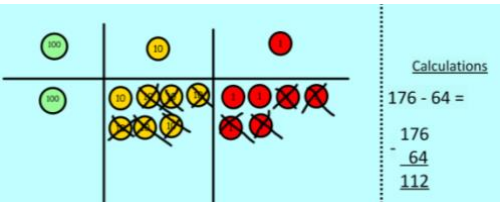
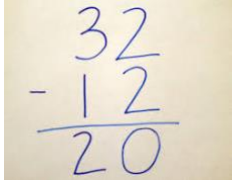
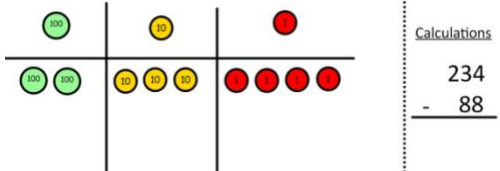
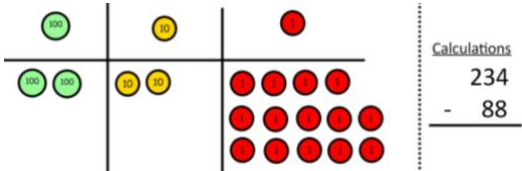
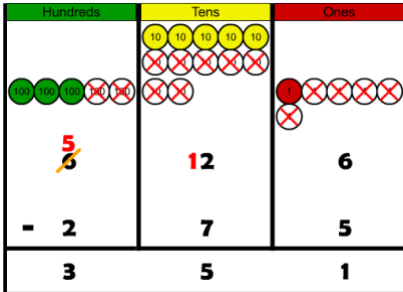
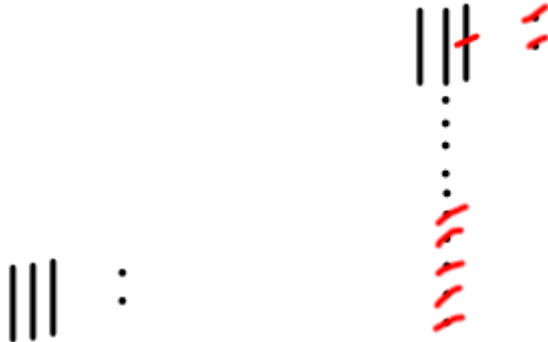
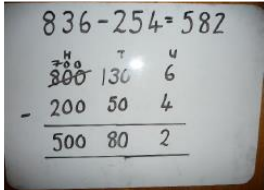
$$16 - 8 =$$

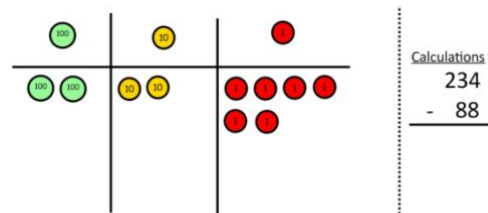
Upwards from 8 to 16: how many do we take off to reach the next 10= 2. Then add the remaining 6 to get to 16. $6+2=16$.

Backwards from 16. Take 6 to get to 10, then the remaining 2 to get to 8.

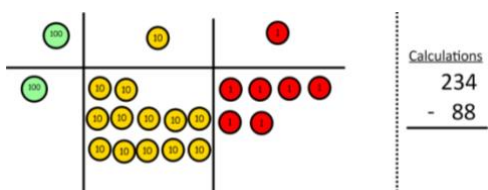
$$47 - 24 = 23$$
$$\begin{array}{r} 40 + 7 \\ - 20 + 4 \\ \hline 20 + 3 \end{array}$$

As a start point before the column method is used, the columnar method is used to demonstrate the composition of numbers. Teachers move onto the column method once children know the value of each digit in their calculation.

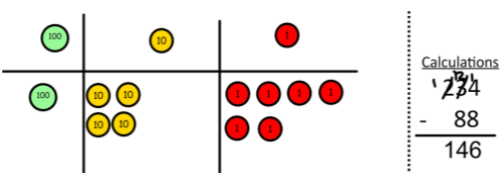
of thousands, millions, tens of millions, tenths, hundredths, thousandths,		Draw the Base 10 or place value counters alongside the written calculation to help to show working. Cross off the numbers as you go. 	This will lead to a clear written column subtraction.  Children must have clear understanding of the place value of each digit.
Column method with regrouping (Y2+) Vocab: Take away, subtract, minus, less than, fewer than, more than, greater than, difference, jump, thousands, hundreds, tens, ones, bigger, smaller, least, biggest, greatest smallest, partition, exchange, decimals, place holder, tens of thousands, hundreds of thousands, millions, tens of millions, tenths, hundredths, thousandths,	Use Base 10/place value counters. to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters  Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.  Now I can subtract my ones.	 Sticks of 10 and one. 32-17  1) Draw sticks of 10/ones (32) 2) Only 2 ones, so exchange a ten for 10 ones. Then subtract 7 3) Subtract the ten. 4) You are left with one ten and 5 ones=15.	 Children can start their formal written method by partitioning the number into clear place value columns. Each child must know the value of each digit and what each number represents. As a start point before the column method is used, the columnar method is used to demonstrate the composition of numbers. Teachers move onto the column method once children know the value of each digit in their calculation.



Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.



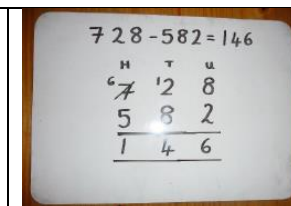
Now I can take away eight tens and complete my subtraction



Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

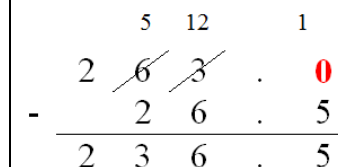


When confident, children can find their own way to record the exchange/regrouping.



Applies to use of decimals (remembering place holders.) Cross numbers off like above.

See use of place holder below.



Subtracting fractions (Y3-6)

Vocab:

Take, subtract, minus, numerator, denominator, convert, mixed number, improper.

Same denominator:

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

Denominators to stay the same, subtract the top numbers to create new fraction.

In this circumstance, children can simplify the end result. In this circumstance: $\frac{1}{3}$

Different denominator:

Step 1: Different Denominators—find lowest common multiple.

5, 10
10

Step 2: Turn fractions into equivalent fractions with the new denominator so both fractions now have the same denominator

Step 4: Calculate with the new fractions.

Step 1: Different Denominators—find lowest common multiple.

3, 6, 9, 12, 15, 18, 21, 24
8, 16, 24

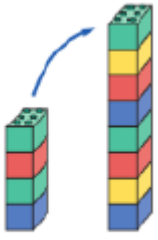
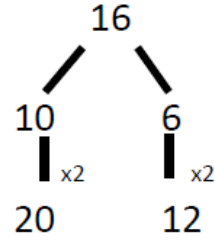
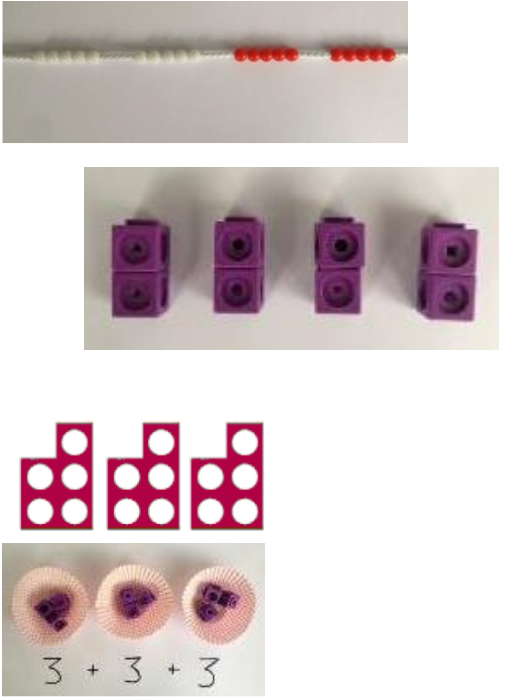
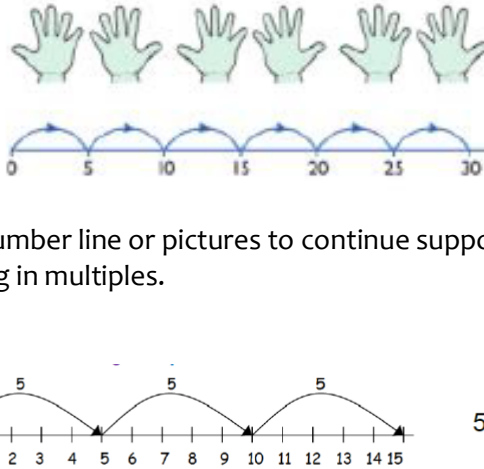
Step 2: Mixed number to improper. Turn fractions into equivalent fractions with the new denominator.

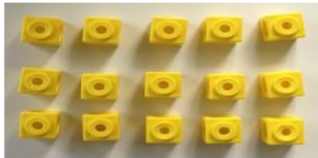
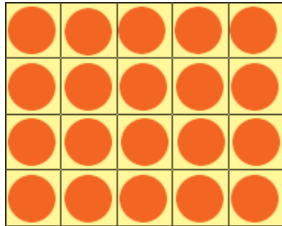
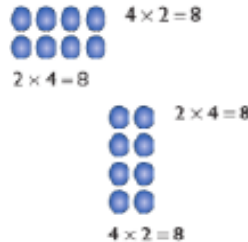
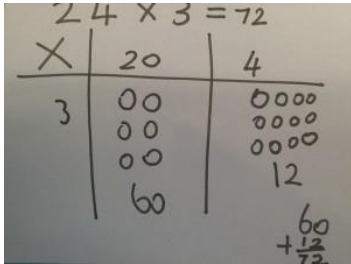
Step 3: Repeat for the other fraction

Step 4: Calculate the new fractions.

Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
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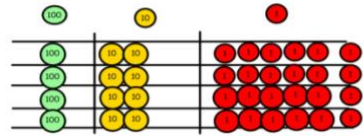
Doubling Vocab: Double, half, multiply by 2, 2 times, 2 groups of, 2 lots of, combine, total.	Use cubes or counters etc to show how to double a number.  double 4 is 8 $4 \times 2 = 8$	Draw pictures to show how to double a number. Double 4 is 8 	 Partition a number and then double each part before recombining it back together. Hold numbers in head.
Counting in multiples/ repeated addition Vocab: Multiple, groups of, lots of, count on, add, jumps of, pattern	 Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples. $5 + 5 + 5 = 15$	Write number sentences to show  $2 + 2 + 2 + 2 + 2 = 10$ repeated addition. Count in multiples of a number aloud. Memorise patterns and sequences. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 $2 \times 5 = 10$ or $5 \times 2 = 10$ 5, 10, 15, 20, 25, 30 Link directly to times tables facts- see above. Nth term: N: 1 2 3 4 5 3 7 11 15 19 Going in 4s. $1 \times 4 = 4$ $-1 = 3$ $4n-1$

Arrays- showing commutative multiplication Vocab: Array, groups of, lots of, columns, rows, commutativity, commutative, inverse, scale factor of ...	Create arrays using counters/ cubes to show multiplication sentences. 	Draw arrays in different rotations to find commutative multiplication sentences.  Link arrays to area of rectangles. Children challenged to find associated facts e.g. 40x2, 4x20, 40x20 to broaden understanding.	Use an array to write multiplication sentences and reinforce repeated addition. 15= 5x3 15= 3x5  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15																											
Written multiplication (Y3-6) Vocab: groups of, lots of, carry, place holder, multiply, times, product, column, row, total, tens of thousands, hundreds of thousands, millions, tens of millions, tenths, hundredths, thousandths,	Show the link with arrays to first introduce the grid method. <table><tr><td>x</td><td>10</td><td>3</td></tr><tr><td>4</td><td></td><td></td></tr></table> 4 rows of 10 4 rows of 3 Move on to using Base 10 to move towards a more compact method. <table><tr><td>x</td><td>T</td><td>U</td></tr><tr><td></td><td></td><td></td></tr></table> 4 rows of 13 Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.	x	10	3	4			x	T	U				They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.  Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. Moving onto multiplying by a 2 digit number. <table><tr><td>x</td><td>30</td><td>5</td></tr><tr><td>7</td><td>210</td><td>35</td></tr></table> 210 + 35 = 245 <table><tr><td></td><td>10</td><td>8</td></tr><tr><td>10</td><td>100</td><td>80</td></tr><tr><td>3</td><td>30</td><td>24</td></tr></table>	x	30	5	7	210	35		10	8	10	100	80	3	30	24
x	10	3																												
4																														
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7	210	35																												
	10	8																												
10	100	80																												
3	30	24																												



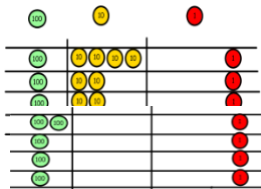
Calculations
 4×126

Fill each row with 126.

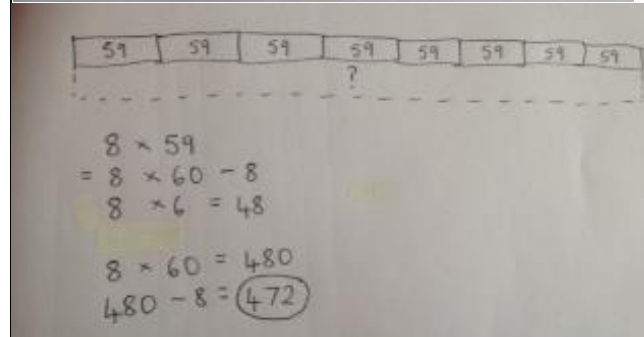
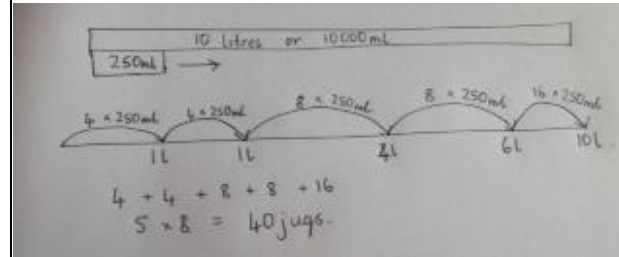


Calculations
 4×126

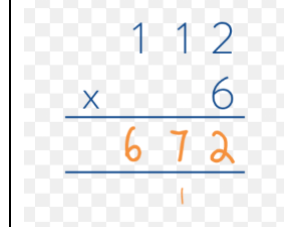
Add up each column, starting with the ones making any exchanges needed.



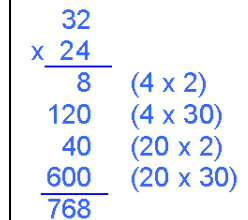
Then you have
your answer.



Start with long multiplication, reminding the children about lining up their numbers clearly in columns.



If it helps, children can write out what they are solving next to their answer.



Moving on to a compact method. Carrying the numbers below each row and remembering the place holder when starting to multiply by the ten. If a decimal is in the question, the answer requires the same amount of decimal spaces.

$$\begin{array}{r}
 25 \\
 \times 14 \\
 \hline
 100 \\
 120 \\
 + 250 \\
 \hline
 350
 \end{array}$$

Multiplying Fractions (Y6)

Vocab:

Denominator, numerator, convert, mixed number, improper fraction, product, multiply, times.

$$\frac{3}{4} \times \frac{1}{6} = \frac{3}{24}$$

Two Fractions
Example : Simply multiply top number and bottom numbers

Mixed Number and Fraction

$$2\frac{3}{4} \times \frac{1}{6}$$

Step 1: Convert mixed number into improper

$$\frac{11}{4} \times \frac{1}{6} = \frac{11}{24}$$

Step 2: Multiply top and bottom numbers.

Whole Number and Fraction

$$2 \times \frac{5}{6}$$

Step 1: Convert mixed number into improper

$$\frac{2}{1} \times \frac{5}{6} = \frac{10}{6}$$

Step 2: Multiply top and bottom numbers.

$$\frac{10}{6} = 2\frac{4}{10}$$

Step 3: Turn improper answer back to mixed number

Multiplying Decimals (Y6)

Vocab:

Decmal, decimal place, product, multiply, times.

$$\begin{array}{l}
 \underline{0.3} \times 4 \\
 3 \times 4 = 12 \\
 = \underline{1.2}
 \end{array}$$

Example 1
Underline the one number after decimal.
Multiply the numbers you can see 3x4.
Ensure one decimal place in your answer.

$$\begin{array}{l}
 \underline{0.07} \times 4 \\
 7 \times 4 = 28 \\
 = \underline{0.28}
 \end{array}$$

Example 2
Underline two numbers after decimal
Multiply the numbers you can see 7x4.
Ensure two decimal places in your answer.

$$\begin{array}{l}
 \underline{0.6} \times 40 \\
 6 \times 40 = 240 \\
 = \underline{24.0}
 \end{array}$$

Example 3
Underline the one number after decimal.
6x4=24, so 6x40=240.
Ensure one decimal place in your answer.
24.0 or just 24.

$$\begin{array}{l}
 \underline{0.5} \times \underline{0.4} \\
 5 \times 4 = 20 \\
 \underline{0.20}
 \end{array}$$

Example 4
Underline the two numbers after decimal.
Multiply the numbers you can see 5x4.
Ensure two decimal place in your answer. Place holder before zero.

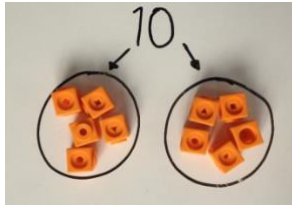
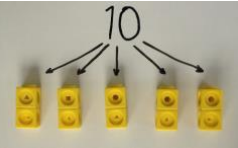
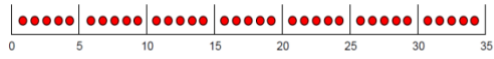
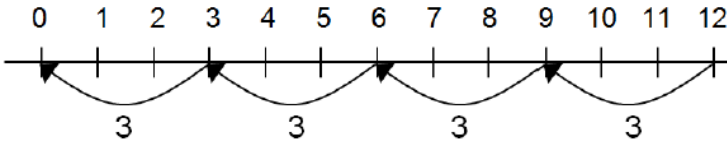
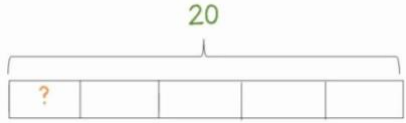
$$\begin{array}{l}
 \underline{0.15} \times \underline{0.3} \\
 15 \times 3 = 45 \\
 \underline{0.045}
 \end{array}$$

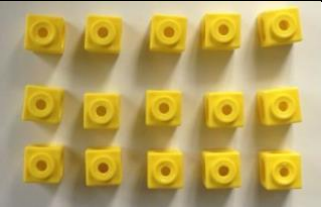
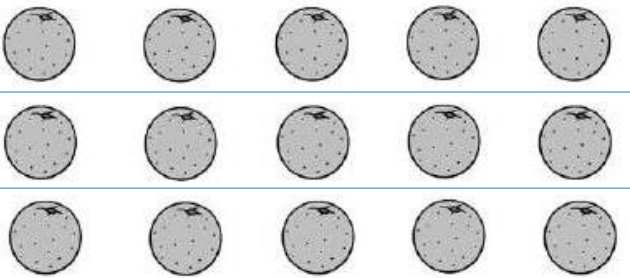
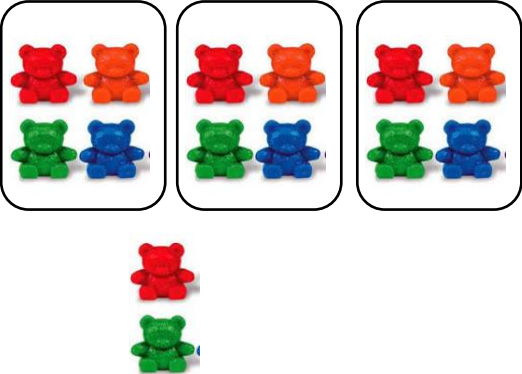
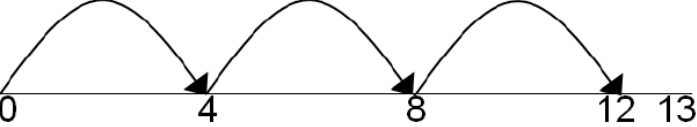
Example 5
Underline the three numbers after decimal.
Multiply the numbers you can see 15x3.
Ensure three decimal places in your answer. Place holder before zero and a zero before the 45.

	3.45×7 Step 1: Place numbers into a column method. No placeholders needed. Step 2: Ensure decimal is ready in your answer. Sausage! Step 3: Multiply each number by the whole number. Don't forget the decimal in the answer.	
Multiplying by 10,100,1000 (Y5-6) Vocab: Decimal place, place holder, jump, column, multiply, times, product	0.004×100 Step 1: Place your two decimals Step 2: Move each number in turn to the left with the correct number of spaces. Step 3: Remove unnecessary zeros, or add place holders if needed. To the left... $\times 10 = 1 \text{ space}$ $\times 100 = 2 \text{ spaces}$ $\times 1000 = 3 \text{ spaces}$	

Division

Objective and Strategies	Concrete	Pictorial	Abstract
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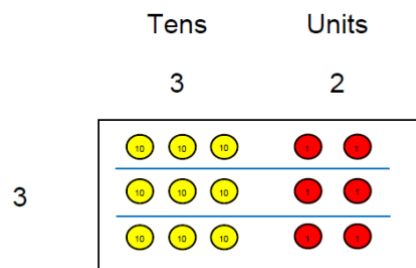
Sharing objects into groups Vocab: Share, divide, part, whole, fair, groups of, lots of, inverse, divisor, factor, multiple	 I have 10 cubes, can you share them equally in 2 groups? Physically move the objects to share equally. 	Children use pictures or shapes to share quantities.  $8 \div 2 = 4$	Share 9 buns between three people. Knowing that $3 \times 3 = 9$. $9 \div 3 = 3$
Division as grouping Vocab: Share, divide, part, whole, fair, groups of, lots of, inverse, divisor, factor, multiple	 Physically divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  $96 \div 3 = 32$  	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.  $20 \div 5 = ?$ $5 \times ? = 20$	$28 \div 7 = 4$ Divide 28 into 7 groups. How many are in each group? Count in sevens to 28, realising there are 4 sevens that make 28.

Division within arrays Vocab: Array, groups of, lots of, columns, rows, commutativity, commutative, inverse, scale factor of ..., divisor, factor, multiple	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$	 Draw an array and use lines to split the array into groups to make multiplication and division sentences.	Find the inverse of multiplication and division sentences by creating four linking number sentences. $7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$ Extend with associated facts: e.g. $70 \times 4 = 280$.
Division with a remainder Vocab: Share, divide, part, whole, fair, groups of, lots of, inverse, remainder, divisor, factor, multiple	$14 \div 3 =$ Divide objects between groups and see how much is left over 	 Draw groups of or jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder. Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. $29 \div 8 = 3 \text{ REMAINDER } 5$ ↑ ↑ ↑ ↑ dividend divisor quotient remainder Express the remainder as a fraction 5 over 8. 5 were left, 8 was the number dividing by.

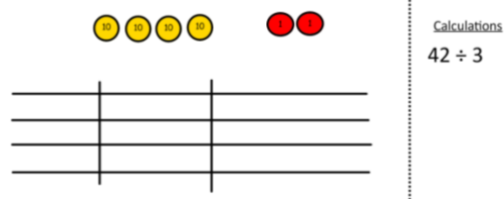
Short division moving towards longer division.

Vocab:

Share, divide, part, whole, fair, groups of, lots of, inverse, remainder, columns, rows, thousands, hundreds, tens, ones, partition, tens of thousands, hundreds of thousands, millions, tens of millions, tenths, hundredths, thousandths, divisor, factor, multiple

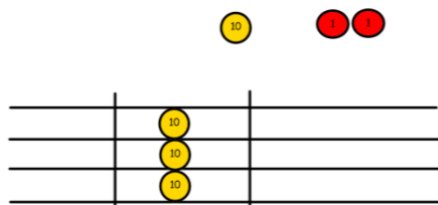


Use place value counters to divide using the bus stop method alongside

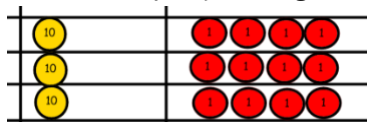


$$42 \div 3 =$$

Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.

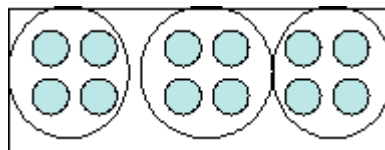


We exchange this ten for ten ones and then share the ones equally among the groups.



We look how much in 1 group so the answer is 14.

Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.



Encourage them to move towards counting in multiples to divide more efficiently.

Begin with divisions that divide equally with no remainder.

$$\begin{array}{r} 218 \\ 3 \overline{) 4272} \end{array}$$

Move onto divisions with a remainder.

$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \end{array}$$

Finally move into decimal places to divide the total accurately.

Remainder can be expressed

$$\begin{array}{r} 14.6 \\ 35 \overline{) 511.0} \end{array}$$

as a decimal by using zero to divide out the number in this 14.6 but could be expressed as 14 and $\frac{21}{35}$.

Count in 35 by using partitioning.

$$\begin{array}{rcl} 30 & +5 & = 35 \\ 60 & +10 & = 70 \end{array}$$

			$90 + 15 = 105$ $120 + 20 = 140$ $150 + 25 = 175$ $180 + 30 = 210$ as far as needed.
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Dividing Fractions (Y6)

Vocab:

Divisor, denominator, numerator, mixed number, improper fraction, divide, share, keep, flip, share.

Operation changes because when you share gets bigger because when you share a fraction, you are dividing into even smaller pieces meaning the denominator increases as a number- hence the multiplying.

Step 1: Turn the whole number into a fraction by putting a one underneath it.

Step 2: Keep the first fraction the same, flip the other fraction and change to multiply. (KFC)

Step 3: Simply multiply the top numbers and then multiply the bottom numbers.

Dividing by 10,100,1000 (Y5-6)

Vocab:

Decimal place, place holder, jump, move, spaces, column, share, divide

Step 1: Place your two decimals

Step 2: Move each number in turn to the left with the correct number of spaces.

Step 3: Remove unnecessary zeros, or add place holders if needed.

To the right...

$+10 = 1 \text{ space}$
 $+100 = 2 \text{ spaces}$
 $+1000 = 3 \text{ spaces}$

Other/Cross-over

Percentage (Y6)

Vocab:

Part, whole, partition,
divide, multiply, times

10%- Divide by 10 (One space to the right)
5%- Half of what 10%
20%- Multiply 10% by 2
25%- 20%+5%
30%- Multiply 10% by 3
35%- 30%+5%
40%- Multiply 10% by 4
45%- 40%+5%
50%- Multiply 10% by 5 (Or Half)
55%- 50%+5%
60%- Multiply 10% by 6
65%- 60%+5%

70%- Multiply 10% by 7
75%- 70%+5%
80%- Multiply 10% by 8
85%- 80%+5%
90%- Multiply 10% by 9
95%- 90%+5%

35% of 330

Step 1: Find 10%
 10%- Divide by 10
 (One space to the right)

$$\begin{array}{r} 330. \\ \hline 33. \end{array}$$

Step 2: Find 5%
 5%- Half 10%
 $15 \div 2 = 7.5$

Step 3: Find 30%
 Multiply 10% by 3

$$\begin{array}{r} 33 \\ \times 3 \\ \hline 99 \end{array}$$

Step 4: Find 35%
 Add 30% and 5%

$$\begin{array}{r} 33.0 \\ + 7.5 \\ \hline 40.5 \end{array}$$

1%- Divide by 100 (Two spaces to the right)
2%- 1% x 2
3%- 1% x 3
4%- 1% x 4
5%- 1% x 5
6%- 1% x 6
7%- 1% x 7
8%- 1% x 8
9%- 1% x 9

7% of 330

Step 1: Find 1%
 1%- Divide by 100
 (Two spaces to the right)

$$\begin{array}{r} 330. \\ \hline 3.3 \end{array}$$

Step 2: Find 7%
 Multiply 1% by 7

$$\begin{array}{r} 3.3 \\ \times 7 \\ \hline 23.1 \end{array}$$

10%- Divide by 10 (One space to the right)
1%- Divide by 100 (Two space to the right)

27% of 330

Step 1: Find 10%
 10%- Divide by 10
 (One space to the right)

$$\begin{array}{r} 330. \\ \hline 33. \end{array}$$

Step 2: Find 1%
 Divide by 100
 (Two spaces to the right)

$$\begin{array}{r} 330. \\ \hline 3.3 \end{array}$$

Step 3: Find 20%
 Multiply 10% by 2

$$\begin{array}{r} 33 \\ \times 2 \\ \hline 66 \end{array}$$

Step 4: Find 7%
 Multiply 1% by 7

$$\begin{array}{r} 3.3 \\ \times 7 \\ \hline 23.1 \end{array}$$

Step 5: Find 27%
 Add 20% and 7%

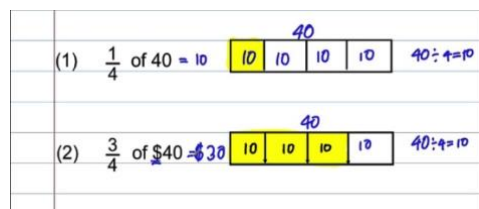
$$\begin{array}{r} 66.0 \\ + 23.1 \\ \hline 89.1 \end{array}$$

Fraction of an amount (Y3-6)

Vocab:

Denominator,
numerator, mixed
number, part, whole

Visually represented with bar model to develop unit and non-unit understanding of a quantity being equally divided. Connections to be made to multiplication and division facts. Once this has been understood, children work abstractly (see below)



$$\frac{2}{6} \text{ of } 72 \div$$

72 divided by 6 = 12

Next, I need to multiply my answer by the
numerator.

$$12 \times 2 = 24$$

2 of 72 is therefore 24!

6

Order of operations (Y6)

Vocab:

BIDMAS, brackets,
indices, division,
multiplication,
addition, subtraction,
order.

Step 1: When you
have mixed
operations. Write
BIDMAS down the
side. Tick off and
complete in order.

Brackets
Indices (e.g. squared/cubed)
Division
Multiplication
Addition
Subtraction

B	$3 \times 7 + 5 - 2$
I	$3 \times 7 + 25 - 2$
D	$21 + 25 - 2$
M	$46 - 2$
A	$= 44$
S	

Example 1

No brackets, so deal with the indices first. 5 squared.
No division, so next do the multiplication.
Next the addition, and finally the subtraction.

B	$3 \times (7 + 5) - 2$
I	$3 \times 12 - 2$
D	$36 - 2$
M	$= 34$
A	
S	

Example 2

Brackets first. No indices.
No division, so do the multiplication.
Finally, subtract.

Progression Across Year Groups

	Typical Calculations			
Year Group	Addition	Subtraction	Multiplication	Division
1	O+O TO+O (up to 20 including zero)	O-O TO-O (up to 20 including zero)	OxO	O÷O TO÷O
2	TO+O TO + multiples of 10 TO+TO O+O+O	TO-O TO - multiples of 10 TO-TO O-O-O	OxO	O÷O TO÷O
3	HTO+O HTO+TO HTO+HTO	HTO-O HTO-TO HTO-HTO	TOxO	TO÷O
4	THTO+HTO THTO+THTO	THTO-HTO THTO-THTO	TOxO HTOxO	TO÷O HTO÷O Remainders expressed with R
5	THTO.t+THTO.t THTO.th+THTO.th Increasing to 5 or 6 digits	THTO.t-THTO.t THTO.th-THTO.th Increasing to 5 or 6 digits	HTOxO THTOxO TOxTO	HTO÷O THTO÷O Remainders expressed as a fraction
6	THTO.tht+THTO.tht Increasing to ten million	THTO.tht-THTO.tht Increasing to ten million	THTOxO TOxTO HTOxTO THTOxTO O.txO O.thxO O.txTO O.thxTO	THTO÷O HTO÷TO THTO÷TO O.th÷O `TO.th÷O HTO.th÷O THTO.th÷O

Applying the Skills

Application of skills	How?
Question stems	Odd one out, true or false, explain..., prove it, what is the same and what is different, are you sure, mark my work. These develop and further calculation skills to ensure reasoning skills are developed.
Estimation of the calculations	Using knowledge of number and the number system, rounding and approximating. Teachers to tease this information from children as a prompt.
Inverse and missing box questions	Using knowledge of calculations and the link between multiplication and division, addition and subtraction, work using the commutative method e.g. starting with an answer or missing information. It is important to vary the position of the answer box within the calculation so the children become used to this.
Include units	Choose units appropriate for year group (see measures objectives) e.g. cm, mm, L, Kg
Worded Problems	Using numbers appropriate year group, children calculate having read the problem provided. If appropriate, this could be extended through application of a second operation or second part (e.g. multiplying and then adding). Vary the vocabulary so that children become adept with their interpretation of mathematical language.
Open ended investigations or many possibilities	Ensure sizes of numbers are appropriate for the year group. Check the child's understanding of the activity - perhaps starting with a non-example model. E.g. using the digits 1-9 (only once) can you find 3 ways of making 8 = $2+6$, $1+7$, $3+5$
Abstract or coded application	Algebraic style questions, replacing numbers with letters for an unknown value. Children must use their calculation, number and number system knowledge to work out the missing values – perhaps using knowledge of the inverse.