Calculation in Multiplication

Tools to support

- Number lines
- Bead strings
- Arrays
- Arrow cards
- Objects/ counters
- Straws
- Hundred/ multiplication squares
- Dienes/multilink

Key Vocabulary

Times, lots of, groups of, sets of, product, multiply, factors, multiples, inverse

What is… lots of…?

Context

- Money
- Measures
- Decimals
- Percentages

Teaching points

- As with every operation teaching each step alongside apparatus is essential.
- A3 grids are useful for teaching grid method so children can physically multiply the objects.
- Estimate and check- Children need to routinely use these skills when calculating to ensure they consider the reasonableness of their answers. Checking could either be using the inverse operation or using an alternative method they are more confident with.
- When moving to multiplication of decimals teachers will need to decide whether it is appropriate to teach children to multiply the decimal out or whether their understanding of place value is secure enough to allow them to complete this without removing the decimal.
- The numbers used in calculations need to be appropriate for the learner e.g. initially we would give numbers that involve the tables children are more confident with to allow them to succeed.
- If children are multiplying decimals they must ensure they lay out the calculation carefully ensuring the decimal point is always lined up. Using the expanded method is helpful here as the children need to record the calculation for each step.

Errors/misconceptions

- Not recognising that if you know 9 x 4 you also knows 4 x 9, 36 ÷ 4 and 36 ÷ 9.
- Thinking of multiplying by 10 as adding a 0 instead of the number being 10 times bigger. Showing children how the number changes on a place value grid can support this.
- Assuming multiplying always makes things bigger (children find it difficult to understand that multiplying by ½ makes things smaller).
- Children making errors when multiplying decimals if their understanding of decimal place value is not secure. (Children should multiply out the decimal if they are not secure in multiplying decimals)

End of year expectations

EOY3: TU X U

EOY4: TUX U HTU XU formal strategy

EOY5: ThHTU X U ThHTU X TU

EOY6: ThHTU x U using long and decimals

Apparatus will be needed with each of these methods up to and including short multiplication when first introducing them.

Drawing Arrays

Drawing an array provides children with an image of the answer as well as seeing the commutative law of multiplication 3 x 4 = 4 x 3

xxxx xxx
xxxx xxx
xxxx xxx
xxx

3x4

4x3

Partitioning when using larger numbers on an array e.g. 3 x 14

xxxxxxxxxx | xxxx
xxxxxxxxxx | xxxx
xxxxxxxxxx | xxxx

3 x 10 =30 3x4 =12
30+12=32

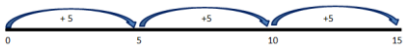
Once confident children can begin to use an empty grid to represent their array. This will help them to move onto the grid method in multiplication and can be used in division as preparation for chunking.

	3
4	12

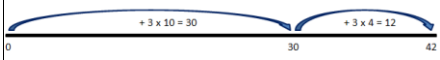
	3
10	30
4	12

Number line

3 x 5 or 3 lots of 5



Partitioning when using larger numbers on a number line e.g. 3 x 14



Partitioning

Children must be secure with their multiplication facts in order to do this effectively.

23 x4 =92

20 x 4 = 80
3 x 4 = 12

Column addition is then used to add these numbers together.

TU
80
+12
92

Grid Method

This is a more efficient model to use as we can calculate the area of the separate rectangles and then add them up using column addition.

e.g. 23 x 4

x	20	3
4	80	12

e.g. 23x54

TU
80
+12
92

x	20	3
50	1000	150
4	80	12

e.g. 4.94 x 3

Th H T U
1 000
150
80
+ 12
1242

x	4	0.9	0.04
3	12	2.7	0.12

T U . t h
12.00
2.70
+ 0.12
14.82

Expanded short multiplication

The links to the grid method are highlighted when modelling this method. Children describe what they do by referring to the value of the digits in the columns.

e.g. 23 x 4

H T U
2 3
X 4
1 2 (4 x 3)
+ 8 0 (4 x 20)
9 2

342 x 7

Th H T U
3 4 2
X 7
1 4 (7 X 2)
2 8 0 (7 X 40)
2 1 0 0 (7 X 300)
2 3 9 4

4362 X 6

TTh Th H T U
4 3 6 2
X 6
1 2 (6 x 2)
3 6 0 (60 x 6)
1 8 0 0 (300 x 6)
2 4 0 0 0 (4000 x 6)
2 6 1 7 2

4.94 X 3

T U . t h
4 . 9 4
x 3
0 . 1 2 (3 x 0.04)
2 . 7 0 (3 x 0.9)
+1 2 . 0 0 (3 x 4)
1 4 . 8 2

Short Multiplication

e.g. 23 x 4

T U
2 3
x 4
9 2

342 x 7

Th H T U
3 4 2
x 7
2 3 9 4

4362 x 6

TTh Th H T U
4 3 6 2
X 6
2 6 1 7 2

4.94 x 3

T U . t h
4 . 9 4
x 3
1 4 . 8 2

Expanded Long Multiplication

e.g. 54 x 23

Th H T U
5 4
x 2 3
1 2 (3 x 4)
1 5 0 (3 x 50)
8 0 (20 x 4)
+ 1 0 0 0 (20 x 50)
1 2 4 2

23 x 4.9

H T U . t h
2 3 .
x 4 . 9
2 . 7 (0.9 x 3)
1 8 . 0 (0.9 x 20)
1 2 . 0 (4 x 3)
8 0 . 0 (4 x 20)
1 1 2 . 7

Long Multiplication

Th H T U
5 4
x 2 3
1 6 2
1 0 8 0
1 2 4 2

HTh TTh Th H T U
4 3 6 2
x 2 6
2 6 1 7 2
8 7 2 4 0
1 1 3 4 1 2

H T U . t h
2 3 .
x 4 . 9
2 0 . 7
9 2 . 0
1 1 2 . 7

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