Watcombe Progression in Teaching and Learning Multiplication

Year and Notes	Children's Written Calculations	Models & Images	Mental Calculations/Known Facts

Year and Notes

Year 3 -

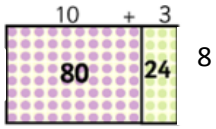
National Curriculum *Choose an appropriate strategy to solve a calculation based upon the numbers involved (recall a known fact, calculate mentally, use a jotting, written method)*
Understand that division is the inverse of multiplication and vice versa
Understand how multiplication and division statements can be represented using arrays
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
Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy Solve problems, including missing number problems, involving multiplication and division *(and interpreting remainders),* including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Guidance

Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication.
Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?;

Children's Written Calculations

Grid method of multiplication



Column Multiplication

Expanded:

10 3

x **8**

80 24

104

Compacted:

1 3

x **8**

104

2

Short multiplication

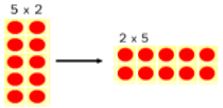
24 x 6 becomes

2 4
× **6**
1 4 4
2

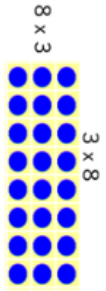
Answer: 144

Models & Images

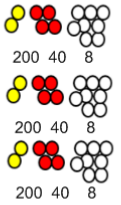
Use of manipulatives -



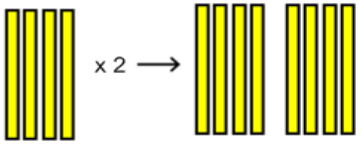
Use numicon to demonstrate commutative property



Use place value counters for repeated addition to



Use dienes to calculate how much a number would be so many times in larger numbers



Counting stick times tables

Mental Calculations/Known Facts

Multiply numbers mentally –
Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (for example, 30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
Multiply a number by doubling and doubling again
Multiply a 2 digit whole number by 10
Place value calculations such as 70 x 3

Instant recall

Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
Derive and use doubles of all numbers to 100 and corresponding halves
Derive and use doubles of all multiples of 50 to 500
Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.
Double 15, 25, 35, 45
Mental recall of 2, 3, 4, 5, 8 and 10 times tables
Begin to know times table facts for 6x, 7x, 8x and 9x

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Year 4 -

National Curriculum

Choose an appropriate strategy to solve a calculation based upon the numbers involved (recall a known fact, calculate mentally, use a jotting, written method)

Multiply two-digit and three-digit numbers by a one-digit number using formal written layout

Use estimation and inverse to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

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

Guidance

Pupils practise to become fluent in the formal written method of short multiplication.

Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4)).

They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 6 = 60.

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu.

Column Multiplication

Expanded:

100	30	3
x		3
300	90	9

399

100	50	3
x		4
400	200	12

612

Compact:

Short multiplication

24 × 6 becomes

	2	4
×		6
1	4	4
	2	

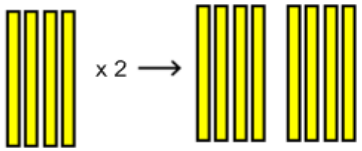
Answer: 144

	1	5	3
x			4
6	1	2	
	2	1	

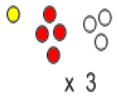
Answer: 612

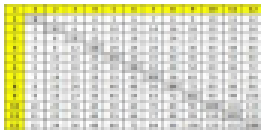
Use of manipulatives -

Use dienes to calculate how much a number would be so many times in larger numbers

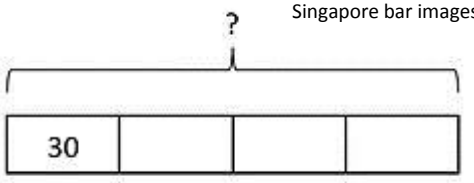


Use tables facts to calculate





Singapore bar images



30 × 4 = 120

Multiply numbers mentally –

Use partitioning to double or halve any number, including decimals to one decimal place

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.

Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example 600 ÷ 3 = 200 can be derived from 2 x 3 = 6).

Use place value to multiply a whole number by 10 or 100

Multiply two multiples of 10 together, e.g. 40 x 30

Times tables & PV calculations with decimals such as 0.7 x 3

Instant recall

Recognise and use factor pairs and commutativity in mental calculations

Recall multiplication and division facts for multiplication tables up to 12 × 12

Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency.