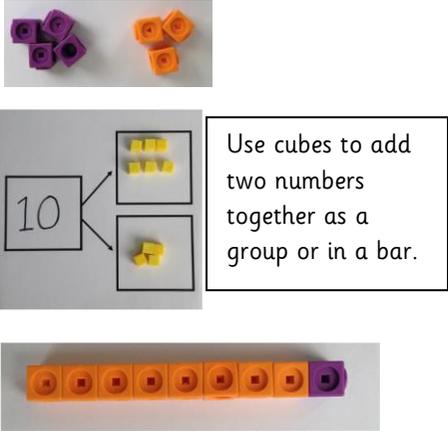
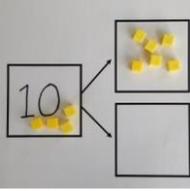
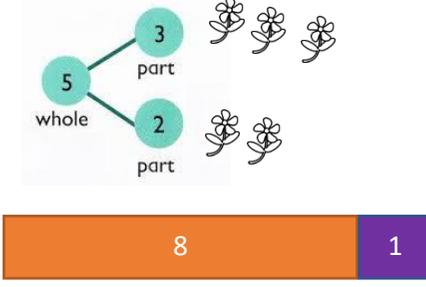
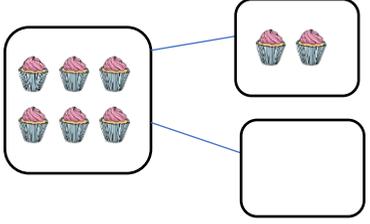
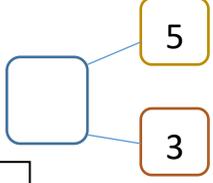
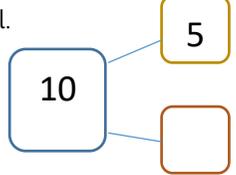


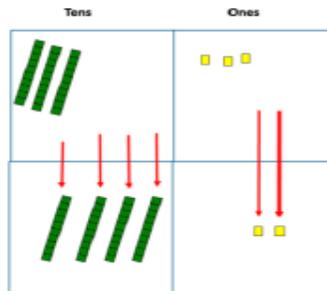
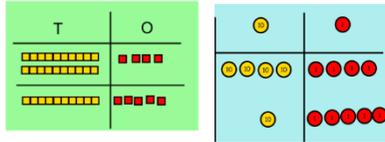
Objectives	Concrete	Pictorial	Abstract	Vocabulary
<p>YEAR ONE</p> <ul style="list-style-type: none"> read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs represent and use number bonds and related subtraction facts within 20 add and subtract one-digit and two-digit numbers to 20, including 0 solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$ 	<p>Concrete</p>  <p>Use cubes to add two numbers together as a group or in a bar.</p> <p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  $4 - 2 + 2$ <p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p> 	<p>Pictorial</p>  <p>Use pictures to add two numbers together as a group or in a bar.</p> <p>Use a pictorial representation of objects to show the part part whole model.</p> 	<p>Abstract</p> <p>$4 + 3 = 7$</p> <p>$10 = 6 + 4$</p>  <p>Use the part-part whole diagram as shown above to move into the abstract.</p> <p>Move to using numbers within the part whole model.</p> 	<p>Vocabulary</p> <p>addition add, more, and make, sum, total altogether double near double half, halve one more, two more ... ten more how many more to make ...? how many more is ... than ...? how much more is ...? subtract take away how many are left/left over? how many have gone? one less, two less, ten less ... how many fewer is ... than ...? how much less is ...? difference between equals is the same as number bonds/pairs missing number</p>

YEAR TWO

- solve problems with addition and subtraction:
- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods
- recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
 - a two-digit number and 1s
 - a two-digit number and 10s
 - 2 two-digit numbers
 - adding 3 one-digit numbers
- show that addition of 2 numbers can be done in any order

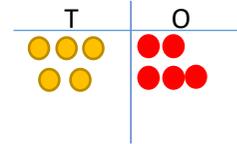
$24 + 15 =$

Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.

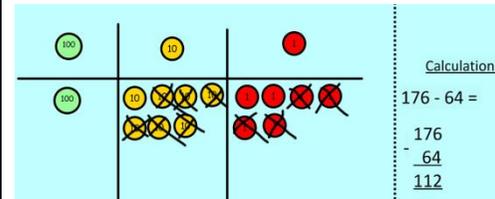
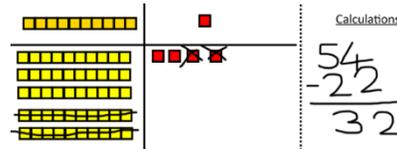


Use Base 10 to make the bigger number then take the smaller number away.

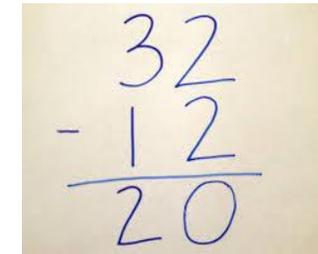
After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.



Draw the Base 10 or place value counters alongside the written calculation to help to show working.



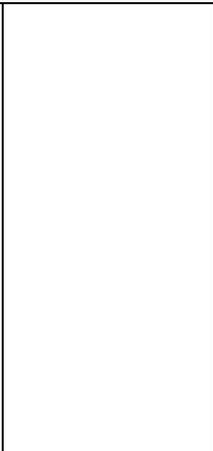
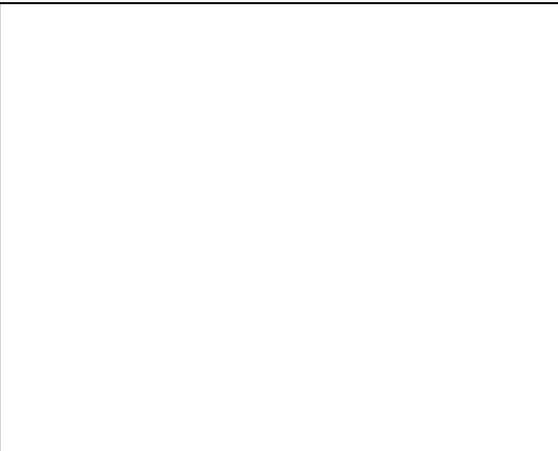
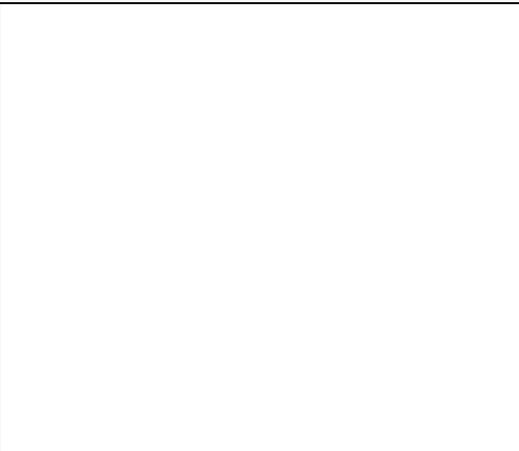
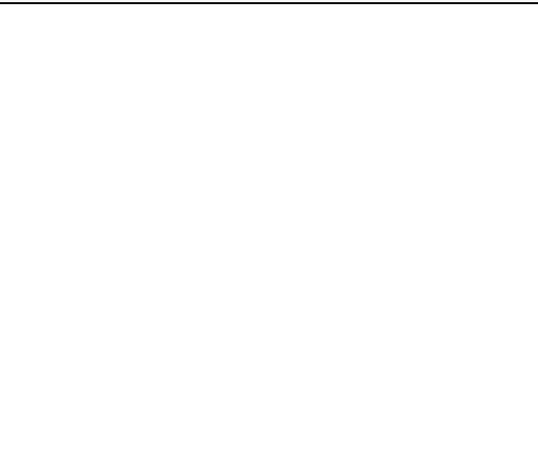
Step 1	Step 2	Step 3
$\begin{array}{r} \text{T} \quad \text{U} \\ 6 \quad 5 \\ + 2 \quad 7 \\ \hline \end{array}$	$\begin{array}{r} \text{T} \quad \text{U} \\ 6 \quad 5 \\ + 2 \quad 7 \\ \hline \quad 2 \\ \hline \quad 1 \end{array}$	$\begin{array}{r} \text{T} \quad \text{U} \\ 6 \quad 5 \\ + 2 \quad 7 \\ \hline 9 \quad 2 \\ \hline \quad 1 \end{array}$



addition add, more, and make, sum, total altogether double near double half, halve one more, two more ... ten more ... one hundred more how many more to make ...? how many more is ... than ...? how much more is ...? subtract take away how many are left/left over? how many have gone? one less, two less, ten less ... one hundred less how many fewer is ... than ...? how much less is ...? difference between equals is the same as number bonds/pairs/facts tens boundary

(commutative) and subtraction of 1 number from another cannot

- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems



YEAR THREE

- add and subtract numbers mentally, including:
 - a three-digit number and 1s
 - a three-digit number and 10s
 - a three-digit number and 100s
- add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex

Make both numbers on a place value grid.

146
+ 527

Add up the units and exchange 10 ones for one 10.

146
+ 527

Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.

A pictorial representation of the addition 146 + 527. It shows a place value grid with counters: 1 hundred (green), 4 tens (blue), 6 ones (red) for 146; and 5 tens (blue), 2 ones (red), 7 ones (green) for 527. The total is 1 hundred, 1 ten, 5 ones, and 1 one.

789 + 642 becomes

7 8 9
+ 6 4 2

1 4 3 1
1 1

Answer: 1431

addition add, more, and make, sum, total altogether double near double half, halve one more, two more ... ten more ... one hundred more how many more to make ...? how many more is ... than ...? how much more is ...? subtract take away how many are left/left over? how many have gone? one less, two less, ten less ... one hundred less how many fewer is ... than ...? how much less is ...? difference between equals is the same as number bonds/pairs/facts missing number

Use Base 10 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

Calculations
234
- 88

Start with the ones, can I take away 8 from 4? I need to exchange one of my tens for ten ones.

Calculations
234
- 88

Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

A place value grid with columns for Hundreds, Tens, and Ones. The grid is divided by vertical lines and a horizontal line for the decimal point. The grid shows 2 hundreds (green), 3 tens (blue), and 4 ones (red) for 234. 8 tens (blue) and 8 ones (red) are crossed out. A 5 is written in the Tens column and a 6 is written in the Ones column. The final result is 3 hundreds, 5 tens, and 1 one.

7 2 8 - 5 8 2 = 1 4 6

874 - 523 becomes

8 7 4
- 5 2 3

3 5 1

Answer: 351

932 - 457 becomes

9 3 2
- 4 5 7

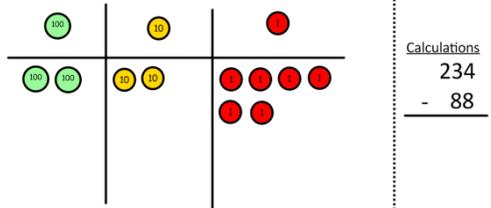
4 7 5

Answer: 475

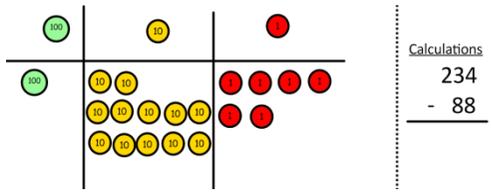
addition add, more, and make, sum, total altogether double near double half, halve one more, two more ... ten more ... one hundred more how many more to make ...? how many more is ... than ...? how much more is ...? subtract take away how many are left/left over? how many have gone? one less, two less, ten less ... one hundred less how many fewer is ... than ...? how much less is ...? difference between equals is the same as number bonds/pairs/facts missing number

addition and subtraction

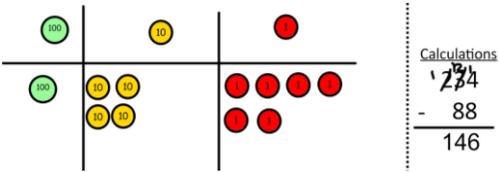
Now I can subtract my ones.



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



Now I can take away eight tens and complete my subtraction



tens boundary,
hundreds
boundary

YEAR FOUR

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

	Thousands	Hundreds	Tens	Ones
+				

	Thousands	Hundreds	Tens	Ones
+	•	••••	••••	••••
	•	••••	••••	••••

$$\begin{array}{r}
 3364 \\
 + 247 \\
 \hline
 3611 \\
 \hline
 11
 \end{array}$$

addition add, more, and make, sum, total altogether double near double half, halve one more, two more... ten more... one hundred more how many more to make ...? how many more is ... than ...? how much more is ...? subtract take away how many are left/left over? how many have gone? one less, two less, ten less ... one hundred less how many fewer is ... than ...? how much less is ...? difference between equals is the same as number bonds/pairs/facts missing number tens boundary, hundreds boundary inverse

YEAR FIVE

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

$$\begin{array}{r}
 3121 \\
 + \quad 148 \\
 \hline
 3306 \\
 \hline
 11
 \end{array}$$

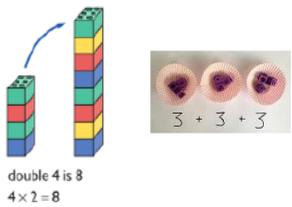
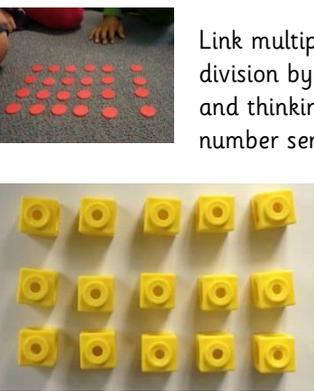
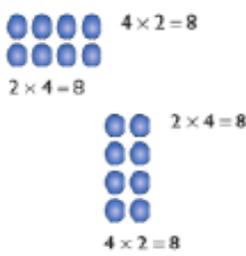
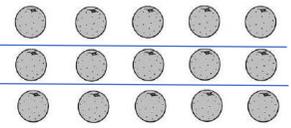
$$\begin{array}{r}
 3.56 \\
 + 2.47 \\
 \hline
 6.03 \\
 \hline
 1
 \end{array}$$

addition add, more, and make, sum, total altogether double near double half, halve one more, two more ... ten more ... one hundred more how many more to make ...? how many more is ... than ...? how much more is ...? subtract take away how many are left/left over? how many have gone? one less, two less, ten less ... one hundred less how many fewer is ... than ...? how much less is ...? difference between equals is the same as number bonds/pairs/facts missing number tens boundary, hundreds boundary, ones boundary, tenths boundary inverse

$$\begin{array}{r}
 42 \\
 6432 \\
 786 \\
 + \quad 3 \\
 \hline
 11944 \\
 \hline
 1121
 \end{array}$$

$$\begin{array}{r}
 401.20 \\
 26.85 \\
 + \quad 0.71 \\
 \hline
 428.76 \\
 \hline
 1
 \end{array}$$

When adding decimals with different numbers of decimal places, children should be taught and encouraged to make them the same through identification that 2 tenths is the same as 20 hundredths, therefore, 0.2 is the same value as 0.20.

Objectives	Concrete	Pictorial	Abstract	Vocabulary
<p>YEAR ONE</p> <ul style="list-style-type: none"> 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 	 <p>double 4 is 8 $4 \times 2 = 8$</p> <p>$3 + 3 + 3$</p>	<p>Double 4 is 8</p>  <p>There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?</p>  <p>2 add 2 add 2 equals 6</p>	<p>$4 \times 2 = 8$</p>  <p>$2 + 2 + 2 + 2 = 10$</p> <p>Share 9 buns between three people.</p> <p>$9 \div 3 = 3$</p>	<p>multiplication multiply multiplied by multiple division dividing grouping sharing doubling halving array number patterns</p>
<p>YEAR TWO</p> <ul style="list-style-type: none"> recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot solve problems involving multiplication and division, using materials, arrays, repeated 	 <p>Link multiplication to division by creating an array and thinking about the number sentences that can be created.</p> <p>$15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$</p>	<p>Draw arrays in different rotations to find</p>  <p>$4 \times 2 = 8$ $2 \times 4 = 8$ $2 \times 4 = 8$ $4 \times 2 = 8$</p> <p>commutative multiplication sentences.</p> 	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  <p>$5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$</p>	<p>multiplication multiply multiplied by multiple groups of times once, twice, three times ... ten times repeated addition division dividing, divide, divided by, divided into grouping sharing, share, share equally left, left over one each, two each, three each ... ten each group in pairs, threes ... tens equal groups of doubling halving array row, column number patterns multiplication</p>

addition, mental methods, and multiplication and division facts, including problems in contexts

$96 \div 3 = 32$

$20 \div 5 = ?$
 $5 \times ? = 20$

$28 \div 7 = 4$

Divide 28 into 7 groups. How many are in each group?

table multiplication fact, division fact

YEAR THREE

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and **progressing to formal written methods**
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Show the link with arrays to first introduce the grid method.

4 rows of 10
4 rows of 3

Move on to using Base 10 to move towards a more compact method. 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.

we are finding groups of a number. We are multiplying by 4 so we need 4 rows.

Calculations
 4×126

Calculations
 4×126

Calculations
 4×126

Calculations
 4×126

$24 \times 3 = 72$

X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

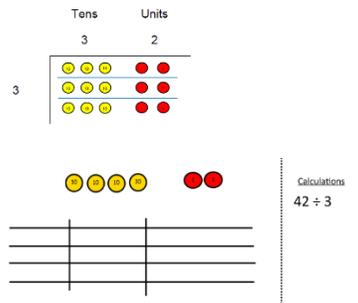
X	30	5
7	210	35

$210 + 35 = 245$

24 x 6 becomes

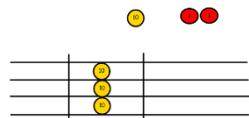
Answer: 144

multiplication multiply multiplied by multiple, factor groups of times product once, twice, three times ... ten times repeated addition division dividing, divide, divided by, divided into left, left over, remainder grouping sharing, share, share equally one each, two each, three each ... ten each group in pairs, threes ... tens equal groups of doubling halving array row, column number patterns multiplication table multiplication fact, division fact

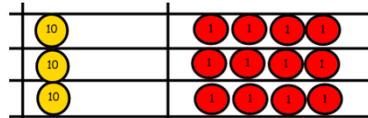


$$42 \div 3 =$$

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.

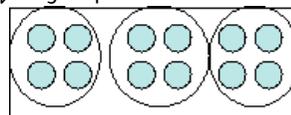


We exchange this ten for ten ones and then share the ones equally among the groups.



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

Children 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.

$$\begin{array}{r} 218 \\ 3 \overline{) 872} \end{array}$$

Move onto divisions with a remainder.

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

YEAR FOUR

- recall multiplication and division facts for multiplication tables up to 12×12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout

342×7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \end{array}$$

Answer: 2394

2741×6 becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \end{array}$$

Answer: 16 446

multiplication multiply multiplied by multiple, factor groups of times product once, twice, three times ... ten times repeated addition division dividing, divide, divided by, divided into left, left over, remainder grouping sharing, share, share equally one each, two each, three each ... ten each group in pairs, threes ... tens equal groups of doubling halving array

<ul style="list-style-type: none"> solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects 				<p>row, column number patterns multiplication table multiplication fact, division fact inverse square, squared cube, cubed</p>
<p>YEAR FIVE</p> <ul style="list-style-type: none"> identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers establish whether a number up to 100 is prime and recall prime numbers up to 19 multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including 			<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid red; padding: 5px;"> $\begin{array}{r} 24 \times 16 \text{ becomes} \\ \begin{array}{r} 2 \ 4 \\ \times 1 \ 6 \\ \hline 2 \ 4 \ 0 \\ 1 \ 4 \ 4 \\ \hline 3 \ 8 \ 4 \end{array} \\ \text{Answer: 384} \end{array}$ </div> <div style="border: 1px solid red; padding: 5px;"> $\begin{array}{r} 124 \times 26 \text{ becomes} \\ \begin{array}{r} \\ \ 4 \\ \times \ 6 \\ \hline 2 \ 4 \ 8 \ 0 \\ 7 \ 4 \ 4 \\ \hline 3 \ 2 \ 2 \ 4 \\ \\ \hline \end{array} \\ \text{Answer: 3224} \end{array}$ </div> </div> <div style="border: 1px solid red; padding: 5px; margin-top: 10px;"> $\begin{array}{r} 124 \times 26 \text{ becomes} \\ \begin{array}{r} \\ \ 4 \\ \times \ 6 \\ \hline 7 \ 4 \ 4 \\ 2 \ 4 \ 8 \ 0 \\ \hline 3 \ 2 \ 2 \ 4 \\ \\ \hline \end{array} \\ \text{Answer: 3224} \end{array}$ </div>	<p>multiplication multiply multiplied by multiple, factor groups of times product once, twice, three times ... ten times repeated addition division dividing, divide, divided by, divided into left, left over, remainder grouping sharing, share, share equally one each, two each, three each ... ten each group in pairs, threes ... tens equal groups of</p>

long multiplication for two-digit numbers

- multiply and divide numbers mentally, drawing upon known facts
- **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
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000
- recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r} 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r} 1 \\ 11 \overline{) 496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer: $45 \frac{1}{11}$

doubling halving array
row, column number
patterns multiplication
table multiplication
fact, division fact,
inverse square,
squared cube, cubed

YEAR SIX

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- 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
- 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
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \\ \underline{300} \\ 132 \\ \underline{120} \\ 12 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{300} \\ 132 \\ \underline{120} \\ 12 \end{array} \begin{array}{l} 15 \times 20 \\ 15 \times 8 \end{array}$$

$$\frac{12}{15} = \frac{4}{5}$$

Answer: $28 \frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 28 \cdot 8 \\ 15 \overline{) 4320} \\ \underline{300} \downarrow \\ 132 \downarrow \\ \underline{120} \downarrow \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28·8

multiplication multiply multiplied by multiple, factor groups of times product once, twice, three times ... ten times repeated addition division dividing, divide, divided by, divided into left, left over, remainder grouping sharing, share, share equally one each, two each, three each ... ten each group in pairs, threes ... tens equal groups of doubling halving array row, column number patterns multiplication table multiplication fact, division fact inverse square, squared cube, cubed