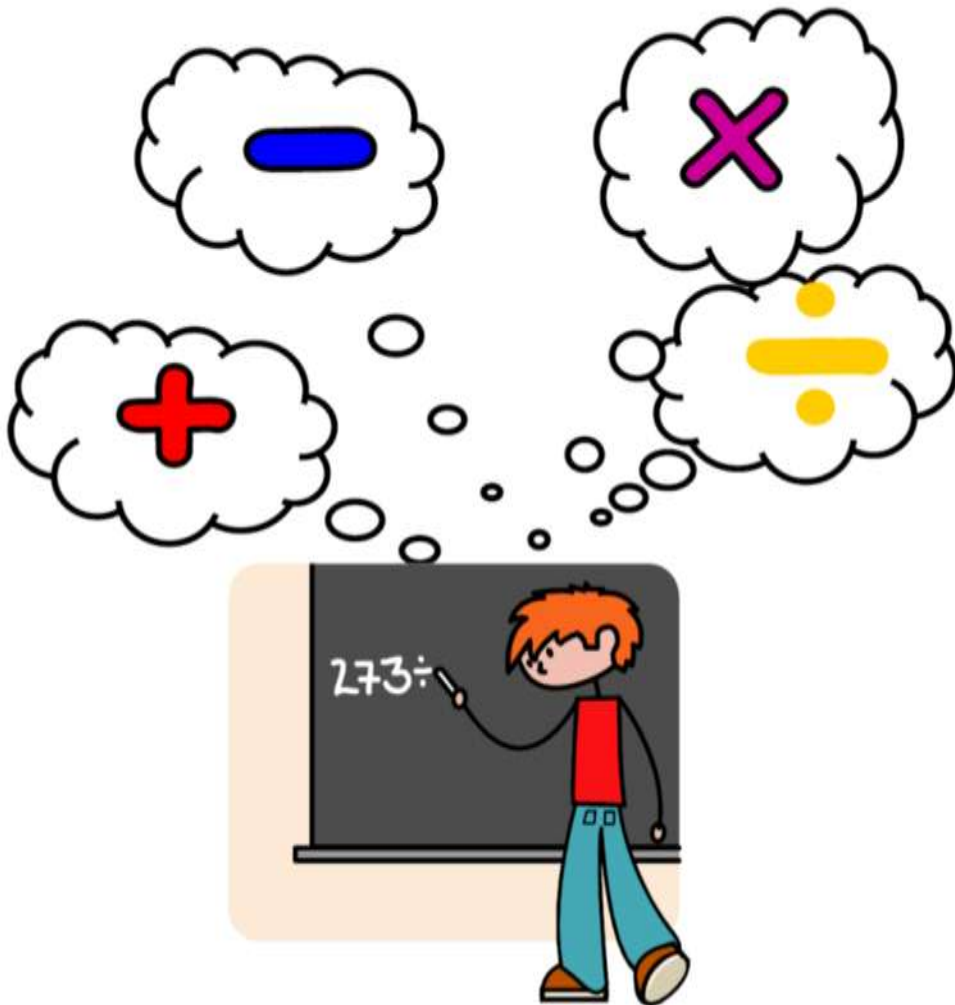


**BENTON DENE PRIMARY SCHOOL
MATHEMATICS**

PROGRESSION IN WRITTEN CALCULATIONS



**CALCULATION : MULTIPLICATION
(WRITTEN METHODS)**
Reviewed: November 2016 - L Gallagher

PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATION

MENTAL CALCULATIONS

(ongoing)

These are a **selection** of mental calculation strategies:

Doubling and halving

Applying the knowledge of doubles and halves to known facts.

e.g. 8×4 is double 4×4

Using multiplication facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2 2 times table
 5 times table
 10 times table

Year 3 2 times table
 3 times table
 4 times table
 5 times table
 8 times table
 10 times table

Year 4 Derive and recall all multiplication facts up to 12×12

Years 5 & 6 Derive and recall quickly all multiplication facts up to 12×12

Using and applying division facts

Children should be able to utilise their tables knowledge and place value understanding to derive other facts.

e.g. If I know $3 \times 7 = 21$, what else do I know?

$30 \times 7 = 210$, $300 \times 7 = 2100$, $3000 \times 7 = 21\ 000$, $0.3 \times 7 = 2.1$ etc

Use closely related facts already known

$13 \times 11 = (13 \times 10) + (13 \times 1)$
 $= 130 + 13$
 $= 143$

Multiplying by 10 or 100

Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left.

Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Partitioning

$$\begin{aligned}23 \times 4 &= (20 \times 4) + (3 \times 4) \\ &= 80 + 12 \\ &= 102\end{aligned}$$

Use of factors

$$8 \times 12 = 8 \times 4 \times 3$$

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

MULTIPLICATIVE PROPERTIES OF NUMBER

Y4: pupils recognise factor pairs and use commutative law in mental calculations

Y5: pupils recognise factors, common factors, prime numbers, square and cube numbers.

Y6: common multiples are explored

PROBLEM SOLVING

Y1: one step problems using concrete materials

Y2: arrays, repeated addition problems in context

Y3: missing number problems related to \times and \div

Y4: use of the distributive law for multiplication eg $3 \times (2 + 4) = 3 \times 2 + 3 \times 4$

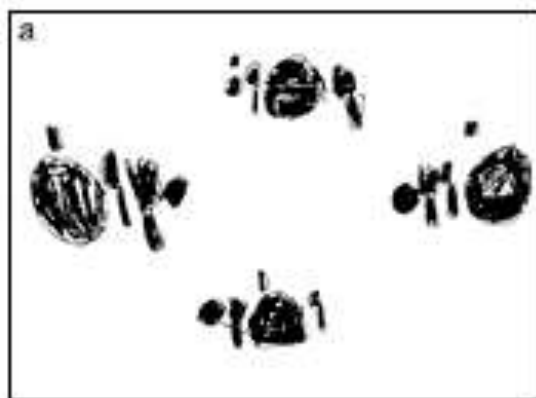
Y5: use knowledge of factors, squares, multiples and cubes. Problems involve simple scaling and may be two step.

Y6: multi-step \times and \div problems.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE. CONTINUE TO USE PRACTICAL MATERIALS ALONGSIDE STANDARD WRITTEN METHODS. THESE ARE EXEMPLIFIED IN THE VISUAL CALCULATIONS POLICY.

YR and Y1

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Y2

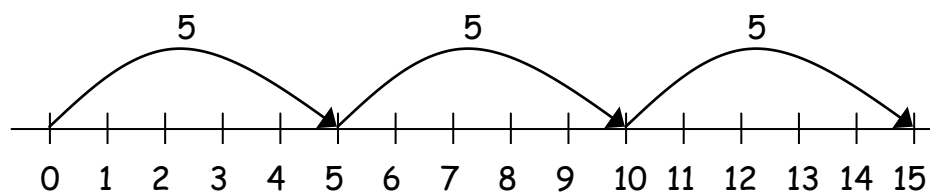
Children will calculate multiplication within learned tables and use \times , \div and $=$ signs. Children will develop their understanding of multiplication and use jottings to support calculation:

✓ Repeated addition

3 times 5 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3

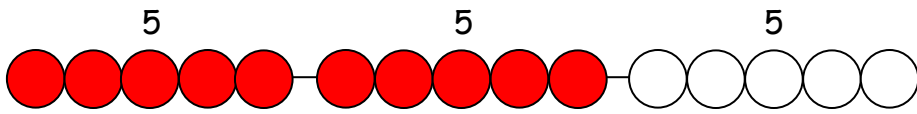
Repeated addition can be shown easily on a number line:

$$5 \times 3 = 5 + 5 + 5$$



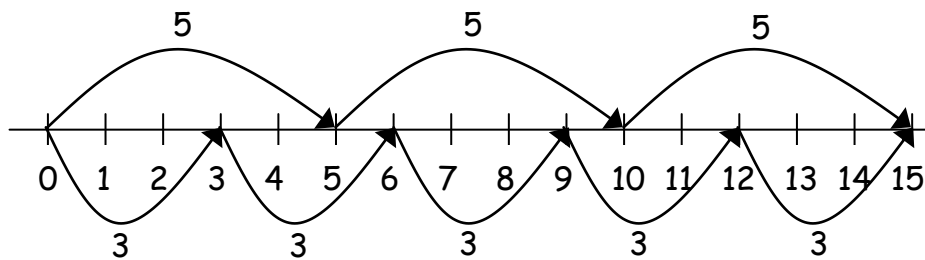
and on a bead bar:

$$5 \times 3 = 5 + 5 + 5$$



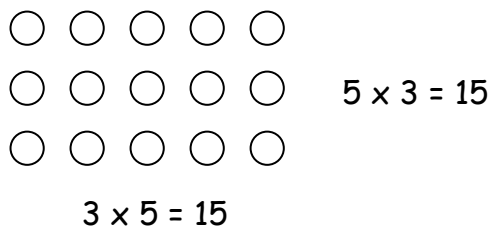
✓ **Commutativity**

Children should know that 3×5 has the same answer as 5×3 . This can also be shown on the number line.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



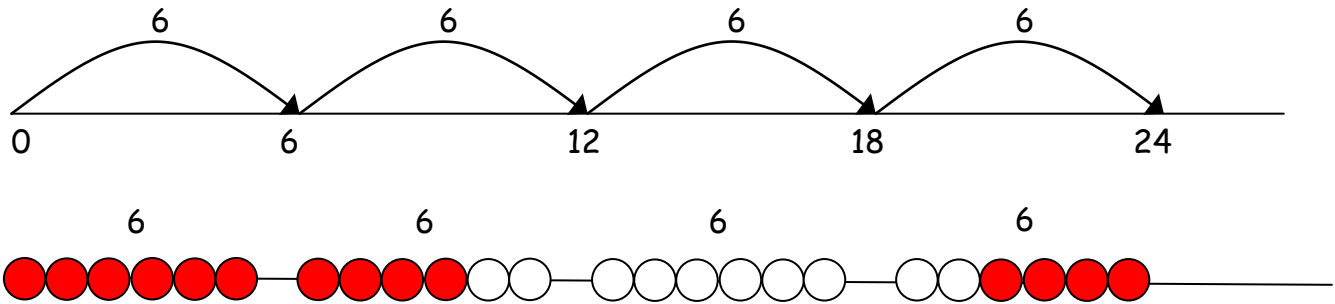
Y3

Children will continue to use:

✓ **Repeated addition**

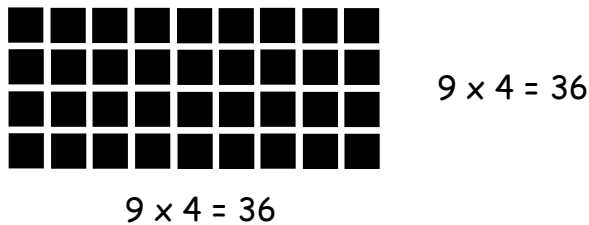
4 times 6 is $6 + 6 + 6 + 6 = 24$ or 4 lots of 6 or 6×4

Children should use number lines or bead bars to support their understanding.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



Children will also develop an understanding of

✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon



✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

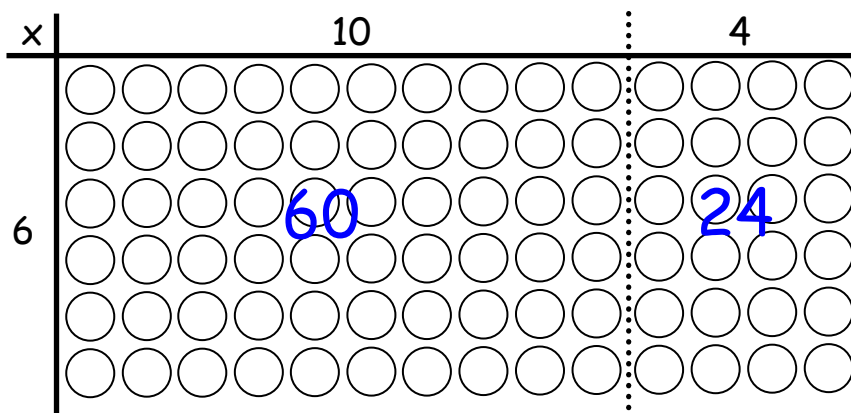
$\square \times 5 = 20$ $3 \times \triangle = 18$ $\square \times \circ = 32$

✓ **Partitioning**

$38 \times 5 = (30 \times 5) + (8 \times 5)$
 $= 150 + 40$
 $= 190$

Y4

Children will continue to use arrays where appropriate leading into the formal method of multiplication.



$$(6 \times 10) + (6 \times 4)$$

$$60 + 24$$

$$84$$

TU x U HTU x U

(Short multiplication - multiplication by a single digit)

$$23 \times 8$$

Children will approximate first

23×8 is approximately $25 \times 8 = 200$

$$\begin{array}{r} 23 \\ \times 8 \\ \hline 184 \\ 2 \end{array}$$

$$\begin{array}{r} 123 \\ \times 8 \\ \hline 984 \\ 12 \end{array}$$

Y5

Formal method of multiplication is extended:

HTU x U

(Short multiplication - multiplication by a single digit)

$$346 \times 9$$

Children will approximate first

$$346 \times 9 \text{ is approximately } 350 \times 10 = 3500$$

$$\begin{array}{r} 346 \\ \times 9 \\ \hline 3114 \\ \hline \end{array}$$

TU x TU

(Long multiplication - multiplication by more than a single digit)

$$72 \times 38$$

Children will approximate first

$$72 \times 38 \text{ is approximately } 70 \times 40 = 2800$$

$$\begin{array}{r} 72 \\ \times 38 \\ \hline 576 \\ 2160 \\ \hline 2736 \\ \hline \end{array}$$

Using place value knowledge, they will be able to multiply decimals with one decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.

e.g. 4.9×3

Children will approximate first

4.9×3 is approximately $5 \times 3 = 15$

$$\begin{array}{r} 4.9 \\ \times 3 \\ \hline 14.7 \\ 2 \end{array}$$

Y6

ThHTU \times U

(Short multiplication - multiplication by a single digit)

4346×8

Children will approximate first

4346×8 is approximately $4346 \times 10 = 43460$

$$\begin{array}{r} 4346 \\ \times 8 \\ \hline 34768 \\ 2 3 4 \end{array}$$

ThHTU × TU

(Long multiplication - multiplication by more than a single digit)

$$2496 \times 13$$

Children will approximate first

$$2496 \times 13 \text{ is approximately } 2500 \times 10 = 25000$$

$$\begin{array}{r} 2496 \\ \times 13 \\ \hline 7488 \\ 24960 \\ \hline 32448 \\ 111 \end{array}$$

Using place value knowledge, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.

For example:

$$4.92 \times 3$$

Children will approximate first

$$4.92 \times 3 \text{ is approximately } 5 \times 3 = 15$$

$$\begin{array}{r} 4.92 \\ \times 3 \\ \hline 14.76 \\ 2 \end{array}$$

Short multiplication

24 × 6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

Answer: 144

342 × 7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ 21 \end{array}$$

Answer: 2394

2741 × 6 becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ 42 \end{array}$$

Answer: 16 446

Long Multiplication

24 × 16 becomes

$$\begin{array}{r} 2 \\ 24 \\ \times 16 \\ \hline 240 \\ 144 \\ \hline 384 \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{r} 12 \\ 124 \\ \times 26 \\ \hline 2480 \\ 744 \\ \hline 3224 \\ 11 \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{r} 12 \\ 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ 11 \end{array}$$

Answer: 3224

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to approximate their answers before calculating. Practical materials should be used with all ages and abilities **ALONGSIDE** written methods (VAK learning).

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.