Calculation Policy: Multiplication

Objectives taken from Strand 3: Knowing and Using Number Facts Strand 4: Calculating

FS	Calculating strand: MULTIPLICATION	Y1 MUST
SHOULD End of year expectations	Observe number relationships and patterns in the environment and use these to derive facts (FS) *Pupil learning outcomes: (will change depending on strategy: see below) e.g.* Count repeated groups of the same size (FS) *Pupil learning outcomes: e.g. I can sort real objects into equal sets*	

Methods

Sort real objects and pictures into sets of equal number while counting aloud.

Use groups of children to count in pairs. For example: encourage children to share small outdoor equipment in pairs.

Move along an outdoor number line, for example jumping forward in twos.

Use washing lines for group activities or small number lines next to resources.

Use puppets to demonstrate counting along a number track or number line.

1	2	3	4	5	6	7	8	9	10

How many sides are there altogether?

Context: Real-life counting opportunities - counting wellington boots and gloves Question the children. For example: we know how many children there are in the class, but do we know how many feet/hands are in the class? Have we got enough wellington boots for all those feet? Are there enough gloves for all those hands? How could we find out? Children could make their suggestions and have a go at their solutions. They may try: matching objects to children; counting in ones, matching their counting to feet; mark making using pictures or tallies or counting in twos for each child.

Show photographs of hands on the interactive whiteboard or on a felt board so they can be moved. Ask the children to arrange them so they can be counted easily. Count together in twos. Make mistakes, leaving out a number or adding in an odd number. Let the children correct you. Can they work out how many fingers are on those hands, use a variety of strategies e.g. tallies, pictures, counting in sets, etc.

Share books and exploit the number potential, e.g. looking for number patterns in a number rhyme book.

Vocabulary

zero, ten, twenty... one hundred, count, count (up) to count on (from, to) count back (from, to) count in ones, twos... tens..., how many times? pattern, estimate ,double, sort, equal, sets of

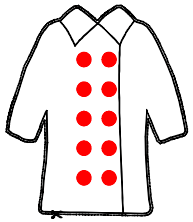
Test Questions

I will clap where a number is missing.
1 2 3 [one clap] 5
Tell me the missing number.

I will clap where a number is missing.
2 4 6 [one clap] 10
Tell me the missing number.

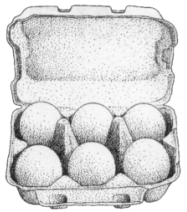
I will clap where a number is missing.
20 40 60 [one clap] 100
Tell me the missing number.

How many buttons are there on this coat?
Count them in twos.
Count them in fives.



Count the pairs of animals on the Ark

How are the eggs arranged in the egg box?



How many eggs are there altogether in the box?

Count these pairs of socks.
How many pairs are there?
How many socks are there altogether?

There are five paintbrushes in each jar. Count the paintbrushes.

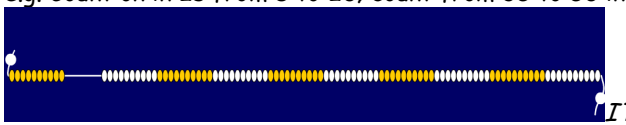
Opportunities for children to explore and apply Share rhymes and songs that involve counting in twos, fives and tens forwards and backwards, for example '2, 4, 6, 8, Mary at the cottage gate'; '1, 2, buckle my shoe'; '10 fat sausages sizzling in the pan'. Provide resources for retelling these rhymes independently through rhyme sacks or scanned images for the interactive whiteboard or a story board. Encourage counting in groups of the same size during role-play. For example: we'll need enough for 6 of us. 2, 4, etc. If 2 can fit on each seat in the train, how many passengers can you take? 2, 4, etc. When organising groups, ask whether they can get in pairs to go to lunch. Have we got everyone? Let's see, that's 2, 4, etc. Provide transparent number squares and glass beads on light boxes or OHPs for pattern making. Model covering up every other one or covering up the row of tens and counting out the pattern. Can they make their own patterns? Put up pictures, for example balloons, on an interactive whiteboard or felt board and numerals in multiples of 2, 5 or 10. The objects can be sorted into sets, numbered and counted.		

Year 1	Calculating strand: MULTIPLICATION	FS COULD / Y2 MUST
SHOULD End of year expectations in bold	Count on or back in ones, twos, fives and tens and use this knowledge to derive the multiples of 2, 5 and 10 to the tenth multiple (Y1) *Pupil learning outcomes (changes depending on unit) e.g.: I can find the number that is ten more or ten less for a particular tens number* Solve practical problems that involve combining groups of 2, 5 or 10 (Y1) *Pupil learning outcomes (changes depending on unit) e.g.: I am beginning to count in 5s*	

Methods

Use models and images e.g. beads to count on in 2s, 5s and 10s

e.g. Count on in 2s from 8 to 20; count from 35 to 50 in 5s; count back in 10s from 80 to 50



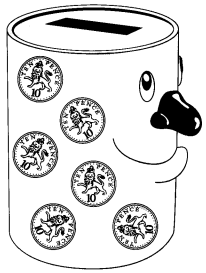
ITP Counting on and back

Use Number Line in Maths Pack 1

Count 2p coins, for example by tapping the coin twice on the table to remember that it is worth 2p.

Ask questions such as: how many 2ps make 12p? What is the value of 4 2ps?

Use Money Machine and Coin Drag in Teaching Money

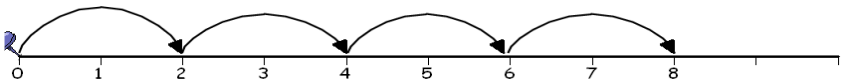


Listen as 10p coins are dropped in a tin one by one, keeping a count and saying how much money is in the tin.

There is 20p in the tin, listen as 5p coins are dropped in one by one. How much money is in the tin altogether?

Use a fully <u>marked</u> number line to represent multiplication as repeated addition, working towards an empty number line as children become more successful, eg

2+2+2+2=8



Use the 100 square to count on in 2s, 5s and 10s

What number comes next?
Describe the pattern. Will 45 be in the pattern? Why?

Use ITP or Primary Games - Paint Squares in Teaching Tables.

Assessment for Learning (AfL)

For AfL questions, see primary framework planning tools

www.standards.dfes.gov.uk/primaryframeworksmathematics/planning/Year1/relationships/Unit1/

Vocabulary

problem, solution, calculate, calculation, number sentence, answer, method, explain, money, coin, pence, penny, pound, pay, change, buy, sell, price, spend

number sequences, zero, ten, twenty... one hundred count (up) to ,count on (from, to), count in ones, twos... tens...

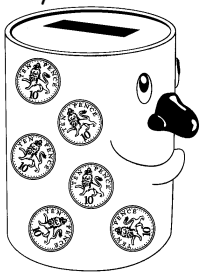
more, many, odd, even, how many times?

pattern, pair, multiple

Test Questions

Count five hops of two along this number line. What number will you reach? (oral question)

How much money is in the money box?



KS1 2001 Level 2c

Write the next number in this sequence:
Five, ten, fifteen, twenty ...
KS1 2001 Level 2c [oral]

How many  coins make 20p?

KS1 2005 Level 2b

The numbers in the shaded squares make a sequence. Continue the sequence by shading more squares.

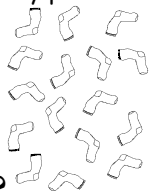
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

KS1 2001 Level 2c

There are 10 crayons in each box.

How many crayons are there altogether? KS1 2000 Level 2c

How many pairs of socks are



there?

Year 2	Calculating strand: MULTIPLICATION	Y1 COULD / Y3 MUST
SHOULD End of year expectations in bold	Derive and recall multiplication facts for the 2, 5 and 10 times-tables and recognise multiples of 2, 5 and 10 (Y2) *Pupil learning outcomes (changes depending on unit) e.g.: I can count in steps of 2, 5 or 10* Represent repeated addition and arrays as multiplication, use practical and informal written methods and related vocabulary to support multiplication (Y2) *Pupil learning outcomes (changes depending on unit) e.g.: I can use a number line to do multiplication*	

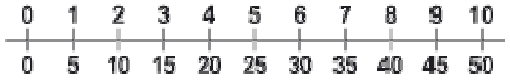
Methods

Strategies to support Knowing and Using Number Facts Objectives

Establish multiplication and division facts for the **2, 5 and 10 times-tables** by counting in twos, fives and tens. If necessary, use practical apparatus, counting or drawing to support pupils. Respond to questions such as: *Count on seven twos. Where do you finish? What are eight fives?*

Chant the tables in unison, using rhythm and the patterns of words to help them to commit facts to memory. Children say: *One five is five. Two fives are ten. Three fives are fifteen ...*so that the answer to *How many 5s make 30?* relates closely to the wording.

Support chanting of tables with a counting stick or number line. This helps to establish the relationship between the increasing steps and corresponding products.

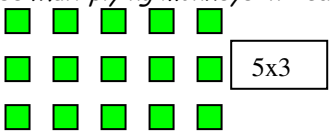


Written Methods

Use an **empty** number line or an array to represent multiplication as repeated addition

5 x 3 = "5 multiplied by three" or "5 times 3" or "5, three times"

Use Multiplying monkeys in Teaching Tables for arrays



Recognise the use of symbols such as ☐ or △ to stand for unknown numbers or signs.

△ X 5 = 25 5 X ☐ =

Assessment for learning (AfL)

See primary framework planning tools - AfL questions within the relevant units

www.standards.dfes.gov.uk/primaryframeworksmathematics/planning/Year2/relationships/Unit1/

Vocabulary

calculate, calculation, inverse, answer, explain, method, sign, operation, symbol, number sentence, number line, mental calculation, written calculation, informal method, jottings, diagrams, pictures, images

lots of, groups of ,x sign, times, multiply, multiplied by ,multiple of, once, twice, three times ,four times, five times... ten times... times as (big, long, wide and so on) ,repeated addition, array ,row , column double,

Test Questions

There are 4 apples in each pack. Mrs Pullen buys 3 packs of apples. How many apples does she buy?
KS1 2001 Level 2b

Ella's dad washes some cars. He uses 12 buckets of water. Each bucket has 5 litres of water.

How many litres of water does he use altogether? KS1 2004 Level 2a

---

4 + 4 + 4 +4 + 4 = 20

Write this addition fact as a multiplication fact.

_____ × _____ = _____

TIMSS Grade 4 1995

Write the missing number in the box.

5 × 4 = 10 × ☐ KS1 2002 Level 3

Draw rings around all the multiples of 5.

45 20 54 17 40

KS1 2005

Write the missing number in the box.

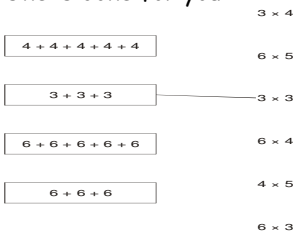
☐ × 5 = 50 KS1 2001 Level 2b

Circle two numbers that add to make a multiple of 10.

11 12 13 14 15 16 17 18 19

KS2 2005 Level 3 (adapted)

Match each addition to a multiplication. One is done for you



KS1 2004 Level 3

Year 3	Calculating strand: MULTIPLICATION	Y2 COULD / Y4 MUST

SHOULD End of year expectations in bold

Derive and recall multiplication facts for the 2, 3, 4, 5, 6 and 10 times-tables , recognise multiples of 2, 5 or 10 up to 1000 (Y3)

Pupil learning outcomes (changes depending on unit) e.g.: I know the 2, 3, 4, 5, 6 and 10 times-tables:

Multiply one- and two-digit numbers by 10 or 100, and describe the effect (Y3)

Pupil learning outcomes (changes depending on unit) e.g.:.I can multiply a number by 10 or 100

Use practical and informal written methods to multiply two-digit numbers (e.g. 13 × 3)(Y3)

Pupil learning outcomes (changes depending on unit /written method) e.g I can multiply a 'teen' number by 2, 3, 4, 5 or 6

Written Methods

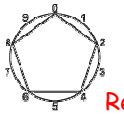
Knowing and Using Number Facts

Know by heart the 2, 3, 4, 5, 6 and 10 multiplication facts and use them to solve questions like: If I have three 5p coins, how much money do I have? How many sides do six triangles have? There are 20 legs. How many zebras is this?

Count on and back from zero in steps of 2, 3, 4, 5, 6 and 10 to answer questions like: What is 4 multiplied by 6? How many 3s make 21?

Generate tables such as the 6 times-table from the 3 times-table by doubling, and generate other tables, in this case the 12 times-table, by doubling again. Use facts in the 2 times-table to derive the 20 times-table by multiplying by 10. Recognise multiples of 2, 5 and 10 up to 1000.

Research questions such as: *What digits can multiples of 2 end in? What about multiples of 3, multiples of 4?* Investigate by joining the last digits of each multiple in order on a digit wheel. For example, the last digits of the multiples of 2 (**2** , **4** , **6** , **8** , **10** , **12** , **14** , **16** , **18** , **20** , **22**) form this pentagon:



Record the outcomes of this enquiry by recording in a table the number, the last digits of its multiples and the shape that they form on the digit wheel. Use the results to answer questions such as: Can 113 be a multiple of 5? How do you know? Can a multiple of 4 ever end in a 7?

Understand the relationship between multiplication and division. For Example state two multiplication sentences and two division sentences that relate to a particular array, for example:

5 × 2=10, 2 × 5=10 10 ÷2=5, 10 ÷5=2

Assessment for Learning (AfL)

See primary framework planning tools - AfL questions within the relevant units www.standards.dfes.gov.uk/primaryframeworks/mathematics/planning/Year3/relationships/Unit1

Vocabulary

problem, solution, calculate, calculation, inverse, answer, method, explain, predict, estimate, reason, operation, symbol, number sentence, equation, mental calculation, written calculation, informal method, jottings, number line, pound (£), penny/pence (p), note, coin, units of measurement and their abbreviations

lots of, groups of ,x sign, times, multiplication multiply, multiplied by, multiple of, product, once, twice, three times, four times, five times... ten times... times as (big, long, wide and so on) ,repeated addition array , row, column, double

Test Questions

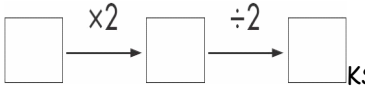
The shop is open for 6 days each week.
It is open for 8 hours each day.
How many hours is the shop open each week?
Show how you work it out.
KS1 2005 Level 3

Circle three numbers that add to make a multiple of 10. KS2 2005 Paper A Level 3

11 12 13 14 15 16 17 18 19

Calculate 13 × 3.
Y3 optional test 2003 Paper A Level 3

Write a number in each box to make this correct.



KS1 '05 L3

Write the answer. 24x4=
KS1 2005 Level 3

A bus ticket costs 25p.
How much will 5 of these tickets cost? KS1 1998 Level 3

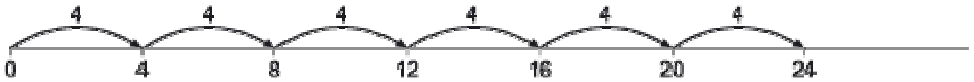
What is four multiplied by nine?
KS2 2005 Mental Test Level 4

Multiply seven by six.
KS2 2003 Mental Test Level 4

Write what the missing numbers could be.
□ × □ = 150
Y4 Optional Test 2003 Paper A Level 3

Written Methods

Review multiplication as repeated addition by counting hops on a number line. For example, find 6 fours by making 6 hops of 4.



Use practical and informal methods to solve simple TU × U calculations. For example, to find 12 × 5 understand that 10 fives are 50 and add on another 2 fives to make 60.

Explain how to multiply a number by 10 or 100. Extend this to multiply one-digit numbers by multiples of 10, recording methods informally.

Use partitioning to **multiply two-digit numbers by one-digit numbers**. For example, work out 13 × 3 by finding 10 × 3 and adding 3 × 3. Record working using informal methods:

Informal recording in Year 3 involving partitioning might be:

15 x 3 =

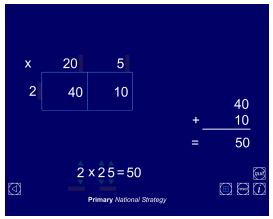
10 + 5

↓ ↓ X3

30 + 15 = 45

×	10	3
3	30	9

30 + 9 = 39



ITP Multiplication Grid

Year 4	Calculating strand: MULTIPLICATION	Y3 COULD / Y5 MUST

SHOULD End of year expectations in bold

Derive and recall multiplication facts up to 10 × 10 and multiples of numbers to 10 up to the tenth multiple (Y4)

Pupil learning outcomes (changes depending on unit) e.g.: I can *count in 6s from zero to 60*

Multiply numbers to 1000 by 10 and then 100 (whole number answers), understanding the effect; relate to scaling up (Y4)

Develop and use written methods to record, support and explain multiplication of two-digit numbers by a one-digit number e.g. 15 × 9 (Y4)

Pupil learning outcomes (changes depending on unit) e.g.: *I can use a written method to multiply a two-digit number by a one-digit number*

Written Methods

Knowing and Using Number Facts

Count on and back from zero in steps of 2, 3, 4, 5, 6 and 10 to answer questions like: *What is 6 multiplied by 8?* and *How many 4s make 36?*

Derive and recall multiplication facts for the 2, 3, 4, 5, 6 and 10 times-tables and state corresponding division facts. Use these facts to answer questions like: A box holds 6 eggs. How many eggs are in 7 boxes? Leila puts 4 seeds in each of her pots. She uses 6 pots and has 1 seed left over. How many seeds did she start with?

Develop knowledge of multiples of 7. Respond to problems such as: There are exactly 7 weeks until my birthday. How many days is that? There are 56 days until my holiday. How many weeks do I have to wait? Recognise that previously learned facts can help to remember multiples, e.g. a multiple of 7 is the sum of a multiple of 3 and a multiple of 4.

Investigate patterns and relationships. For example, add together the digits of any multiple of 3 and generalise to help recognise two-and three-digit multiples of 3.

Using the 'Number dials' ITP use knowledge of number facts and place value to derive new facts; for example, by knowing 8 × 4 = 32 derive the answers to 80 × 4 and 320 ÷ 4.

Multiply and divide numbers up to 1000 by 10 and then 100. Understand and can explain that when a number is divided by 100 the digits of the number move two places to the right and when a number is multiplied by 100 the digits move two digits to the left.

Apply knowledge of multiplying by 10 and 100 to solve problems involving scaling, such as: *A giant is 100 times bigger than you. How wide is the giant's hand span? How long is the giant's foot?*

Assessment for Learning (AfL)

See primary framework planning tools - AfL questions within the relevant units www.standards.dfes.gov.uk/primaryframeworks/mathematics/planning/Year4/relationships/Unit3/

Vocabulary

calculate, calculation, equation, operation, symbol, inverse, answer, method, explain, predict, reason, reasoning, pattern, relationship, decimal, decimal point, decimal place, pound (£), penny/pence (p), units of measurement and abbreviations, degrees Celsius

lots of, groups of , times, multiplication, multiply multiplied by, multiple of, product , once, twice, three times, four times, five times... ten times times as (big, long, wide, and so on) repeated addition ,array row, column double, factor inverse

Test Questions

Sita worked out the correct answer to 16 × 5. Her answer was 80.
Show how she could have worked out her answer. KS1 2004 Level 3

What is fifty-six multiplied by ten?
KS2 1997 Mental Test Level 3

What is four multiplied by nine?
KS2 2005 Mental Test Level 4

Multiply seven by six.
KS2 2003 Mental Test Level 4

Circle all the multiples of 8 in this list of numbers.

18 32 56 68 72

KS2 2002 Paper A Level 4

Calculate 58 × 6.
KS2 1998 Paper A Level 4

Write in the missing numbers.
4 × □ = 200
KS2 2002 Paper A Level 3

Here is a number sentence.

4 × □ < 17

Which number could go in the box to make the sentence true?

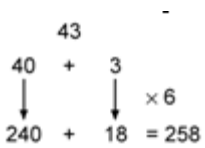
A 4
B 5
C 12
D 13

Write a calculation that you could do to check that the answer to 53 × 4 is 212.

Write in the missing digit.
□7 × 9 = 333
KS2 1996 Paper A Level 4

Written Methods

Continue to use informal jottings for 2-digit by one digit e.g. 43 x 6 = 258



The Grid Method

Use knowledge of multiplication facts to 10x10 to develop written methods for multiplying a **two-digit** by a **one-digit** number. When calculating 38 ×7 approximate first (approximately 40 ×10 =400), partition into 30 ×7 and 8 ×7 and represent this on a grid.

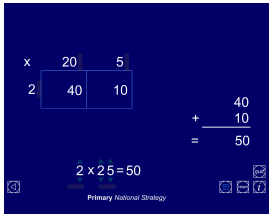
38 ×7 =(30 ×7) +(8 ×7) =210 +56 =266

×	7
30	210
8	56
	266

The number with the most digits is always placed in the left-hand column of the grid so that it is easier to add the partial products.

Develop and use written methods to record, support and explain multiplication of two-digit numbers by a one-digit number.

One length of the swimming pool is 25 metres
Jane swims 5 lengths of the pool.
How far does Jane swim altogether?
Kiz swims 225 metres in the pool.
How many lengths does he swim?
Explain how you solved these problems. Could you have done them differently?



ITP Multiplication Grid and BBC Skillswise.

Year 5	Calculating strand: MULTIPLICATION	Y4 COULD / Y6 MUST

SHOULD End of year expectations in bold

Recall quickly multiplication facts up to 10 × 10, use to multiply pairs of multiples of 10 and 100 (Y5)

Pupil learning outcomes (changes depending on unit) e.g.: I can use tables facts to multiply multiples of 10 and 100

Extend mental methods for whole-number calculations, e.g. to multiply a two-digit by one-digit number (e.g. 12 × 9), to multiply by 25 (e.g. 16 × 25)(Y5)

Pupil learning outcomes (changes depending on unit) e.g.: I can use different mental strategies for multiplication depending on the numbers involved. I can explain why I chose a particular method

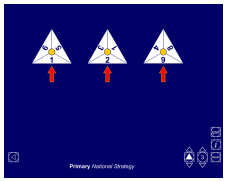
Refine and use efficient written methods to multiply HTU × U, TU × TU, U.t × U (Y5)

Pupil learning outcomes (changes depending on unit) e.g.: I can solve multiplication calculations using written methods. I can explain each step

Written Methods

Knowing and Using Number Facts

Continue to secure speed of recall of multiplication tables to 10 × 10. Use this knowledge to recall, for example, 8 squared or the seventh multiple of 8. Derive families of calculations such as 8 × 3, 80 × 3, 800 × 3, 80 × 30, 80 × 300.



Number Spinners ITP e.g. 12 x 9

Moving Digits ITP

Identify the factors of a two-digit number such as 56 by listing its factor pairs: 1 and 56, 2 and 28, 4 and 14, 8 and 7. Establish that 70 and 8, and 7 and 80, are factor pairs of 560. Use lists of factors to find common factors of two numbers such as 36 and 54. Find common multiples of two numbers such as 8 and 12, identifying 24, 48 and 72 as numbers in a sequence of common multiples.

Multiply and divide whole numbers and decimals by 10, 100 and 1000, describing the effects. Recognise, for example, that 3400 is 100 times larger than 34 and that 0.4 is 10 times smaller than 4. Round whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number, and use this to find approximate answers to calculations.

Assessment for Learning (AfL)

See primary framework planning tools - AfL questions within the relevant units

www.standards.dfes.gov.uk/primaryframeworks/mathematics/planning/Year5/relationships/Unit2

Vocabulary

calculate, calculation, equation, operation, symbol, inverse, answer, method, strategy, explain, predict, reason, reasoning, pattern, relationship, decimal, decimal point, decimal place, estimate, approximate, pound (£), penny/pence (p), units of measurement and abbreviations, degrees Celsius

lots of, groups of,times, multiply, multiplication, multiplied by ,multiple of, product, once, twice, three times, four times, five times... ten times times as (big, long, wide, and so on) ,repeated addition, array, row, column, factor, inverse

Test Questions

Here are five digit cards.

0	1	4	5	8

Use all five digit cards to make this correct.

□□ × 2 = □□□

KS2 2004 Paper B Level 3

This relationship connects the number of pencils and the number of boxes.

number of pencils = number of boxes × 12

How many pencils are in 18 boxes?

Y5 Optional Test 1998 Paper B Level 4

John says: 'Multiples of 4 always end in 2, 4, 6 or 8.'

Is he correct? Write YES or NO. Explain how you know.

Use the digits 2, 3 and 4 once to make the multiplication which has the greatest product.

□□ × □

KS2 2004 Paper B Level 4

An apple costs seventeen pence. How much will three cost?

Y4 optional test 1999 Mental Test L4

Written Methods

Use partitioning to multiply and divide whole numbers by a one-digit number, using jottings to help. For example, find 73 × 5 by adding 70 × 5 to 3 × 5, link mental methods to the written methods that children use.

Refine and use efficient written methods to multiply whole numbers and decimals. Approximate first then check answers. Discuss when to record methods and how the method helps children to keep track of the steps to an answer that they can use to check later.

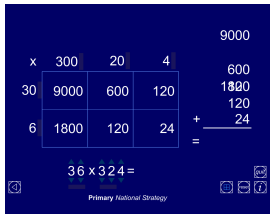
Begin to recognise the efficiency of different methods

TU x TU

47 × 36

(estimate: 50 × 40 = 2000)

×	40	7	
30	1200	210	1410
6	240	42	282
			1692



Mulitplication Grid ITP

HTU x U

327 x 6

X	300	20	7	
6	1800	120	42	1800

120
+ 42
1962

Use the grid method to solve U.t x U

4.9 x 3

X	4.0	0.9
3.0	12.0	2.7

12.0
+ 2.7
14.7

Year 6	Calculating strand: MULTIPLICATION	Y5 COULD
SHOULD End of year expectations in bold	**Use knowledge of place value and multiplication facts to 10x10 to derive related multiplication facts involving decimals, e.g. 0.8x7** Use knowledge of multiplication facts to derive quickly squares of numbers to 12 × 12 and the corresponding squares of multiples of 10 (Y6) *Pupil learning outcomes (changes depending on unit) e.g.: I can say the squares of numbers to 12 × 12 and work out the squares of multiples of 10* Calculate mentally with integers and decimals: TU × U, U.t × U, (Y6) *Pupil learning outcomes (changes depending on unit) e.g. I can use different mental strategies for multiplication depending on the numbers involved. I can explain why I chose a particular method* **Use efficient written methods to multiply integers and decimals by a one-digit integer, and to multiply two- and three-digit integers by a two-digit integer (Y6)** *Pupil learning outcomes (changes depending on unit) e.g.: I can use efficient written methods to multiply whole numbers and decimals*	

Written Methods

Knowing and Using Number Facts

Continue to consolidate knowledge of multiplication facts. For example work out numbers in the 13 times-table by combining multiplication facts from the 10 and 3 times-tables.

Work out products and quotients involving decimals (e.g. 0.6 × 8 and 5.6 ÷ 8) using facts from the 8 times-table. Given a fact such as 17 × 14 = 238, work out 18 × 14 = 252 by adding a further 14. Similarly, multiplying by a near-multiple of 10, such as 51 or 49, multiply by the multiple of 10 and adjust by adding or subtracting the appropriate number.

Derive quickly the square numbers to 12 × 12 and squares of multiples of 10, such as 40 × 40.

Recognise that prime numbers have only two factors. Use knowledge of multiplication and division facts to determine, say, that 47 is prime and that 51 is not prime. Find the prime factors of a two-digit number and use tests of divisibility to decide whether a number such as 342 is divisible by 2, 3, 4, 5, 6, 9 or 10. Use knowledge of inverse operations and estimation skills to check results.

Apply knowledge of multiplication and division facts to multiplication and division of two-digit numbers, including decimals such as 5.6 or 0.56. Use knowledge of place value to multiply and divide whole numbers and decimals by 1000, 100 or 10, and by multiples of these, and explain the effect.
Recognise, for example, that 25 × 0.3 is equivalent to 25 × 3 ÷ 10.

Use calculators to explore, for example, the effect of multiplying and dividing whole numbers by a positive number greater than 1 and a positive number less than 1.

Assessment for Learning (AfL)

See primary framework planning tools - AfL questions within the relevant units www.standards.dfes.gov.uk/primaryframeworks/mathematics/planning/Year6/relationships/Unit1/

Vocabulary

calculate, calculation, equation, operation, symbol, inverse, answer, method, strategy, explain, predict, reason, reasoning, pattern, relationship, decimal, decimal point, decimal place, estimate, approximate, pound (£), penny/pence (p), units of measurement and abbreviations, degrees Celsius
lots of, groups of, times, multiplication, multiply multiplied by, multiple of, product, once, twice, three times, four times, five times... ten times times as (big, long, wide, and so on), repeated addition, array, row, column, double, factor, inverse, integer

Test Questions

Some children do a sponsored walk. Jason is sponsored for £3.45 for each lap. He does 23 laps. How much money does he raise?
Lynne wants to raise £100. She is sponsored for £6.50 for each lap. What is the least number of whole laps she must do? KS2 1997 Paper B Level 4

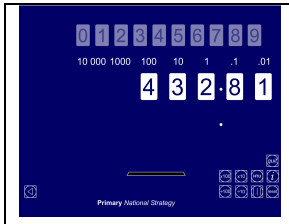
Four biscuits cost twenty pence altogether.
How much do twelve biscuits cost?
KS2 2005 Mental Test Level 4

Explain why 16 is a square number.
Y5 Optional Test 1998 L3

Multiply seven by nought point six.
KS2 2003 Mental Test L4

What is the next square number after thirty-six?
Y7 Progress Test 2005 L4

What is nought point four multiplied by nine? KS2 2005 Mental Test Level 4



Moving Digits ITP

Written Methods

Use a secure, reliable method of written calculation for each operation. Recognise when one method is more efficient than another, for both whole and decimal numbers.
Continue to check first if a mental method will work and then decide which method is most appropriate. Check results by rounding to approximate answers.

Use efficient written methods to multiply two- and three-digit whole numbers and decimals by one-digit whole numbers, and to multiply two- and three-digit whole numbers by two-digit numbers. Continue to approximate first and to check answers. Explain the method used and the steps involved.

The Grid Method

5.65 × 9 (estimate: 6 × 9 = 54)

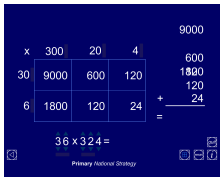
×	5	0.6	0.05	
9	45	5.4	0.45	50.85

Answer: $5.65 \times 9 = 50.85$

4.92 X 3 (Approximately 5 x 3)

x	4.0	0.9	0.02	
3.0	12.0	2.7	0.06	

12.0
2.7 +
0.06
14.76



Multiplication Grid ITP

Year 6+ — Calculating strand: MULTIPLICATION

COULD End of year expectations in bold

Recognise the square roots of perfect squares to 12 × 12 (Y6/7)

Recognise and use multiples, factors, divisors, common factors, highest common factors and lowest common multiples in simple cases(Y6/7)

Pupil learning outcomes (changes depending on unit) e.g.:

Understand how the commutative, associative and distributive laws, and the relationships between operations, including inverse operations, can be used to calculate more efficiently; use the order of operations, including brackets(Y6/7)

Consolidate and extend mental methods of calculation to include decimals, fractions and percentages(Y6/7)

Rules & Laws of arithmetic summary – see guidance paper 'methods of calculation' for more detail

Rules of arithmetic	Instructions	Examples
Brackets	Always carry out first any calculations that are within brackets	40 – (3 + 2) = 40 – 5 = 35 20 ÷ (18 – 13) = 20 ÷ 5 = 4
Multiplication and division	After working out those calculations in the brackets do the multiplication and division calculations next before addition and subtraction. If the expression involves only multiplication and division calculations work from left to right or reorder moving a number with its associated operation.	5 x 2 – 8 ÷ 2 = 10 – 4 = 6 9 x 8 ÷ 3 = 72 ÷ 3 = 24 9 x 8 ÷ 3 = 9 ÷ 3 x 8 = 3 x 8 = 24
Addition and subtraction	Finally do the addition and subtraction calculations. If the expression involves only addition and subtraction calculations work from left to right or reorder moving a number with its associated operation.	25 + 19 – 11 – 18 = 44 – 11 – 19 = 33 – 19 = 14 25 + 19 – 11 – 18 = 25 – 11 + 19 – 18 = 13 + 1 = 14
Laws of arithmetic	**Description**	**Examples**
Commutative laws for addition and multiplication	When adding two numbers the order of the numbers can be reversed. When multiplying two numbers the order of the two numbers can be reversed.	4 + 18 = 18 + 4 5 x 7 = 7 x 5
Associative laws for addition and multiplication	When adding three or more numbers any adjacent pair of numbers can be added first. When multiplying three or more numbers, any pair of adjacent numbers can be multiplied together first.	3 + 6 + 4 = (3 + 6) + 4 = 3 + (6 + 4) 3 x 4 x 5 = (3 x 4) x 5 = 3 x (4 x 5)
Distributive laws for multiplication and division over addition and subtraction	When a sum or difference is being multiplied by a number, each number in the sum or difference can be multiplied first and the products are then used to find the sum or difference. When a sum or difference is being divided by a number, each number in the sum or difference can be divided first and the dividends are then used to find the sum or difference.	(30 + 8) x 7 = (30 x 7) + (8 x 7) (30 – 3) x 9 = (30 x 9) – (3 x 9) (20 + 8) ÷ 4 = (20 ÷ 4) + (8 ÷ 4) (60 – 12) ÷ 3 = (60 ÷ 3) – (12 ÷ 3)

Test Questions

Six times a number is three thousand. What is the number?
KS2 2005 Mental Test Level 5

Write in the two missing digits.
□0 × □0 = 3000
KS2 2002 Paper A Level 5

Circle two different numbers which multiply together to make 1 million.
10 100 1000 10 000 100 000
KS2 2000 Paper A Level 5

Write the three missing digits.
□□ × □ = 371
KS2 1997 Paper B Level 5

The same number is missing from each box.
Write the same missing number in each box.
□ × □ × □ = 1331
KS2 1999 Paper B Level 5

Estimate the value of nine point two multiplied by two point nine.
KS3 2005 Mental Test Level 6

Kim knows that
137 × 28 = 3836
Explain how she can use this information to work out this multiplication.
138 × 28
KS2 1997 Paper A Level 5